

**MAPPING AND AUDIT OF INFORMATION AND
COMMUNICATION TECHNOLOGIES IN LIBRARY AND
INFORMATION SCIENCE EDUCATION
IN SUB-SAHARAN AFRICA**

By

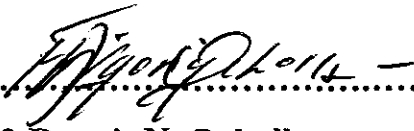
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2004

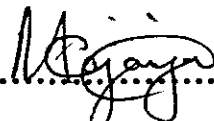
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Declaration

I declare that this study, "Mapping and Audit of Information and Communication Technologies in Library and Information Science Education in Africa" is my own work both in conception and execution. All information that was used has been duly acknowledged in the text and references.

Signed:  21 March 2004
Mabel Khayisia Minishi-Majanja

Acknowledgements

This work would not have been successfully completed without the assistance of:

- My Promoter, Prof. Dennis N. Ocholla, for his unfailing and illuminative guidance, encouragement and dedication.
- Moi University for granting me study leave, and for financial support for the field work.
- All the Respondents to this study, for their enormous goodwill, professionalism and questionnaire-friendliness, in responding to such a lengthy questionnaire.
- Prof. Le Roux (DLIS) and Mr. Mthembu (Department of Geography) for invaluable specialized assistance with various sections of the research.
- Mrs. Mostert, Mrs. Johnstone, Ms. Dube, for their constant support and encouragement throughout the study, and for making me feel like a member of the department.
- Dr. Ikoja-Odongo of Makerere University and my colleague, Mr. Kiplang'at for their relevant and constructive comments and discussions. Thank you for letting me bounce-off my thoughts and ideas on you.
- Empangeni Methodist Church, my spiritual during my studies in South Africa.
- Terence, who humbly relocated and persevered with my two years absence, my brothers and sisters, especially Oliver Minishi and his family, for their love and support, ACEAN, and the Gundu family for timely services rendered.

Dedication

TO GOD BE THE GLORY, GREAT THINGS HE HAS DONE.

“Great is His faithfulness, morning by morning new mercies I see. All I have needed His hand has provided. Great is the faithfulness of the Lord unto me.”

and

To my late father, Festo Minishi and my late mother, Elizabeth Lusanji

ABSTRACT

The aim of this study was to map and audit the types, nature and diffusion of ICTs in LIS education and training programmes in sub-Saharan Africa. The study largely applied quantitative research method whereby a descriptive survey was conducted, using the questionnaire and content analysis techniques. Questionnaires were sent to 51 LIS schools in 19 countries of sub-Saharan Africa and 29 (57%) were returned. Thirteen (45%) of the responses were from Southern Africa, 11 (38%) from Eastern Africa and 5 (17%) from West Africa. The anticipation of the study to include North Africa, Central Africa and a larger representation from West Africa was not fully fulfilled because of time, communication and logistical constraints. Electronic mail was the major medium of communication between the researcher and respondents.

The study found out firstly that a wide variety of ICT competencies have been incorporated in LIS curricula and most of the ICT modules are core. LIS schools offer ICT modules covering general ICT knowledge, information storage and retrieval, network technologies, communication technologies and library management technologies. Specific modules that are offered in 90% of the LIS schools include Hardware and Software Selection, Operating Systems, General Applications Software, Local Area Networks and Intranets. Modules that do not rate highly include Software Engineering, Distributed Systems and Broadcasting Technologies. However, most LIS schools fail to achieve a balance or combination of theory and practical teaching of the modules. Secondly, although all LIS schools have computers or access to computers, a majority do not have adequate quantities or appropriate quality of computers. Most students (55%) share a computer with six or more colleagues and in the worst case, one computer is shared by 108 students. Hardware is obsolete in many (52%) LIS schools, thus incapable of handling new/powerful software and complex operations. But a majority of LIS schools have access to electronic databases and other ICT supported information resources including the Internet, CD-ROM services, electronic document delivery services, library networks and subject gateways. Thirdly, ICT application in teaching and learning has increased but the use is still largely supplemental to traditional

teaching methods and learning styles. Very few LIS schools offer online education and where offered, it is highly selective of programmes and modules. Inadequate knowledge and skills by academic staff, combined with inadequate resources have made it difficult for the full power of ICTs as instructional technology to be exploited. ICT use in research is only partial/sometimes and hence not exploiting the full potential of ICTs, especially for collaborative research and electronic publishing of research results. However, academic administration is computerized and approximately half the activities are conducted online. Fourthly, there is generally a lack of ICT policies at institutional and national levels to map the direction and benchmark the development of ICTs. Comprehensive and reliable ICT policies are lacking in most (62%) institutions and the fragmented policies found in 41% of the institutions do not provide a stable base and plan for diffusion of ICTs. Additionally, the ICT infrastructure both at institutional and national levels is inadequate in most countries thus affecting Internet connectivity, information flow/traffic and general access to the full range and power of ICTs. Moreover, the competence of academic staff and students is a constraint and often requires extra sessions to be organized to provide both ICT literacy and advanced skills. Lastly, other factors impeding increased and rapid diffusion of ICTs in LIS education in sub-Saharan Africa as reflected in the findings include: poor funding levels within tertiary and higher education institutions resulting in unsustainable ICT projects, inappropriate software due to obsolescence and cost of updates, lack of ICT knowledge (epistemological access) among students because of poor ICT background in schools and home, and underutilization caused by inadequate expertise by academic staff and insufficiencies of technical support staff in terms of skills and numbers.

The study notes that LIS education in sub-Saharan Africa needs to be relevant, visible and competitive in an increasingly globalised and online/networked world. It is recommended that, firstly, LIS schools should increase the amount of this practical component or hands-on practice when teaching ICT modules. Similarly, experimental learning that highly integrates the use of ICTs should be emphasized. Secondly, the use and application of the full range of ICT as tools for teaching/learning be increased in LIS education in sub-Saharan Africa and efforts must be made to offer more online

classes/courses/programmes. Thirdly, LIS schools must strive to improve the levels of access to computers and the Internet for academic staff, and offer opportunities for their training and re-skilling, but it is also strongly suggested that LIS academic staff develop a positive attitude towards ICT-induced changes in approaches, techniques and skills of teaching. Fourthly, students be made cognizant of the changes in the educational and work environments, and given all possible opportunities to take advantage of ICTs for their personal career growth. LIS schools should strive to provide the facilities and guidance for students. Fifthly, LIS departments need to lobby, together with other academic units within their institutions, to gain greater access to Internet resources for academic research and modern learning dispensation. At the same time, academic staff and students should be encouraged to exploit ICTs for their research needs and activities. Sixthly LIS schools should jointly add their voice to efforts being made by other professional ICT interest groups such as African Information Society Initiative (AISII), national ICT groups/societies and other stakeholders, to lobby for improved ICT policies and infrastructure in their institutions and countries. Lastly, the study recommends further and qualitative research to reveal the entire extent to which ICTs have diffused into LIS education in Africa, focusing on quality/standards and user studies

It is concluded that ICTs are widely viewed as fundamental agents for narrowing the gap between the developed/information rich and the less-developed/information poor countries/environments, by providing the capabilities which could allow the less developed countries to "leap-frog" development, and hence tackle many social and economic problems. While this may be so, the ability for countries in sub-Saharan Africa to exploit existing and available ICT products effectively depends on there being infrastructure, planning and qualified people, among other things, who can effectively harness the benefits of the technology. It is noted that Africa itself is a very diverse entity and the differences among countries in their economies, levels of education, languages, underlying cultures, and historic associations, all have considerable effect on the likely success in the uptake of a new technology. Thus the analysis of this immensely complex scene can only be done from a perspective of limited experience and inevitable subjectivity.

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Glossary and Notes

Information and Communication Technologies (ICTs) is a compound term used to describe the convergence of new technologies that use electronic means of capturing, processing, storing and communication information based on digital representation. These technologies encompass computer hardware, software, communication links and networks. They also include intermediate technology based largely on analogue representation held in electromagnetic waves such as radio, television, telephone and facsimile.

ICTs audit refers to the assessment of information and communication technologies held by an agency or organisation.

ICTs mapping is the systematic inventory and visual presentation of information and communication technologies in an agency or organisation.

Instructional Technology. A general term that includes the use of educational hardware and software for achieving specific objectives in the classroom (Rosenberg & Elsbree, 1989)

Internet Data distribution (IDD). A system of disseminating near real time earth observations via the Internet. A unique and decentralised system built by the Unidata community of more than 150 universities, IDD in some ways resembles a data broadcast system built on point-to-multipoint communications. Unlike other systems which are based on data centres where information can be accessed, this uni-data IDD is designed so as to enable universities to request for certain data sets to be delivered to computers at their site as soon as they (data sets) are available from an observing system. The IDD system also allows any site with access to specialised observations to inject the data set into the IDD for delivery to other interested sites (Domenico, 1995).

Library and Information Science (LIS) is a discipline that encompasses the study and analysis of sources, development, collection, dissemination, use, evaluation and management of information in all its forms, including the channels and technologies that are used to communicate it.

LIS schools is used in this study to refer to departments, facultiesinstitutes or schools within a university, college or other tertiary institution, that provides formal programmes in the education and/or training of library and/or information science professionals/paraprofessionals.

ProLISSA/DISSANet - Progress in Library and Information Science in Southern Africa / Development of Information Science in South Africa Network. *For conference proceedings and further information, see: <http://www.dissanet.com>.*

University of Zululand **DLIS-LISA** (Department of Library and Information Science / Library and Information Students Association) conference. *For proceedings and further information see the department web page at: <http://www.uzulu.ac.za>*

Abbreviations and Acronyms

AAU	Association of African Universities
AISI	African Information Society Initiative
AJOL	African Journals On-Line
AVU	African Virtual University
CD-ROM	Compact Disc – Read Only Memory
CDS/ISIS	Computerized Documentation Systems / Integrated Set of Information Systems
CIDA	Canadian International Development Agency
CLNAT	Creating Learning Networks for African Teachers
DANIDA	Danish International Development Agency
DfID	Department for International Development (UK)
DLIS-LISA	Department of Library and Information Science - Library and Information Students Association
DSL	Digital Subscriber Line
DTP	Desk Top Publishing
GII	Global Information Infrastructure
HEI(s)	Higher Education Institution(s)
HITD-A	Harnessing Information Technology for Development (Africa) Project
HTML	HyperText Mark-up Language
ICT(s)	Information and Communication Technology(ies)
IDD	Internet Data Distribution
IDRC	International Development Research Centre
IMF	International Monetary Fund
INASP	International Network for the Availability of Publications
IPS	Inter press Service
ISDN	Integrated Services Digital Network
ISP(s)	Internet Service Provider(s)
LAN(s)	Local Area Network(s)
LEEP	Library Education Experimental Program

LIS	Library and Information Science
NEPAD	New Partnerships for African Development
NICI	National Information and Communication Infrastructure
PANA	Pan African News Agency
RICI	Regional Information and Communication Infrastructure
SICI	Sectoral Information and Communication Infrastructure
SIDA	Swedish International Development Agency
SPSS	Statistical Package for the Social Sciences
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
UTP	Unshielded Twisted Pair (cables)
VICI	Village Information and Communication Infrastructure
VOIP	Voice Over Internet Protocol
VSAT(s)	Very Small Aperture Terminal(s)
WAN(s)	Wide Area Network(s)
WWW	World Wide Web
XML	Extensible Mark-up Language

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Chapter One

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 CONCEPTUAL SETTING

Information and Communication Technologies (ICTs) are perceived as key catalysts in current and future social and organisational change. Information and Communication Technology (ICT) is a compound term that is used to refer to the convergence of a wide array of new technologies presently being developed and used in the creation, processing and transmission of information. Broadly, these technologies encompass all aspects of data/information recording, handling and transmission, and include computers, telecommunications, satellites, fibre optics, video-based multimedia applications, automated speech outputs, electronic broadcast technologies. The United Nations Economic Commission for Africa (UNECA) views ICTs as a combination of equipment, services and activities such as *internet services provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services and other information related activities* (Adeya, 2001). ICTs are “embedded in networks and services that affect local and global flow and accumulation of knowledge” (Adeya (2001:3). The combination of any two or more of these multifaceted elements that form these technologies results in a conglomeration that offer fast and attractive information handling capabilities. For instance, the Internet with its World Wide Web platform, facilities and tools for information exchange, networked with electronic publishing and knowledge management services such as intelligent gateways, epitomise the power of ICTs. ICTs are characterised by high-speed communication and capabilities for handling vast amounts of information and traffic at the same time.

Johnston (2001) observes that ICTs are shrinking the traditional barriers of time and space while at the same time increasing the rate of growth of the amount of knowledge. Besides, the increasing range of human knowledge can be transmitted faster, in bigger bulk and easier than before, making human endeavour, in all spheres, seem limitless. In

organisations, ICTs have become an important ingredient in organisational competitiveness as ICT resources increasingly get linked to the overall organisational strategy such as ICT-related decision-making in corporations. In the current information-driven economy, ICTs are considered to be power tools for the information/knowledge industry because they are more efficient economic substitutes for labour or the older technologies. The United Nations Development Programme refers to ICTs as a “powerful enabler of development” (UNDP, 2001: section 2.1.1) because of the significant impact on the economic, scientific, academic, social, political, cultural and other aspects of life. Additionally, ICTs are increasingly influencing values, principles and activities, of diverse groups of people including those in higher education and Library and Information Science (LIS) education.

1.1.1 ICTs and LIS Education

The changing patterns of higher education are significant for LIS education because LIS education is inherently a higher education agent. As part of the higher education sector, LIS education must strive to be competitive and up-to-date with global trends. Higher education as a sector, has embraced ICTs, which are seen not only as an impetus of change in traditional concepts of teaching and learning, but also as prime motivations behind the higher education change as the interplay of technological developments and socio-economic change, shape the processes of teaching and learning (Johnston, 2001). Consequently, there has arisen a string of new concepts/phrases in educational circles such as e-learning, web-based education, virtual learning (environments), ICT-assisted education, on-line learning, Computer-Based Instruction (CBI), digital education, etc., as well as the redefinition of older concepts such as work-based learning and distance education. According to Rich, Robinson and Bednarz (2000:264), many benefits arise from the use of ICTs in higher education including: improved learning process and enhanced educational outcomes, more flexible delivery and greater access to education, improved administration of courses, greater resource sharing and potentially reduced costs, and creation of a variety of managerial, commercial and strategic opportunities.

Edwards (1997) observes that within the higher education sector, one of the environments most prone to technology as a force dictating change is in fact Library and Information Science (LIS). On the one hand, increasing globalisation of higher education and the consequent extension of competition beyond institutional, national and regional boundaries, make it important for LIS to improve the quality of education provided, take part in educational networks and develop innovative strategies in planning and administration of LIS education (Curry, 2000). On the other hand, ICTs are considered significant in the achievement of LIS educational goals/objectives and the fulfilment of the primary tasks of LIS schools by their (technologies') contribution to organisational strategic goals and competitiveness. LIS schools have to harness the opportunities offered by ICTs in teaching and learning. This is, 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. To achieve any of the above, LIS schools in Africa have to analyse and explore the range of institutional/national/regional and global initiatives that support the harnessing of ICTs for educational use and then strategise and adapt/adopt these initiatives in LIS education.

Among other strategies, these developments have meant that there is need for greater infusion of ICT knowledge and skills into LIS course content, as well as the diffusion of ICT competency into the learners/students for future career growth. ICT knowledge and skills, especially in network, communication and retrieval technologies, are essential for effective information service provision, particularly since the internet has become a major information resource that provides libraries and their users with access to vast amounts of information. And as distinctions continue to blur between telephones, television and computers (Curry, 2000), information professionals have to be able to navigate information networks competently so as to provide relevant services and materials for their users. LIS graduates are therefore expected to increasingly use ICTs on a continuing basis. 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. Lim

(1998) argues that LIS education curricula should be build around a 'virtual library' model, offering an integrated approach to modern information service provision because the Internet and all associated technologies are increasingly defining the domain of the information profession. Hence LIS curricula must include sufficient content and practice on ICTs to prepare graduates to confidently provide enhanced information services and fit into new information handling roles. Conversely, LIS students need to enter LIS education programmes with some working level of technological competency so that LIS courses can concentrate on teaching the use and management of the technologies rather than starting to teach computer skills (Curry, 2000). Additionally, it is also desirable that LIS educators make competent use of ICTs as tools of content delivery, for research and for academic administration purposes. Thus ICTs can be perceived as amalgam of appropriate curricula, competent staff, able students and management that can strategically position LIS education to participate in the increasing globalisation of higher education.

1.1.2 ICTs for Globalisation of Higher Education

Globalisation refers to an extension beyond national borders, of the same market forces that have operated for centuries at all levels of human economic activity - promoting efficiency through competition, offering greater opportunity for people to tap into larger markets around the world (Government of Canada, 2002). Globalisation is said to describe the increased mobility of goods, services, labour, technology and capital throughout the world. Information and communication technology is viewed as one of the means of effecting global integration for social and economic development. The UNDP for instance, advises countries to take advantage of the potential of ICTs in improve the efficiency, accessibility and quality of education, especially by developing countries that wish to accelerate their social and economic development within a globalized economy (UNDP, 2001). The Government of Canada (2002) observes that although not a new development, the pace of globalisation has increased with the advent of technologies and can be perceived as a powerful force for poverty reduction as societies and economies integrate around the world.

However, an IMF publication (International Monetary Fund, 2000) entitled "Globalisation: threat or opportunity" argues that while some people view globalisation as a process that is beneficial - a key to future world economic development - inevitable and irreversible, others regard it with hostility and fear, believing that it increases inequality within and in between nations. This IMF report further explains that although globalisation offers extensive opportunities for true world development, the concept is not progressing evenly, thereby leaving some sectors, countries or regions even more underdeveloped. Some of the risks and challenges that impede uniform progress include the varied national levels of socio-economic development, sustainability of funding, formulation of visionary policies, and access to disenfranchised groups (Thapisa & Birabwa, 1998). The Government of Canada (2002) observes that despite the fact that international integration presents considerable opportunities for developing countries, the process also contains significant risks and concerns about increasing inequality, shifting power and cultural uniformity. For example, some of the necessary policies for integration are not easy for poor countries. These policies as identified by the Government of Canada (2002) include:

- Macroeconomic stability to create the right conditions for investment and saving;
- Outward oriented policies to promote efficiency through increased trade and investment;
- Structural reform to encourage domestic competition;
- Strong institutions and an effective government to foster good governance;
- Education, training, and research and development to promote productivity;
- External debt management to ensure adequate resources for sustainable development.

The implication of the above concerns is that the greatest gains of globalisation are made by developed countries, which have those relevant policies in place. Thapisa and Birabwa (1998) observe that globalisation under the current world order, which does not offer "level playing field", appears to endanger the fledgling industries of developing countries as they cannot compete with the established big industries from the developed countries, thus causing more economic imbalance and dependency. Thus ICTs, being one of the vital tools for effecting global integration, may also empower or disenfranchise further

the poor countries. Yet disconcertingly, even though poor countries have not been able to integrate quickly, it would be 'suicidal' for them to remain isolated by ignoring or rejecting globalisation trends.

These broad concerns of global integration are mirrored in higher education. Carnoy and Rhoten (2002) observe that there are five ways in which globalisation impacts education, namely in (a) financial terms i.e. reduction of public spending on education, (b) labour market terms i.e. governments to attract foreign capital using skilled labour, (c) educational terms i.e. increasing comparison of local education to international standards, (d) information technology terms i.e. introduction of ICTs to expand quantity, lower costs and improve quality of education, and (e) global networks terms i.e. transforming world culture, which may inherently result in marginalisation of some cultures. Mapped against policy guidelines mentioned earlier, the impact raises concerns for underdeveloped countries. In other words, even though educational changes, in response to globalisation, share the same defining parameters, there are variations across regions, nations and localities. These variations, including the nature and level of ICT exploitation, result in differentiated outcomes of higher education, whose significance can only be appreciated against a mapping and audit of the existing resources.

1.1.3 ICTs Mapping and ICTs Audit

The verb 'mapping' means to discover or give information about something, especially the way it is arranged or organised (Hornby, 2000). To 'audit' on the other hand is to examine the quality and/or standard of something (Hornby, 2000:63). The concepts of ICT mapping and audit can be understood from the more familiar concepts of information mapping and information audit as defined by Ellis, Barker, Potter and Pridgeon (1993).

1.1.3.1 Mapping

Information mapping refers to the 'exploration of information use and needs, and graphical representation of part(s) of an information system' (Ellis, Barker, Porter & Pridgeon 1993:149). Ellis et al (1993) argue that the idea of mapping is to discover the resources of an organisation as a factor of information resources management.

Information mapping is a methodology for creating effective business communication and documentation through the assessment of an organisation's current knowledge system, identification of areas for improvement and possible solutions, design or improvement of the knowledge system to meet organisational objectives, and assistance with the implementation of the knowledge system by providing content development services, skill transfer programmes, and implementation support services (Information Mapping Inc., 2002). According to Information Mapping Inc. (2002) the information mapping method can be used to help organisations capture organisational knowledge and develop high-quality, structured content. This may involve the design and development of operating procedures and best practices, policy manuals, system documentation, training materials, e-learning programs, and Web and intranet content and navigation structures.

According to Mapp (2002), mapping of information technology is important because of the value of IT to business management. Mapp (2002) argues that successful implementation of ICT strategy is often overwhelmed by the process itself because it focuses on technology for its own sake, instead of being governed by the fundamental business practices. He proposes a seven-initiative IT mapping strategy based on the practices:

- i. Aligning IT strategy with enterprise-wide business needs;
- ii. Instil business process principles in your IT department;
- iii. Optimizing IT applications and architecture;
- iv. Hiring, cultivating, and keeping the right team of people;
- v. Providing business solutions through relationship management;
- vi. Streamlining efficiencies across IT and
- vii. Improving customer satisfaction (Mapp, 2001, ¶ 3).

These IT mapping strategies lead to better development and use of the technology. Thus the mapping of ICTs in LIS education, which involves taking inventory of the ICTs in use, should result into an analysis of effective harnessing of ICTs in terms of professional LIS goals within the context of higher education in Africa.

1.1.3.2 Audit

Information auditing is the evaluation of an organisations information system (Ellis, Barker, Porter & Pridgeon 1993). The term “information audit” is generally understood to refer to needs analysis or assessment (Booth & Haines, 1993), but as Robertson (1994) explains, the word audit in modern sense has become synonymous with processes of discovery, checking, verification, compliance and control of a system. Generally, an audit surveys needs, assesses how internal systems meet these needs and develops prescription for greater effectiveness of a system. The purpose of an audit alludes to accountability and responsibility, focusing on determining the needs of a population and how well these needs are being addressed (St. Clair 1995). The objectives of an information audit include establishing major goals, determining needs, mapping of available resources and establishing constraints hindering the satisfaction of needs. The final product of an audit should be a record of decision-making chain which can be used in implementing change (Worlock, 1987).

In broad management sense, Ellis, Barker, Potter and Pridgeon, (1993) identify two types of auditing. One is compliance auditing which refers to the traditional idea of an audit of an organisation’s accounts, ensuring that procedures and standards are adhered to. The other is advisory auditing, which is more concerned with the appraisal of existing systems and practices i.e. assessment of appropriateness, problems and relationship of the audited entity to organisational goals. Information related audits tend to be of the latter type of auditing aiming at strategic planning rather than systems control. In the context of Library Science, LaRosa (1995:45) defines an information audit as “a systematic method of exploring and analysing where a library’s public are going strategically and determining the challenges and obstacles facing those publics.” Underwood (1994:59) observes that information auditing “offers a means of identifying tangible information resources in a commercial or non-commercial environment” and can assist in the building of information inventory and profile. He implies that information mapping can, therefore, be seen as one of the several techniques used in information audits, especially as a means of providing an accurate inventory of the resources. The audit results point to problems, issues, and opportunities and provide recommendations for how to address them.

An audit of ICTs involves systematic exploration, analysis and description of ICT strategies including the challenges encountered by organisations in the harnessing of these technologies. The objectives of a technology audit include determining infrastructural/systems needs, adequacy, integrity, security and cost effectiveness, so as to obtain a clear understanding of the strength of an organisation (DeNucci, 2002). This suggests that there is a set of desirable criteria against which the system is measured. Such criteria can be based on the state-of-the-art practices, internal needs or market forces. Whatever the criteria, the results of an IT audit can have far-reaching implications such as a major change in business operations. Suffice it to note here that an IT audit provides a clearer picture of the importance of IT to strategic organisational/business objectives, desirable technologies, the pros and cons of using certain/different technologies, obsolete attitudes, practices and procedures and also areas of high risk.

In addition to an IT audit, it is important to have a communications audit. A communications audit is often intended to provide a means of assessing the state of communication channels in an organisation. Ellis, Barker, Potter and Pridgeon (1993) underscore the importance of communications audit by observing that at functional level, effective communication is recognised as a motivation of the workforce while at research level, communication is a dependent variable of the systems approach, which can affect behaviour. By implication, a communications audit leads to the determination of strategic planning for an infrastructure and systems that best serve the objectives of an organisation. Conclusively, an ICTs audit combines the IT and communications components to form a desirable whole entity framework for present-day organisations that are increasingly dependent on ICT systems for the delivery of administrative functions, teaching, research and management.

With the ever-increasing dependence on ICT systems for higher education, it is important for higher education institutions to conduct regular ICT audits. Thus an audit of ICTs in LIS education in Africa involves establishing the current diffusion rate and infrastructural capacity and an analysis of their adequacy in supporting the needs and objectives of the profession.

1.2. CONTEXTUAL SETTING

The current world trend towards globalisation favours increased use of ICTs. Greater use of ICTs' at institutional, national, regional and international levels facilitates wider, faster and global exchange of information, education and other commodities. Many developing countries are taking steps to become part of this global interactive village, but even though opportunities for leapfrogging are available, economic and technological disadvantages, as well as other factors, pose unique circumstances that result in under-utilisation of ICTs in Africa, inadvertently posing the threat of marginalization.

While it is important for efforts to be made so that the LIS profession in Africa can also benefit from the presence and prevalence of the technologies, it is also important to consider and be realistic about the extent to which changes can be made. In discussing issues of distributive justice and information communication technologies in higher education in South Africa, Broekman, Enslin and Pendlebury, (2002:29) pose a question: "Should South African universities introduce or develop on-line learning for flexible mode delivery under circumstances in which some students do not have access to ICTs?" This pertinent question can analogously be applied to LIS education in Africa. Rephrased in the LIS context the question could read: should African LIS education introduce ICT-based programmes for flexible information services delivery under circumstances in which some students and graduates have no/poor access to ICTs at their training and/or future work place? In attempting to find an answer to this question, it is useful to examine African LIS education and the status of ICTs in higher education on the continent.

1.2.1 LIS Education in sub-Saharan Africa

LIS education in Africa is challenged to produce graduates armed with wide knowledge and skills of the latest developments in the information environment (Odini, 1999). LIS education generally has to adjust to the changing higher education environment, handle the ubiquity of information technology in the profession and deal with the rapidity and transient nature of technological developments. In Africa, there are added complications of inadequate resources and an underdeveloped, heterogeneous information environment, which makes it no easy task to determine educational directions. However, LIS education

and training in Africa has over the years made strides to remain competitive. Ocholla (2000) observes that despite the lack of resources and infrastructure, many domestic (African) LIS education programmes have shown significant growth. There are approximately over 51 LIS schools in sub-Saharan Africa, each offering a variety of programmes ranging from certificate/craft level to doctoral level. Although most of these programmes were imported or inherited from former colonial masters, many of them have recognised the need to modify their curricula in order to cater for local job markets (Ocholla, 2000). But to do this, many issues have to be resolved.

1.2.1.1 Issues of ICTs in the LIS Curricula

A LIS curriculum currently needs to carefully balance between the amount of information technology (IT) content and traditional LIS content because both are essential for the graduates. Thapisa (1999a) urges for the development of lasting LIS competencies for the twenty-first century, which he predicts, should prepare graduates for a world of electronic document delivery, electronic libraries and virtual libraries. Odini (1999) underscores the vital role of LIS education institutions in the preparation of a workforce that is armed with wide knowledge and skills of the latest developments in the information environment and hence familiar with emerging ICTs. Ocholla (1997:13) concurs that IT education is an essential part of LIS education that must be intensified in the curriculum, but observes that even though the importance of IT education is recognised by LIS schools in Africa, 'there are disparities when it comes to the nature, type and range of IT courses offered in Eastern and Southern Africa LIS schools.' These disparities, he notes, are linked to factors such as teaching resources, expertise and attitudes of trainers, implying that some LIS schools include as much IT content as their resources (human and ICT infrastructure) capacity permit, rather than what may be deemed sufficient. Kloppers (1996) concurs that the importance of IT education¹ is recognised by LIS schools in South Africa, but there are constraining factors hindering its balanced inclusion in the curricula. However, it is encouraging to note that LIS education

¹ Kloppers identified the following as IT component: network technologies i.e. telecommunications, Internet, hardware & software, Internet facilities, tools, electronic publishing, LANs, intelligent gateways; communication technologies i.e. human-computer interface, speech technologies, virtual reality, graphic user interfaces, natural language processing; retrieval technologies i.e. artificial intelligence, electronic CAS, hypertext, electronic document delivery, on-line database searching, automatic indexing, text digitization and multimedia/hypermedia.

programmes in Africa offer an increasing variety of IT courses/modules such as: basic elements of computers, keyboard skills and word processing, library automation, database construction and management, on-line searching, selection of hardware and software, information systems design and analysis, electronic networks and networking, multimedia information sources, telecommunications, desktop publishing and a intelligent systems (Ocholla, 2000).

Despite the importance of offering more ICT courses, traditional LIS courses/modules, albeit with revised content and orientation, are still very relevant for LIS graduates in Africa because many of the jobs still require these skills. Many jobs are in organisations that are only partially automated and hence traditional courses such as cataloguing, classification, collection development, information sources, abstracting, indexing, archival studies, records management, conservation of information materials, etc. should be offered alongside new comers such as information/knowledge management, information audit, user studies, information resources management, repackaging, information economics, bibliometrics, in addition to those modules identified by Ocholla (2000) and Kloppers (1996). Most of the new areas or enhancement of traditional theory and practice are essentially products of new technologies, which place a lot of emphasis on the management of information content rather than simply the management of technology or the management of physical information materials. Hodges (1995) argues that it is more important for an information professional to know the type of information content needed to satisfy a given inquiry than just simply the intricacies of computer systems. Nonetheless, a good knowledge of both is important. LIS practitioners today have to know what information is useful to a client, how to use the technologies, how to interrogate a system in order to obtain desired information and how to create an effective and useful electronic information service. The curricula for LIS education need to include all these components.

A LIS curriculum in Africa also needs to have the right balance between *theoretical* and *practical* aspects of training. Odini (1999) argues that LIS educators while designing scope, knowledge and skills for the curriculum should place emphasis on practical skills.

Thapisa (1999b) concurringly laments that the slant of LIS education in Africa is largely theoretical and argues for change in LIS education from overtly academic and theoretical orientations to the workplace and IT-led education. This researcher agrees that LIS is basically a practice-oriented discipline requiring professionals to apply their professional knowledge and skills. In most cases, many job advertisements emphasise experience (Ocholla, 2001).

1.2.1.2 Issues of ICT Resources

Notwithstanding the benefits of ICTs in LIS and/or higher education, there are barriers to ICT utilisation in Africa. Some of these include the lack of a good reliable and adequate ICT infrastructure, lack of finance compounded by rapid technological advancements, lack of national information policies, and a non-literate population using a multiplicity of languages (Zulu, cited in Addo, 2001). According to Ocholla (1997), factors such as availability of teaching resources, attitudes of trainers, attitudes of trainees, higher education bureaucracy and red tape in curricula review, time and expertise, bring about disparities in the nature, type and range of IT courses offered in Eastern and Southern Africa LIS courses. Ocholla (2000) further observes that most LIS schools still lack sufficient funding, are unable to attract suitable staff, have inadequate equipment, and lack computer laboratories dedicated for departmental use.

Despite the inadequate resources, some universities in Africa, especially in South Africa, have not only incorporated ICT content in their programmes, but also offer some courses on-line. In such cases, other dimensions of the resources problem, such as the unequal distribution of resources, may arise. For instance, while some students have personal computers as well as prior knowledge of computer use, others lack both, requiring the department to make provisions. In South Africa, Broekman, Enslin and Pendlebury, (2002) recommend that for the sake of justice, all students must be provided with the means to acquire membership of the global intellectual community, through obligating all universities to allocate sufficient funds for the provision of full access to ICTs, as well as development of students' capacity to use the ICTs. Likewise, LIS graduates in Africa have to be enabled to be members of the global LIS profession, but without losing their

local identity. As Odini (1999) argues, the competencies currently required for the LIS job market in Africa should reflect local needs but at the same time remain internationally acceptable academically. Thus, even though the distributive justice and criteria may not be completely clear, it must be recognised that the rest of the world is not waiting for this clarification. Broekman, Enslin and Pendlebury (2002:34) additionally advocate what they term as “differentiated treatment” appropriate to each student's current capacity.

1.2.1.3 Issues of the sub-Saharan Africa Information Environment.

In Africa, the information environments are varied because of disparities among its people in terms of economics, culture, geographical dispersion, politics and other physical challenges. Odini (1999) cautions that for Africa, it is no easy task to determine educational directions because of the complexity of trying to find a balance between the rapid and transient nature of the technological developments, on one hand, and the scarce resources coupled with the underdeveloped and varied information environment, on the other. Thus LIS education in Africa is challenged to address issues of information poverty and globalisation while considering differences in:

- i. economic status of the population whereby some sections of the population are economically disadvantaged in that they cannot afford the new technologies and the required infrastructure such as leasing of telephony, software, networking, electricity, etc. However, situated as it is in higher education and for the educated, LIS education can be said to be focused towards, and addressing the privileged elite as is corroborated by Ocholla's (1997) observation that many LIS graduates prefer to work in urban areas and associate with the elite. This raises an ethical issue for practitioners and trainers.
- ii. cultures whereby some sections are culturally and/or socially disadvantaged such as women, children, poor, etc. Attempts to provide information services to these groups often have to incorporate other factors such as illiteracy, freedom and poverty.
- iii. geographical location whereby some areas are rural and remote while others are urban and metropolitan. Rural populations lack basic infrastructure such as housing,

electricity, telecommunication, physical access routes and other facilities that provide support for information services.

- iv. political empowerment hence there are marginalized groups such as minorities.

The above challenges have implications on the LIS curriculum in that the knowledge, skills and attitudes imparted in LIS training have to be broad-based and/or varied so as to enable graduates take up jobs in any environment.

1.2.2 ICTs and Africa's Higher Education

The use of ICTs in Africa has grown rapidly, especially in urban areas. According to an Internet Status Report of February 2002, all 54 countries and territories have local connectivity and the number of dial-up Internet subscribers now stand at 1.3 million with total international incoming bandwidth of over one gigabit per second (Jensen, 2002). Jensen (2002) further observes that it is difficult to provide an accurate number of users because of the prevalence of shared accounts, but estimates that there are over 4 million African Internet users. There could be wider usage but the prohibitive cost of connection forms a major hindrance for many people in Africa. Jensen (2002), additionally estimates that the average cost of using local dial-up for 20 hours a month is about \$68, even though ISP subscription charges vary greatly. Comparatively, Internet use for 20 hours is \$29 in USA, \$53 in Italy and \$65 in Britain. Another major problem of Internet use in Africa is the sparse and unreliable fixed line network, which suffers from inter-exchange congestion, thus rendering the delivery of web pages difficult. Jensen (2002) opines that in response to the high cost vis-à-vis slow speed, and considering that much of the internet use is for email, ISPs have launched lower-cost- email-only services which have subsequently attracted greater usage.

Apart from electronic mail, Africa's Internet use has expanded into other areas such as the roaming dial-up Internet access, which is now available for travellers in Africa. About 10 African countries are able to provide advanced services such as Integrated Services Digital Network (ISDN) and video conferencing. Other services such as Voice-Over-Internet (VOIP) and email-to-fax gateways, though not widely available, can be found in

few countries such as South Africa and Egypt. The development of web content from Africa is expanding with the increasing organisation-based web sites. There are few notable governmental web sites but many non- and inter-governmental sites. News media are well represented by the continent-wide Inter Press Service (IPS) and Pan African News Agency (PANA). All these efforts are an indication that Africa joins the worldwide consensus over the importance of ICTs in development. However, despite the developments, Africa's connectivity is still poor, especially when compared to the total population and 'lags far behind that of the rest of the world' because of the inadequate telecommunications systems, socio-economic situation and lack of human resources (UNESCO, 1998).

Although ICTs have emerged as a necessary facility for enhancing academic and governance activities in Higher Education, Higher education institutions in sub-Saharan Africa, particularly universities face many difficulties originating from factors such as underdeveloped economies, relationship with government, rising enrolment and the legacy of having modelled their systems on foreign systems (Girdwood, 1995). Collectively, these difficulties have led to a general deterioration of conditions that are compounded by the competitiveness of the 21st century. The problems Girdwood identified in 1995 are still more or less prevalent and they include:

- lowered and fluctuating funding;
- reliance on foreign funding especially for conflict-torn countries;
- internal pressures to reduce budgets;
- disbursement control by governments making flexible use of funds or virements impossible;
- poor planning and administration since long term plans have proved virtually impossible given that funding may be in monthly or haphazard instalments;
- higher student enrolments without increase in facilities such as library funding, classrooms, laboratories and hostel capacities, etc.;
- poor research standards because of unfavourable research conditions; and
- brain drain because of poor staff remuneration (Girdwood, 1995:94).

Upon such a poor backdrop, sub-Saharan Africa's higher education institutions must face the current challenges and changes, including those brought about by the introduction on the scene of ICTs. Daly (2000) observes that the complexity of African universities' situation is amplified by the complexity of African nations and their development problems and argues that the gap of ICTs between developing and developed world is larger than the income gap and the information infrastructure in African higher education is poorly positioned especially when compared to Europe and North America. Daly (2000) further observes that computers are relatively scarce in universities and those that are available are often antiquated. Moreover, there is lack of connectivity in African universities resulting from both the universities' own technological difficulties and those of the larger communications networks in which they operate. As a result, he cautions that African students will find themselves increasingly disadvantaged in their careers. However, Daly (2000) concedes that there has been some real progress in the development of systems such as distance education, particularly citing countries such as South Africa, Ghana and Zimbabwe.

Within the limited resources, higher education in sub-Saharan Africa has found it important, strategically and effectively to develop greater ICTs application. Some efforts have been made, in the form of projects and initiatives, to enable higher education in Africa to get connected (Jensen, 1998). Through a wide variety of initiatives, progress has been made in distance education where over 140 institutions offer distance tertiary education in countries such as Ghana, Kenya, South Africa, Tanzania, Zambia and Zimbabwe (Daly, 2000). Jensen (1998) provides many examples of these initiatives, which include:

- i. The *African Virtual University* (AVU) project, supported by InfoDev fund of the World Bank. This is perhaps the most significant initiative currently, towards connecting Africa's higher education to global trends. The aim of AVU is to deliver distance education with telephone call back-up for voice intervention using satellite technology which offers access to high quality learning. With the motto of "Education for the Knowledge Age", the mission of AVU is to "bridge the digital divide and knowledge gap between Africa and the rest of the world by dramatically

increasing access to global educational resources, tapping the power of modern ICTs” (AVU, 2002). Currently hosting 29 partner sites all over Africa, AVU’s three objectives are to (1) increase access to high quality, affordable tertiary and life-long learning opportunities, (2) integrate African academics and workers into world-wide community of learning and (3) expand the pool of skilled labour for the new global economy (AVU, 2002).

- ii. The *Education for Development of Democracy Initiative* (EDDI) project aims to be a catalyst for African education institutes to strategically reform themselves by providing high speed access to 100 universities in Africa (Jensen, 2002).
- iii. The *Regional Information Society Network for Africa* (RINAF) project, financed by the Italian, Netherlands and Korean governments, is a framework for UNESCO’s support for African co-operation in the promotion of academic and public sector computer networking. Initially providing support for training and PC equipment in about 18 African countries, RINAF promotes national and regional strategies and telematics application for development in 43 countries in the areas of education, research, media, libraries and culture (Jensen, 2002).
- iv. *United Nations University (UNU) Africa Network* is one of UNU’s projects which aims to build networks of African scholars, translate academic findings in Africa into agendas for action, and disseminate key research findings to relevant African government representatives (Jensen, 2002).
- v. The *USAID Leland Initiative*, alias Africa Global Information Infrastructure Project, is a 5 year \$15 million project whose aim is to bring the benefits of the global information revolution to more than 20 African countries through connection to the internet (USAID Leland Initiative home-page, 2001). The four objectives of the project are to (1) improve connectivity within Africa, (2) increase access by African people and information for sustainable development, (3) enhance African ability to find to find solutions to African problems, and (4) making African-produced information available to the world (USAID, 2001).
- vi. The UNESCO project on *Creating Learning Networks for African Teachers* (CLNAT) is part of the larger HITD-A² project for the development of national

² Harnessing Information Technology for Development (Africa) Project

information and communication infrastructures within the AISI framework. The CLNAT project aims to contribute to the provision of meaningful modern learning environments through connectivity to the Internet (AISI, 2003).

In addition to the examples above, individual countries and institutions are taking steps towards catching up with organisational trends of the 21st century (Addo, 2001; Ajayi, 2000). Universities in South Africa and Egypt have already implemented cyber campuses (Ajayi, 2000). But there is need to balance enthusiasm for futuristic goals with realism about the pace and base of change that sub-Saharan Africa higher education institutions can expect to achieve given the financial and infrastructural inadequacies and uncertainties i.e. the dilemma of the digital divide. Likewise, LIS education needs to recognize and endeavour to fulfil its role in enabling Africa to remain visible in the information age.

1.3 STATEMENT OF THE PROBLEM and MOTIVATION OF THE STUDY

ICTs have essentially redefined the way in which LIS educators and practitioners perceive and express the profession. The value of the LIS profession worldwide has been heightened by technological advances, which have eclipsed it into dynamism and growth. However, the benefits of resultant changes have yet, and are unlikely to equitably permeate to stakeholders on the African continent. The reasons behind inequitable diffusion are both historical and socio-economical. Many higher education institutions in Africa are still not part of the globalisation and information-age prime movers because these institutions lack access to ICTs (AAU, 2000a). Yet higher education should operate in an ICT-ubiquitous environment, not only as producers of competent workforce, but also as prime movers of change. The ever increasing dependence on ICTs in education for teaching/learning, research, delivery of administrative functions and communication suggests the importance of maintaining an effective ICT audit (Villanueva, 2002). The Association of African Universities (2000a) recommends regular assessment of ICT maturity by higher education institutions so that the findings can be used to set

benchmarks and goals by identifying current ICT profiles, determine funding priorities, as well as apply for grants or conduct fund-raising.

LIS education and training programmes in developed countries such as United States of America, Canada and Britain have been impacted by ICTs (Manmart, 2001). A cursory glance at current studies from these countries suggest that much of the current efforts in these countries are directed towards optimising ICT benefits, evaluating specific ICT refining applications rather than concerns about initiating the use/implementation of technologies. Thus Manmart (2001) recommends that it would be pertinent to study the impact of ICTs on LIS education in each part of the world separately. The problems in Africa are that:

- a) there seems to be limited and inadequate diffusion of ICTs in LIS education and training in Africa, which casts aspersions at the quality of graduates from these schools. The gravity of this problem may not be clear until a mapping and audit of current ICTs status is done.
- b) many LIS schools lack the time, expertise and environment to reflect upon their contribution to globalisation strategies because they (LIS schools) are “too busy merely coping with the adverse circumstances” prevalent in African higher education (Girdwood, 1995:94).
- c) LIS education may not be strategically poised for innovative and creative knowledge production and competitiveness. To avert such danger, greater exploitation of ICTs is vital for the enhancement of these important aspects of development because “the underdeveloped nations of the future will be those which will come late to the information revolution” (de Horowitz, cited in Addo, 2001:143)

Yet it is not clear the extent to which ICTs have been incorporated in African LIS education both as soft technology and hard technologies. No comprehensive and comparative study focussing on LIS education in Africa had hitherto been conducted. Related previous studies done in this subject area by Ocholla (2000), Kloppers (1996), Shiholo (1997), Manmart (2001), and other scholars only partially investigate the issues

and hence pointed the way and suggested further research. In view of the above and considering global developments, it is important to carry out a mapping and audit of the African ICT capacity, against an overview of current global trends and applications of ICTs in LIS education. An inventory of this capacity will enable LIS educators on the continent to evaluate their programmes, tools and subsequently make informed decisions regarding greater incorporation of these technologies.

1.4 AIM AND OBJECTIVES OF THE STUDY

The purpose of this study was to map and audit the types, nature and diffusion of Information and Communication Technologies in LIS education and training programmes in sub-Saharan Africa.

1.4.1 Objectives of the Study

The specific objectives of the study were to:

- 1.4.1.1 establish the types of ICTs competencies currently taught in sub-Saharan Africa LIS education;
- 1.4.1.2 establish the types of ICTs in use (e.g. Internet, Intranets, hardware, software, courseware, databases, etc.) in sub-Saharan Africa LIS education;
- 1.4.1.3 determine the extent to which ICTs are applied/used in teaching and learning, research, and academic administration in LIS schools in sub-Saharan Africa;
- 1.4.1.4 establish the levels of ICT support available in terms of policies, infrastructure, hardware and human resource in LIS schools in sub-Saharan Africa;
- 1.4.1.5 establish problems encountered in the availability and use of ICTs in LIS schools in sub-Saharan Africa;
- 1.4.1.6 determine ICTs needs and establish the gaps between ICTs needed and ICTs available in LIS schools in sub-Saharan Africa; and
- 1.4.1.7 determine and suggest strategies for bridging ICT gaps in LIS schools in sub-Saharan Africa.

1.4.2 Research Questions

1.4.2.1 What ICTs are needed/relevant in LIS education:

- a) as course content?
- b) to support research?
- c) as instructional technology?
- d) for administration and for communication in African LIS schools?

1.4.2.2 What ICTs are currently available in sub-Saharan Africa LIS schools:

- a) as course content?
- b) to support research?
- c) as instructional technology?
- d) for administration, for management and for communication?

1.4.2.3 What are the ICTs institutional

- a) policies?
- b) human capacity/expertise?
- c) range of hardware and software?

1.4.2.4 What problems are experienced by LIS education in utilisation of ICTs in sub-Saharan Africa LIS schools?

1.4.2.5 What discrepancies exist between needs and available resources in sub-Saharan Africa LIS schools?

1.4.2.6 What strategies and solutions can address the above problems in sub-Saharan Africa LIS schools?

1.5 SCOPE AND LIMITATIONS OF THE STUDY

This study was mainly based on the established and mainstream higher and tertiary education frameworks of universities, colleges and polytechnics, whose organisational structures are more or less standard. Higher education institutions are information intensive, with rigid, hierarchical structures, traditional roles and tasks, and offer excellent opportunity to study the impact of ICT use. In most cases such institutions fall under one specified government ministry/department which sets overall national educational goals and policies. Some of these policies, for instance funding policies,

policies on institutional collaboration and ICT policies, influence the nature, types and administration of technologies available as well as possible strategic plans for future development. Additionally, these mainstream institutions have internal structures that facilitate coherent development of instructional technology. This is not to suggest that LIS education is conducted only under the above mainstream institutions. There are a variety of non-mainstream LIS education programmes. In some countries, professional associations and private organisations also offer LIS education programmes. There are also a variety of continuing education programmes offered by professional organizations and/or employers of LIS graduates such as national or public libraries. These types of LIS education programmes, though significant, are not being included in this study.

This study focused on LIS education and training programmes found in tertiary/higher education institutions in sub-Saharan Africa. However, not all countries/territories offer LIS education. At least 18 countries are known to offer LIS education programmes, namely Botswana, Eritrea, Ethiopia, Ghana, Kenya, Liberia, Malawi, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zaire, Zambia and Zimbabwe (Ocholla, 2000; Fang, Stueart and Tuamsuk, 1995).

Although it would have been interesting to delve into, and examine several choice systems and software used in LIS education, this would have required more time and resources in order to come up with meaningful findings. It would also have required high level expertise in software design and wider experience in on-line educational theory and practice. This would inadvertently have expanded the study to unmanageable size. The study has therefore, only made an overview, rather than evaluative examination of the technologies, systems and software.

1.6 SIGNIFICANCE OF THE STUDY

LIS educators are continually concerned about the quality of their products (LIS graduates). This study on ICT is central to the relevance of current curricula in African LIS schools. The mapping and audit will facilitate evaluation and comparison of the sub-

Saharan Africa scene, and against current global trends and applications of ICTs on LIS education in particular. In Canada, for instance, LIS schools have had to adjust to changes that have been largely instigated by ICT on the job market requirements, funding insecurity, globalisation effects and industry needs by relocation of LIS courses into other academic units for mutual and/or better financial support; broader and more flexible LIS curricula, closer links with industry flexible scheduling of courses and classes application (Curry, 2000). The findings of this study could provide a decision-making framework for LIS education planners and implementers to help them determine their technological needs for subsequent planning and implementation of necessary change.

It is further envisaged that the study would add to the relatively small but growing literature on African LIS and would thus be useful to other researchers. This forms a significant reference for research, especially because of its scope and breadth. Lastly, this study is important to the researcher as a means of deepening one's knowledge and developing expertise in this area.

1.7 SOURCE MATERIAL

Literature was reviewed from journals, conference papers, research publications, official government publications and books. Considering the fact that ICTs is a dynamic field, effort was made to use the latest publications and hence the major source of materials was the Internet in general. More specifically the following databases/hosts/websites provided needed materials: IFLA website and databases which are rich with latest information from all parts of the world, in the form of conference papers, policies and legislation on a wide variety of LIS issues/topics/concepts; EmeraldInsight services, Ebscohost databases, LISA and SABINET. Additionally, websites of individual institutions, especially LIS departmental web pages were used. Journals and books from the University of Zululand library were also very useful. Lastly, attending conferences such as the Conference on Information Technology in Tertiary Institutions (CITTE), 25-27 September 2002 at the

University of Natal in Durban – South Africa; ProLISSA/DISSANet³, Conference, 25-26 October 2002 at the Farm Inn in Pretoria – South Africa, the annual LIASA Conference, 23-26 September 2003 at the Rustenburg Civic Centre in Rustenburg – South Africa, and the 3rd and 4th DLIS-LISA⁴ Annual conferences held on 12th September 2002 and 8 September 2003 respectively, at the University of Zululand. Seminars and workshops also proved to be invaluable eye-openers for the researcher and significant sources of primary information.

1.8 DISSEMINATION OF RESEARCH FINDINGS

The findings of this study are disseminated through this dissertation. Parts of the findings have also been disseminated through local and international conference papers, seminar presentations, workshops, articles in refereed international journals and lectures.

1.9 STRUCTURE OF THESIS

- Chapter 1 Introduction and Background:** Conceptual Setting, Contextual Setting, Statement of the Problem and Motivation of the study, Aim and objectives of the Study, Research Questions, Scope and Limitations of the Study, Significance of the Study, Source Material, Dissemination of Research Findings, Structure of Thesis.
- Chapter 2 Theoretical framework:** The Diffusion of Innovations Theory and its application to ICTs in Library and Information Science and instructional technology.
- Chapter 3 Literature Review:** Integrated review of related literature under various broad headings i.e. ICTs in Tertiary and Higher Education; ICTs in higher education in sub-Saharan Africa; ICTs in LIS

³ Progress in Library and Information Science in Southern Africa / Development of Information Science in South Africa Network.

⁴ Department of library and Information Science / Library and Information Students Association.

education; LIS education in Africa and ICTs in LIS education in Africa

Chapter 4 Methodology: Detailed description and explanation of research design and methods, target population, research techniques and instruments, data collection procedures and problems, ethical considerations.

Chapter 5 Data Presentation and Analysis: Report of the data using tabulations, tables, figures and description.

Chapter 6 Findings and Discussion: Exposition on salient issues arising out of the findings.

Chapter 7 Summary of Findings, Conclusions and Recommendations.

References

Appendices

1.10 Summary

This chapter has defined and discussed Information and Communication Technologies (ICTs) conceptually in globalized Library and Information Science (LIS) education and contextually in the sub-Saharan Africa setting. Mapping and audit of ICTs are explained as means by which the problems associated with diffusion of ICTS in Sub-Saharan Africa LIS education can be clarified. The chapter has also set the aim, objectives and research questions that guided the research. The next chapter discusses the theoretical framework for the study.

Chapter Two

THEORETICAL FRAMEWORK

2.1 INTRODUCTION

The aim of this study was to map and audit information and communication technologies (ICTs) in library and information science (LIS) education in Africa. The study, which was conducted against a backdrop of ICTs in higher education, sought to find out the nature and types of ICT knowledge, skills and resources that have been incorporated in LIS education in sub-Saharan Africa. In cognisance of the vital role of ICTs in current global integration efforts and standards, the study sought to investigate the status of ICTs in LIS programmes as a means of assessing ICT capacity in sub-Saharan Africa, with specific reference to the Library and Information science discipline. This chapter explains the theoretical basis for the study by first briefly reviewing its conceptual background in the education discipline and discussing the theory of Diffusion of Innovations and how this theory applies to the adoption of information and communication technologies in education programmes for Library and Information Science education, both as soft and hard technologies.

The aim and objectives of this study suggested conceptual and theoretical frameworks consisting of technological (ICTs) adoption and educational innovation. It was found pertinent to address both hard and soft technologies and examine the effect of technological developments on LIS education. Technological adoption, in the case of LIS can be perceived in the form of soft technologies i.e. innovative ideas and practices, and hard technologies i.e. the ICT products that have transformed both the LIS workplace and hence the education and training for that changed workplace. Educational innovation overlaps technological adoption because of the influence of technology on both educational content and educational methods. The theory that was selected for this study was Rogers' Diffusion of Innovations Theory (Rogers, 1983). This theory was considered a suitable framework because of its potential application to information technology ideas, artefacts and techniques, and has been applied as the theoretical framework for a number

related studies such as information systems projects (Clarke 1999; Larsen 1997), instructional technology (Surry, 1997; Surry & Farquhar, 1997), media literacy programmes (Yates, 2001) and telemedicine (Ibbotson, 2000), among others.

2.2 CONCEPTUAL BACKGROUND

2.2.1 LIS Services and LIS Education

In-depth exposition of the changes that ICTs have brought to LIS services and education, are examined in the literature review in Chapter Three of this thesis. Suffice it, therefore, to only note here an overview contributed by Sutton (2001) who observes that the changes brought into the 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. Kloppers (1996) underpins the significance of these changes by observing that the future success of the LIS profession will depend on the recognition of the implications of the new information environment that is inextricably linked to ICT developments. *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).

Sutton (2001) further observes that the above changes in the LIS workplace have had implications for LIS education. For instance, the implication of transformatory changes for LIS education is the emergence of new areas of knowledge and skills, such as information economics, artificial intelligence, human/computer interaction, and Internet tools (Sutton, 2001). On the other hand, the natural evolutionary changes are reflected in LIS education in terms of:

- what is taught, in that the content of LIS courses have increasingly included ICT aspects such as database design, construction and management, online searching and

retrieval, bibliographic utilities, MARC records, integrated library automation software and many others. In some cases, this content is integrated in previously existing courses such as cataloguing, management, indexing and reference services, while in other cases, new courses/modules have been developed.

- how it is taught, i.e. the delivery or teaching methods are slowly adjusting to new and improved techniques such as computer-based instruction, online teaching/learning, distance education and fieldwork simulations.

It is important to note that the latter implication permeates the entire/broader education field and thus it is useful here to briefly examine some of the changes that take place in the broader educational thought because these changes impact LIS educational methods, just as much as any other higher education discipline. Two aspects of educational relevance to this study are learning theories and instructional technology.

2.2.2 Learning Theories

Human cognition is the notion that learning is made up of approximately six distinct and fundamental processes, namely, reception i.e. outside stimuli translated into neural codes; attention i.e. a state of selective awareness, short-term memory i.e. temporary retention through chunking, long-term memory i.e. encoding meaningfully for permanent storage, and retrieval i.e. recalling stored information (Erickson & Vonk, 1994:62). However, while the above statement may not be overly disputed, there are different education paradigms, which provide varying views of how teaching and learning is or should be conducted. Each paradigm is based on a set of fundamental beliefs that provide a great deal of insight and foundation for understanding the processes of teaching and learning. According to Boggs (1999), some of the popular educational paradigms include:

- human cognition theories such as Gagne's conditions of learning and information processing;
- developmental theories such as Piaget's cognitive development, stages of development, conservation and moral development theories; and
- behaviourism theories such as Skinner's operant conditioning, classical conditioning, and reinforcement theories.

Each of these theories is impacted by technological developments such as ICT innovations to bring about new approaches and practices. One of the current changes that is thus underpinned by shifts in psychological and pedagogical theory is the Learning paradigm (Boggs, 1999).

2.2.2.1 The Learning Paradigm

It is opined by Gredler (1992:196) that educational practice has always emphasised what to think and learn rather than how to think and learn because the task of teaching content (what) is easier than the task of teaching strategies (how). Boggs (1999) observes that higher education has witnessed a paradigm shift from "instruction" to "learning". This new focus, the learning paradigm or learning revolution, focuses on the learning aspect with the implication that students have, or should have more control than teachers do. He, however, notes that some faculty are opposed to this shift for fear that the standards of academic achievement will drop if students have greater control of the learning process. Nevertheless, proponents of the new focus point out that the control is not really affected by this shift (Boggs, 1999). Teachers will continue to be in control but from a different perspective - that of designers, enablers and facilitators of learning, rather than storehouses and dispensers of knowledge to be learned (Boggs, 1999).

2.2.2.2 Implications of Paradigm Shift

Schuyler (1997) observes that the challenge of the learning paradigm shift is in uprooting the traditional, deeply entrenched administrative and instructional structures because the teachers, who should spearhead the transformation are not convinced of the need to change. In addition, the ICTs, despite the fact that they brought about the changes, seem nonetheless to perpetuate rather than alter the old administrative structures. However, Boggs (1999) suggests that the following are necessary for adaptation of education in this learning paradigm:

- Teachers have to create more situations for active learning, aiming at achieving competency rather than just mere transfer of knowledge. Imperatively, higher education teachers have to become educators i.e. interested in learning theories,

instructional methods and how these theories and methods are used to support learning.

- Students may adopt the collaborative learning style, which enables them to learn and adopt ideas from each other.
- Examining and grading students should reflect competency of each student or performance standard and should not be subject to "curves" (normal curve or skewed curve). As educators, higher education teachers have to lead in identifying desirable learning outcomes and formulate appropriate methods of assessing these outcomes.

To view this shift more positively, Boggs (1999) argues that the shift should be perceived at institutional level rather than faculty level, whereby the:

- mission should focus on learning as opposed to previous focus, which has been on research, service and teaching.
- responsibility for learning should be the concern of the institution and not be left to the student. Institutions have to become more accountable for learning outcomes rather than merely establishing the standards and providing instruction.
- support for learning should be provided by professors, focusing on ensuring that planning and operational decisions are made to impact on student learning, rather than administrative efficiency, as has been the practice. Students should be viewed as customers who should be attracted and retained by good products and services (e.g. marketable courses, flexible/accommodative timetables, effective delivery techniques, etc.)
- learning outcomes should form the basis of evaluating higher education rather than resources and processes, as has been the practice.

Thus he argues that the purpose of the learning paradigm should not be just incremental to previous paradigms, but rather a holistic system-wide change that prioritises learning.

2.2.2.3 The Role of ICTs in the Learning Paradigm

ICT tools are particularly important for the success of the learning paradigm because these technological tools facilitate the required changes. For example, with computers,

teachers can be able to accommodate different learning styles and provide active learning situations such as simulations, role-playing and multimedia presentations more easily and effectively. Courseware on networked environment, with chat room, group discussion forums and email facilitate interaction and collaborative experience among disparately placed students (Boggs, 1999). Tutorial presentations with self-evaluation features enable students to focus on learning the competencies rather than on semester examinations. Electronic performance support systems, using performance-centred technology can also offer tools for collecting, managing and distributing knowledge. These systems include coaches, intelligent tutors and feedback mechanisms and can be applied in novice as well as expert systems.

2.2.3 Educational Instruction Theory

Instruction is defined by Gredler (1992) as a human undertaking whose purpose is to help people learn. Learning is composed of a series of transformations of information phases, each having a different instructional implication, and hence instruction involves a set of planned external events, which influence the processes of each phase by promoting the learning process. Instructional technology is a general term that includes the use of educational hardware and software for achieving specific objectives in a learning situation such as a classroom (Rosenberg & Elsbree, 1989). Instructional theories, therefore, encompass such concepts as the learner, contextual variables and instructional variables that impact one another to influence the learning process (Schunk, 1991). Shoffner, Jones and Harmon (2000) observe that instructional design is grounded in learning theories because the instructor's perception of the learning process influences the design. In other words, it is how the instructor believes learning takes place or an individual learns that determines presentation and sequencing of content in education. According to Gredler (1992), there are five components of instruction, which are based on the varieties of learning. These are:

- ◆ Performance outcomes/objectives which need to be formulated and described unambiguously because they help to determine and articulate the learning needs and testing parameters;
- ◆ Instructional events for each phase;

- ◆ Preparation for learning, which includes gaining attention, informing the learner of the objectives and stimulating recall of previously learned knowledge;
- ◆ Acquisition and performance based on the phases of learning, (i.e. selective perception, semantic encoding, retrieval and responding, and reinforcement) each phase supported by instructional events such as presentation of distinctive features, offering learning guidance, eliciting performance and providing feedback; and
- ◆ Retrieval and transfer to ensure retention and relevant transfer or application of concepts.

These components mutually support each other to bring about learning and fundamentally, the principles of instruction are underlined by the need to create an appropriate learning environment. For instance, from the realisation that experiences play a major role in human development, Gagne (as cited in Gredler 1992) concludes that learning depends on environmental circumstances. This implies that situations can encourage or inhibit the development of human intellect and thus Gagne argues that in addition to internal states, specifically contrived environment or instructional design enhances learning (Gredler, 1992).

2.2.3.1 Instructional Design

As noted above, instruction is a general term referring to all the events that directly influence learning. Instructional decisions are based on the skills that are to be imparted/learned, and for each variety and phase of learning, as well as on the environment that is expected to bring about optimal learning. In an institutional setting such as a university or college, learners are grouped for instruction and there is great responsibility for the institution to provide the right environments for learning to effectively take place. However, it should not be forgotten that the actual learning, essentially takes place within an individual and hence instructional design must take cognisance of this. Additionally, instructional design needs to include both immediate and long-range phases, be systematic and be based on sound learning theory (Gredler, 1992).

2.2.3.2 Instructional Models

Instructional decisions are based on the skills that are to be imparted/learned, and for each variety and phase of learning. Schunk (1991) observes that instructional models provide the tailoring of instruction to individual differences found in cognitive styles of learners. Learners have variations in perceiving, organising, processing and remembering information, which affect performance (learning). For example, a model that involves media instruction may be based on the nature of learning outcomes expected, which are in turn based on the characteristics of the learners. Each selected media needs then to be reviewed for its capability to provide required instructional events. However, there are other factors, which influence the selection of any given media, such as group size, ease of implementation and cost of the media. In models of computer assisted instruction, basic components of software include the review of factors that provide for student control, problem selection, feedback, student motivation, sequencing, pre-testing, assessment and evaluation, modes of presentation and safety factors.

Shoffner, Jones and Harmon (2000) conclude that as the future developments in technology and education emerge and accelerate, educators should think beyond tradition and embrace both the soft and hard technologies in instructional practice. They also observe that education has been reactive, rather than proactive, always lagging behind the rest of society in technological adoption, when in fact education should be the first and the wisest in adopting technological innovations.

2.3 THE DIFFUSION OF INNOVATIONS THEORY

The diffusion of innovation theory is essentially a social process in which subjectively perceived information about a new idea is communicated and rests on the premise that a new idea, practice or object has perceivable channels, time and mode of being adopted by individual or organisations (Rogers, 1983). According to Rogers and Scott (1997), the paradigm of diffusion research has its roots in rural sociology research of the 1940s. The key of the studies that influenced its growth is the investigation of the diffusion of the hybrid corn seed among Iowa farmers in the United States of America by Ryan and Gross

(cited in Rogers & Scott, 1997). According to Rogers and Scott (1997), Ryan and Gross purposed to find out the reasons for the hybrid corn seed's success, so as to obtain lessons that might be applied in other farm innovations. Rogers and Scott (1997:4) observe that the findings of this study had far reaching implications beyond agricultural innovations, with the result that by the 1960s, the diffusion model was being applied in a wide variety of disciplines including education, health, communication, business, general sociology and economics. Currently, the diffusion of innovation theory is widely used to study the adoption of innovations such as the Internet and other ICTs (Rogers & Scott, 1997).

2.3.1 The Concepts

2.3.1.1 Diffusion

Diffusion is a special type of process of 'communication by which an innovation in the form of new ideas, practices or products, is spread, through certain channels, over time, among the members of a social system' (Rogers & Scott, 1997:4). From this definition, there are four main concepts namely innovation, communication channel, time and social system, which are identified by Rogers (1995) as the four major elements of the diffusion process. These elements are each explained below so as to help in the comprehension of the theory.

2.3.1.2 Innovation

An *innovation* is an idea, practice or object that is perceived as new by members of a social system (Rogers & Scott, 1997:5). Innovation theorists postulate that there are certain characteristics which determine the rate at which an innovation is adopted by a social system, and these characteristics include relative advantage, compatibility, complexity, trial-ability and observability of the innovation (Rogers & Scott, 1997:5).

- a) *Relative advantage* is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, prestige, convenience or satisfaction. According to the diffusion of innovations theory, the greater the perceived advantage, the faster its adoption (Rogers & Scott, 1997).

- b) *Compatibility* is the degree to which an innovation is perceived as being consistent with existing values, past experiences and needs of potential adopters. According to the diffusion of innovations theory, the more compatible with the prevailing social system, the faster its adoption because individuals will not, as an initial step, need to adopt a new value system as would be the case with an incompatible innovation (Rogers & Scott, 1997).
- c) *Complexity* is the degree to which an innovation is perceived as difficult to understand and use. According to the diffusion of innovations theory, ideas that are simpler are adopted more rapidly than complicated ones because the complicated ideas often require that individuals/adopters first acquire new knowledge and skills, which can then enable them to understand the new idea (Rogers & Scott, 1997).
- d) *Trial-ability* is the degree to which an innovation may be experimented with, especially on a limited basis. According to the diffusion of innovations theory, an innovation that can be tried, especially in instalments, represents less uncertainty and anxiety and hence will be adopted faster (Rogers & Scott, 1997).
- e) *Observability* is the degree to which the results of an innovation are visible to others. According to the diffusion of innovations theory, visibility of results stimulates peer discussion and authenticates the significance of the innovation and hence enhances the adoption of the innovation (Rogers & Scott, 1997).

Thus the relative advantage, compatibility, complexity, trial-ability and observability of ICTs may singly or combined influence their incorporation in LIS education in sub-Saharan Africa.

2.3.1.3 Communication Channels

These are the means by which messages about an innovation are transmitted among members of a social system (Rogers 1995). Information regarding the innovation has to be disseminated so as to introduce the innovation, form or change attitudes, influence decisions regarding the innovation and support the evaluation of the innovation (Rogers

& Scott, 1997). In so far as ICTs are concerned, the major channel of communication has been these technologies themselves.

2.3.1.4 Time

Rogers (1995) argues that the *time* element of diffusion focuses on three dimensions namely, the decision-making processes, an individual's innovativeness and the rate of adoption. *The decision-making process* dimension refers to the time involved between the introduction of the idea to the decision to accept/reject the new idea. The *individual innovativeness* dimension refers to the degree to, and rate at which individuals in a social system catch on to a new idea. Rogers and Scott (1997:6-7) postulate that there are five categories of adopter innovativeness, that is innovators, early adopters, early majority, late majority and laggards. In higher education, LIS may be said to be early adopters since in most cases it was LIS services that first adopted computerisation. The *rate of adoption* dimension of time refers to the relative speed with which a new idea is adopted and is measured in terms of the members that adopt the new idea at a given time (Rogers & Scott, 1997:7-8).

2.3.1.5 The Social System

The *social system* element of diffusion is defined as 'a set of interrelated units such as individuals, groups, organisations, subsystems, that are engaged in joint problem-solving to accomplish a common goal' (Rogers & Scott, 1997:8). In a social system or unit there are norms, opinion leaders and change agents, which variously influence the diffusion process. For instance, innovation decisions may be optional (where the person or organisation has a real opportunity to adopt or reject the idea), collective (where a decision is reached by consensus among the members of a system), or authority-based (where a decision is imposed by another person or organisation which possesses requisite power, status or technical expertise). The higher education social system is full of bureaucracies that sometimes stifle and at other times facilitate adoption. In many sub-Saharan African countries, these bureaucracies have been accused of more often impeding rather than facilitating the adoption of innovations.

2.3.2 Relevance of Diffusion of Innovation Theory

Surry (1997) observes that diffusion research, in its simplest form, investigates how the major elements of diffusion, and a multitude of other factors, interact to facilitate or impede the adoption of a specific product or practice among members of a particular adopter group. Professionals in a number of disciplines, from agriculture to marketing, have used the theory of innovation diffusion to increase the adoption of innovative products and practices (Surry, 1997). Clarke (1999) observes that the diffusion theory has potential application to information technology ideas, artefacts and techniques, and has been used as the theoretical basis for a number of research projects on information systems. Likewise, the theory of innovation diffusion has been incorporated into the field of instructional technology in an effort to increase the adoption of instructional technologies because of a growing realisation that innovative instructional products and practices have suffered from a lack of utilisation (Surry, 1997). Suffice it to say that the diffusion of innovations theory provides a suitable framework for investigating the reasons for and rate of adoption of any new ideas practices or objects.

Lyytinen and Damsgaard (2001) conducted a critical study of the popular approach to the diffusion of information technology (IT). Their study focused on analysing aspects such as the nature of IT, the concept of diffusion arena, the analysis of pull and push forces within diffusion of innovations research, the view of adopters as rational decision makers, and the presumption that innovating social system has no history, and no feedback. Their findings indicated that IT components should be understood as networked, malleable, and learning intensive artefacts, which are socially constructed. Moreover, the diffusion arenas were volatile, subject to political control and overlapped with several institutional regimes with different interest and concerns. They concluded that the dynamics of constituting diffusion arenas deeply shape the direction and pace of diffusion process and recommended that diffusion researchers should trade generalizability against accuracy and simplicity in their theoretical accounts of IT diffusion, arguing that knowing better and deeper is more important than knowing broader.

Larsen (2001) discusses the applicability of diffusion of innovations theory using the

perspectives of mechanic and organic organisational settings, reaching the conclusion that the diffusion theory has only limited validity. Larsen (2001) argues that no suitable theory of diffusion of Information Science/Technology has been developed as yet and hence, the diffusion of innovations theory, at best, is an umbrella for strategy, innovation, network theory, social structural theory, and a host of other approaches to understanding ICT related change in organisational settings. However, Surry (1997) observes that the diffusion theory itself is in fact not one, well-defined, unified, and comprehensive theory, but rather a large number of theories, from a wide variety of disciplines, each focusing on a different element of the innovation process. Lyytinen and Damsgaard (2001) concur that the diffusion of innovations theory draws upon other theories of organisational behaviour adopted from microeconomics, sociology and communication theory. However, Rogers (1995) attempts to present a unified theory by synthesising all the most significant findings related to diffusion from the variety of disciplines. In his 1995 edition of the book *Diffusion of Innovations*, he presents four of the most widely used theories of diffusion namely, Innovation Decision Process; Individual Innovativeness; Rate of Adoption; and Perceived Attributes, each of which is briefly outlined below.

2.3.2.1 Innovation Decision Process

According to Rogers (1995), diffusion is a process that occurs over time and can be seen as having five distinct stages, that is, knowledge, persuasion, decision, implementation, and confirmation. He postulates that potential adopters of an innovation must learn about the innovation, be persuaded as to the merits of the innovation, decide to adopt, implement the innovation, and confirm (reaffirm or reject) the decision to adopt the innovation. Surry (1997) observes that this theory has been widely applied to instructional technology, but points out that, it is often criticised for being change-agent oriented because it emphasises the change agent's role.

2.3.2.2 Individual Innovativeness

Rogers' Individual Innovativeness theory states that there are individuals who are predisposed to being innovative, and these will adopt an innovation earlier than those

who are less predisposed (Rogers, 1995). This individual innovativeness theory can be seen as a continuum on which at one extreme, there are the “innovators”, who are the risk takers and pioneers in adopting an innovation very early in the diffusion process, while at the other extreme are the “laggards” who resist adopting an innovation until rather late in the diffusion process, if ever at all (Surry, 1997:3). In between there are the early adopters, the early majority and the late majority.

2.3.2.3 Rate of Adoption

The Rate of Adoption theory states that innovations are diffused over time in a pattern that resembles an s-shaped curve, whereby an innovation first goes through a period of slow adoption, then a gradual growth before experiencing a period of relatively dramatic and rapid growth, then stabilisation and finally eventual decline (Surry, 1997).

2.3.2.4 Perceived Attributes

The theory of perceived attributes states that potential adopters judge an innovation based on their perceptions in regard to five attributes of the innovation, namely trial-ability, observability, relative advantage, complexity and compatibility (Rogers, 1995). Surry (1997) observes that the theory of perceived attributes has been used as the theoretical basis for several studies relevant to the field of instructional technology because these attributes have been found to play a significant role in several IT-related adoption studies. Surry (1997) cites studies by Wyner, Holloway and Eads, in which relative advantage and compatibility were found to be significant perceptions among potential adopters of instructional technology in high schools.

2.4 THE DIFFUSION OF ICTS IN LIS EDUCATION

Rogers (1995:35) explains that "a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome." A technology is both information and equipment because most technologies

have hardware and software components (Rogers, 1995; Shoffner, Jones & Harmon, 2000). The hardware aspect consists of "the tools that embody the technology as a material or physical object," and the software aspect consists of "the information base for the tool" (Rogers, 1995:14).

2.4.1 ICTs and the Diffusion Theory

The theory of the diffusion of innovations has been applied in studying information systems, information and communication technology (ICT) and software application packages (Larsen, 1997). Larsen further observes that in the areas of information technology, two distinct themes emerge out of the many research efforts. First, whether or not information technology can be clearly defined in relation to the innovation and diffusion process considering that unlike the classic innovations, which are distinctive, with salient characteristics that do not change during the diffusion process, information technology innovations in fact do change. Larsen explains that adopters of ICT innovations often change or make modifications to the innovation in accordance with their own perceptions and needs during the diffusion process and thus it is not easy to describe innovations of this type as distinct, separate, and unchangeable entities. This leads to the second theme and that is whether or not the theory is sufficiently robust when applied to the adoption decision and the diffusion process for ICTs (Larsen, 1997:1). Larsen furthermore argues that a theory can only be regarded as robust when it predicts adoption/diffusion as well as non-adoption/non-diffusion better than any other approach, yet the traditional diffusion theory becomes stressed when it is applied to innovations that do not possess the key characteristics on which the original theory is based upon. Larsen opines that the diffusion of innovation theory only partially applies to ICTs, and that other approaches, for example, organisational psychology theory, also requires consideration when studying the diffusion of information technology.

Another important set of issues raised by Larsen (1997) is the pre-adoption vs. post adoption implications. Considering that the diffusion of IT is a social phenomenon, he observes the importance of investigating whether the stages and characteristics of diffusion are largely social constructs or derived from technology. To do this, Larsen considers pre- and post-adoption beliefs and attitudes. In regard to pre-adoption, Larsen

(1997) argues that people have a cognitive map and previous information about a phenomenon that influences individual thinking and behaviour. Larsen illustrates this argument with a hypothetical study focusing on the diffusion of Windows '95. He notes that because Windows had been around since 1985, some "potential users" might have known about, or have experience from the use of Apple MacIntosh, which had user features quite similar to Windows '95. He observes that the basic theoretical question here should be the relative impact of previous knowledge on the pre-adoption beliefs and attitudes (Larsen, 1997:1). However, he concedes that organisational culture and action might also influence pre-adoption beliefs and attitudes. In regard to post adoption stage, Larsen argues that people's interpretation of a phenomenon may very well change as a function of exposure and the duration of that exposure. Thus a study must take such dynamics into account in order to avoid an inherent danger of omitting the most salient post adoption beliefs and attitudes from investigation. Larsen further argues that this inherent danger enlarges with increased flexibility of the ICT being studied.

In a Position Statement presented at WG8.⁵ '97 at Ambleside, also presented at DIGIT '97 at Atlanta, and IRMA '98⁶ at Boston, Larsen (1997; 1998), cautions that researchers must be careful in thinking that the technology is the driving force for organisational change. It may well be that greater attention should be paid to people, people's ideas and how these ideas evolve over time. He suggests that research may benefit from more clearly positioning itself along two axes. The first axis is the difference between the organisation and the individual as the research focus. The second axis is the difference between looking upon the technology as the basis for developing phases and characteristics (diffusion studies) and looking upon change as a social phenomenon. Larsen concludes that diffusion studies may continue to focus on the individual and organisational level, but suggests a shift to social theory platforms because of the shortcomings of the dominant technological theory base.

⁵ WG8, standing for Working Group 8, is one of the Working Groups within the subcommittee ISO/IEC JTC1/SC17 (*International Organization for Standards/International Electronic Commission/Joint Technical Committee 1/Steering Committee 17*) "Identification Cards" and was established in 1988 to develop standards for contact-less chipcards.

ICTs are undoubtedly an innovation in the discipline and profession of LIS. It is useful to apply the tenets of diffusion theory to better understand ICTs diffusion into the LIS social system for several reasons. First, the diffusion theory provides a framework that helps ICT proponents understand why ICTs may be adopted by some individuals/organizations and not by others, so as to explain, predict and account for factors that increase or impede the diffusion of innovations. The diffusion theory can thus help the LIS community identify qualities (i.e. relative advantage, compatibility, etc.) that make ICTs appealing to potential adopters, take a closer look at the communication channels used in dissemination of ICT information, determine the time it should take, and the nature of adopters. These, in turn, will provide a better understanding of how to introduce and develop a successful diffusion campaign of the new technologies into the LIS social system, especially in less technologically developed countries.

Gomulka (1971) identifies two channels for diffusion to a less developed country. The first channel for diffusion is the exchange of knowledge and the second channel for diffusion is innovations from other countries. For either one of these channels to be utilised, so that the diffusion rate of a less developed country expands, is dependent upon two factors:

- ◆ the degree of openness and receptivity of the underdeveloped country, which is in turn influenced by three main conditions, i.e. transportation sectors within the country, communication sectors within the country, and the general education levels of the population. All of these conditions tend to be low in underdeveloped nations. Low levels of transportation, communication, and education produces a low degree of openness, making the less developed country almost closed to the diffusion process.
- ◆ the rate of growth of exports, which in turn may be a result of the low rate of growth of the total population, very limited growth of the technological sector or relatively little communication with more advanced countries.

⁶ International Recording Media Association Conference in 1998.

As noted earlier, Rogers (1995) identifies four factors that influence adoption of an innovation, namely the innovation itself, the communication channels used to spread information about the innovation, time, and the nature of the society to whom it is introduced. What follows now is a closer look at ICTs in relation to the four factors.

2.4.2 The Innovation Itself: ICTs

According to the theory of perceived attributes suggested by Rogers (1995), an innovation is more likely to be adopted if it has relative advantage, is compatible, is less complex, is triable and has observability.

2.4.2.1 The relative advantage of ICTs in LIS education

The relative advantage of ICTs in LIS is the overall increase in efficiency and effectiveness of professional practice through the use of powerful and fast information handling and transmission technologies. Empirical evidence of the relative advantage of ICTs in LIS practice and education in sub-Saharan Africa is a subject of many studies and publications (Adeya, 2001; Aina, 1993; Alemna, 1999; Chisenga, 1999; Kloppers, 1996; Moahi, 1996; Moyo, 1996; Ocholla, 1997, 2000; Raseroka, 1998; Thapisa, 1999a, 1999b). In a nutshell these authors argue that it is important for Africa in general and the LIS profession in particular, to adopt, albeit to certain degree, the new technologies because ICTs are a prime force in the world today for development and survival.

2.4.2.2 ICTs Compatibility

The fundamental ideas of LIS, that is, information organisation, retrieval and dissemination are the tenets on which ICTS are built. LIS professionals do not have to fundamentally change their mode of operation in order to incorporate ICTs because the compatibility of ICTS to existing LIS values and practices is quite evident.

2.4.2.3 Complexity of ICTs

Rogers, (1995) observes that potential adopters should not perceive an innovation as a complex activity. ICTs have existed now for over 50 years and hence have become more or less common place. In LIS and more so in developing countries, one of the major

problems is the lack of expertise in ICT use, which is sometimes confused with the complexity of the technologies.

2.4.2.4 ICTs' Trial-ability

The attribute of trial-ability is important for ICTs in LIS because potential adopters want to know if the benefits it claims to have, really exist (Rogers, 1995). ICT installation is a costly undertaking and so it is imperative and important that some organisations may want to try out in small applications/sections before deciding on full-scale adoption. ICTs as an innovation are highly triable because a potential adopter has many alternative approaches, most of them in piecemeal.

2.4.2.5 Observability of ICTs in LIS Education

Observability is the fifth attribute important to potential adopters (Rogers, 1995). The observable results of adopting ICTs in LIS have been enumerated by many studies (Accenture, Markle & UNDP, 2001; Mangan, 2000; Manmart 2001; Marcum, 1997; Sutton, 2001, etc.). Not only have professionals recognised the benefits, but also users of LIS services appreciate the value of ICTs.

2.4.3 Communication Channels

Rogers (1995:18) defines a communication channel as “the means by which messages get from one individual to another” and postulates that the nature of the relationship between individuals determines how successful the innovation is transmitted from source to receiver and the effect of the transfer. Rogers (1995) argues that while mass channels such as mass media, memoranda, brochures and others are rapid and efficient means of communicating to a large number of potential adopters, such as LIS lecturers in a country, interpersonal communication is more effective in persuading potential adopters to accept a new idea. For instance, a face-to-face communication among lecturers regarding the use of a given courseware, say WebCT, can increase the potential of acceptance because a lecturer who has implemented the package is likely to be more convincing to others about the effectiveness of the technology. Yates (2001) observes that the majority of potential adopters are more influenced by peer conversation than

scholarly writings and curriculum resources. Yates (2001) additionally underscores the importance of conferences and workshops where individuals with similar interests and of similar status can discuss and share stories about how the technology has worked well in a variety of situations. Yates' views support Rogers' (1995:18) opinion that the "dependence on the experience of near peers suggests that the heart of the diffusion process consists of modelling and imitation by potential adopters of their network partners who have adopted previously" and thus 'diffusion is a very social process.'

2.4.4 Time

A third important factor in the diffusion process is the element of time. Yates (2001) observes that time is often ignored in other behavioural research and yet the inclusion of time in diffusion research is one of its strengths. Rogers (1995) identifies three dimensions of time - that is - in, innovation-decision process theory, the individual innovativeness theory, and in the rate of adoption theory.

2.4.4.1 Time and the Innovation-Decision Process

The innovation-decision process is the process through which an individual learns about an innovation, forms an attitude, adopts or rejects, implements the new idea, and confirms the decision to do so (Yates, 2001). Rogers (1995) identifies five main steps in this process: knowledge, persuasion, decision, implementation and confirmation. These steps are in turn influenced by previous practice, felt needs/problems, innovativeness, and norms of the social systems.

a) *Knowledge of the Innovation,*

The first stage of the innovation-decision process entails seeking one or more of three types of knowledge about the innovation. Rogers (1995) describes these as: awareness knowledge is information that an innovation exists, 'how-to' knowledge consists of the information necessary to use an innovation properly, and principles knowledge consists of information dealing with the functioning principles underlying how the innovation works. The knowledge stage of the innovation-decision process is of great value to LIS educators in Africa because at such a vulnerable stage of the innovation-decision process,

LIS educators would be able to visualise the impact of ICTs on their programmes.

b) Persuasion Leading to Forming an Attitude toward the Innovation.

Forming an attitude, whether positive or negative, towards an innovation is a function of feeling rather than knowing and hence the main type of thinking at the persuasion stage is affective (Rogers, 1995). The attitude formation carries involves a search for evaluative information which can help in the reduction of uncertainty over aspects such as the consequences of adoption and/or non-adoption, advantages/disadvantages of adoption and/or non- adoption. Rogers (1995) postulates that the important aspects that shape persuasion include the source of evaluative information, the type of information and how the potential adpter interprets the information received. Even though the formation of a favourable/unfavourable attitude towards an innovation does not lead directly to immediate adoption, the main outcome of the persuasion stage is towards such a decision.

c) Decision to Adopt or Reject,

Rogers (1995) explains that the decision stage occurs when an individual engages in activities that lead to choosing to adopt or reject an innovation. In some cases, a small-scale trial by the prospective adopter or a peer is used to remove any lingering uncertainty. In LIS education, this is the stage at which a decision can be made to revise the curriculum, develop new courses or programmes and/or change names of programmes.

d) Implementation of the New Idea

Implementation involves overt behaviour change as opposed to the mental exercise of the preceding stages (Rogers, 1995). Rogers further observes that problems of implementation both technical and logistical have to be addressed and these are more serious in an organisational set-up than in individual's set-up. For example, when a LIS school decides to adopt ICT innovations, some of the implementation problems may include synchronisation with the parent institution of such things as ICT policy, infrastructure, training, technical support and sustainable funding. Rogers (1995) observes that the organisational structure that ought to give stability and continuity, may

in fact, turn out to be a resistant force to the implementation of an innovation.

e) *Confirmation of the Decision.*

Rogers (1983:184) states that “empirical evidence by several researchers indicates that a decision to adopt or reject is often not the terminal stage in the innovation-decision process.” There is a further process, the confirmation stage, in which the adopter seeks reinforcement for the decision already made. Conflicting information about the innovation can create a state of dissonance and lead to discontinuance of implementation.

A macro-level perspective of ICTs as an innovation in LIS education in sub-Saharan Africa suggests that the time and innovation-decision process may be between the decision and the implementation stages (Ocholla, 2002; Kloppers 1996). LIS practitioners, scholars, interest groups like the professional associations and ICT experts have been advocating for greater incorporation of ICTs in LIS education in Africa. This suggests that the innovation is known and many people are persuaded of the necessity to adopt, but the decision to adopt and the implementation of the decision has been often hampered by other factors such as funds, human resources, policies and infrastructure.

2.4.4.2 Time and Individual Innovativeness

The innovation-decision process is influenced by individual innovativeness. Rogers (1995:22) defines innovativeness as “the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system.” Some individuals adopt a new idea much earlier than others do - these are the innovators. Yates (2001) observes that innovators actively seek new information and are able to cope with the uncertainties that accompany new innovations. Early adopters accept an innovation soon after the innovators, followed by early and late majorities, and lastly the laggards (Rogers, 1995). LIS schools that first changed their curricula to incorporate ICTs can be considered as innovators or early adopters. However, most LIS schools are tied to their parent institutions when it comes to full implementation of ICTs. Besides, these attributes might be difficult to ascertain in LIS education in sub-Saharan Africa because while the acceptance and a positive attitude towards ICTs in LIS education may

be evident, yet translating them into action may not always follow (Kloppers, 1996).

Rogers (1995) identifies several additional characteristics dominant in the innovator type: (1) venturesome, desire for the rash, the daring, and the risky, (2) control of substantial financial resources to absorb possible loss from an unprofitable innovation, (3) the ability to understand and apply complex technical knowledge, and (4) the ability to cope with a high degree of uncertainty about an innovation. These characteristics are not commonly found in many Africa LIS schools because of socio-economic, technological as well as cultural-historical reasons. LIS schools that have exhibited characteristics of Roger's (1995) innovators include the revamped LIS programmes in USA such as Michigan, Florida State, etc. (Mangan, 2000; Marcum, 1997). It is expected that some of the LIS schools in sub-Saharan countries/institutions that enjoy relative economic and political stability, are likewise in advanced stages of re-engineering their programmes

Rogers (1995) likewise identifies several additional characteristics of Early Adopters, which are that they (1) are the integral part of the local social system, (2) form the greatest degree of opinion leadership in most systems, (3) serve as role model for other members or society, (4) are respected by peers, and (5) are successful. Like the Innovator category, these characteristics are not commonly found among LIS schools in Africa, mainly because of socio-economic and other reasons. However, it is expected that with socio-economic strategies like the New Partnership for Africa's Development (NEPAD) an effort by individual countries/institutions, sub-Saharan Africa may develop its own set of Early Adopters, let alone Innovators.

Rogers (1995) further identifies several additional characteristics to be found in the Early Majority, which are that they: (1) interact frequently with peers, (2) seldom hold positions of opinion leadership, (3) are one-third of the members of a system, making the early majority the largest category, and (4) deliberate before adopting a new idea. These characteristics of Early Majority are exhibited in some LIS schools in Africa, whereby a few LIS schools or professors attend international conferences and are in touch with renowned LIS innovators. Such schools/professors may hold little position of leadership

internationally, but are opinion leaders in Africa because they are in a position to bring home the experiences and knowledge obtained by their international interaction.

Rogers (1995) further identifies characteristics of the Late Majority: (1) one-third of the members of a system, (2) pressure from peers, (3) economic necessity, (4) sceptical, and (5) cautious. The larger majority of LIS education in Africa exhibits these characteristics. Pressure from global trends and competition from related sectors bears on LIS schools to adopt ICTs, so as to keep up with developments and remain visibly relevant in the job market.

Rogers (1995) finally identifies characteristics of the Laggards: (1) possess no opinion leadership, (2) isolates, (3) point of reference in the past, (4) suspicious of innovations, (5) innovation-decision process is lengthy, and (6) resources are limited. While the first four characteristics of this category might not apply in many sub-Saharan African LIS education social systems, characteristic 5 and 6 certainly do. Ocholla (1997) observes the lengthy processes and bureaucracy of curriculum change, while Ocholla (2002), Kloppers (1996) and Aina (1993) observe the dearth of ICT resources in LIS schools in Africa.

2.4.4.3 Time and the Rate of Adoption

The rate of adoption is the third dimension of time in the diffusion of innovations. According to Rogers (1995), adoption of innovations is slow and gradual at the start. Yates (2001) observes that this was evident with media literacy, whereby many teachers and administrators were first reluctant to adopt, but later, more schools started accepting media literacy as an integral part of the educational process. Rogers (1995) postulates that the cumulative frequency distribution over time resembles an s-shaped curve, rising as more adopters perceive the relative advantage and compatibility.

2.4.5 The Nature of LIS Society

The fourth and final factor, which influences the diffusion of innovations, is the nature of the society to whom the innovation is introduced. Rogers (1995:23) defines a social system as “a set of interrelated units that are engaged in joint problem-solving to

accomplish a common goal.” Members of the LIS education social system include LIS schools, lecturers, students, and LIS service organizations and practitioners. Diffusion of ICTs within these social systems is dependent upon the social structure, norms and opinion leaders within the system (Rogers, 1995).

2.4.5.1 Social Structure

Within the social system of educators there is a diverse group of individuals who act and react differently. For example within a LIS school, there is a head of department, lecturers and students, each group with its peculiar orientation towards ICTs. Some lecturers have greater orientation towards ICTs than others. Among the students, there are those whose backgrounds have already exposed them to ICTs. Additionally, there are diversities in intellectual capacity, aptitudes and attitudes. These social structures are useful as benchmarks of regularity, stability and prediction of behaviour with some degree of accuracy (Rogers, 1995). A social system's structure facilitates or impedes diffusion of an innovation (Rogers, 1995).

2.4.5.2 Norms

Norms within the social system provide guidelines for acceptable behaviour and also affect diffusion, in that they can facilitate or create a barrier for the diffusion of an innovation. For example, the norm LIS service is to facilitate dissemination of information by, say, providing wider access to information through electronic networks and everyone in the system, whether at managerial or at desk level is expected to facilitate the norm. To establish this norm requires preparation in ICTs as fundamental to the practice. Thus ICTs as innovation in LIS education is facilitated.

2.4.5.3 Opinion Leaders

According to Rogers (1995), opinion leaders are individuals who provide advice and information about an innovation to members of the social system. Opinion leaders influence the adoption of innovations by not only supporting the norms of the social structure, but also serving as a model for others. It is important to establish the opinion leaders of LIS education in Africa, whether they are LIS schools, LIS service

organisations or individuals. Opinion leaders are at the centre of the communication network and reach a large number of people via the interconnected flow of information (Rogers, 1995). It was envisaged that the findings of this study would reveal the LIS schools, countries or regions that may be perceived as opinion leaders

2.5 INSTRUCTIONAL TECHNOLOGY AND THE DIFFUSION THEORY

Instructional technologists routinely incorporate theories from “communication, cognitive psychology, management, computer science, behavioural psychology and many other fields into the development of instructional products and systems” (Surry, 1997:9). But many of these products and systems are not easily adopted and Surry (1997) argues that there appears to be many reasons for instructional technology's lack of utilisation, ranging from teachers' intrinsic resistance to change, to entrenched bureaucracies and inadequate funding. To fully explain, predict and account for the factors that impede or facilitate the diffusion of instructional technology, Surry and Farquhar (1997) suggest that it is necessary to first understand the multitude of factors that influence adoption of innovations and hence the need to incorporate the diffusion theory in instructional technology research. Surry (1997) argues that the applications of the diffusion theory to instructional technology can be grouped into two major categories of research, micro and macro level, each with distinctly separate goals.

2.5.1 Micro-level Approach

One of the major categories of ICT diffusion research focuses on increasing the adoption and utilisation of specific instructional products such as courseware, whose goal is to develop theories of technology adoption that lead to a more widespread use of instructional innovations (Surry, 1997). Rather than being concerned with large scale, systemic change, theories in this category focus on the adoption of a specific innovation by a specific set of potential adopters, and hence they are micro-level ICT diffusion theories. Surry (1997:3) refers to these as Product Utilisation Theories, which focus on change intended for various parts, within a structure, that would benefit the most from innovations. Yates (2001) cites Burkman's 1987 user-oriented instructional development

process as an example of the product utilisation approach.

2.5.2 Macro-level Approach

The first major category of ICT diffusion research focuses on the reform and restructuring of educational institutions, whose goal is to develop theories of organisational change in which technology plays a major role. Surry (1997) observes that these theories typically involve the adoption of a wide range of innovative technologies and practices and are referred to as systemic change theories. He further argues that because of their broad scope, system change theories can be thought of as macro-level ICT diffusion theories. Surry and Farquhar (1997) explain that instructional development theorists may approach diffusion research from a macro-level, when the underlying philosophy is a desire for complete educational reform that is both organisational and structural. Yates (2001) cites Reiguluth's 1987 Third Wave Educational System as an example of a macro-level approach to educational reform, which was concerned with revamping an entire institution. In order to maximise the potential benefit of diffusion theory, Surry (1997) recommends that instructional technologists should adopt a more instrumentalist philosophy of technology because technological superiority is not the only necessary condition for diffusion.

2.5.3 Adopter Based Instrumentalist Theory

Instrumentalist philosophy views technology as a tool that is under human control and hence it is the human interaction and social aspiration, not just the technological superiority, that guides change (Surry & Farquhar, 1997). These authors contrast instrumentalist with deterministic philosophy, which focuses on the notion that anything technologically superior, eventually takes over that which is technologically inferior. Nevertheless, Surry and Farquhar (1997) caution that while adopting the instrumentalist view, instructional technologists must not completely dispose of the deterministic philosophy because it is still important to develop superior products and systems.

Adopter-based theories focus on the human, social, and interpersonal aspects of innovation diffusion (Surry, 1997). Surry further observes that adopter based theories are inherently instrumental in philosophy because they view the end user, the individual who

will ultimately implement the innovation in a practical setting, as the primary force for change. Segal (1994:2) underscores the importance of adopter-based theory by observing that technology exists in a social context and, unless designed for the sake of design itself, serves only a social function. Surry (1997) points out that examples of adopter-based theories can be found in both the Macro and Micro categories of ICT diffusion research. But Burkman (1987) was the first major author in the field to suggest a Micro (Product Utilisation) theory based on an instrumentalist view of instructional technology. Burkman's theory of a user-oriented instructional development (UOID) focuses on the opinions, needs, and perceptions of the potential adopters being seen as the primary forces that influence adoption. Thus the non-adoption of many ICT products in higher education in Africa may be partially explained by the fact that the research on whose development these products is based did not include the opinions and needs of developing countries.

Tessmer (cited by Surry, 1997) emphasises the social factors of implementing an instructional product within the context of its use. According to Surry (1997), Tessmer proposes the use of an analysis procedure, which involves identifying the physical and use factors of both the instructional and support situations, to ensure that a product "is actually used, correctly used, and continually used." Surry and Farquhar (1997) propose Adoption Analysis for furthering a Micro (Product Utilisation) perspective of the instrumentalist philosophy. As Surry (1997) explains, though similar to the Environment Analysis procedure, 'this process takes a slightly broader approach in considering adoption factors from the perspectives of both users and organisations. The end result of an Adoption Analysis is an effective implementation plan that specifies a process of successful adoption.' Surry (1997) also cites Hall and Hord's 1987 Concerns Based Adoption Model (CBAM) as a notable example of an instrumentalist Macro (Systemic Change) theory of diffusion. Surry (1997) observes that CBAM proposes to bring about systemic restructuring by understanding the social, political, and interpersonal aspects of an organisation.

Surry (1997) concludes that although instructional technologists have largely been seduced by the simplicity and basic logic of technological determinism, the decision to adopt an innovation, however, often defies simple logic and successful products must

meet a myriad of considerations beyond simple instructional effectiveness or user wants. Thus the adoption of ICTs generally in higher education in Africa, and particularly in LIS education cannot be guaranteed based on the knowledge that these technologies are superior. According to the Association of African Universities (2000b), ICT tools are expensive and even though their application in teaching and learning is being seriously considered, their adoption should be carefully balanced against other ways in which teaching and learning may be improved and strengthened.

2.6 CRITICISM OF THE DIFFUSION OF INNOVATION THEORY.

Critics of the theory include Clarke (1999) who argues that the Diffusion of Innovation Theory is at its best as a descriptive tool, less strong in its explanatory power, and less useful still in predicting outcomes, and providing guidance as to how to accelerate the rate of adoption. He further argues that there is doubt about the extent to which it can give rise to readily refutable hypotheses because many of its elements may be specific to the culture in which it was derived (viz. North America in the 1950s and 60s), and hence less relevant in East Asian and African countries. However, the current study, being largely descriptive, exploited this aspect of the theory.

2.6.1 Appropriateness for Developing Countries.

Rogers (1983) observes that the classical diffusion model was developed from a reality of socio-economic conditions and by scholars with an ideological position not compatible with the reality of the developing world. To support his point, Rogers cites a 1976 study by Bordenave, which recommended that Latin American communication researchers must refrain from perceiving their reality through foreign concepts and ideologies because such a perception does not enable them to get to the main issues affecting development (Bordenave, cited in Rogers, 1983). Rogers concludes that diffusion research in developing countries should focus on equity issues rather than innovation. This view is partially corroborated by African scholars in so far as ICTs are concerned because to some extent, it is not ICTs as an innovation that is usually the issue (Aina, 1993; Ajayi, Isalawu and Raji, 1999; Alemna, 1999; Kloppers, 1996; Ocholla 2002;

Thapisa & Birabwa, 1998). Rather, it is the socio-economic reality as well as other issues of finances, human resource capacity, politics and culture that have great influence on the diffusion of any innovation. In a way, the current research reveals the preponderance of socio-economic problems that do not leave a clear scene for investigating on the strict and narrow principles of the diffusion of innovation theory. Nevertheless, the findings of this study can be used for further investigation into those elements.

2.6.2 Centralised vs. Decentralised Diffusion Systems.

The diffusion model is based on a centralised system whereby an innovation originates from an expert source to passive potential adopters who accept or reject the new idea. Rogers (1983:333-334) observes that this centralisation is because of “the fact that the basic paradigm for diffusion research grew out of the Ryan and Gross’s 1943 hybrid corn study, which was based on the centralised agricultural development system of USA at the time,” and thus influenced the formulation of the diffusion model. Although the classical diffusion model is relevant in much of current reality, it is criticised by Schon (as cited in Rogers, 1983:334) for its failure to “capture the complexity of relatively decentralised diffusion systems in which innovations originate from numerous sources and evolve as they diffuse via horizontal networks.” Rogers (1983) concurs that some new ideas are decentralised, diffusing horizontally through informal networks with a high degree of modifications occurring as adopters try to fit the innovation in their particular circumstances. ICTs are one such innovation, whereby there is no overall control by governments or strict top-down diffusion. Neither can the ICT industry be defined in top-down terms because various disciplines and industries (social systems) converge to make the whole. Instead, there is wide sharing of power among members of the various social systems and a great deal of local experimentation and remodelling by adopters (Rogers, 1983).

2.7 SUMMARY

This chapter has discussed the theory of Diffusion of Innovations and how it is applied in the adoption of information and communication technologies in education programmes

for Library and Information Science education. As a soft technology ICTs are incorporated as course content in LIS that represent the new practices of the information professions. As a hard technology ICTs are incorporated as instructional technology employed by LIS educators as an innovative and appropriate means of effecting knowledge transfer of the soft technologies. Although the theory dwells more on the hard technology aspects, both components are important for the successful diffusion of ICTs in LIS education. The theory is not a 'tight fit' for this study, but its principles provide a suitable framework and/or backdrop for this research. Elements of ICTs as an innovation are investigated in this study in terms of their relative advantage, compatibility, complexity, trial-ability and observability. The time element of the theory is not investigated but the social system and communication channels aspects are considered alongside the innovation decision process and perceived attributes of ICTs. The next chapter – Chapter 3 - reviews literature pertaining to the impact of ICTs in both higher education and LIS education.

Chapter Three

REVIEW OF RELATED LITERATURE

3.1 INTRODUCTION

This chapter reviews studies and literature from journals, conference papers, research publications, official government publications and books, to form an integrative review of four cross-related perspectives of this study. Nueman (2000:447) explains that an "integrative review presents the current state of knowledge and pulls together disparate research reports in a fast-growing area of knowledge." The purpose of this study was to map and audit the types, nature and diffusion of Information and Communication Technologies (ICTs) in Library and Information Science (LIS) education and training programmes in sub-Saharan Africa. The first section of this chapter reviews the role of ICTs in higher and tertiary education generally. The second section reviews the extent of ICTs integration in Africa and Africa's higher and tertiary education. The third section examines the impact of ICTs on LIS education, and the fourth section examines Africa's LIS education.

The ICT sector continues to grow tremendously, branching into a wide array of specialities, the major ones being software engineering, hardware developments, networking, telecommunications and artificial intelligence. As each of these branches develop more and better enhanced products and services, every discipline, including science, business, health, education and library and information science (LIS), has to constantly re-examine their ICT needs and adapt ICT tools relevant for their purposes. The LIS profession must continually harness these technologies, not only because ICTs improve the effectiveness of professional practice, but also because these technologies influence future development and direction of the profession. The rate of ICTs exploitation and use varies greatly between technologically advanced and developing countries such that current studies in the former, are far ahead of the realisable levels in the latter countries. Focus on ICTs in developed countries is perhaps more on what Sutton (2001:242) refers to as transformative trends i.e. representing 'systematic changes that

substantially alter the boundaries' of the profession. Developing countries, on the other hand, still focus on what the same author refers to as the "natural evolution of the traditional LIS domain" i.e. using ICTs to do old tasks better (Sutton, 2001:242). However, global integration requires that developing countries stay cognisant of the scenario in developed countries and vice versa.

3.2 ICTS IN TERTIARY AND HIGHER EDUCATION

Many scholars observe that ICTs have transformed higher education by providing greater access, new frontiers to learning and richer content (e.g. Revill, 2002; Morales & Roig, 2002; Werry, 2001; Darkwa & Mazibuko, 2000; Dowlin & Loertscher, 1999; Hooke, 1999; Larose, David, Dirand, Karsenti, Grenon, Lafrance & Cantin, 1999; Schulman & Sims, 1999; MacDougal, 1998). Faced with growing demand by graduates and employers, who want skill-oriented, interdisciplinary education, higher education has embraced the power of ICTs in order to improve accessibility, quality and efficiency of its services and products.

3.2.1 The Role and Impact of ICTs in Higher Education

In the first place, these technologies have stimulated and accelerated the production and growth of knowledge which Gregorian (1996) observes, has resulted in fragmentation and explosion of knowledge, requiring higher and better skills of mastering and/or imparting the knowledge. And the same technologies provide tools for the effective integration and management of the vast and fragmented knowledge (Gregorian, 1996). Secondly, there is mounting pressure from graduates and employers, pleading for skill-oriented education, real life orientation of courses and interdisciplinary approaches, thus prompting higher education institutions to adopt greater use of the new technologies (Burbules, 2000). Unavoidably, universities and colleges are responding to the many changes and adjusting to the new demands and advancements through incorporation of ICTs into the various aspects of their operations. According to Bull, Dallinga-Hunter, Epelboin, Frackmann, and Jennings (1994), ICTs affect four major aspects of higher

education namely, management and administration, teaching and learning, research, and libraries and information services.

3.2.1.1 ICTs in Higher Education Management and Academic Administration

ICTs are tools used in the administration and management of higher education institutions to store and communicate essential information in order to reinforce existing decision-making structures. These structures rely on multi-directional and multi-dimensional information flow and use in between the various facets/aspects of administrative and managerial divisions. Although differing from country to country and from one institution to another, administrative computing and networking can be categorised by the organisational structure of higher education institutions, which generally/broadly divides into four categories. The four categories are (1) academic i.e. programmes and courses, students admission/registration/enrolment and examinations, (2) finance i.e. accounting, purchasing and inventory, (3) personnel i.e. staffing, recruitment, training, positions and payroll, and (4) physical plant i.e. planning, maintenance, inventory, room assignment, etc. organisation (Bull, Dallinga-Hunter, Epelboin, Frackmann, & Jennings, 1994:28). Each division/category operates with various specific sets of information and communication processes, whose effective management boosts the total efficiency of the entire institution.

In the management of higher education, institutions are able to re-engineer their policies, structures and programmes in order to realign them to meet new, ICT-induced demands. Alexander (2001) argues that even though increased use and investment in ICTs by universities have occurred as a reaction to higher education crisis, it is believed that ICT use provides solutions for part of on-going management problems such as the need to reduce costs so as to make higher education accessible to the financially challenged; the need to expand higher education opportunities so as to cope with increased demand that has resulted from higher populations and improved basic education availability. This further provides solutions that need to provide high quality education to satisfy the current demand for broad yet industry ready knowledge and skills; and the need to

address the diversified needs of a pressurised clientele who need flexibility in time, space, courses and methods of learning.

a) Wider Accessibility to Higher Education

One of the major challenges facing higher education is to address the increasing demand for higher education. ICTs make it possible to provide wider access to higher education for more people without limiting admission to lecture hall space, hostel beds, mobility to relocate to a campus or ability to invest heavy sums of money (Bull, Dallinga-Hunter, Epelboin, Frackmann & Jennings, 1994). MacDougal (1998:1) observes that in the United Kingdom, the widening access to educational opportunity and attainment continues to grow as more ICTs are taken on board. ICTs have made this possible through the use of virtual classrooms that can potentially be accessed from anywhere on the globe, enabling students to have access to world-renowned faculty. Despite some difficulties, Pollock and Cornford (2000) observe that the numbers of online classes offered by higher education institutions, are growing rapidly in the UK. In the United States of America, about 33% of the higher education institutions offer at least one degree programme online while all institutions incorporate some form of online teaching (Werry, 2001). Herther (1997) adds that over 150 accredited institutions in the United States of America, offer entire undergraduate programmes to virtual students.

b) Competitiveness

ICTs have created demand for a new set of competencies required in the current ICT-driven job market. There is great competition among higher education institutions to attract and retain students by offering the best possible programmes at affordable costs and time. Werry (2001:1) observes that there has been a “rush by universities, venture capitalists and corporations to develop virtual universities, online courses, education portals and courseware.” He further notes that universities, colleges, faculties, schools and departments have been forced not only to facilitate access to more students, but also ensure that students are retained by offering competitive programmes in competitive environments. Thus many universities, including the elite, top notch or ‘Ivy League’ universities have responded to the aspect of increased competition, by launching online

courses and/or programmes. In some cases universities have established subsidiaries, which exploit their competitive brand name, while avoiding the some of the traditions that have been associated with the name. Werry (2001) cites Woody's observation that Ivy League administrators fear that they may be left behind and so using phrases such as 'leveraging of brands' and 'tapping intellectual capital' to market online courses, they have developed some of the most aggressive and sophisticated examples of commercial online education (Werry, 2001:3).

c) *Cost Reduction*

In the general hype to join the ICT bandwagon, it is believed that higher education is cheaper online than through the traditional set up. Schulman and Sims (2002) observe that online education which can be accessed remotely eliminates or at least reduces the cost of dormitories, athletic programmes and other traditional campus facilities, saving both the university and student from these expenditures. The Florida State University system, for instance, expects online programs to save 40% of the cost of in-class programs (Caught, cited in Schulman & Sims, 2002:1). It is therefore expected that institutions that offer comparatively cheaper programmes will be able to attract and retain more students. However, other studies warn that there is a misconception that web-based learning does necessarily reduces costs, when in fact costs usually increase in terms of labour, expertise, time and effort (Martin, Kerrisk & Richards, cited in Smith 2002; Brabazon, cited in Smith, 2002; Kochtanek & Hein, cited in Smith, 2002; Bagherian & Thorngate, cited in Smith, 2002; Curry, 2001). Additionally, students often find that the cost of aspects such as printing increase because most students still need printed course notes and other reading material for studying (Smith, 2002).

3.2.1.2 ICTs in Teaching and Learning (*Content Delivery*)

The integration of new technologies in teaching and learning is said to be a significant factor in the promotion of academic innovation and transformation, hence influencing the teaching and learning paradigm (Morales & Roig, 2002). There is a new paradigm, - the learning paradigm⁷ - which requires university professors/lecturers to have skills in

⁷ The learning paradigm is more fully described in Chapter 2, section 2.1.2.1 of this thesis.

instructional technology, in addition to their subject matter expertise. Academic staff need to be cognisant of, and use the new and variety of learning styles such as active learning, learning to learn, collaborative learning, problem-solving, role playing, etc. which are easily facilitated by ICTs. They (professors) need to adjust their instructional methods to incorporate the use of ICT-based tools such as tutorial software/courseware, and learn to develop courseware for each course through increased use of ICTs as integrated instructional devices that foster greater hands-on learning, richer simulations, provision of exploratory environments, flexi-time learning, in addition to automated pedagogy (Burbules, 2000). As stated by Morales and Roig (2002), these adjustments are necessary to enable universities achieve their objectives.

Educational delivery has been enhanced by new interactive pedagogical techniques that use ICTs and employ multimedia educational resources (Shoffner, Jones & Harmon, 2000). Methods of delivering higher education now include the linking a rich variety of educational resources in a multimedia integrated environment that involves putting together different types of information in different formats in a “computer linked to text, graphics, still pictures, animations, sound and video” (Thomas, 1996:5). Such approaches and practices eclipse the traditional methods of formal education, which concentrated mainly on two senses - hearing and seeing – that resulted in passive learning, and replaces them with multimedia applications that involve all the senses that accommodate different learning styles and results in more effective learning (Hubbard, 1993). For instance, a video-based presentation can employ a variety of visual effects such as zooming in or out, showing interesting details and demonstrating “before-and-after cause-and-effect relationships, thus providing more meaningful and even interactive learning sessions” (Barron, 2002:185). Comparative studies between online education and in-class education report that there is qualitative advantage in offering computer-based instruction. Schulman and Sims (2002) cite studies conducted in 1997 by Vasarhelyi and Graham at the University of Michigan, Gubernick and Ebeling at the University of Phoenix, and Schutte at Cal State Northridge. All these studies reported improved achievement attributed to computerisation (Schulman & Sims, 2002). However, Schulman and Sims (2002) also noted that there are other studies, which argue that the

improvement in performance is not significant.

The earliest and most predominant application of computers in tertiary teaching and learning, is the use of word processing for term paper writing in the case of students and notes and handout preparation in the case of lecturers. Currently, special and suitably structured software, such as WebCT, CyberProf, Docent, Moodle, Prometheus, etc., have been developed to support the different forms and facets of computer assisted learning (CAL), such as *online/e-learning/web-based education, virtual learning and/or Computer-Based Instruction (CBI)*. Most of these forms utilize the Internet as a major working place where disparate students from diverse locations, even internationally, can engage in both individualised and collaborative learning activities using various diverse media. Other teaching media categories include audio-visuals such as television, video, film, audiotapes, hypermedia such as hypertext and multimedia systems, interactive media such as simulation, modelling, and micro-worlds and discursive media such as teleconferencing (Laurillard, 1993). These media are severally combined in teaching learning models such as virtual classroom, supported self-learning and collaborative learning (Ljosa, 1998).

According to Ljosa (1998), the *virtual classroom* is whereby audio/video conferencing facilities are connected in real time, to various sites in a manner that can reproduce lecture/classroom situation. In such an environment, the teacher/expert is the centre of activity, while there is *minimal interaction from students/learners*. The virtual classroom is often accompanied with complementary information, which can be delivered in a variety of formats. The main benefit of the virtual classroom is the ability to transcend space and reach learners in disparate locations. However, innovative learners can also take more control of their learning situation by for instance, planning a group discussion to which they invite an expert (or experts) to participate by telecommunication (Ljosa, 1998).

The *supported self-learning model* allows a learner to strategize, access core content and respond at a convenient time, pace and for as long as necessary, using off-line or on-line

technologies (Ljosa, 1998). The lecturer supports students by posting relevant course material, flexibly structured and arranged in modular form. Guidelines of course content, assignments and feedback are available in such a way that allows easy adaptation to each learner's needs. This model uses special software such as WebCT, CyberProf, Docent, Moodle, Prometheus, etc. which are suitably structured for on-line or web-based course authoring, delivery and management. The model is widely used for distance education.

Collaborative learning model involves dynamic horizontal information flow between learners, enabling them to share experiences and information either in real time or otherwise in order to carry out a common project or operation. The lecturer's role is that of a facilitator/moderator, suggesting new perspectives, directions, questions or subjects (Ljosa, 1998).

These models exemplify how ICTs have transformed the education process in that some of the traditional roles of teacher and learner have been redefined. Considering that learners at higher education level are highly literate and mature, ICTs permit a shift of emphasis from faculty-centeredness to student-centeredness. The lecturer's role can be more to do with guiding the exploration and acquisition of knowledge rather than that of solely imparting knowledge, hence requiring lecturers to have skills in instructional technology and group dynamics, in addition to their subject matter expertise. Students, on the other hand, are increasingly responsible for their learning by learning how to learn and being actively involved in thinking, doing, discussions, problem-solving and experiential learning. Thus both lecturers and students need good ICT skills such as word processing, spreadsheets, internet use, electronic mail, web page design, data management, graphic design, multimedia programmes, hypermedia tools and information skills.

Computer assisted learning has gained importance in higher education, especially with the shift towards instructional and content enrichment through simulations and hypermedia networking. Corporate and campus agendas have recognised that e-learning such as the above models depict, has the power to really transform performance,

knowledge and skills landscape, so much so that education and training is posed to become one of the largest sectors in world economy (Gunasekaran, McNeil & Shaul, 2002).

3.2.1.3 ICTs in Academic Research

Research information and research communication are two of academic research aspects that rely heavily on ICTs. On a broader scale, UNDP (2001) observes that the development of scientific research networks on a worldwide basis using the Internet, has helped to empower research programmes even in developing countries. Research processes in higher education have been enhanced by the ICT environment that enables researchers to co-ordinate research information and collaborate in research activities. Accenture, Markle and UNDP (2001) observe that the development of scientific research networks on a world-wide basis using the Internet, has helped to empower research programmes even in developing countries. For example, 'virtual research groups - composed of interconnected specialists of different parts of the world - allow databases to be shared, conferences to be organised, papers to be circulated and discussed, and collaborative research and reporting to be undertaken' (Accenture, Markle & UNDP, 2001: section 2.2.2 ¶ 3). According to Minishi-Majanja (2003:162) the research process in most cases requires:

- relevant, current, timely and accessible information, which is currently available in on-line databases, electronic bulletin boards or from other scholars through electronic mail. Researchers can access and obtain information faster and hence are sure of the *currency of their data and reliability of their studies and findings.*
- faster and accurate computation and processing of data, which is efficiently achieved using specialised statistical software packages. The once lengthy and complicated computations that would take laborious time and effort, can now be easily and quickly accomplished with high levels of accuracy, leaving the researcher with ample time to interpret and infer, thus contributing towards better research findings.

- effective presentation and dissemination of findings currently possible through software such as PowerPoint, and sophisticated networks such as institutional intranets and extranets, library networks, national/regional networks, teleconferencing networks and the global internet. Researchers can self-publish on the web or use email to send their findings to colleagues, professional organisations and other consumers. A research report, complete with graphics, can be attached to electronic mail to be opened and read using the hypertext mark up language (HTML) tools at its destination. Comments by referees or scholarly colleagues can be emailed back, and corrections easily done with the power of ICTs.

Academic research has also been enriched by ICTs in that these technologies form new research fields. Almost every academic field has been impacted by new technologies, which have permeated the essence or core of disciplines, thus requiring inquiry. The “focus and attention given to information processing and information technology is subject to scientific investigation because these are important fields for education and the scientific community” (Bull et al, 1994:5).

3.2.1.4 ICTs in Academic Libraries and Information Services

It could be argued that within many institutions of higher education, libraries and information services were among the first departments to be impacted by information technology. Library automation was introduced to improve the efficiency of university libraries in their role of providing information for lecturers, students, researchers, administrators and the public. The application of information technology in libraries is twofold, that is, (1) for housekeeping tasks so that processes of acquisitions, cataloguing, circulation and inventory can be efficiently handled, and (2) for information retrieval so that library users can easily find and use information materials from local or remote collections. ICTs are used in provision of bibliographical information, catalogue information, access to remote sources of information e.g. databases, internet archives, etc. and also for communication of information provision matters. Libraries in higher education institutions are thus able to widen the range of information services available for the higher education community.

3.2.2 Benefits of ICTs to Higher Education

From the foregoing paragraphs, it is discernible that many benefits are expected from the use of ICTs in higher education. According to Baillie and Percoco (2000), most benefits depend on the availability of optimum conditions for the use of the technologies. Baillie and Percoco (2000) further argue that for benefits to be obtained, specific educational environments such as student types, needs and numbers, teachers' expertise and enthusiasm, classroom styles and contexts, and overall institutional setting have to be appropriate. Rich, Robinson and Bednarz (2000) add that, to secure many of these potential benefits, there is need for various dimensions of collaboration between students, academic staff, technology specialists, teaching resources, databases and information centres. They argue that "effective deployment of ICTs, not only facilitates collaboration but also probably, in many circumstances, demands it" (Rich, Robinson & Bednarz, 2000:264). Benefits of ICTs in higher education can be perceived in terms of:

- a) flexibility that can be achieved by lecturers in content delivery using multi-channel applications such as internet-based virtual reality, video conferencing, interactive radio and television, teletext, intranet platforms, collaborative teaching methods, linkages to multi-media sources and individualised CD-ROM tutorials (UNESCO, 1998:section 2.3). However, the loss of personal, face-to-face contact sometimes lowers the net value of online courses.
- b) improvement in students learning because ICTs facilitate improved motivation, learning by trial and error, practical experience, self-paced learning, concretisation of abstract concepts and hence better retention of lessons (Gunasekaran, McNeil & Shaul, 2002:2). The development of intranets and extranets offer very capable platforms for comprehensive learning and performance support environments for example, the linkages to a wide variety of information content to support course material (Gunasekaran, McNeil & Shaul, 2002).

In this regard, a study conducted by Morss (1999) at Creighton University, to find out the reactions of students and lecturers to the introduction of WebCT courseware, reported that students were happy with the:

- improved communication with lecturers such as quicker feedback through email and/or ICT testing techniques, reinforcement of learning through accessible provision of supplementary content, reference links, conceptual maps and self-testing exercises.
- more enjoyable learning experience due to options, flexibility and responsibility.

Lecturers, on the other hand, reported:

- ✓ improved use of class time conceptual application since complex concepts and supplementary content can be given to students ahead of time on a web page or through email.
- ✓ flexible delivery which includes self-testing exercises for high problem content subjects e.g. mathematics, chemistry and computer science.
- ✓ opportunity for reflection and collaboration among lecturers within and across departments.

- c) professional skills development for both teachers and learners. According to a UNDP (2001) report, ICT-mediated learning can facilitate sophisticated and customised performance simulation suitable for most vocational training programmes such as in health care, engineering, information technology services and in education, at low and/or marginal costs.
- d) the promise of distance education's benefits of transcending geographical, time and affordability barriers to education. Furnell, Onions, Bleimann, Gojny, Knahl, Roger and Sanders, (1998) observe that the mass popularisation of the internet and world wide web have resulted in opportunities that have developed distance learning concept into an even more advanced on-line environment. This has enabled higher education to have a wider outreach capacity; whereby more students can be enrolled in e-courses without the limitation of space and time.

e) enhancing of efficiency and effectiveness of education administration and management. ICT-based data repositories and networks facilitate collaborative curricula development, cost-effective procurement of educational materials, efficient time scheduling and efficient monitoring of processes and educational data (Accenture, Markle & UNDP, 2001). However, it is important to note that costs may not be realistically or significantly lowered considering that effective online environment for teaching often requires fewer students.

3.2.3 Issues of ICTs in Higher Education

Lee (2001) observes that all major changes are accompanied with doubts negative aspects alongside the positive aspects and enthusiasm. At their worst, ICT is regarded as “disruptive” because it has “great appeal to its users but upsets the traditional models” of doing things (Blackwell, 2001:34). Thus the potential, power and impact inherent in the incorporation of ICTs into higher education also raise some concerns and challenges.

3.2.3.1 Philosophical Issues

Despite the foregoing benefits, other schools of thought caution that scholarship in particular, instead of benefiting, may be losing out in the ICT-based environment. For example, Gregorian (1996) observes that the resultant fragmentation of knowledge, hence the fragmented approach to learning that has been brought about with increased knowledge production by ICTs, leaves scholars ignorant of vast fields of knowledge that a truly educated person ought to know. Additionally, instead of uniting human beings into a general community of values and discourse, he argues that this specialisation has divided them into “small and exclusive coteries, narrow in outlook and interest” (Gregorian, 1996:599). Gregorian concludes that specialised education turns students into instruments for serving the specialised needs of specialist societies only. Kling (1996) adds that the improvement in educational outcomes obtained when using ICTs, is not that much less costly because of the need to have smaller class populations, extra and constant in-servicing of teachers, greater supervision by management, smarter hence more expensive teachers, lesser teaching load and to have sustainable funding so as to meet the

cost of technology itself. Roberts (as cited in Revill, 2002) concurs that there is a decline in scholarly output while the cost of books and periodicals has increased, as well as the cost of increased lecturer's time, high cost of infrastructure and technical support. Morales and Roig (2002) caution that there is also a potential threat to scholarly authoritativeness whereby lecturers might be "outdone by an unlearned ever-changing technology, future uncertainty and sharing their professional tuff" with technology experts (Morales & Roig, 2002:4). Whether or not these claims of loss are significant, can be debated. What seems to be no longer debatable is that every educational system, institution, university or department requires ingenuity, commitment and courage in the recognition and implementation of ICTs because this is a global trend.

3.2.3.2 Policy and Implementation Issues

The ultimate full exploitation of ICTs in higher education is epitomised in the concept of the *virtual university*. A university with a "decrease in the importance of the campus, as students 'login' from a distance to access 'courseware', new media technologies replacing traditional lectures, courses being delivered and assessed over the internet, promising higher education available anywhere and at any time" (Pollock & Cornford, 2000:1). Even though there appears to be no one generic model of the virtual university, Foster (2000) observes that virtual university models can be located on a spectrum. At one end of the spectrum are institutions dedicated to distance learning e.g. UK's Open University, Western Governors University, Disney University, etc., whose programmes are offered almost exclusively online. At the other end are institutions that partially offer individual courses online, incorporating WWW resources into what is predominantly a face-to-face module. These trends, though in some cases to a lesser magnitude, are repeated in many countries all over the world as universities and colleges respond to changes and need for wider accessibility, competitive competencies and quality education.

The potential of ICTs in higher education notwithstanding, Dowlin and Loertscher (1999) observe that efforts in the USA to establish virtual universities have not gone smoothly. The Western Governors Virtual University of USA and the California Virtual University, both failed to take off as had been anticipated. Pollock and Cornford (2000) report similar

failure in UK. After conducting research on the concept of virtual universities, under the UK's Economic and Social Research Council - Virtual Society Programme, they observed that the actual emerging model of a Virtual University bears little relationship to the vision and concluded that the Virtual University works in theory but not in practice. Both the UK and USA reports concur that the problem may be inherent in the vision or perspective. Dowlin and Loertscher (1999) observe that the ultimate concept may have been 'over-hyped' and may not be translatable into reality.

a) Implementation Approach

There seems not to be consensus regarding the best approach for implementing the virtual university concept or its parts thereof. Dowlin and Loertscher suggest a bottom-up approach whereby virtual education is implemented first on small scale, such as at departmental level rather than in the entire university. This suggests a decentralised system, which conversely comes with issues of standards, software, viruses, piracy as well as costs and logistics of use and connectivity. Pollock and Cornford (2000) on the other hand, decry this piece-meal, bottom-up, course-by-course approach as an impediment to growth because it is slow, labour-intensive and prone to failure. The notable undercurrent in these arguments may be funding in that the centralised approach often requires large initial amounts, while the piecemeal approach may begin with relatively less capital.

b) Funding and Commitment

Optimum exploitation of ICTs in higher education requires that both management and staff be committed to the concept and its implementation. Also required are infrastructural strategies, standards and financial commitment to facilitate use. Foster (2000) observes that there is need for commitment from the institution's management and staff, especially because of the technological and organisational challenges involved such as changes in internal structures, sustainable funding, inter-institutional collaboration, changes in teaching and learning and the co-ordination of a wide range of people across the organisation.

c) Staff Motivation

Morales and Roig (2002) observe that to implement ICT-based teaching requires considerable additional time and commitment such as learning of the technologies, re-focussing of teaching styles and producing materials. Dowlin and Loertscher (1999) suggest that there should be a policy of academic rewards and entrepreneurial benefits forthcoming for lecturers, including intellectual property rights.

3.3 ICTS AND HIGHER EDUCATION IN SUB-SAHARAN AFRICA

In view of the role of ICTs, there is enormous potential for their integration in higher education in sub-Saharan Africa. The premise of such potential lies in the perception that ICTs are catalysts for development that can enable African scholars and the populace to join the global village whose main commodity is information and knowledge. Raseroka (1997) observes that through globalisation and use of computer-based multimedia, developing countries of Africa can transform education. It is envisaged that ICTs can help to break down traditional barriers to higher education, develop competitive work force and curb brain drain (Darkwa & Mazibuko, 2000: ¶ 6). Chisenga (1999) concurs and adds that ICTs are tools that can enable Africa to contribute to global information resources by translating indigenous knowledge into web content. However, the realization of these benefits and/or potential depends upon the ICT capacity.

3.3.1 Sub-Saharan Africa's ICT Capacity

The use of ICTs in Africa has grown rapidly, especially in urban areas even though this growth does not seem to be enough as the problem of the digital divide is still felt in Africa (James, 2001). Whether narrowly focussing on computers and Internet connectivity, or broadly including telephone access, facsimile, television and broadcasting media, there is an enormous technological gap between the Organisation for Economic Co-operation and Development (OECD) countries and developing countries (Wilson III, 1999). Adeya (2001) observes that there are constraints against the development of ICT in Africa such as inadequate computerisation, inadequate infrastructure and inadequate human capacity, most of which relate to the economic

disadvantage of these countries. For instance, wider use of the Internet in Africa is impeded by the cost and telecommunication infrastructure (Jensen, 2002; Main, 2001). The digital divide problem is exacerbated by the fact that most software products are expensive, proprietary and continuously enhanced and/or developed. Software enhancements, apart from the financial burden created, have the added problem of rendering hardware obsolete.

Thus ICT capacity building is difficult, lengthy and expensive for most African countries, especially considering that there are also other basic priorities such as provision of food and medicine. There is, therefore, concern that Africa is lagging far behind the rest of the world in the adoption of ICTs, a factor which casts anxiety when viewed in the light of globalisation of a period dubbed as the information era. Wilson III (1999) observes that the growing ICT gap correlates to divergence in economic wealth and that the two gaps are mutually reinforcing. However, James (2001) observes that declining cost computers and other related devices can help bridge the digital divide by enabling developing countries to gain greater access to the Internet and computerisation, as long as there are well structured ICT policies to guide implementation.

3.3.1.1 Africa's ICT Policies

Addo (2001) observes that the growing importance of ICTs in addressing development issues mean that countries have to direct considerable amounts of their resources towards the development and exploitation of these technologies through supportive policies. Of great importance are national information infrastructure (NII) policies and policies for the development of telecommunication infrastructure on which the use of the Internet depends. ICT policies can empower both micro and macro level investment (World Development Report, 1999; Alemie, 1998; Raseroka, 1997). Daly (2000:6) argues that policies of liberalisation of telecommunication structures are the key to opening up greater Internet use because the resultant competition will, not only lower costs and improve quality of the services, but also lead to the “development of innovative service models that can reach remote and rural areas.” Daly (2002) suggests that both regional collaborative initiatives such as the African Information Society Initiative (AISII), as well

as national efforts such as National Information and communication Infrastructure (NICI) would boost the ICT development efforts. At national levels, Thapisa and Birabwa (1998:57) recommend that national governments in Africa should establish "Information and Communication Think Tanks" whose activities would include the formulation of ICT policies. And from case studies of universities in Ghana, Lesotho, Nigeria, South Africa, Swaziland, Tanzania and Zambia. Ajayi (2000) concludes that the formulation of a strategic policy is a very essential component of developing ICT capacity in African universities. Addo (2001) observes that political leadership and national policies that emphasise research and the development of expert skills are also very important for connectivity and ICT utilisation.

It appears that current policies are inadequate in providing sufficient frameworks for ICT development, for instance, in areas of entrepreneurship, trans-border data flow and communication (World Development Report, 1999), even though most ICT policies in Africa are general/national i.e. covering a whole country's approach or sectoral, i.e. "focussing on a whole sector such as production, publishing, media, business, libraries or education" (Adeya, 2001:17). Policy issues at organisational level do not seem to have attracted much attention in so far as the wider audience is concerned, yet the implementation of ICT policy is often found at micro level i.e. within individual organisations.

3.3.1.2 Computerisation

According to Adeya (2001:10), Africa has made great advances in adopting "computerisation in both public and private sectors, but especially in the fields of business, travel, health and education." Although some of the ICTs have been donated, acquired or assembled in an effort for organisations to "leap-frog" into the globalisation agenda, Ocholla (2002) concurs with Adeya (2001) that Africa has some modern ICT facilities, even though these may be seen to be in relatively small pockets and of small fraction when compared to the developed world. Jensen (2002) observes the following:

Most recent estimates for the number of PCs in Africa put the total at about 7.5 million for 2001 – an average of about 1 per 100 people,

however, some studies such as ACCT's 1995 survey indicates that this may be an over- estimate by between 3 and 6 times, making the average closer to than 1 per 500. Almost all of the PC equipment uses Intel or Intel-compatible processors except for the publishing industry where there are significant numbers of Apple Macintosh PCs. As a result Microsoft Windows is the dominant operating system, although because many PCs are older machines using 386 and 486-processors and there are still large numbers of DOS-based systems. (Jensen, 2002: section on ICT hardware and software, ¶ 1).

Jensen (2002) further observes that there is greater computerization both quantitatively and qualitatively, in the private sector than in the government. However, the level and rate of this computerisation in Africa is still a matter of concern, especially to techno-enthusiasts, scholars and a sizeable fraction of the general populace. For instance, the best ICT-resourced country in sub-Saharan Africa, South Africa, is nonetheless still not able to offer most of its university students, physical access to computers (Broekman, Enslin & Pendlebury, 2002). In a study at an up- market South Africa University, Broekman, Enslin & Pendlebury found that 76% of second year, and 56% of first year education students, who enrolled for a distance education programme, had no physical access to computers (Broekman, Enslin & Pendlebury, 2002:31).

3.3.1.3 Telecommunications

The telecommunications infrastructure, though improved, has not yet reached many rural areas in Africa and hence Internet connectivity beyond major cities and towns is still difficult. Darkwa and Mazibuko (2000: ¶17) observe that Africa as a whole boasts of only 2% of the world's telephone network, with a telephone density of less than two lines per 1000 inhabitants. Thapisa and Birabwa (1998) conducted an exploratory study of Africa's initiative at building a plan for the formulation and development of National Information and Communication Infrastructures (NICIP). Critically examining the impact of globalisation, Thapisa and Birabwa observè that Africa is lagging behind in the exploitation of the information revolution because of the absence of modern and adequate

telecommunications system and an underdeveloped information infrastructure. However, Jensen (2002) observes a substantial increase in the rate of expansion and modernization of fixed networks whereby the number of main lines have grown about 9 percent a year between 1995 and 2001 - an increase from 12.5 million to 21million fixed lines across Africa - but argues that this growth is still poor because it is off a very low base - of about one per 130 inhabitants in Sub-Saharan Africa (excluding South Africa) - and concentrated (70%) in the large cities, such that the bulk of the population are not reached. On a sub-regional level, the countries of the Sahel and Central Africa are the worst off, such as Mali, Niger Congo and Chad having one phone lines for every 200-500 people. North Africa and South Africa have a tele-density of around 1 in 13, West and East African coastal countries have densities in between – usually 1 in 50 to 1 in 100. With the exception of North Africa and South Africa, only a few smaller countries have so far been able to increase their tele-density above 1 in 50 - these are Botswana, Cap Verde, Gabon, Mauritius, Mayotte, Namibia, Sao Tome, Senegal and Swaziland” (Jensen, 2000). Main (2001) observes that the whole of sub-Saharan Africa has fewer telephone lines than the Manhattan Island in USA. Thus obtaining a connection takes a long time, for example it takes an average delay of 10 years to obtain a telephone line in Ethiopia and Sudan, over 7 years in Algeria and 5-6 years in Kenya (Main, 2001:87). Nevertheless, Jensen (2002) concedes that the penetration of the mobile network services, despite the high cost of their (mobile phones) usage, has greatly ameliorated the situation. Only a few countries (Botswana, Cote d'Ivoire, Egypt, Kenya, Ghana, Mauritius, Morocco, the Seychelles, Sudan, Togo, Tunisia, South Africa and Uganda) have advanced services such as ISDN and video conferencing, while data communication services based on X.25 are available in half (27) of the countries, most prevalently in the Francophone ones (Jensen, 2002). The use of these facilities is, however, limited because of the costs involved.

3.3.1.4 Networks and Connectivity

The Internet is dependent on the telephone network, which in turn is made up of costs of the line and the charges of usage/connection time and hence arise issues of connectivity capacity and cost; software licensing, growth and costs; hardware advancements;

multimedia links; and even lack of political support/goodwill (Addo, 2001; Darkwa & Mazibuko, 2000; Raseroka, 1997). The pervasiveness and availability of a telephone network, plus its affordability are major challenges in Africa. Thapisa & Birabwa argue that the monopoly and restrictions on telecommunication services by governments result in slow and expensive development of Internet connectivity. However, it is important to note that some national governments such as Botswana, Ghana, Uganda, etc. have liberalised the telecommunication systems, thus enabling the expansion of services (Thapisa & Birabwa, 1998). In 1999, only 1% of the African population was connected to the Internet and the majority of the few connected were to be found in one country, South Africa (Wilson III, 1999:3). Jensen (2002: section on The Current Status of the Internet in Africa, ¶ 2) observes that:

As of mid 2002 the number of dialup Internet subscribers was close to 1.7 million, 20% up from the previous year, mainly bolstered by growth in a few of the larger countries such as Egypt, South Africa, Morocco and Nigeria. Of the total subscribers, North Africa and South Africa are responsible for about 1.2 million, leaving about 500 000 for the remaining 49 Sub-Saharan African countries. In Africa, each computer with an Internet or email connection usually supports a range of three to five users. This puts current estimates of the total number of African Internet users at around 5-8 million, with about 1.5-2.5 million outside of North and South Africa. (Jensen, 2002: section on The Current Status of the Internet in Africa, ¶ 2).

In addition to connectivity, it is important for the networks to have sufficient or adequate capacity to handle the large throughput of Internet traffic. To deliver web pages over the Internet requires high-speed networks with large bandwidth to carry voice, data and video. Such capacity, whether through high speed networks, satellites or cabling systems, is still too costly for the average developing country. Jensen (2002) observes that most countries in Africa have dialup capacity of only 64Kbps because there is lack of circuit capacity and besides, these countries cannot afford the high international telephone

tariffs. He adds that the use of fiber optic cable for international traffic is still in its infancy in Africa and most international telecom connections are carried via satellite. According to the ITU, the total number of 64Kbps international circuits in Africa was close to 59 000 in 2000, 4% of the world total (Jensen, 2002). However, 23 countries, among them South Africa, Egypt, Kenya, Mauritius, Morocco Nigeria and Zimbabwe, have international internet links carrying more than 2Mbps, which permits acceptable levels of traffic (Jensen, 2002).

3.3.1.5 Human Capacity

Part of sufficient infrastructure includes human capacity or expertise to develop, implement and manage ICTs. Africa's capacity in human skills is still inadequate partially due to brain drain and partially because of inadequate training opportunities (Addo, 2001). Darkwa and Mazibuko (2000: ¶18) observe that only few scholars, mainly to be found in South Africa and Botswana are familiar with online teaching environment. Ocholla (2002) argues that Africa needs ICT experts because of the increasing number of modern ICT facilities that are to be found in many sectors. Addo (2001:149) recommends the establishment of centres of excellence to help "tap, train and develop expertise." Yet specialist training, for instance, in telecommunications is extremely limited, available in only two major regional centres for training in telecommunications – European School of Management Technology (ESMT) in Senegal, for francophone countries and African Advanced Level Telecommunications Institute (AFRALTI) in Kenya, for Anglophone countries (Jensen, 2002).

3.3.1.6 Addressing the Digital Divide.

Efforts to address the digital divide problem in Africa include one notable example, the Economic Commission of Africa - African Information society Initiative (ECA-AISI). The ECA's conference of Ministers of Development and Planning adopted an action framework to build ICTs in Africa in 1996 (UNESCO, 2001). This framework - the African Information Society Initiative (AISII), was a response to the need for the continent to harness the potential of ICTs for its development. The goal of AISI is the achievement of a sustainable information society in Africa by 2010 through actions and

partnership of African countries. These actions are outlined on the AISI (2003) website and include:

- Developing national plans for building information and communication infrastructure;
- Eliminating legal and regulatory barriers to the use of ICTs;
- Establishing an enabling environment to foster the free flow and development of information and communication society;
- Developing policies and implementing plans for using ICTs in the public sector;
- Identifying, developing and introducing information and communication applications in areas of the highest impact on socio-economic development at national level;
- Facilitating and establishment of locally based, low-cost and widely accessible Internet services and information content;
- Preparing and implementing plans to develop human resources in ICTs;
- Adopting policies and strategies to increase access to information and communication facilities with priorities in servicing rural areas, grassroots society and other disenfranchised groups, particularly women and youth; and
- Creating and raising awareness of the potential benefits of African information and communication infrastructure (AISI, Home page, 2003).

According to AISI (2003), the primary vehicle for implementing AISI framework is the Partnership for Information and Communication Technologies in Africa (PICTA), which comprises multi-lateral, bi-lateral, non-governmental and research organisations, and private foundations and other private sector representatives. PICTA plans activities and projects and designates lead agencies for their joint implementation. Currently the implementation has concentrated on seven component areas consisting of (1) policy awareness, (2) national information and communication infrastructure policies and plans, (3) connectivity, (4) training and capacity building, (5) democratising access to the information society, (6) sector applications, and (7) development information infrastructure (AISI, 2003). Some of the main activities that have been undertaken include policy awareness, national policy workshops in more than 12 countries technical

workshops on connectivity and use of ICTs for development, and projects for democratising access to the information society (AISI, 2003). Policy advice is provided by the African Technical Advisory Committee on AISI, which comprises experts from public sector, private sector, universities, research institutions and non-governmental organisations (AISI, 2003). AISI has been endorsed by the African Regional Conference on Telecommunications for Development, African Ministers of Communication, Information Society and Development Conference, the Organization of African Unity (OAU)⁸ and G-8. AISI works closely with the UN Special Initiative for Africa (UN-SIA) priority area on Harnessing Information Technology for Development (UNESCO, 2001).

Thapisa and Birabwa (1998) identified other major initiatives such as the Southern Africa development community (SADC)'s agreement in 1996 on establishment of a high quality, regional information and communication infrastructure and the Pan African news Agency (PANA) launch in 1983 by the then Organization of African Unity (OAU). These are some efforts to bridge the digital divide between Africa and the rest of the world, but more importantly, to create effective digital opportunities and speed the continent's entry into the information and knowledge global economy.

3.3.2 The Challenge of Africa's Higher Education ICT Capacity

Africa needs a higher education environment that responds to the continent's educational and social crises. Addo (2001) opines that the crisis in developing countries is the failure in the delivery of education and higher education, which is expected to produce highly qualified professionals who can fuel development, experiences acute shortages of space, time and money in most countries on the continent. Without professionals and scholars, there is "inadequate capacity for innovation and creation of stocks of knowledge, factors that give one nation an advantage over another in the generation of wealth and power" (Thapisa & Birabwa, 1998:49). The right environment should provide expansion of opportunities for more people to access higher education affordably, while maintaining high/competitive standards of quality. While ICTs may not be the panacea, these

⁸ OAU changed its name to African Union (AU) in July 2002 at a launching ceremony in Durban, South Africa.

technologies offer significant solutions because of their enormous potential to increase access to education and reduce unit costs, for instance through collaborative education or distance education (Addo, 2001; Kennedy, 2001).

Of the studies that discuss ICT application and transformation of education in Africa, Addo (2001) underscores the importance of ICTs in education for developing countries emphasising their many benefits such as increased accessibility, reduction of costs, collaborative education, enhanced performance and improved creation and dissemination of knowledge. Darkwa and Mazibuko (2000) discuss ICT application especially in distance education. Ajayi (2000) identifies the various uses of ICT in higher education institutions. Broekman, Enslin and Pendlebury (2002) observe that all roads in higher education lead to ICT because the Internet has rewritten the rules of teaching and learning. However, these potential benefits are not being realised because higher education institutions in the developing countries of Africa face many difficulties originating from factors such as underdeveloped economies, relationship with government, rising enrolment and the legacy of having modelled their systems on foreign systems (Girdwood, 1995). Darkwa and Mazibuko (2000) observe that higher education in Africa faces the challenge of meeting new demands such as expansion, quality (appropriate competencies and learning methods), affordability, high quality human resources development. Ajayi (2000) observes that higher education institutions in Africa have not had access to the revolutionary ICT tools for learning research and development thus they have been left out of the globalisation and information age revolution. Addo (2001) concurs that higher education institutions in Africa are not only at the wrong end of the digital divide but lack basic educational resources. Studies conducted in universities report of these inadequacies. For example, a study to determine the usage of the Internet and intranet facilities at the University of Zambia revealed that there was no policy for the integration of ICTs in university activities and hence poor investment, lack of skills and poor marketing, subsequently leading to little or no use of the Internet and intranet facilities (Chifwepa, 2003). Chifwepa (2003:130) observes that academic staff have "... to be very zealous to trek to the library and hope that there would be no queue and that the server would be working." Besides, many (42%) of the academic staff lack

the know-how and those who do use the Internet mainly (97%) for email services only (Chifwepa, 2003).

Despite these problems and prevailing conditions, Africa's higher education institutions bravely face the current challenges and changes and endeavour to compete in the 21st century environment. Commenting that higher education institutions in developed countries have played a leading role in ICT development by being in the forefront of development and use of ICTs and the Internet, Ajayi (2000) urges universities in Africa to play the role of addressing the digital divide through preparing the needed human resource, providing intellectual services, technological gate-keeping, being technology transfer agents, and identifying opportunities and inequities of the ICT processes. Daly (2000) concurs that African universities should take their vital role in national and regional development as gatekeepers and agents of diffusion for necessary ICTs, monitors of the social impact of ICTs, and trainers of users, professionals and policy-makers. Darkwa and Mazibuko (2000) observe that ICTs, though severely under-utilised in Africa, hold the promise for meeting the demands e.g. through distance education and virtual or online colleges. Similarly noting that ICTs are scarce in universities in Africa and connectivity is poor, Daly (2000) concurs with Dakwa and Mazibuko's (2000) view that even with the limitations in resources, ICT applications must be strategically and effectively developed e.g. by determining priorities, optimising available ICTs, and ensuring strategic sustainability - both financial and organisational.

One of the issues of concern is the fact that most of the software programmes used in Africa are foreign or based on foreign models (Darkwa & Mazibuko, 2000: ¶ 24). Even though there is a small fraction of involvement in software production and hardware assembling, Africa is largely a consumer of ICT products and scholars (Ocholla, 2002; Addo, 2001) decry the foreign ownership of many ICT systems used in Africa because this makes it difficult for African users to control the systems, content, direction of education development or cost. The result is that Africa imitates and lags behind other nations, factors that condemn the continent to being perpetual followers rather than leaders or even partners in ICT matters. This may be seen as the result of the absence of

research, arguably because of inadequate funding, expertise or commitment and Addo (2001) recommends the formation of consortia among universities to address the problem of limited research in the ICTs sector. On the other hand, James (2001) suggests some cost-cutting measures and adaptations such as:

- i. Use of open source software;
- ii. Cheaper versions of software e.g. NewDeal, Office2000, etc. which can also operate on older hardware;
- iii. Refurbished computers distributed by such organisations as New Deal, Freecom, *Computer Aid International*, and *World Computer Exchange*;
- iv. Redesigning of hardware to lower the cost of Internet access, for instance using hardware that does not have hard drive or disc drive but has Internet software;
- v. Merging Internet technology to use television connection with modifications; and
- vi. Community wireless LANs e.g. Air Port (<http://www.freebase.sourceforge.net>) and Residential Gateway (<http://www.wavelan.com>) (James, 2001).

3.3.3 Education and Research for ICT in Africa

Arguably and apart from the general state of poverty, the effective use of ICTs in Africa depends on education systems that emphasise the use of these ICTs (Addo, 2001). Adeya (2001) notes that many studies on ICTs in Africa decry the lack of required skills for ICT usage and suggests that wider use of the Internet in developing countries will depend on there being a larger population of ICT-literate young users. Many studies, she adds, recommend education and training in order to develop this necessary human capacity of end-users, mediators and ICT technocrats. As Wilson III (1999) explains, when a new resource like ICT is distributed, its benefits are likely to accrue to those in the best position to take advantage of the resources, in this case, the ICT literate.

Effective development of ICT solutions in Africa can be found if there is a clear understanding of the work practices, organisational structures, human capacity, education and training and other related issues. It appears that little research has been carried out on the ICT capacity and exploitation in Africa's higher education (Adeya 2001). Ajayi (2000) observes the need to assess the present state of ICTs in higher education

institutions and identify future needs in order to give an indication of the existing gap and point to some of the critical issues and Adeya (2001) reiterates that the lack of substantive analytical work, especially on the implications of ICTs in Africa is caused by the paucity of accurate data and statistics, the rapid rate of ICT developments and the erroneous perception that the continent is homogeneous in its ICT capacity. Adeya (2001) recommends more research in areas such as information infrastructure, information economy, information management, education and training in ICT, socio-cultural and political issues of technology and gender issues.

Adeya (2001) also observes that the problem of research in general and research on ICTs in particular can also be perceived as a dilemma of funding, communication and expertise. African governments and organisations rarely have sufficient funds to invest in in-depth research. Much of the research carried on is funded by foreign organisations such as the Canadian International Development Agency (CIDA), the International Development Research Centre (IDRC), the DANIDA, Department for International Development (DfID), the Swedish International Development Agency (SIDA), the United States Agency for International Development (USAID), the Carnegie Corporation, etc. Most of this type of sponsorship is for action research in areas that afford visibility for donors and not necessarily where research is needed most. African researchers are usually forced to tailor their research proposal based on guidelines provided by the funding agency. In many cases, the reports often are not communicated in research communication channels such as learned journals.

Notwithstanding the problems, the research process in Africa has been transformed by ICTs. Some researchers and organisations are making efforts to publish online. For example, the Zimbabwe Scientific Association publishes research findings through BIOLINE (Hussein, cited in Adeya, 2001), while the International Network for the Availability of Scientific Publications provides access to research undertaken and published in Africa through African Journals On-Line (AJOL) (INASP, 2002). The drawback for some of these efforts is the fear of local invisibility since many African researchers and institutions may not subscribe to the online journals let alone being on the

Internet because of costs of access human capacity (Adam, cited in Adeya, 2001).

3.4 INFORMATION AND COMMUNICATION TECHNOLOGIES IN LIBRARY AND INFORMATION SCIENCE EDUCATION

As higher education become increasingly cost conscious, whereby funding levels and viability are closely associated with competitiveness (Werry, 2001), likewise LIS education needs to facilitate access for more students as well as ensure that students are retained through offering competitive programmes in competitive environments. To do this, LIS curricula need to consolidate new concepts of knowledge, skills and proficiency of a changing LIS workplace, into core competencies.

3.4.1 The Changing LIS Workplace

The roles, paradigms and organisational cultures of library and information services have been greatly changed by ICTs impact on general information use, ways in which people learn and the new perceptions of information by business sector (Manmart, 2001). Marcum (1997) concurs that the professional role of librarians is changing because of changes in society and how information is used. ICT developments have not only increased the quantity of information, range of formats and tools available for retrieving it, but also changed the nature of information, information seeking behaviour and the significance of formal information resources (Stoker, 2000). Ostensibly, ICT concepts and products affect all aspects of LIS work including information creation, coding, processing to information transmission and use, leading to changes in perceptions and activities of the information professions (Mangan, 2000). Lim (1998) argues that LIS education curricula should be build around a virtual library model, offering an integrated approach to modern information service provision because the Internet and all associated technologies are increasingly defining the domain of the information profession. MacDougal (1998) is similarly of the view that the attention of libraries, especially in higher education, is focussing on connectivity, content and competencies and hence it is imperative that the appropriate infrastructures be put in place to create an enabling environment for library publics. These trends lead to the fact that practitioners require new skills and competencies in areas such as:

- searching of databases as intermediaries for publics who lack access or cannot do it for themselves (Rudasill, 2002);
- hybrid management skills derived from professional knowledge in information management, investment management, as well as communication and negotiation skills (MacDougal, 1998); and
- information strategies and delivery methods, efficient and effective for traditional and virtual environments, such as for distance learning students. (Johnston, 2001).

Stoker (2000) suggests that additionally, the competencies of LIS graduates should include skills in interpersonal communication, teamwork, report-writing skills, numeracy and time management. These and other new competencies are required because of new job roles and new job titles, such as Technology Initiatives Librarian, Internet Services Librarian, Electronic Services Librarian, Digital Librarian, Information Technology Librarian, Multimedia Services Librarian (Moyo, 2002:225), and in the case of cataloguing and indexing personnel, titles such as Information Organisation Manager, Knowledge Access Manager, Information Architect, or Information Manager (Lawton, 2002:40). Subsequently and inevitably, these changes affect LIS education by creating the need to produce a new type of professional, who has the desirable competencies, is capable of working in the new environment and can but justifiably designated by the new titles. This chain effect is best summarised by the suggestion made by Dowlin and Loertscher (1999) that “virtual libraries require virtual librarians produced in virtual schools.”

3.4.2 Transformation of LIS Education

To transform LIS education in accordance with its changing constituency requires a clear understanding of the changing LIS work place and visionary projection into the future. Studies conducted in USA, Canada, UK and other developed countries examine the changes that LIS education has to make in correlation with changing market demands. In a 1997 study, Marcum discusses four LIS schools - Drexel University, Florida State University, University of Illinois and University of Michigan - that overhauled their curricula to meet the needs of the twenty-first century. These four LIS schools obtained

special grants/funds from W. K. Kellogg Foundation under the Human Resources for Information Systems Management (HRISM) to test the notion that an infusion of funds would help to transform LIS schools into agents of change. In Canada, Curry (2000) examines trends and issues in LIS education, while Stoker (2000) examines issues of change for UK LIS educators in the twenty-first century. All these and other studies (e.g. Tenopir, 2000; Mangan, 2000) variously observe several identical changes that have taken place, the significant ones being change of name, broadening of aims, creation of new programmes, review of curricula, new courses, distance education and fostering of closer liaison with industry.

3.4.2.1 Change of Name

A change of name may reflect structural, strategic or cosmetic change. Some schools have dropped the word "library" from the name and brought in "communication" and/or "technology", while others have adopted what they consider more up-market names (Mangan, 2000:3). Examples from USA include the University of Drexel's college of Information Technology, the University of Michigan's School of Information, Florida State University's School of Information Studies (Marcum, 1997), Syracuse University's School of Information Studies, University of Tennessee's School of Information Sciences University of California - Berkeley's School of Information Management and Information Systems (Tenopir, 2000:2). In UK Stoker (2000:4) observes that there is a general change in the names from 'Information Studies' to 'Information Management'. In Canada however, it is not so much just the change in name, but more a trend towards creating *professional information entrepreneurs rather than library functionaries*, achieved by offering more courses on entrepreneurship and related fields (Curry, 2000). Thus the name of the LIS programmes may not ostensibly change but their structure and focus definitely does. However, Stoker (2000) argues that the removal of the term 'library' is sometimes merely a marketing exercise because the basic concepts that underlie information service provision and the required skills have not really changed. This concurs with Marcum's (1997:4) observation that the dropping of the term 'library' from the names of the University of Michigan and Drexel University's, had not amounted to "discarding of the important tenets of the profession," but rather, it had served to place

emphasis on 'information' as the unifying and broader mission and thus widen the scope of the programs.

3.4.2.2 Broadening of Aims

Broadening of the mission or aims of the curriculum creates opportunities for specialities that include high-tech or non-traditional library careers (Marcum, 1997). In concurrence, Mangan (2000:3) cites the observation made by the dean of Syracuse School of Information studies that "the schools that will remain viable are those which have adapted the view of broadening the range of information services beyond the confines of traditional library settings." The mission statement of the renamed Michigan School of Information seems to take this on board as it is said to "inherit the rich traditions of service, leadership, research and access, and extent these values into the digital age" (Mangan, 2000:2). In Canada, Curry (2000) observes that some LIS departments have made a transition from offering library-oriented to broader information-oriented programmes, thus enabling LIS schools in Canada to provide fewer compulsory courses and prerequisites, more choices for specialisation and by electives, and even courses with international flavour.

3.4.2.3 Creation of New Programmes

Some LIS schools have created new programmes to accommodate the broadened aims and/or attract more students. Such changes have been effected at the University of Michigan, Drexel University, University of Illinois/Urbana-Champaign and Florida State University (Mangan, 2000; Marcum, 1997). At the Florida State School of Library and Information Studies, the need to provide professionals who can work in any discipline has induced the emergence of undergraduate LIS education (Marcum, 1997). In what she calls "new homes, new partners," Curry (2000) observations of trends in Canada exemplifies another approach to this change, in which a LIS department may relocate within the university's administrative structure into another faculty or make partnership with another academic unit. Such partnership involves the creation and offering of joint programmes, sharing staff and/or having a joint budget. However, some of these changes have been made because of a vulnerability to financial cuts and the threat of extinction in

some cases. A relocation or partnership promises better financial security by for instance, enjoining with a larger and/or better-funded department (Curry, 2001; Marcum, 1997). In other cases the partnership is for mutual support of two or more similarly vulnerable departments. In a different scenario in USA, the University of Michigan's School of Information created new programmes such as Visual Communications, Medical Informatics, Electronic commerce and structured Information, that attracted more students and funding, consequently boosting the budget from \$1million in 1992 to \$12million in 2000 (Mangan, 2000:4). In yet another version a LIS department may use flexible scheduling to offer courses that are attractive and marketable across various other departments (Curry, 2000).

3.4.2.4 Revision/Review of Curricula

Adjusting curricula to meet the demands of students, employment market and higher education sector is a challenge that has several effects on LIS education. Stoker (2000) observes that the growth of ICTs and their effect/impact on LIS professional practice is, and will continue to be the main reason behind core curriculum changes because at the work place, modern LIS professionals need new additional competencies that can enable them to function and be marketable in the current economic and social set-ups (Mangan, 2000; Marcum, 1997). While acknowledging that the potential knowledge base for ideal LIS professional who can work in any environment is far too enormous for any new course, Stoker (2000) observes that LIS core areas have at least expanded to accommodate new significant areas such as systems analysis and design, and organisational theory. This concurs with Marcum's (1997) findings that the core curricula of revamped LIS schools in USA are broad-based, with an integrated and interdisciplinary approach, but also with a wide range of competency based courses such as language processing, distributed computing and networking, artificial intelligence and social aspects of information systems. Stoker (2000) warns of an adverse effect of enlarging core i.e. the marginalization or elimination of some of the traditional mainstream/specialist courses, such as music librarianship, rare book librarianship and children's librarianship. But he observes that there is no clear-cut solution to the issue and recommends that educators respond to the employment market by, for instance, offering

some of these specialisations as electives accordingly.

3.4.2.5 Creation/Addition of New Subjects/Courses/Modules.

Stoker (2000) observes that the core of LIS curriculum has had to be enlarged bringing on board other areas such as systems analysis and design, organisational theory, etc. in addition to relevant traditional courses. In particular, the growing field of knowledge management has introduced a wide variety of new courses either as core or electives. At Michigan, for instance, students can specialise in human computer interaction, information economics, management and policy (Mangan, 2000). It is important to note that as ICTs develop, some courses initially developed as separate ICT courses, may get integrated in other core areas, as happened at the Victoria University of Wellington, where a course module on “virtual reference” developed as part of the “Digital Libraries” course, was later given to the core course on reference services (Smith, 2002:217). Manmart (2001:2) reports that in Thailand, some of new courses are Database Management, Electronic Resources, Internet Tools, Knowledge Management, and Mathematical methods. Ocholla (2002:3) reports that in sub-Saharan Africa, the new courses include Computer Application for Information Services, Telecommunications, Internet, Desktop Publishing, Electronic Publishing, Database construction and Management, Multimedia, Hardware & Software Selection and exploitation, Web-casting and Push Technology, Electronic Networks and Networking, On-line searching, Management Information Systems.

3.4.2.6 Web-based Instruction and Distance Education.

The modern pressures of time and money, coupled with an increasing requirement for changing, job-specific skills, have resulted in the fading of the need to attend regular classes and given rise to the development of web-based instruction and distance education (Curry, 2000). Stoker (2000) observes that alternative modes of delivery such as part-time, distance learning have arisen in the UK to alleviate the problem of cost. Further, he predicts that there is likely to be an increase in the creation of internet/online course to allow for flexibility of attending as well as lower the costs. In USA, examples abound. Burnett (2001) observes that Florida State University-School of Information

Science has witnessed a 500% growth in enrolment in six years through the adoption of online and distance course delivery. The Library Education Experimental Program (LEEP) at the University of Illinois at Urbana-Champaign Graduate School of Library and Information Science offers masters degree and advanced certificate programmes by distance education (LEEP, 2002). LEEP's focus is independent learning and Internet instruction whereby web-based instruction on the Internet exploits developments in multimedia by using a combination of voice/audio, graphics, and other digital media. According to the LEEP (2002) web site, students are able, in consultation with their advisors, to design their own programme of study and the school is also able to offer flexible scheduling of courses and instructor-authored web pages. Moreover, it is argued that the use of third generation distance education systems which involve network technologies provide models that add a social component to the distance learning process while constructing new knowledge (Burnett, 2001). Stoker (2000) observes that full-time undergraduate programmes in UK are losing market to distance education while there is potential for increasing postgraduate programs.

3.4.2.7 Closer Liaison with Industry

LIS schools forge links with relevant firms in the relevant industries such as software companies, hardware manufacturers, telecommunications and broadcasting corporations (Curry, 2000) in order to obtain free or subsidised hardware and software, while industry finds an opportunity for development or marketing of products. Although not in the LIS department, an example of such an arrangement is at the University of Zululand, where Hewlett Packard has equipped two computer laboratories with over 200 PCs. In Canada, LIS departments have forged partnerships with government as well as with hardware and software firms such as IBM and Microsoft (Curry, 2000).

In response to the changes within the LIS profession as discussed above, many LIS schools in the developing world recognise the need to make a variety of alterations (Manmart, 1997; Ocholla, 2002). The extent of change and level of ICT incorporation varies from country to country and from institution to institution. At one end are schools that have launched virtual library schools, for instance the San Jose State University's

Virtual Library School, which was launched in 1999 (Dowlin & Loertscher, 1999). At the other end, especially in the developing countries are schools that have only incorporated ICT concepts in course content, even though these concepts are taught only theoretically (Ocholla, 2002; Sulistyo-Basuki, 1999; Lim, 1998; Mahmood, 1997; Manmart, 1997). The common focus is the aim to produce professionals who can function effectively in the ICT-driven information environment and society. Stuart (cited by Manmart, 2001) explains that these new professionals think conceptually and reason logically, using both knowledge and advanced technologies to deliver information services. This view is corroborated by the vision of San Jose's Project which aims to offer "an internationally recognised program that creates and sustains LIS professionals whom will transform libraries into the 21st Century through innovation and collaboration" (Dowlin & Loertscher, 1999:5).

3.4.3 ICT Resources for LIS Education

The effective implementation of ICT-based change depends largely on technological capacity of a LIS school. The importance of an adequate ICT environment for modern LIS education is exemplified by Main's (as cited in Smith, 2002:214) argument that "with information seeking increasingly taking place in the virtual world, it is vital that library and information management graduates have experience of taking at least one course in a virtual classroom." It is reasonable to expect that if information work is increasingly taking place in cyberspace, then information professionals should be experienced cyber-spacers, which in turn, underscores the importance of adequate ICT infrastructure and appropriate software for training.

3.4.3.1 Infrastructure in LIS Schools

An ICT infrastructure is the backbone through which ICT applications run. According to the Association of African Universities (2000) a sufficient infrastructure should consist of equipment, carrier technology, functionality, accessibility and operating systems, each having relevant variables such as:

- Equipment that may include stand alone and/or networked computer hardware, modems, local area networks, intranets or campus wide backbone connecting LANs and multi-campus networks;
- Carrier Technology such as satellites technology that includes VSATs and wireless radio/television, fibre-optic technology, unshielded twisted pair, coaxial technology. Sufficient bandwidth and routers availability are important in ensuring that the wide variety of information products can be accessed efficiently;
- Functionality such as email, internet access, conferencing tools and multimedia tools; and
- Operating systems that may be freeware or proprietary (AAU, 2000b: section 2.6. ICT infrastructure).

Other important aspects of infrastructure include accessibility and actual use. Accessibility can be measured in terms of “computer-student ratio, computer-staff ratio, organisation of access i.e. whether centralised or decentralised, free vs. fee-based access and regulated vs. unregulated access” while actual use infrastructure issues include ‘the average time of ICT use by students and staff, and/or the number of accounts registered on the network’ (AAU, 2000b:section 2.6). Additional supporting environment for ICT infrastructure includes reliable electricity supply with a standby uninterrupted power supply (UPS) system, national ICT policy that liberally regulates telecommunication services, ISPs operations, cross-border exchange and other relevant developments.

3.4.3.2 Courseware: Software for Teaching/Learning

The WWW offers a platform for different methods of active learning styles such as simulation, role playing, practical performance, problem-solving and even listening to lectures. Many distance education and continuing education programmes are exploiting this platform for both wider reach and effectiveness. Lehtinen (2000) observes that thousands of experimental studies on the educational impact of ICT have been carried out since the first attempts to assess the educational use of information technology in the early 1970's, and altogether, the reviews and meta-analyses of the experiments show that ICT students have learned more and faster than students in control groups. In a review

and a critique of more than 100 research studies on evidence of learning and the learning potential of educational software Mumtaz (2000) found evidence that:

- ICT support differentiation providing enrichment and extension for able students, and support and motivation for weaker ones.
- ICTs allow independent learning at an individual pace, facilitates repetition and can improve teacher/student interaction.
- ICT provides motivation and variety, generating enthusiasm, interest and involvement, maintaining attention and enjoyment, and supports the development of novel ways to present difficult ideas.
- Thinking skills and problem solving strategies are enhanced when using ICTs, and challenging tasks and a responsive environment enhances students' sense of competence.
- Using the Internet facilitates communication; it develops skills of searching, interpreting and organising information often defined as "network literacy".

(Mumtaz, 2000).

Hooke (1999) observes that the Internet offers not only immediacy of availability, but also the potential for integrated use of text, sound and graphics. Additionally for LIS education, there is the extra bonus benefit of situated cognition, i.e. learning content in the context in which it would be used. For example, since information relevant to LIS education is increasingly available on the web, the offering of web-based courses is a way of enriching content through direct integration of the said information resources into LIS programmes (Smith, 2002; Hooke, 1999).

Advancements in ICT provide for three modes of web-based education delivery namely local, i.e. same-place-same-time, synchronous, i.e. different-place-same-time, and asynchronous i.e. different-places-different-times (Bourne, et. al, cited in Caviedes, 1998). The local mode involves an electronic classroom, usually a computer laboratory on a LAN configuration, with a lecturer in front of the class, but using the computer to instruct and demonstrate, and students performing activities on their computers as they follow the lesson. The synchronous mode requires higher networking configuration as the

students and lecturer are in diverse locations. Students could be as close as on campus residence or far away in another continent. An example is the broadcast type of class, which is usually scheduled at a specific time, but reaching audience far and wide. The asynchronous mode also requires high networking capacity but in addition relies on storage of material to be learned in hypertext and/or hypermedia. Each student accesses the material at his/her own convenient time and place over the network and similarly interacts with classmates and lecturer using email, discussion forums and/or bulletin boards. For each mode of these three modes, links to relevant materials on the Internet, subject portals or other local databases provide additional help to enrich the teaching/learning. There are LIS web-based education programmes, variously utilising these modes for web-based learning, both undergraduate and postgraduate levels in Europe, USA (Barron, 2002), Canada, Australia (Hooke, 1999) and many other parts of the world.

a) **Web-based Learning Environment**

On-going development of courseware that provides entire suites of teaching/learning resources has given a big boost to ICT-based teaching (Rudasill, 2002). Web-based learning environments (WBLE) for LIS are available using any of the academic courseware in the market as long as the courseware selected is compatible with institutional computing environment such as hardware capacity, networking software environment and communication links. It is possible to use courseware on an intranet within the university/institution/organisation for on-campus access, especially where Internet connectivity is a problem. However, the full impact of a WBLE can only be felt on the Internet. Reliable technical support is also necessary. Smith (2002) observes that a WBLE usually has 6 important tools, each providing part of the features that make online instruction. These are:

- i. **Course controlled access**, which ensures that only the relevant (e.g. registered) students are permitted access to the materials of a given course. This can be facilitated by user accounts or enrolment features such as course control, student ID/password, uploading of class lists via a spreadsheet. A bonafide student should

easily log on and have access to syllabi, class notes, tutorials, tests and general help with the course.

- ii. **Course materials/tools** include syllabi, timetables, schedules, notices, notes, tutorials, reading lists and assignments. Innovative content displays of material allow for hierarchical display of chapters or sections and in varied modes e.g. html, pdf. and PowerPoint presentation. Another useful feature allows students to categorise content or merge content for printing. Reading lists can include hypertext links to articles available through full text services. However, care must be taken to ensure that such links are to full-text services and/or databases that the institution subscribes to, and also that all students have access because individual subscriptions and licenses may not be possible for students. Additionally, these digitised materials might not remain permanently on-line and besides, not all relevant materials are digitised.
- iii. **Asynchronous discussion forums/tools** provide for course, project or group listserves. WebCT and Blackboard courseware provide group spaces for projects, sub-group discussion and/or sub-group directory of common files. Asynchronous forums are advantageous in that there is no time constraint for contributing to the discussion, it allows longer and considered responses, provides flexibility of searching and viewing the discussion e.g. by topic, author or time, and attachments can be posted to augment the discussion. It should also be a possibility for the teacher to email responses to individuals and groups within the discussion. Previous live sessions can also be saved and made available.
- iv. **Synchronous chat forums** are tools for real-time discussion. An example is the facility on the WebCT and BlackBoard software, which allows real time chat, with a shared whiteboard for displaying PowerPoint style diagrams and slides (Smith, 2002). Synchronous forums create a greater feeling of involvement because of the real-time element and are a closer simulation of a face-to-face discussion. The LEEP courses have up to two hours per week of live Internet interaction at a regularly scheduled time. Some software includes facilities for prompting an individual student either to contribute or get back to the topic, as well as enabling students to "whisper" to each other or to the lecturer.

- v. **On-line testing, marking and student performance records** are tools for the management of these aspects of a course. In some courseware such as WebCT, a student can submit assignments as/on the individual student's web page, which has the added bonus of acquainting students with web page design (Smith, 2002). Teachers can use different testing techniques e.g. multiple choice, fill-the-blanks, essay, etc., marking can be automatic or otherwise, and feedback provided for students to access any time.
- vi. **Web publishing** tools enable a lecturer to provide a repository of notes for students. In most cases, the lecturer posts the notes and other relevant reading material on his/her web-site alongside other documents such as assignments (Smith, 2002).

In all the above features, navigation and appearance is important and some coursewares provide colour schemes and logos for the lecturer to choose from, while others provide options for designing. Blackboard and WebCT, for instance relieve the lecturer of the need to develop navigation and formatting aspects (Smith, 2002). Smith (2002:216) also cites the following as advantages of web-based teaching/learning:

- ease of access and involvement for distance and part time students, who cannot otherwise easily attend scheduled on-campus classes;
- access to course materials online, from any Internet connected computer, at any time;
- rapid updating of course materials and distribution to students;
- ability to re-use course materials;
- provides the experience of working in a digital environment because the medium reinforces the message since web-based learning provides not just the specific skills to be learned, but also provides an experience of the information management environment;
- marketing of courses to a wider student body, such as practitioners - people who are in employment - and overseas students; and
- ease of administration of online tests, with feedback to students (Smith, 2002:216).

The above advantages/ features may be used in selecting courseware, but an important added point when evaluating courseware is its futurity i.e. the potential for future

advancements.

b) Examples of Courseware include:

- i. ARIANDE Project, which offers authoring, delivery and course management tools;
- ii. WebCT which offers authoring, delivery and course management tools;
- iii. BlackBoard - a commercial software;
- iv. CyberProf - a collection of tools to create and manage online courses;
- v. Docent - for creating, delivery, administration and management of web-based courses;
- vi. Moodle - a free, open-source PHP software for producing modular internet-based courses;
- vii. Prometheus- specifically designed for colleges and universities; and
- viii. Others such as Basic Support for Cooperative Work (BSCW), Classpage, Convene, e-College, Jones e-education, Fle3 Learning Environment, Generation21, ILIAS, IntraKal, Jenzabar, KEWL, Lotus Learning Space, TopClass, virtual-U and Trainersoft.

Of the above, the most cited is WebCT which is applied in LIS programmes in Croatia (Petr, Vrana and Aparac, 2002), USA (Rudasill, 2002), UK (Williams, cited in Smith, 2002:219), New Zealand (Smith, 2002), South Africa (Ocholla, 2002). Many others continue to be developed and the creation of courseware is done variously by software companies, academic staff at universities, professionals or joint effort between the two. The San Jose Project courseware, for example, involved public, non-profit agencies as well as technology firms such as The California State Library's Knowledge Transformation Center, which created the tutorials and Stanford University, who provided course modules, Living Stone Technology Inc., who supplied a "Digital Media Management System and the Electronic Classroom" and Silicon Graphics Inc., who assisted in the creation of video streaming system for asynchronous distribution (Dowlin & Loertscher, 1999).

3.4.3.3 Human Resource Capacity: Teaching Staff

Stoker (2000) observes that staff recruitment and development in LIS education has not always matched the needs. He explains that the introduction in UK of ICT-based courses in modular degrees and 2-semester year, coupled with the requirement for staff to maintain a significant research and publishing profile, have led to overloading and inefficiency. In USA, this problem was resolved by recruitment of new faculty members with non-traditional LIS background such as computer science, psychology, economics, business and public policy, to bring these specialisations into the four schools that had revamped their curricula (Marcum, 1997). Additionally, ICT and Internet use by LIS lecturers is not uniform since it depends on factors such as age, ICT knowledge and computer skills and experience (Manmart, 2001). Manmart also observes that among the uses of ICTs by academic staff, course delivery is the poorest application area across the board because it poses various challenges to lecturers as explained below.

a) Changing Educational Theories

Changes in educational thought and practice have transformed delivery of education such that cognitive psychology that began in the 1970s has been propelled by the introduction of microcomputers in education, bringing with them more possibilities and responsibilities in the instruction process. Hence in addition to their traditional subject knowledge, a teacher now has to “create interactive tutorials, static/dynamic web pages, organise information for learners, organise links and access to remote databases and create appealing presentations” (Rudasill, 2002:197). At the same time, teachers have to recognise the diversity in students' learning styles and endeavour to cater for them amid other diversity dimensions such as intelligence, social status, gender and ethnicity. Shoffner, Jones and Harmon (2000) observe that the presentation and sequencing of content in an online environment is determined by how the designer (lecturer) perceives the learning process - that is, how the designer believes an individual learns. Thus 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 (Barron, 2002; Olcott & Wright, 1995).

b) Knowledge of Hypertext Mark-Up Language

To use the WWW platform, lecturers/instructors must understand the hypertext-mark-up language (HTML) coding methodology (Rudasill, 2002) and now the Extensible Mark-up Language (XML). Knowledge of the HTML code and sufficient other technologies enable a lecturer to take advantage of the unique capabilities of the media and hence offer great advantages over the class lecture, regardless of the software/courseware. In a study covering bibliographic instruction and reference librarians in USA, Rudasill (2002) found that to create tutorials, librarians preferred to use the HTML code, Dreamweaver and Photoshop, while to create web pages, they preferred DreamWeaver, HTML code and FrontPage, and to create bibliographic guides, control/print page screen capture and Adobe editors were used. These skills are not always readily available and academic staffs are required to make time and effort to acquire them.

c) Distance Education Methods

Barron (2002:183) in discussing successful faculty participation in distance education quotes Beaudoin's observation that "...faculty have to acquire new skills to assume expanded roles not only to teach distance learners but also to organise instructional resources suitable in content and format...". Some of the competencies required include proficiency in selection and use of technology, designing student-centred instruction and adjusting communication methods in the absence of lecturing and non-verbal feedback. Various studies have concluded that further education is necessary for faculty to obtain these competencies (Rockwell, Schauer & website Fritz, 2000; Threlkeld & Brzoska, 1994; Willis, 1993; Wilkes & Burnham, 1991; Egan, Sabastian & Welch, 1991). Barron (2002) observes that a lecturer needs to be committed to student interaction so as to make each student feel that he/she is in touch with the lecturer as well as part of a class, even though they may not physically meet.

3.4.3.4 Human Resource Capacity: Students

When web-sites have taken the place of handouts, each student has direct, constant access to up-to-date course material, specifications and requirements and hence the problems of

misplaced course outlines, forgotten deadlines, missed timetable changes, unobtainable/lost notes or mutilated/missing library materials are eliminated. Barron (2002) argues that there is better students' participation on on-line courses because all students, including those who would normally be quiet in class, get to contribute to discussions. Their contributions are better thought out because they have time to reflect and/or rewrite before contributing. He further observes that group projects are effectively completed because they are not impeded by the problem of physical separation of group members and besides, students can access documents on the reading list by following on-line links that are provided by the lecturer. In some cases, documents contain the email address of the author(s), making it possible for a student/reader to ask for clarification or even dispute a point with the author, while in other cases, the document referred to can be found to be indexed/listed alongside many others of related subject content. There may be an added bonus for students to hone their information retrieval skills, Internet navigation and creation of web-based resources (Hooke, 1999, Smith, 2000). For example, Hooke (1999:2) observes that in her quest to trace documents through following up links on a reading list, she "got to learn a bit more about search engines and discovered that there were many other papers of enormous interest." However, the benefits and advantages notwithstanding, there are some major aspects of information technology that challenge the provision of relevant and sufficient students' learning. These include:

a) Physical Access to ICTs

Smith (2002) observes that the flexibility a student gets on on-line learning comes with other needs such as access to computer network, adapting to online study methods, learning to efficiently read online, proficiency in ICT use, knowing when to print and increased printing responsibility/cost. It is important for each student to have access to the same standard of computing and network equipment so that some are not disadvantaged by say, being unable to open certain files because of disparities in software. Physical access is usually less of a problem with local or on-campus on-line education where the institution offers computing facilities either centrally or in departments. However, for distance education or where students are expected to obtain their own equipment, disabling disparities can occur. The LEEP programmes at the

University of Illinois require their distance students not only to have access to necessary technology at work or home, but also to have access to specific compatible hardware, specifically 'either UNIX, IBM-compatible or Macintosh', software and network connectivity (LEEP, 2002). Such demands can disadvantage poor students.

b) Epistemological Access to ICTs.

There is usually concern regarding the levels of technology competence required of students because computer illiteracy or a poor mastery of basic computing often impedes the on-line learning process (Herther, 1999; Manuel, 2001). The LEEP programmes at the University of Illinois, for example, expect students to have four basic competencies, i.e. elementary knowledge of microcomputer operating system, information retrieval skills, e-mail and bulletin board skills, and basic HTML coding (LEEP, 2002). Broekman (1992) adds that epistemological access has a lot to do with developmental aspects and affinity to technology, an affinity gained by confidence gained through interaction. Every student is challenged to gain this confidence in order to reap maximum benefit of web-based learning.

c) New Learning Skills

Students need to acquire new learning skills for the new environment by developing new mental modes such as self-discovery and independent learning (Tallman & Benson, as cited in Smith, 2002). The LEEP programmes at the University of Illinois expect students to be "strong academically and able to learn independently" (LEEP, 2002). How and where students should obtain these skills is often unsaid.

d) New Learning Environment.

Students are often said to value face-to-face interaction with lecturers and classmates (Smith, 2002; Gillham & Hall, 2000; Curry, 2000; Herther, 1999). Barron (2002) argues that the use of ICTs as a mechanism of content delivery cannot replace the dynamic relationship between a lecturer and students, such as the enthusiasm, facial alertness, smiles, eye contact inquisitiveness, etc., which can be seen/felt in a face-to-face interaction. However, ICTs make it possible to structure and encourage formation of

learning communities, for instance through collaborative projects (Kazmer, 2000), chat forums or even occasional face-to-face forums (Smith, 2002) that mimic the face-to-face experiences. Burnett (2001) argues that the use of third generation distance education systems which involve network technologies provide models that add a social component to the distance learning process while constructing new knowledge. But Curry (2000) cautions that in distance education, it is quite time-consuming, requires excellent technology and innovative teaching skills to develop a cohort of students who never meet and manipulate their socialisation so as to achieve good results.

3.5 LIBRARY AND INFORMATION SCIENCE EDUCATION IN SUB-SAHARAN AFRICA

Disparities in “socio-political and socio-economic development are reflected in ICT use in sub-Saharan Africa” (Ocholla, 2002:1). Since those who harness, manage and promote ICT use stand at the threshold of social development, it is expected that wider distribution and access will eliminate the almost invisible barriers to development that are inherent in information poverty, perpetuated by a WWW platform that may silently exclude some countries/people. This challenge partially falls on information professionals and educators to provide access to ICTs and train the populace on how to use them effectively.

ICTs in LIS education should be perceived in two contexts that are intertwined. On one hand ICTs form a body of knowledge and skills that have to be mastered by graduates whose competencies will include handling electronic information services in libraries, information centres and other organisational set-ups. This body of knowledge and skills includes mastery of hardware, software, communication networks and strategies, information searching and retrieval, and other information service skills. Chisenga (1999:3) adds that to enable African professionals translate the continent's knowledge into web content, these professionals need competencies in areas such as “web page design using HTML and XML, networks and networking, meta-data, digitisation, management of electronic documents and the establishment of subject based information

gateways (portals).” On the other hand, ICTs are the tools that enhance the teaching/learning of the said body of knowledge and skills, facilitate research and academic administration. In most cases, the two contexts are not differentiated because teaching using the technology is inadvertently teaching about the technology. For example, the best way to teach/learn the ERIC database is by actual using it in the course. This emphasises the importance of integrating ICTs in courses.

3.5.1 Curricula and Expansion of ICT Education (*Restructuring LIS Education in Africa for the ICT Age*)

The introduction of ICT education into LIS programmes in Africa is historically documented by Aina (1993), who observes that IT courses were first offered in the late 1980s in both formal and continuing education programmes. Many LIS schools in Africa have recognised the challenges of a dynamic field and taken necessary steps to expand their curricular so as to equip their graduates with relevant competencies (Ocholla, 2002; Odini, 1999; Thapisa, 1999; Shiholo, 1999). Several studies have been conducted to determine the amount of ICT education in LIS programmes (Aina 1993; Kloppers, 1996; Ocholla, 2002; Shiholo, 1996). Of these studies, two - Aina's and Ocholla's - stand out as being broader in scope in terms of coverage of a substantial part of Africa.

In 1993, Aina conducted a study on the education and training for IT in Africa with the aim of identifying LIS schools that covered substantial IT content in their curricula. Using a sample of 10 institutions representing West Africa-5, Eastern Africa-3, and Southern Africa-2), he examined their curricula against the four IT modules of Information Science recommended by the Institute of Information Scientists (1988). The four modules are (1) computer systems, (2) software and hardware, (3) Telecommunications, Information Technology applications, and Environment, (4) health and safety, ergonomics, data protection, copyright, piracy, encryption, etc. The major findings are discussed in the subsections below. Nine years later, Ocholla (2002) conducted a preliminary exploratory and analytical study to determine the extent to which ICTs are available and exploited in teaching, learning, research and academic administration in sub-Saharan Africa's LIS schools. Using a sample of 7 (14%) leading

LIS schools from seven different countries, a qualitative open-ended questionnaire was sent by e-mail to the head of each school, of which six, (85.8%), responded. The major findings are discussed in the subsections below.

Both studies (Aina, 1993; Ocholla, 2002) recognise the importance of ICT education in LIS programmes and observe that LIS schools in Africa have incorporated these courses. On the incorporation of ICTs in LIS Education in Africa, Ocholla (2002) concludes that the technological capacity of each country, institution and department determines the development and use of ICTs in LIS schools. *It may appear that ICT educators have a difficult time demarcating and designing content areas for curriculum because of a number of reasons. Firstly, as Adeya (2001) explains, formal systems of education favour the imparting of 'codifiable' and general skills, yet most ICT related skills are application specific, requiring hands-on experience, and hence hard to codify for formal education and training. Secondly, the design of curricula often depends on one or a group of experts in the field, who are able to sequentially and logistically plan programmes, content and time for implementation. The lack or absence of this important expertise and support system, in a field whose content is often shifting, results in a situation whereby each institution does the best it can, thus resulting in diverse curricula. Adeya (2001:10) criticises that ICT curricula in higher education in Africa is "poorly designed, showing no distinctions between major concepts such as computer architecture and management systems, or lumping together areas such as software and hardware."*

3.5.1.1 Expansion

Ocholla (2002:2) observes that the number of LIS schools is rising as the need for vocational and higher education increases in each country. This growth mirrors international trends that have seen a rise in the need for higher and vocational education (Stoker, 2000; MacDougal, 2000; Pollock & Cornford, 2000; Foster 2000). However, Ocholla (2002:2) raises concern that the job market for LIS graduates in Africa does not seem to be equally growing because of poor library development in African countries. This corroborates Aina's (1993) observation that LIS graduates even with IT competencies could not find suitable work environments. However, Ocholla (2002)

further observes that some jobs are lost to competition from other information related disciplines and argues that this competitive disadvantage of LIS graduates is linked to ICT capacity, competency and exploitation by LIS schools. Comparable scenarios in USA in the early 1990s led to closures and transformation of some LIS schools, e.g. the University of Columbia and University of California - Berkeley's respectively (Mangan, 2000). Thus the expansion of LIS education is not only about more schools/programmes, but also and more importantly, about re-examining employment requirements and revamping curricula accordingly, including the encompassing of those information related disciplines that would make LIS graduates competitive in the job market.

3.5.1.2 ICT Competencies

Several African LIS educators and scholars have reiterated the need to produce graduates armed with competencies for working in the current information environment, which though still largely traditional, is increasingly becoming ICT dependant for efficiency and effectiveness (Aina, 1999; Odini, 1999; Shiholo, 1999; Thapisa, 1999; Ocholla, 1997, 2002). Ocholla (2002) observes that the sub-Saharan African job market requires additional and new competencies such as computer literacy, word processing, spreadsheets, database construction and management, online searching and retrieval, CD-ROM services, electronic current awareness service, automatic indexing and abstracting, text digitisation, desktop publishing, electronic publishing, library automation systems, telecommunications, selection of software and hardware, home page design and administration, facsimile transmission, and archiving of audio visual and electronic documents. Most of these mirror what Kloppers (1996) had identified in a study on Information Technology in LIS in South Africa, that LIS curricula in South Africa needs to include courses in network technologies, communication technologies, and retrieval technologies⁹. Thus the review of a LIS curriculum in most cases involves infusing ICT content into the curricula whether through updating traditional courses or creating new courses (Ocholla, 2002; Manmart, 20000).

⁹ According to Kloppers (1996), Network technologies include telecommunications, Internet hardware and software, Internet facilities, Internet discovery tools, electronic publishing, LANs and intelligent gateways. Communication technologies include human computer interface, speech technologies, virtual reality, graphic user interfaces and natural language processing. Retrieval technologies include artificial intelligence, electronic current awareness systems, electronic document delivery, online database searching, automatic

3.5.1.3 Continuing Education

LIS education in Africa, just like higher education globally, needs to recognise that professional education is continuous because no amount of core is enough to last five years, leave alone a lifetime, in a fast-changing hi-tech society. Ocholla (2002) and Stoker (2000) concur that no one skill will equip an individual at all stages of their career because technical skills quickly become outdated. Stoker (2000) further observes that professional education can no longer be delivered in one slice because of its diversity, and that knowledge and skills acquired in full time education now have limited span of relevance and hence need to be continuously updated. Aina (1993) observes that antiquated library and information managers need continuous education to enable them leap into the current IT-oriented services. However, in planning continuous education programmes, educators need to remember that the content of continuous education may not need to add up to complete programmes of study because, in some cases, it may just be a module that is relevant to a new development. Additionally, employers and employees are no longer finding it affordable to allow for full time study leave. Thus since many work places have online facilities which can facilitate staff to acquire skills without leaving their place of work, online programmes may be the best convenient option to satisfy this increased need for continuing education.

3.5.2 ICT Resources (Hardware, Software, Networks)

The quality of ICT education depends heavily on the availability of suitable hardware, software and networks. For LIS schools, this should translate into current high capacity hardware that is able to accommodate a myriad of necessary software yet operate at high speed; latest software to handle the variety of tasks involved in information services and efficient networking for on-line access, transmission and communication. Ocholla (2002) observes the need for LIS schools in sub-Saharan Africa, when endeavouring to integrate ICT resources in teaching, learning and research, to have various ICT products and services including computers and computer application services. These resources would include hardware, software, management information systems, telecommunications,

internet connectivity, DTP technology, electronic publishing technology, electronic databases, multimedia systems, online search and retrieval systems, search engines, web-casting, push technology and electronic networks and networking (Ocholla, 2002:2).

Both Aina (1993) and Ocholla (2002) decry the problem of inadequate resources as a major constraint in the teaching and use of these technologies in Africa. ICT resources in LIS schools in developing countries of Africa and Asia are inadequate and the few available are often over-stretched and outstripped by demand (Aina, 1993; Ocholla, 2002; Manmart, 2001). Manmart (2001) observes that poor infrastructure, inadequate levels of access to computers, unavailability of internet services and web-sites are some problems inhibiting the implementation of Internet-rich curricula in Thai LIS schools. Aina (1993) and Ocholla (2002) concur that many LIS schools encounter a myriad of resources-related problems such as funding, human skills, appropriate hardware and software, adequate quantities and space, telecommunication links, security and maintenance. Aina (1993) and Ocholla (2002) also concur that where resources are available, students' ICT access for LIS education works better in decentralised computer laboratories because of greater accessibility for students and better control by LIS staff. Examples include the University of Botswana and Moi University. However, Ocholla further observes that the trend in South Africa is for universities to centralise facilities into a Student Learning Centre for instance at University of Cape Town and University of Zululand. Centralisation is seemingly preferred because it ensures that core software resources are standardised and networked, and licenses are negotiated collectively. The centralised approach works well if the university authorities are committed to the development and sustainability of ICT resources.

However, inasmuch as the above studies have observed the importance and lack of ICT resources, and even though some schools are said to be 'better-resourced' than others (Ocholla, 2002:6), the levels of adequacy and/or inadequacy of the available resources are not entirely clear because there seems to be no inventory, mapping and audit of ICT resources in LIS schools. A LIS school planning to offer ICT-based courses may find itself hampered by either the lack of up-to-date hardware and/or software, lack of internet

connectivity, poor competencies among lecturers, or poor/varied entry competencies among students (Ocholla, 2002). Manmart (2001) observes that the degree of ICT infrastructure has a correlation to the level of ICT infusion in LIS curricula. The absence of relevant computer hardware and software, networks, Internet services and human expertise, make it difficult to teach or learn the necessary competencies effectively. Ocholla (2002) concurs that even though the quality and quantity of integrating ICTs in LIS education in Africa is growing, it is often compromised by the inadequacies of infrastructure. Likewise, ICTs have not been incorporated in LIS curricula of many of the 130 Indian LIS schools because of low ICT capacity (Kanjilal, 2002). Approximately 0.4% of the population have Internet access and Kanjilal (2002) cites this low level of internet connectivity as the major problem inhibiting online delivery of LIS courses.

Thapisa and Birabwa (1998) recommend that in Africa, the individual and combined roles of public sector, private sector media and non-governmental organisations in the development of ICT infrastructure under the implementation of the AISI framework will enhance connectivity. Thapisa and Birabwa (1998) emphatically argue that concerted strategies at national level in terms of policies, funding, involvement of all stakeholders and liaison with other governments, are the key to the achievement to the vision of creating an African information society. But even in the case of the best infrastructure, the fragility of technology presents its own array of challenges such as mainframe crashes, connectivity problems and computer malfunctioning (Hooke, 1999).

3.5.3 Human Capacity in LIS Schools

Many studies underscore the importance of human capacity and the level of technological ability in raising technological exploitation (Broekman, Enslin and Pendlebury, 2002; Ocholla, 2002; Adeya 2001). The importance of a large cohort of ICT users, not only as a market for ICT products, but also as a basis for the development of the technologies cannot be overemphasised (Addo, 2001; Adeya, 2001; Darkwa & Mazibuko, 2000). The participation of ICT-literate teaching staff and students propels the usage of ICTs because there is a correlation between knowledge and skills in using computers and innovativeness as well as confidence in expanding one's usage of other ICTs (Manmart,

2001). Addo (2001) and Massis (2003) observe that the technologies alone, without human know-how, are often under-utilised and Ocholla (2002) concurs with this view that the competencies by LIS staff and students are important for the competitiveness of LIS education. Manmart (2001) observes that the use of Internet by LIS lecturers in Thailand depended on factors such as age, ICT knowledge and computer skills and experience and that these competencies were not uniformly prevalent. However, although some studies mention the need for competent ICT personnel and teachers, most of the studies on LIS education in Africa, are silent or presume the issue of ICT competency among LIS educators/lecturers. Aina (1993) mentions the problem of brain drain but without elaboration. Likewise, Broekman, Enslin and Pendlebury (2002) discuss issues of students' ICT abilities, but not staff.

3.4.3.1 Educators' Expertise

The ICT capacity, competency and exploitation by LIS faculty can be seen as the hallmarks of quality. Lecturers who are novices find it difficult to plan and include ICT concepts in their courses, let alone knowing what to include. Thus ICT competency as a requirement for recruitment into teaching is increasingly being demanded (Ocholla, 2002), as a means of ensuring that the few ICT resources available are used to the optimum. Aina (1993) observes that attracting and retaining IT competent teachers is a major problem in Africa because of brain drain when lecturers opt for more lucrative appointments locally and abroad. Another interesting angle is given by Manmart (2001) who recommends that the head of LIS department needs to be recruited on the basis of their vision especially on matters of ICT. It is imperative that a less visionary and enthusiastic head of a LIS school may fail to identify and set ICT goals, spearhead infrastructural planning and follow through with the implementation. A head of a LIS school should set goals, formulate policies and influence the formulation and implementation of institutional ICT policies and goals.

3.5.3.2 Students' Expertise

ICT capacity, competency and exploitation by students influence the quality of ICT-

based education that they obtain. Broekman, Enslin and Pendlebury (2002:31) refer to epistemological access, i.e. "a certain level of computer literacy, confidence and informed judgement." Curry (2000) observes that in order to concentrate on learning the use of technologies in information handling, students should enter LIS programmes with high levels of technological competencies.

In Africa, there is greatly varied entry behaviour, knowledge and skills, most of which correlate to students' school and home backgrounds. Disparities are often noted between urban vs. rural school backgrounds, and between rich vs. poor home backgrounds whereby students from urban and/or rich backgrounds come with fairly high levels of computer literacy, positive attitude and enthusiasm. This situation correlates with the theories of social construction of knowledge, which imply that, the "relationship between the social and the personal is central to epistemological access and knowledge is constructed and develops in and through social mediation" (Broekman, Enslin & Pendlebury, 2002:31). Epistemological access to ICTs is a developmental aspect of affinity that depends on socially mediated confidence development. Thus, disparities in social mediation result in diverse levels of competence. Such disparities force institutions to provide computer literacy courses in a bid to bridge the gaps. In a number of LIS schools such as in South Africa and Botswana, computer literacy courses are offered during the first year of study (Ocholla, 2002). LIS schools in the region are satisfied with their current efforts and students' competencies in ICT usage, but are quick to add that continuous hands-on experience and "re-skilling opportunities" are essential for graduates to maintain competitiveness (Ocholla, 2002:6).

To develop proficiency and competency, a student needs to have continued regular use of technology (Ocholla, 2002). This means that sufficient support in terms of resources, have to be available to enable students, especially those from poor and/or rural backgrounds, to have continued use and practise learnt skills. Such support consists of providing, not only computers with current software and access to the Internet and on-line databases, but also mediation by experts and the broader virtual community (Broekman, Enslin & Pendlebury, 2002). Even though there are issues of costs and

misuse which lead to restrictions, it is possible to introduce controls such as passwords and Internet accounts, as is the case in some South African universities (Ocholla, 2002). But a situation whereby students have to pay directly for Internet use is not appropriate for learning because it favours the rich students and supports only the rich enthusiasts.

3.6 SUMMARY

In developed countries such as the United States of America, some LIS educators fear that schools have gone overboard in their eagerness to embrace ICTs, so much so that Library Science professors feel like second class citizens. But in sub-Saharan Africa, even though many LIS school have made strides to stay current, it is still safe to say that there are no such fears of near total eclipsing of Library Science. Nonetheless, LIS education in sub-Saharan Africa must join the concerted effort being made by higher education institutions to strengthen the higher education sector, by dealing with the problem of ICT development and usage. ICT exploitation in higher education in Africa faces many challenges, most of them associated with the broader Africa's problems regarding technological innovation, ICT use and connectivity. Major among these are the lack of expertise, inadequate infrastructure and funding, but also rigid and/or inappropriate educational structures and methods (Ocholla, 2002). While the much-hyped concept of virtual learning may still remain an elusive dream, not only in Africa but also in some of the most technologically developed countries, a great deal of the ICTs have been taken on board in many higher education programmes in order to produce competent individuals who can function effectively in an ICT ubiquitous world. There are many projects and donations that can enable higher education in Africa to fully exploit ICTs for the benefit of all. As for expertise, Ocholla (2002) observes that many LIS programmes in Africa have taken necessary steps to produce required competencies, but recommends an in-depth mapping and audit of this technological capacity. Such a study, he argues, would provide a means of determining the capacity for greater/lesser ICT infusion into LIS education.

This chapter has reviewed literature that relates to the purpose of this study and hence provides a theoretical basis/background to this study. The next chapter, Chapter Four, discusses the research methodology of the study.

Chapter Four

RESEARCH METHODOLOGY

4.1 INTRODUCTION

There are different fundamental ways of studying a phenomenon, usually referred to as approaches to research, and their differences are often exhibited in the methods used in observing, measuring and understanding the social reality that is being studied. This implies that any given phenomenon can be studied from different starting points, basing on alternative assumptions, focussing on different variables and ultimately arriving at unique findings. Vulliamy, Lewin and Stephens (1990) observe that there are many approaches to social research and the choice of any one approach depends on the nature, scope, aims and objectives of a study. It is for these reasons that Neuman (2000) argues that the approach chosen by a researcher often determines the results of the research because each approach offers its own set of philosophical assumptions and principles that characterise the expected outcome.

The aim of this study was to map and audit the types, nature and diffusion of information and communication technologies (ICTs) in library and information science (LIS) education and training programmes in sub-Saharan Africa. The specific objectives of the study were to establish the types of ICTs currently taught and used, determine the nature and extent to which ICTs are applied in academic research, teaching, learning, academic administration, communication and management, establish the levels of ICT support available in terms of policies, infrastructure, hardware and human resource, establish problems encountered in the availability and use of ICTs, determine ICTs needs, establish the gaps between ICTs needed and ICTs available, and determine strategies for bridging the gaps. This study is broad in scope, in that it was conceptualised to cover LIS schools in almost the entire African continent.

The importance of this study stems from the transformatory change, which is taking place in higher education as well as in the information and communication technology industry.

The developments thereof have a dramatic effect on the way higher education institutions view and carry out their functions of teaching, learning and research. These developments pose a big challenge to higher education institutions in Africa, especially since these institutions, through their professional and academic programmes, have a critical role to play in determining how well Africa responds to the knowledge evolution. The onus of meeting this challenge lies partly with educators within each profession and/or field to 'strengthen the capacity of African higher education institutions for the effective integration and utilisation of ICTs in their multidimensional functions and to ensure the widespread use of these technologies by the institutions' (AAU, 2000:Part 3 section 4). In order to account for the contribution of LIS, this study therefore explored, analysed and described the status of ICTs and ICT education in the LIS schools within the sub-Saharan Africa region.

4.2 METHODOLOGICAL APPROACH

This study employed the quantitative approach to explore and describe the nature, range and types of ICTs available for LIS education, and determine the extent to which these technologies have been infused in Africa. A quantitative study involves the measurement of variables that relate to the phenomenon under investigation and hence linked to general causal explanations (Neuman, 2003). The inquiry may be based on and testing of hypotheses or a theory composed of variables, measured with numbers and analysed with statistical procedures, in order to determine whether the predictive generalisations of the theory hold true. Leedy (1997) explains that the quantitative approach is typically used to answer questions about the relationships among measured variables with the purpose of explaining, predicting and controlling phenomena. Most quantitative research, not only in social science, but more so in the natural sciences, employs positivist principles, which hinge on the adherence to laws and formulae. The positivist researcher prefers precise quantitative data, based on rigorous, exact measures. Although more of a Natural Science approach, Neuman (2000:66) observes that positivism sees social science research as an "organised method for combining deductive logic with precise empirical observations of

individual behaviour in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity.”

However, the quantitative approach was chosen for this study because of the conceptual framework, which is largely statistical and descriptive. Focus of the study is directed more towards quantitative measures and external relationships, but with lesser emphasis on the complex internal causal relationships. This is not to say that ICT use and application cannot be subjected to qualitative investigation. It may in fact be interesting to study the deep-seated attitudes that influence the use and development of ICTs in society. However, the thrust of this study was to explore, through a mapping and audit exercise, the social reality that is prevailing in LIS education on the African continent. This, in itself, is an important step and basis towards understanding other relationships within the social reality. Nevertheless, attitudinal aspects were also explored as side/bi-products of this social reality.

4.3 RESEARCH DESIGN AND METHODS

Ikoja (2002) postulates that a research method is a means by which a research project is implemented, while research design provides the structure that describes what is to be done and how it is to be done. The objective of a research design is to plan, structure and execute the study in a way that maximises the validity of its findings. The selection of a research method and design is, therefore, crucial since it not only determines the route by which research outcomes will be reached, but also influences and sets out the expected outcomes.

4.3.1 Survey Method

This study is basically a descriptive survey research. Neuman (2000) observes that surveys are widely used in social science research whereby researchers seek to explain the causes of phenomenon by comparing the attributes of each variable within the phenomenon, as well as identifying and examining other characteristics that are systematically linked to the phenomenon. By careful comparison of these characteristics

and attributes, inferences are drawn. De Vaus (1986) postulates that there are two distinguishing features of surveys. These are (1) the form of data collection and (2) the method of data analysis.

- *Form of data collection.* Survey research is characterised by a structured or systematic set of data which de Vaus (1986:3) refers to as a ‘variable by case matrix.’ Information or attributes about the same variables are collected from many cases and/or population and organised together into a matrix. Survey data collection relies on measuring naturally occurring variations. Unlike experiments that control alternative explanations in order to measure a phenomenon, surveys measure the variables that represent the alternative explanation, and then study or examine their effect(s) on the phenomenon, so as to rule out the alternative explanations (Neuman, 2000). Thus this study collected data on the same variables, from diverse cases in order to compare responses and arrive at explanations by means of statistical analysis.
- *Methods of data analysis.* The process of survey analysis involves coding, categorisation, tabulation and computing data, before interpreting it using deductive logic and inferential analysis. De Vaus (1986) observes that the matrix is fundamental for survey analysis because it facilitates the deductive reasoning and inferential prediction. Additionally, since instead of controlling temporal order, survey data collection procedures use control variables to approximate causality, surveys are considered to be subject to correlational analysis. This implies a relatively high external validity and relatively low internal validity of the results. Thus Powell (1991) observes that surveys are appropriate for exploratory analysis in relationships, especially in a large, geographically dispersed population. This study targeted such a dispersed population of LIS schools scattered in the many countries found in sub-Saharan Africa. Each LIS school was, however, expected to respond to the same wide set of questions and their answers categorised, tabulated and analysed for cumulative emerging concurrence or diversity.

4.3.2 Descriptive Survey

A descriptive study involves in-depth description of phenomena whereby “a researcher’s goal is to describe that which exists as accurately as possible” (Mouton & Marais,

1991:44). Mouton and Marais (1991) further explain that the description ranges from the narrative type found mostly in historical analysis, to highly structured statistical description found in quantitative analysis. In this study, the description leans more towards statistical description, which is characterised by the use of variable classification into frequency tables and cross tabulations. Generally, the type of description varies with the context. It is also useful to note that the descriptive method can be applied in different types of research approaches and environments (Mouton & Marais 1991), for instance in surveys, description is often used to examine characteristics of a population, estimate proportions, make generalisations, make predictions and test relationships (Powell, 1991). A descriptive survey, not only identifies and describes the characteristics of a population, but also estimates the proportions so as to reveal its traits. In this study for instance, this meant that it was not enough just to know that some ICT modules are offered without knowing the importance assigned to each module and the extent to which hands-on training is done. As Powell (1991) observes, research also needs information regarding characteristics and proportions in order to make predictions about specific relationships.

4.3.3 Applied Research

Applied research is a dimension of research that focuses on the use to which research findings will be put. Neuman (2000) observes that applied research is used to either find solutions to specific problems or help practitioners in the accomplishment of tasks. Unlike the basic research dimension, applied research's emphasis is more on seeking solution(s) than theory formulation. For this reason, applied research often differs methodologically from basic research. Neuman (2000:24) clarifies this point by postulating that while "basic researchers emphasise high scientific standards of perfection in methodology, applied researchers may compromise by squeezing the study into applied settings, thereby trading off practical needs for methodological rigor." Additionally, Freeman & Rossi (as cited in Neuman, 2000:25) observe that the rigor and standard of applied research depend on the expected use of the results. Thus applied research can match high scientific standards when it is expected that the findings are to be used for groundbreaking developments in a discipline or by scholars and researchers. Otherwise the primary consumers of applied research are people/institutions who will put

the results/findings to immediate practical use, such as teachers, counsellors, caseworkers, decision-makers, managers or committees (Neuman, 2000) as is likely to be the case with this study.

This study is an applied descriptive survey, the purpose of which was to establish the types of ICT options available for LIS education and hence determine the extent to which these options are being exploited. As an applied research, the study focussed on social impact assessment whose findings can be used to sensitise stakeholders in their quest for *being relevant (keeping up to date) and sustaining their relevance in a fast changing, ICT advanced world*. The scope of the study is what de-Vaus (1986:32) refers to as 'nomothetic explanation' i.e. general but partial, in this case, covering the whole/general region of sub-Saharan Africa but with 'partial' focus on a specific element (ICTs) of the LIS education component of higher education. The unit of analysis was the LIS school/faculty/department in any institution of tertiary/higher education within the countries in the specified region.

4.3.4 Dimension of the Study

In the conceptualisation of this research, it was envisaged that a cross-sectional study, covering all identifiable LIS schools in tertiary and higher education institutions in Africa, would sufficiently yield reliable data that would lead to pertinent findings. However, because of the broad scope, the study could not examine in detail, the causal relationships or carry out in-depth evaluation of the effect of ICTs. Such an undertaking would have rendered the study *unmanageably large*. The central interest of the study lay in discovering concrete determination of the status of ICT use and ICT education, the findings of which could form a basis for the said further and in-depth evaluation. Regrettably, data from and/or communication with the northern part of Africa proved difficult and hence confined the study to sub-Saharan Africa as detailed in the next section.

4.4 TARGET POPULATION

A research population can be specified in terms of unit of cases, geographical scope and/or temporal boundaries (de Vaus, 1986). The universe of theoretical aggregation for this study was planned to cover all the 54 countries of the African continent. These countries are often academically categorised into five major groupings, i.e. Anglophone, Franco-phone, Luso-phone, Arabic and Spanish. There are 24 Franco-phone countries (40.6%), 21 Anglophone countries - 35.5%, 5 Luso-phone countries - (8.4%), 7 Arabic countries - (11.8) and 2 Spanish countries - (3.4%). This study intended to cover all these countries and effort was made to establish contact with all identifiable LIS schools. However, this effort was largely unrewarded, especially with the North African countries. Only one LIS school, the Department of Library and Information Science at the University of Garyouins in Libya, responded from that region and hence it was considered best to leave the whole region of North Africa out of the study altogether. Thus the target population for this study finally focussed and consisted of LIS Schools in Anglophone, Franco-phone and Luso-phone Africa, effectively then, to the region referred to loosely as sub-Saharan Africa. Within this region, this study further made loose geographical categorisation of the 47 countries into four parts of the region, namely (1) Southern Africa (including the countries of Angola, **Botswana**, Comoro Islands, Lesotho, Madagascar, **Malawi**, Mozambique, **Namibia**, **South Africa**, Swaziland, **Zambia** and **Zimbabwe**), (2) Central Africa (including the countries of Cabinda, Central Africa Republic, **Democratic Republic of Congo**, Equatorial Guinea, Gabon, Republic of the Congo, and Sao Tome and Principe), (3) Eastern Africa (including the countries of Burundi, Djibouti, Eritrea, **Ethiopia**, **Kenya**, Somalia, Rwanda, Seychelles, **Sudan**, **Tanzania** and **Uganda**), and (4) West Africa (including Benin, Burkina Fasso, **Cameroon**, Chad, Cote De Voire, Gambia, **Ghana**, Guinea, Guinea Bissau, **Liberia**, Mali, Mauritania, Niger, **Nigeria**, **Senegal**, **Sierra Leone** and Togo). LIS schools were identified in only eighteen (*appearing in bold above*) of these countries.

4.4.1 LIS Schools in sub-Saharan Africa

The term 'LIS school(s)' is used in this study to represent independent academic units within universities, colleges, polytechnics, technikons and similar tertiary institutions,

that offer professional or paraprofessional programmes in library and/or information science. There is yet no consensus on what to term such a unit because each higher education institution names such units according to their structure, objectives and academic-political ethos. Thus a 'LIS school' may be designated as a school, institute, faculty, department or section, and it may have one or a combination of terms such as library, information, communication, science, studies or technology. Further, the specific names, nature and character of a LIS school may vary from country to country and even from one higher education institution to another within a country. Such variation is often a product of diverse perceptions in response to unique job market requirements. A preliminary investigation into the naming revealed that the designation of the schools varied from country to country, and even between institutions within one country. Generally, the majority (40) were referred to as departments, while others were referred to as school (5), Institute (2), College (1), Faculty (1), Unit (1) and Centre (1). In this study the term "LIS school" is preferred to be used in referring to any of the above different designations.

An estimated number of 55 LIS schools in 18 of the 47 countries were targeted for this study. This estimation was derived from a 1999 comparative study of LIS training in Africa, which identified 48 schools (Ocholla, 2000) and IFLA's World Guide to Library Archive and Information Science Education (Fang, Stueart & Tuamsuk, 1995). Of the 48 identified by Ocholla (2000), four LIS schools in South Africa have since closed down, thus leaving 51 LIS schools that were included in this study. *See Appendix B for a complete list of LIS schools in sub-Saharan Africa by country.*

Of the 51 LIS schools, South Africa has the largest number, i.e. 15, which is about 29% of the total, followed by Nigeria which has 8, (15%), and Kenya, which has 7, (13%). Thus over 62% of LIS schools are in 3 countries, leaving only 38% distributed among the remaining 15 countries. Table 4.1 below shows the distribution of LIS schools per country. It is also noteworthy that even though Lusophone countries of sub-Saharan Africa were expected to be included in the study, they were not represented. This was basically because no LIS schools could be identified in any of the Lusophone countries.

Although a Google search found one institution in Mozambique, an email inquiry to the Center of Informatics at the University of Eduardo Mondlane in Mozambique failed to yield a response/contact. Thus the study includes only Anglophone and Franco-phone African countries.

Table 4.1: Number of LIS Schools per country

Country	Number of LIS Schools	Percentage
Botswana	1	2.0%
Cameroon	1	2.0%
DRC	1	2.0%
Ethiopia	1	2.0%
Ghana	1	2.0%
Kenya	7	13.7%
Liberia	1	2.0%
Malawi	2	3.9%
Namibia	1	2.0%
Nigeria	8	15.7%
Senegal	1	2.0%
Sierra Leone	1	2.0%
South Africa	15	29.4%
Sudan	3	5.9%
Tanzania	2	3.9%
Uganda	1	2.0%
Zambia	1	2.0%
Zimbabwe	3	5.9%
Total	51	100.4%

4.4.2 Sampling

Since the goal of this study was to accurately analyse the status, development and use of ICTs in LIS education in sub-Saharan Africa, it was deemed very important to obtain data and views from as many varied units/elements as possible. This decision was based on the presumption that the ICT landscape in Africa is as diverse as the continent's many countries. Each country is an aggregate of myriad socio-economic, political and cultural factors, which influence the level of ICT development and use and hence any attempt at sampling for meaningful representation would be difficult. Besides, one of the principles of sampling is that the "smaller the population, the bigger the sampling ratio" (Neuman, 2000:217). In quantitative research, there is general agreement that a bigger sample size

is often more representative of the population. However, to determine the right sample size, it is also important to consider the degree of precision and accuracy desired. Neuman (2002) observes that larger samples are needed in order to yield higher levels of accuracy, but cautions that a large sample does not always guarantee a representative sample because other factors such as the sampling frame and sampling techniques influence the representation of a population. This study required high level precision and a fair amount of accuracy because of the nature and anticipated use of the findings. To provide accuracy and representativeness of a widely variable or highly diverse population, the study, therefore, required a large sampling ratio in concurrence with Powell's (1991:74) observation that "greater variability requires a correspondingly larger sample."

Further, the thrust of this research was to investigate the status of ICTs and ICT education in LIS schools in sub-Saharan Africa, which meant that it was necessary to obtain views from as many parts and countries as possible. With the exception of South Africa, which has a large cluster of LIS schools, there was found to be a wide dispersion of LIS schools over the continent. Southern Africa as a whole had 23 LIS schools identified, while Eastern had 14 and West Africa had 13 LIS schools each. There was only one LIS school identified from Central African countries. Thus considering the wide dispersion of LIS schools, and because of the small sampling frame, this study strove to include the whole population of 51 LIS schools in Africa. This means that there was no sample drawn. For each LIS school, key informants were identified as the respondents. These consisted of people, who by virtue of their position or specialisation, were in a position to have and provide detailed information of the ICTs status in their respective LIS school. The key informants included deans, directors and/or heads of departments.

4.5 RESEARCH TECHNIQUE, STRATEGY AND PROCEDURE

A research technique is defined by Ikoja (2002) as the strategy by which research is conducted. A research technique is made up of instruments and/or tools, plus procedure(s) that are used by the researcher to measure and collect the research data.

Powell (1991) emphasises the importance of selecting research techniques by observing that the decision is critical to the reliability and objectivity of research data. Mouton and Marais (1991) concur with this view that researchers should consider the different factors that could affect the validity and reliability of the inferences. These factors may be inherent, not only in the variables being studied, but also in the data collection instruments, which may, for instance introduce bias in the responses. While it is impossible to totally eliminate/avoid bias, care must always be taken to use techniques that enable a researcher to minimise it.

In the social sciences, the common survey techniques used include questionnaires, interviews, observation and content analysis. Ordinarily, mapping and audit studies and processes rely heavily on the interview technique, mainly because the interview technique has the advantages of a better response rate and greater capacity for correction of misunderstandings. Interviews are also acclaimed for the opportunity for the researcher to follow-up on any interesting characteristics that may arise in the course of the interview. However, the geographical scope of this study could not permit the use of the interview technique and hence instead, this study employed questionnaires and content analysis techniques.

4.5.1 Questionnaires and Questionnaire Construction

Questionnaires are often used in surveys as the primary data collection instruments (Busha & Harter, 1980). A decision to use questionnaires for this study was made because:

- a) The nature and scope of the study pointed to this technique. Questionnaires were viewed as the logical technique to study a population that is dispersed over an entire expansive continent like Africa. Questionnaires were also found to be cheaper and cost effective for collecting the vast amounts of data, within a relatively short period.
- b) The quantitative data required for this study could best be obtained through questionnaires. Moreover, questionnaires permitted respondents to provide well thought-out responses and where necessary, verified information that would be analysed to reveal the actual ICTs situation in LIS schools.

- c) The fixed format of questionnaires often helps to reduce some form of variation in answers. However, this could not be guaranteed considering the fact that respondents' interpretation could still introduce a lot of variation.
- d) Questionnaires are the easiest way of collecting structured data for the variables by case matrix.

The framework of the questionnaire was based on two prototypes, namely the Association of African Universities (2000b) and that of Kloppers (1996).

- i. The Association of African Universities (AAU) undertook a study of the use and application of information and communication technologies (ICTs) in higher education Institutions in Africa. Using a detailed questionnaire, AAU (2000:Part 3 section 4) made an assessment/survey of ICTs capabilities at every member university of the Association of African universities. The purpose of the survey was to collect data that would be the basis:
 - ◆ for assessing the state of the use and application of ICTs in African higher education and research institutions;
 - ◆ to develop appropriate strategies and programmes to strengthen the capacity of African higher education institutions for the effective integration and utilisation of ICTs in their multidimensional functions and to ensure the widespread use of these technologies by the institutions; and
 - ◆ to establish and maintain a database on the state and use of ICT in higher education institutions in Africa, which will be updated periodically to assess the progress and development in the area.

To a large extent, this study is similar in goals and structure to the AAU study and thus the questionnaire structure was replicated from that landmark study. The questionnaire is divided into 4 sections:

SECTION 1: Facts about LIS schools.

SECTION 2: The state, use and application of ICT in LIS education.

SECTION 3: ICT needs in LIS schools.

SECTION 4: Additional relevant comments and information.

- ii. Kloppers (1996) studied the extent to which Information Technology education was offered in LIS departments in South Africa in preparing graduates for working in EIS. She identified three sub themes/problems (Kloppers, 1996:4). They included:
- ◆ what information technologies needed to be taught in order to adequately equip graduates for electronic information service;
 - ◆ what the current state of information technology education in South Africa's information science departments was; and
 - ◆ the attitudes of heads of information science departments towards information technology education.

The ethos of Kloppers' (1996) study can be perceived as a partial version of this study, differing with it in terms of phenomenological and population scope, but focussing on similar variables. Thus many of the type of questions asked by Kloppers are included in this study.

A detailed questionnaire with both structured and non-structured questions was used. Closed-ended or fixed alternative questions enable a researcher to present alternatives for the respondents to select choices closest to their own positions or views. Such questions help clarify the intent of the question for the respondent and are easily coded to produce meaningful results for analysis. For example, the use made of ICTs in teaching and learning can be expressed variably, but the questionnaire specified aspects such as lecture presentation, electronic discussion groups, course management, etc in order to guide respondents.

On the other hand, open-ended questions allow respondents to convey the fine shades of their attitudes to their satisfaction instead of forcing them to choose one of the several statements usually found in closed-ended questions (Judd, et al, 1991). Ideally, open-ended questions can be used when all of the possible answer categories are not known or when there is need to explore the views of respondents. Thus the open-ended questions allowed the respondents to answer questions in a relatively unconstrained way. This was

found necessary when soliciting data regarding for instance, ICT courses offered by LIS schools, because the development of courses/modules is usually entirely an individual institution's prerogative. Other areas where the variables could not be comprehensively listed include software systems being used, types of equipment in use, and databases that a LIS school subscribes to.

The decision to use both types of questions was taken on the strength that combined both types of questions. These would enrich the data collected and consequently the *subsequent findings*.

4.5.2 Content Analysis

According to Powell (1991), content analysis is essentially a systematic, objective, quantitative analysis of occurrence of words, phrases, or concepts in documents. Content analysis allows a researcher to compare content across many texts and subsequently analyse it using quantitative techniques. Neuman (2000) observes that researchers use content analysis for many different purposes such as studying trends in topics, themes in songs, ideological tones in literature/speeches or even propaganda in political dispatches. The researcher employs objective and systematic coding, counting and recording to come up with quantitative descriptions of the variable(s) being studied, and then analyses these descriptions. In content analysis, coding and measurement are important because the constructs in content analysis are operationalised with a coding system i.e. "a set of instructions or rules on how to systematically observe and record" the data (Neuman, 2000:294). Units of analysis are determined and measured.

It is important to note the significance of content analysis on the objectivity of research data since content analysis is reactive. That is because the process and circumstance of providing content analysis data is without initiation by, or influence from the researcher. The researcher is able to probe into, and/or extract the data as it has been pre-presented. This means that the phenomenon of respondents expressing what they think the researcher wants to hear, or what will portray the respondent in a positive manner, is

largely eliminated. But of particular relevance to this study is Neuman's observation that content analysis is helpful when a topic must be studied at a distance (Neuman, 2000).

For this study, content analysis was based on an examination of existing documents such as mission statements, syllabi and course outlines. Most of this data was obtained from web sites of some of the LIS schools. In other cases the researcher requested responding LIS schools to mail the documents that provide background information of their school/faculty/department. The documents obtained included mission statements, programmes being offered, structures of programmes, course descriptions, staff/faculty, history, admission requirements, annual reports, research programmes/publications, etc.

Manifest coding was used in order to capture constructs. Manifest coding refers to the visible surface content that can be turned into objective quantitative data and measured (Neuman, 2000). This is unlike latent coding whereby the variables represent constructs, whose meaning is imbedded in the content but is not visible on the surface, and therefore must first be interpreted or deciphered (Neuman, 2000). This study used manifest coding in order to capture constructs such as ICT courses offered by LIS schools, degree/education programmes offered, relative academic weighting of ICT courses e.g. core versus elective modules, and practical vis-à-vis theory courses. The validity of manifest coding was assured because it was not found necessary to investigate imbedded connotations or multiple meaning of the data. Where applicable, data extracted by content analysis was merged with quantitative data obtained through the questionnaires.

4.6 DATA COLLECTION PROCEDURE

A variety of devices were employed in order to obtain data for the study. They included email communication, postal communication and personal visits. Two types of data collection were desirable, namely (a) documents with content analysis information in the form of background data from primary documents, and (b) questionnaire responses.

4.6.1 Obtaining Documents for Content Analysis

The documents obtained included brochures, syllabi, regulations, annual reports, etc., which contained background information such as the mission statement, history of the department/LIS school, list and description of programmes being offered, structure of each programme, course descriptions, staff/faculty capacity, admission requirements and research programmes and/or publications.

Background information was sought firstly and majorly from web sites for those LIS schools with a presence on the Internet. LIS schools that have posted background information on their home pages included the University of Botswana, University of Namibia, University of Ghana, Moi University, University of Cape Town, University of Orange Free State, University of Potchefstroom, University of Pretoria, Rand Afrikaans University, University of South Africa, University of Stellenbosch, University of Western Cape, University of Zululand, University of Dar-es-Salaam, University of Natal, the Cape Technikon, Durban Institute of Technology, Technikon South Africa and Durban Institute of Technology.

In addition to internet-based information, the researcher made personal visits to, and obtained information from the following LIS schools - Moi University, Kenyatta University, University of Nairobi; Kenya Polytechnic; Sigalagala Technical Institute; School of Professional Studies, and the University of Zululand.

For the rest, contact was first established with the HODs or someone within the LIS school/programme. The relevant documents requested for included brochures, academic calendar, curriculum/syllabi, course outlines and regulations governing the programmes. Respondents were requested for these documents to be mailed. LIS schools that had to be contacted in this way included those at the University of Addis Ababa, University of Malawi, Ahmadu Bello University, Bayero University, Abia State University, University of Ibadan, University of Maiduguri, University of Nigeria, The Polytechnic Nekede, Owerri, University Chiekh Anta Diop - Dakar, Fourah Bay College, University of Transkei, University of Fort Hare, University of Natal, University of the North,

University of Transkei, ML Sultan Technikon, Port Elizabeth Technikon, Pretoria Technikon, Technikon South Africa, Khartoum University, Omdurman Islamic University, Omdurman Ahlia College, Bagamoyo School of Library, Archival & Documentation Studies, Makerere University, University of Zambia, Telecom Staff Training & Evelyn Hone College of Applied Arts, National University of Science and Technology, Bulawayo Polytechnic and Harare Polytechnic.

4.6.2 Questionnaire Administration

Questionnaires were sent to 51 LIS schools in sub-Saharan Africa. Excepting LIS schools in Kenya and the University of Zululand, questionnaires were mailed (email and postal/airmailed) to respondents on January 21 2003. Mailing was considered the best option because the target population is dispersed over great distances that could only be reached by mail. Neuman (2000:272) cautions that the response rate of mail questionnaires is usually doubtful and advises that because of this, the sample size should be large. This study targeted the whole population of 53 institutions, some of which can be contacted by e-mail. The questionnaires, therefore, were in digital format but could be downloaded into hard copy when necessary. For all the institutions, questionnaires were airmailed with self-addressed return envelopes. In both cases (airmail and e-mail), effort was made to attain a high response rate through establishment of personal contact with key informants via e-mail and telephone reminders.

Questionnaires were personally delivered to LIS schools in Kenya and at the University of Zululand. Each LIS school was given one week to complete the questionnaire. The researcher then visited and collected the completed questionnaires personally. Questionnaires were hand-delivered and collected in Kenya and at the University of Zululand because it was more convenient and easy for the researcher to administer them in this way. This method of questionnaire administration often offers a 100% response rate as was the case with the above LIS schools in this study.

4.7 ETHICAL CONSIDERATIONS

Social research is a dynamic process that involves respondents and researchers. It is based on mutual trust and co-operation. Ikoja (2002) cautions that because of the freedom of action involved, research practice can have adverse effects on the participants thereby causing serious problems to the subjects and the community in general. He further observes that for research freedom not to violate the rights of those involved in the research process, research must be guided by unwritten standards and principles. As a matter of principle, ethical considerations were kept in mind when conducting this study. Respondents were assured of their rights, of consent, to protection from disclosure of information and respect for their privacy. Scholarly consent was obtained from each participant in the study, to ensure a clear understanding and willingness to participate in the study. Anonymity and confidentiality of individuals was promised but was found to be unnecessary. In one case, the respondents made a point of indicating their individual participation, which was consequently acknowledged in Appendix B. However, since the unit of analysis was the LIS school rather than individual people, the issue of privacy and confidentiality was not enormous.

Another ethical issue considered was the integrity of the researcher. According to Sarantakos, cited by Ikoja (2002:216), there are eight elements a researcher must follow to do faithful and thorough work. These are: accuracy in data collection and processing, use of appropriate research methodology, appropriate interpretation of the data, accurate reporting, non-fabrication of data and or criminal misconduct. This researcher attempted, to the best of her knowledge and capability to adhere to these principles.

4.8 DATA PRESENTATION AND ANALYSIS

Analysis and interpretation of data means studying the tabulated material in order to determine inherent facts or meanings. It involves breaking down existing complex factors into simpler parts and putting the parts together in new arrangements for purposes of interpretation (Katz, 1992). The data collected was tabulated under the various themes and subheadings, and presented using tables, bar graphs, frequencies, percentiles and

generalisations. Quantitative data was analysed using the Statistical Package for the Social Sciences (SPSS) while qualitative data was analysed using techniques of analytic comparison, successive approximation and parallel demonstration. Both descriptive and inferential statistical analysis procedures were applied.

The researcher analysed and interpreted the data by using contingency tables. By using the contingency tables the researcher was expecting to present relevant information collected. After the data had been analysed and interpreted, the researcher, thereafter, made deductive observations, drew inferences, drew conclusions and made recommendations.

Cognisance was taken of the fact that a large number (34.5%) of the LIS schools in the study, were from South Africa, a country which additionally happens to be also comparatively more technologically advanced. However, the study also considered that not all higher education institutions in South Africa are highly developed. As pointed out by Kloppers (1996), there are some South African institutions of higher education, the historically disadvantaged institutions, whose level of development is similar to those of many other developing countries of Africa. Thus while acknowledging South Africa's superior ICT development, it can, nonetheless, be assumed that the generalisations that could be inferred from the South African scenario may not overly invalidate generalisation to the rest of the continent.

4.9 PILOT STUDY

A pilot study is a fourth principle for improving reliability of a hypothesis-testing situation. The purpose of this pilot study was to test the research instrument. In this study, a pilot study was conducted prior to the main study, whereby the questionnaire was pre-tested at 5 LIS schools comprising of two universities and one technikon in South Africa, a university in Kenya and a polytechnic in Zimbabwe. In the South African study, one of the universities belonged to the category of "Historically Advantaged Institutions" (HAIs), while the other belonged to the "Historically Disadvantaged Institutions" (HDIs)

category. As Kloppers (1996) points out, the HAIs may represent the most advanced higher education institutions on the continent, which are similar in development to higher education institutions in developed countries. The HDIs, on the other hand, represent the type of higher education institution that can be found in any developing country of Africa. The questionnaire was emailed to the respondents in December 2002. The results of this pilot study are provided in section 4.9.3 below.

4.9.1 Reliability and Validity of Instruments

Reliability and validity are central issues in all scientific measurement (Neuman, 1997:137). While both concern how concrete measures are developed for a construct, reliability is about achieving stability, dependability and consistency of research instruments while validity is an indicator that an instrument is actually capturing the meanings of the construct as expected. To achieve reliability and validity of the questionnaire it was pre-tested for clarity, completeness, relevancy and shortcomings in a pilot study among the four LIS schools in South Africa. The purpose was to establish its effectiveness before the actual study.

4.9.2 Data Collection

Questionnaires, which comprised twelve pages each, were e-mailed to L/IS schools in five institutions consisting of three universities and two polytechnics. The institutions included the University of Pretoria, the University of Zululand, Moi University, Harare Polytechnic and the Durban Institute of Technology. E-mail services were favoured in the pilot study so as to save on the time for communication. Although the responses were not as prompt as expected, four (80%) were finally received by the end of January 2003.

4.9.3 Impact on Research Instruments

4.9.3.1 The use of the terms Institute, School, Faculty, Department and Unit were found to be confusing to some respondents. This seemed to be the case because in some countries and even institutions, L/IS programmes are offered by a department within a larger faculty that often transcends L/IS as a discipline. To solve the problem, the acronym L/IS was added to precede each time the above

designations were used. This helped to clarify that in case L/IS operates under a faculty such as Faculty of Arts, then it is the department that the questionnaire is targeting or referring to and not the entire faculty.

4.9.3.2 Section 2.1 of the questionnaire which provided for "yes" or "no" answers was found to be problematic because some LIS schools could not be categorical. To solve this difficulty, the section was reorganised in the main study, into tables that provided for multiple and variety of choices. Instead of a simple "yes" or "no", respondents now had choices as to whether specific ICT course content is taught as core/required course", "elective", "integrated in other courses" or "not taught at all", taught as "theory" or "practical". Thus by ticking in the various boxes, this would provide for the variety of approaches to the teaching of ICT content.

4.9.3.3 As a result of changes indicated in 4.9.1.2 above, sections 2.2.2 and 2.2.3 were found unnecessary because these concepts had been merged into the tables of section 2.1. Sections 2.2.2 and 2.2.3 were, therefore, removed.

4.9.3.4 Section 2.2.1: Application of ICT in teaching/learning activities and Section 2.3.1: Application of ICTs in LIS Research, were modified to provide for different levels of ICT use. This was achieved by replacing the "yes" or "no" choices with "always", "sometimes" and "not at all"

4.10 PROBLEMS ENCOUNTERED DURING THE RESEARCH

4.10.1 Identification of relevant and reliable subjects for a study is a significant factor for research because of the importance of respondents in social science research. It was the intention of this study to be as comprehensive as possible by including all LIS schools in sub-Saharan Africa. However, not all LIS schools were identified. It has come to our attention that Nigeria alone has about 22 LIS schools, and that there is a LIS school in Eritrea. There may be other LIS schools in tertiary institutions other than those in well-known universities, colleges and technikons.

But these LIS schools are not documented and hence it was difficult to ascertain their existence or establish contact with them.

4.10.2 One of the hallmarks of a comprehensive research instrument is that it requires a fairly friendly respondent. The questionnaire for this research was comprehensive, requesting not only for a lot of information, but also for information that is not usually at the fingertips of L/IS education directors. For instance, the data for section 2.5 i.e. on ICT infrastructure, and part of section 2.6 on Telecommunications required the respondent to contact or consult with IT systems personnel and/or other specialists/technicians. This dependence on the extra goodwill of respondents caused a lot of anxiety.

4.10.3 It had been the researcher's wish to enclose self-addressed envelopes with stamps so as to facilitate the postal return of the questionnaire. However, this could only be achieved in South Africa, whose postal services could honour their own stamps. For the other countries, it was not conceivable that their postal system would accept South African stamps. Thus although self-addressed envelopes were enclosed, it required the respondents to meet the cost of and affix stamps. This placing of an extra burden on the respondent may have affected the response rate. This may be one of the reasons for non-response by some of the LIS schools.

4.10.4 Reliance on email for questionnaire administration had its positive and shortcomings. For instance, even though prior to questionnaire distribution, an email contact had been established with some respondents/key informants, some of the contacts became unusable when email messages kept bouncing back after the questionnaire had been sent both via email and airmail. The advantage was that the researcher could send frequent reminders via email, often one message bulk-addressed. However, in some cases, the numerous email reminders and/or the two reminders by airmail to the institutions that could not be reached via the email, did not yield any response.

4.10.5 Responses were rather slow in coming, often involving many weeks of anxious waiting before receiving one or two responses. Initially planned for three months, it took more than six months of data collection to receive an acceptable response rate.

4.11 SUMMARY

This chapter has given a detailed account of the methodological procedures followed and issues that arose during the process of conducting this research. Within the realm of a quantitative approach, a descriptive survey was conducted, using the questionnaire and content analysis techniques. Effort was made to reach all 53 LIS schools identified in 18 countries of Anglophone, Franco-phone and Luso-phone sub-Saharan Africa. The study relied heavily on email communication, first to establish contact and secondly for questionnaire administration. This use of electronic mail worked efficiently in the Southern Africa region, albeit with much follow up, whereby the digital version of the questionnaire was preferred. For the rest of the target population, hardcopy questionnaires were largely predominant, but with email follow-up/reminders. Ultimately, a 55% response was achieved. The next chapter presents and analyses the data obtained.

Chapter Five

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

5.1 INTRODUCTION

Data analysis is the tabulation of data in order to determine inherent facts or meanings. This exercise involves summarizing data into smaller, simpler and manageable parts to ensure easy and correct interpretation. At the same time, this exercise should be done in such a way that the results and interpretation thereof respond to the aim and objectives of the study. Both the Statistical Package for the Social Sciences (SPSS) and MS-Excel were used for this exercise. This chapter deals with the processing, presentation and general analysis of data. It is divided into twelve sections, ten of which present the data, each of which has various sub-sections.

The aim of this study was to map and audit the types, nature and diffusion of information and communication technologies (ICTs) in library and information science (LIS) education and training programmes in sub-Saharan Africa. The importance of this study stems from the revolutionary change, which is taking place in higher education and Information and Communication Technologies (ICTs). These changes have a dramatic effect on the way LIS schools carry out their functions of teaching, learning and research, as well as on the content of LIS education programmes. These developments pose a big challenge to LIS schools in Africa, not only as torch-bearers of the LIS professions, but also as part of the higher education institutions that contain the largest reservoirs of knowledge and talent in the region and therefore, have a critical role to play in determining how well Africa can respond to the knowledge evolution.

In order to fulfil the above aim and the study objectives, many variables were considered in the collection of data. Apart from general background information regarding the LIS schools, variables also focused on concepts relating to ICT knowledge being learned at LIS schools, the direct application of ICTs in the teaching, learning, research and administrative activities of LIS schools, ICT facilities that are available in LIS schools, and the challenges/problems of incorporating ICTs in LIS schools. A detailed

questionnaire (Appendix A) with both structured and non-structured questions was sent, via email and air mail, to 51 LIS schools in four regions of Africa, that is, Southern region – constituting 23 institutions, the Eastern region – constituting 14 institutions, the Central region constituting 1 institution, and the West Africa region constituting 13 institutions (*see Appendix B for individual institutions*). Responses were obtained from 29 institutions, which translated into a 57% response rate, with regional distribution as shown in the Table 5.1 below.

Table 5.1: Distribution of Respondents by Region and Type of Institution

Region	No. of responses received			% Total
	<i>Universities</i>	<i>Other</i>	<i>Total</i>	
1. Southern Africa	10	3	13	45
2. Eastern Africa	6	5	11	38
3. Central Africa	0	0	0	0
4. West Africa	5	0	5	17
Total	21 (72%)	8 (28%)	29	100%

** Other than Universities, institutions that offer LIS education include Polytechnics, Technikons, Institutes of Technology and Professional schools.*

The response rate for Eastern Africa was 79%, as compared to Southern Africa's 57% and West Africa's 38%. As seen in table 5.1, no responses were received from any of the LIS schools in Central African countries, mainly because the researcher was unable to establish reliable email contact that could have been used for more persistent follow-up.

Most of LIS education and training occurs in universities, an indication of adequate academic standards and professionalism because the parent universities usually impose some quality control for all the programmes offered. Rosenberg (2000:13) quotes Harris's conclusion that "the centering of the library school within university is generally recognized as desirable..." in order to safeguard the integrity of certificates, diplomas and degrees as well as attract quality staff, students and professional recognition. However, this indication should not be viewed as a judgement over the quality of other tertiary level institutions, as that is neither the mandate nor within the scope of this study. Rather, as observed by Rosenberg (2000:14), there was a trend for para-professional and non-

professional programmes to be offered outside universities because “universities are expensive locations for non-graduate education and training.” However, responses in this study showed that para-professional training is offered in 14 of the LIS institutions, revealing that apart from the seven ‘other’ institutions, at least seven universities offer programmes at one or more of these levels.

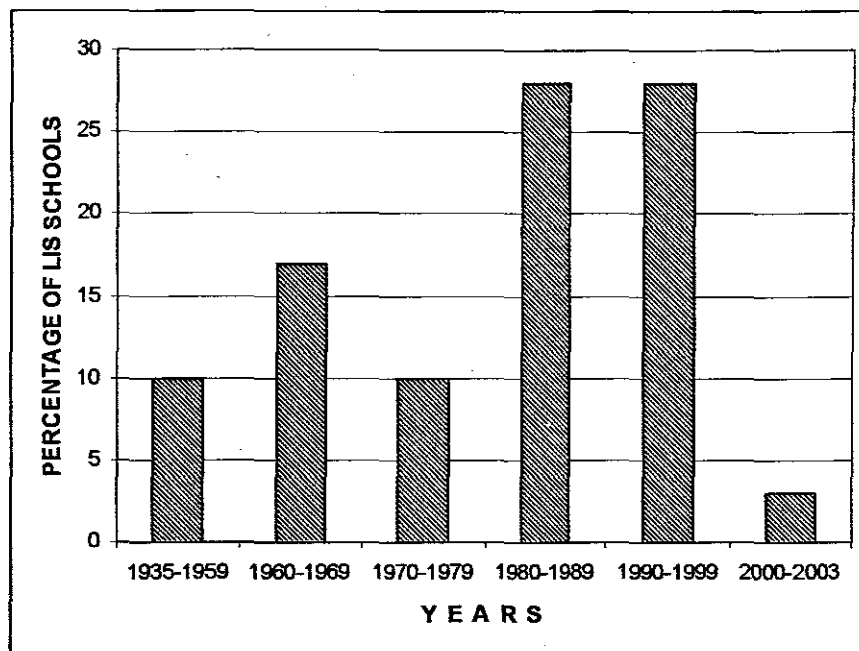
5.2 LIBRARY AND INFORMATION SCIENCE SCHOOLS IN AFRICA

The first section of the questionnaire sought to collect basic information about LIS schools in Africa, such as their names, when they were established, programmes offered and their population. This information formed the background on which ICT education is built.

5.2.1 Establishment of LIS Schools in sub-Saharan Africa

According to the responses, the earliest LIS schools in sub-Saharan Africa were established in South Africa at the University of Cape Town in 1939, followed by the University of Pretoria in 1947 and University of South Africa (UNISA) in 1955. The rest of sub-Saharan Africa started to establish LIS schools in the 1960s, coincidentally, but not surprisingly with liberation from colonial rule. However, the growth was slow in the 1960s and 1970s, with five (17%) and two (10%) schools being established in the sixties and seventies, respectively. A more significant increase in the number of new LIS schools was in the 1980s, when eight (28%) LIS schools were established, and in the 1990s when another eight (28%) new LIS schools were established. Only one LIS school has so far been established between 2000 and June, 2003. Figure 5.1 shows the development and establishment of LIS schools in sub-Saharan Africa. For details of the year each institution was established, see Appendix C at the end of this chapter.

Figure 5.1: Summary of Growth of Library Schools in sub-Saharan Africa



5.2.2 Nomenclature

Over 80% of LIS education is offered under the designation of LIS - Library and Information Science (46%) and/or simply IS - Information Science (35%). It was observed that disciplinary nomenclature varies because of the emerging trend that has seen the introduction and leaning towards information science as a discipline in an increasingly 'ICT' centred world that seems to overshadow the role of libraries by directly linking users to information through the Internet. Underwood (2003) observes that it is not yet clear whether Information Science is a parent discipline or alternative discipline to library science. As the discussion continues regarding the ambiguous definitions, this study noted that at least 42% of the LIS schools in sub-Saharan Africa have had to change their name for different reasons. Initially in the 1970s and early 1980s, the names changed from "Librarianship" to "Library Science/Studies" (LS) so as to assert the fact that the discipline was scientific and professional as befitted university level disciplines. But the more significant change for the discipline happened in the 1980s and 1990s whereby LIS schools incorporated "information" science into their programmes and thus changing names from "Library Science" to "Library and Information Science". This was

the case at UNISA (1983), University of Zululand (1988), University of Natal (1989), Omdurman University (1995) and University of Cape Town (1996). Bayero University made this change in 2002, and University of Botswana, University of Pretoria and Makerere University made similar changes although they did not indicate when this was done.

The relinquishing of the term "library" from the nomenclature was discerned in the 1990s with many LIS schools preferring to use the term "information Science" (African Regional Centre for Information Science, Kenya School of Professional Studies, Moi University, University of Pretoria, University of Stellenbosch and UNISA) or "Information Studies" (Rand Afrikaans University, University of Dar-es-Salaam, University of Ghana and University of Natal). In most cases this change was made in order to accommodate the wider scope that had characterised LIS activities with the introduction of computers and other information technologies into the profession. An example for the reasons of this change is UNISA, which changed in 1993 from, Department of Library and Information Science to, Department of Information Science explaining that the latter was an umbrella discipline that included not only Library Science, but also Museology and Archival Science.

Nevertheless, some institutions still retain the term 'library' in their name. While the reasons for retaining the term "library" in the name could be a subject of discussion, this aspect was not investigated by this study. But it was suggested by some scholars that such departments wish to continue highlighting the importance and presence of library science in their programmes. They emphasized the significance of library science concepts in the emerging discipline of information science.

Other LIS schools have added other terms to the LIS denotation so as to reflect the presence of other disciplines such as Communications and Information Technology. For instance at the University of Sierra Leone, the Institute of Library Studies has changed its name to the Institute of Library, Information and Communication Studies (INSLICS) and offers programmes in Communication Studies. Other variations include those of

Department of Information and Liberal Studies at the Kenya Polytechnic, Bagamoyo School of Library, Archives and Documentation, Eldoret Polytechnic Small Business Centre, and Department of Information and Technology at Sigalagala Technical Training Institute. The complete list of nomenclature can be seen in Appendix C.

Apart from instructive naming, the positioning of LIS departments within the institutional organograms may have an effect on the nomenclature chosen because departments in universities are usually administered under a Faculty, School or Institute. This then requires that the name and discipline of the department be one that falls within the broader disciplinary area of the faculty/school/institute. Thus departments may wish to adopt names that allow flexibility, as for instance "information science" which can fall under technology, applied sciences and engineering sciences. Table 5.2 summarises the nomenclature of respondents.

Table 5.2: Distribution of Respondents by Nomenclature

	IS	LIS	I & T	Other	Total No.	% of Total
1. Institute/Centre	1	0	0	1	2	7%
2. School	0	1	0	1	2	7%
3. Faculty	0	1	0	0	1	3%
4. Department	8	12	1	1	22	76%
5. Unit/Section	0	1	0	1	2	7%
Total	9 (31%)	15 (52%)	1 (3%)	4 (14%)	29	100%

Most LIS programmes in sub-Saharan Africa are offered under the auspices of departments (76%), with the remaining 24% being offered under Institute/Centre (7%), School (7%), Unit/Section (7%) and Faculty (3%). The positioning of LIS programmes in organograms may have an effect on the nomenclature because departments in universities are usually administered under a Faculty, school or institute. This then requires that the name and discipline of the department be one that falls within the broader disciplinary area of the faculty/school/institute. Thus departments may wish to adopt names that allow flexibility such as "information science" which can fall under technology, applied sciences and engineering sciences.

5.2.3 Programmes offered in LIS Schools

Respondents were requested to list the programmes that they offer, also stating the level at which each programme is offered. This information was meant to take inventory of the types and levels of programmes offered in sub-Saharan LIS schools. In answer to the question, some respondents referred the researcher to their web-sites while others provided the information on the questionnaire. 17 (65%) of the 26 respondents had web-sites on the Internet (*see Appendix B*). However, the type and amount of information at these web-sites varies, ranging from those websites that provide details of courses/modules, to those that merely mentioned/listed the LIS school among departments within their respective institution's web-site. It was also found that the names of programmes were not entirely uniform. Rosenberg (2000) observes that the lack of consistency in names of courses vis-à-vis standards of content and length were a historical accident that is often perpetuated by national or institutional structures and practices. However, by examining the objectives and/or course descriptions, it was possible to identify similarities and hence the programme titles used in Table 3 below. In general, responses showed that LIS schools in Africa offer three levels of undergraduate programmes and four levels of postgraduate programmes. Table 5.3 shows the programme names and the LIS schools that offer each programme.

Table 5.3: Programmes available in LIS Schools

N = 29

Kinds of Programmes	L I S Schools		
	*Abbreviation	No.	%
5.2.3.1 Undergraduate - Certificate Level			
i. Certificate in Library and Information Studies/Science	SLADS/EP/HP/KP/EASLIS/STTI/TSA/UB	6	21%
ii. Certificate in Information Science	KSPS	1	3%
iii. Certificate in School Librarianship	UB	1	3%
iv. Certificate in Health Information and Records Mgt.	HP	1	3%
v. Certificate in Archives and Records Mgt./Administration	HP/KP/UB	3	10%
vi. Higher Certificate in Library and Information Science	TSA	1	3%
5.2.3.2 Undergraduate - Diploma Level			
i. Diploma in Library Studies	TSA/UG/USL	3	10%
ii. Diploma in Information Science/Studies	EP/ KP/KSPS/STTI/UoN/UNISA	6	21%
iii. Diploma in School Librarianship	HP/UB/UN	3	10%
iv. Diploma in Library/Information Science/Management	BUN/DIT/EASLIS/UB	4	14%
v. Diploma in Archives and Records Mgt./Administration	SLADS/KP/EASLIS/UB/UG	5	17%
vi. Diploma in Library, Archives and Documentation Studies	HP/SLADS	2	7%
ii. Diploma in Information Technology/Computers	STTI	1	3%
iii. Diploma in Youth and Children's Information Work	UNISA	1	3%
ix. Advanced/Higher Diploma in Information Management	BUN/HP	1	3%
5.2.3.3 Undergraduate - Bachelors Degree Level			
i. Bachelor of Library and Information Science	ASU/BUN/KSPS/EASLIS/UB/USL/UWC/UZ	6	21%
ii. BSc/BA. Information Science	MU/RAU/UG/UP/UNISA/UZ	6	21%
iii. BA in Information Systems	KSPS/UB/UoS/	4	14%
iv. BA in Archival Science	UNISA	1	3%
v. BA in Arts & Culture - Societal Information	UNISA	1	3%
vi. Bachelor of Information Science (BIS)	UP	1	3%
ii. Bachelor of Information Science and Technology	NUST	1	3%
iii. Bachelor of Technology in Library/Information Science	DIT/TSA	2	7%
5.2.3.4 Postgraduate - Post-Graduate Diploma			
i. Post-Graduate Diploma in Library and Information Science	UCT/USL/UZ	3	10%
ii. Postgraduate Diploma in Information Studies	UN	1	3%

iii. Post-Graduate Diploma in Records and Archives Mgt.	RAU/UN	2	7%
iv. Post-Graduate Diploma in School Library Services/Science	KSPS/UZ	1	3%
v. Post-Graduate Diploma in Museology	UN	1	3%
5.2.3.5 Postgraduate - Honours Bachelor Degree			
i. Honours (Bachelor) degree in Library and Info. Science	UCT/UP/UZ	2	7%
ii. Honours (Bachelor) degree in Information Science	UP/UNISA/UoS/UZ	2	7%
iii. Honours (BA) in Archival Science	RAU/UNISA	2	7%
5.2.3.6 Postgraduate - Masters Degree			
i. MA/MSc. Library/Information Science	ARCIS/EASLIS/OIU/UB/UCT/UDSM/ UG/UN/USL/UNISA/UWC/UZ	12	41%
ii. Master of Library and Information Science	ASU/BUN	2	14%
iii. Master of Information Science	RAU/UP/UNISA/UoS	4	14%
iv. MPhil - Library/Information Science	ARCIS/MU/UCT/UG/UoS	5	17%
v. Master of Technology in Library/Information Science	TSA	1	3%
vi. Master of Education (M.ED) -LIS	KU	1	3%
vii. MA Archival Studies	UG	1	3%
5.2.3.7 Postgraduate - Doctoral Degree			
i. PhD - Library/Information Science	BUN/OIU/UB/UCT/UDSM/UG/UN/UP	7	24%
ii. DPhil	ARCIS/MU/RAU/UB/UP/UNISA/UoS/UZ	8	28%
iii. PhD. Computer Science	UP	1	3%

* Some of these abbreviations are created for this study. .

ASU	Abia State University, Department of Library and Information Science
ARCIS	African Research Centre for Information Science
SLADS	Bagamoyo School of Library, Archives and Documentation Studies
BUN	Bayero University, Nigeria, DLIS
DIT	Durban Institute of Technology, DLIS
EP	Eldoret Polytechnic, Small Business Centre
HP	Harare Polytechnic, Department of Library and Information Science
KP	Kenya Polytechnic, Department of Information and Liberal Studies
KSPS	Kenya School of Professional Studies, Dept. of Information Science
KU	Kenyatta University, Department of Library Studies
EASLIS	Makerere University, East African School of LIS
MU	Moi University, Faculty of Information Sciences
OIU	Omdurman Islamic University, DLIS
RAU	Rand Afrikaans University, Department of Information Studies
STTI	Sigalagala Technical Training Institute, Dept. of Information & Technology

TSA	Technikon South Africa, Department of Library and Information Studies
UB	University of Botswana, Department of Library and Information Studies
UCT	University of Cape Town, Dept. of Information and Library Studies
UDSM	University of Dar-es-Salaam, Department of Information Studies
UG	University of Ghana, Department of Information Studies
UoN	University of Nairobi, Department of Information Studies
UN	University of Natal, Department of Information Studies
UP	University of Pretoria, Department of Information Science
USL	University of Sierra Leone, Institute of Library, Info. & Communication Studies
UNISA	University of South Africa, Department of Information Science
US	University of Stellenbosch, Department of Information Science
UWC	University of Western Cape, Department of Library and Information Science
UNIZUL	University of Zululand, Department of Library and Information Science
NUST	Zimbabwe National University of Science and Technology, DLIS

Overall, paraprofessional programmes are offered in 16 (55%) of the LIS schools, undergraduate degree programmes in 18 (62%) of the LIS schools, and postgraduate degree programmes in 20 (69%) of the LIS schools, of which 14 (48%) offer up to doctoral level.

5.2.4 Student and Staff Component of LIS Schools

Respondents were requested to provide statistics of registered students and the staff establishment as at the time of the study. Each LIS School was required to separately indicate the number of undergraduate and postgraduate students. The pilot study had also revealed that LIS schools did not only have their own students but that additionally, LIS courses/departments accommodated students, usually from the same institution but registered for other programmes other than in LIS programmes. Such students often take LIS modules that have wider applicability such as Internet Searching, Information Systems, Knowledge Management and IT Tools. Thus, the study required respondents to specify the number of such 'other' students both at undergraduate and postgraduate. The responses showed that these non-LIS students are only found in undergraduate programmes as none were reported among the postgraduate programmes. Appendix C provides a comprehensive picture of the registration figures for 22 LIS schools.

From the 22 (76%) respondents who provided the figures, it was observed that the smallest LIS school has a student population of 13 students and the largest has 1145 students. The population of undergraduate LIS students range from 0 in LIS schools that offer only postgraduate programmes, to 1171. Postgraduate students' population also ranges from 0, in LIS schools that do not offer postgraduate programmes, to 150 students. The population of non-LIS students ranges from 0 to over 1000. It was interesting to note that some of the institutions could not give exact figures and hence indicate 'plus' or 'minus' (e.g. ± 300).

Respondents were also required to state the number of academic staff, ICT staff and administrative staff. Appendix C shows the figures for each institution. The study observed that some departments make use of temporary/contract or part-time academic

staff. Where specific figures of such staff were given, the researcher equated two part-time/temporary/contact staff to one full-time staff and incorporated the number accordingly (That accounts for the ½s on Appendix C). Considering that the number of academic staff is subject to unequal and/or non-uniform factors such as approved establishment, student numbers, etc. it was considered inappropriate to compute the mean. However, it was observed that the smallest department in terms of academic staff has four while the largest has 24 and the arithmetic mode was six academic staff.

Three (12%) of the respondents stated that ICT and/or administrative services are centralised and, therefore, ICT staff are shared with other departments within their institution, thus making it difficult for such departments to give specific figures. Of the 21 respondents who provided the data on staff, eight (38%) have no ICT staff and two (8%) have no administrative staff. The figures for ICT staff were observed to range between zero and four staff, with the mode (arithmetic) being at one staff. The figures for administrative staff were observed to range from 0 to 10 with the mode being also at one staff. Cumulatively from the responses, the approximate total population of LIS schools in sub-Saharan Africa during the period January-June 2003 was as follows:

Figure 5.2: Population of Sub-Saharan LIS Schools

Students:

Undergraduate -LIS	5,755
Undergraduate -Other	3,450
Post-Graduate - LIS	699
Total Students	9,904

Staff:

Approximate Staff-Student Ratio

Academic	296	1:34
ICT	26	1:381
Admin	66	1:150

NB Appendix C provides details of above data.

5.3 ICT CONTENT IN LIS PROGRAMMES

The study identified 29 ICT courses/modules, under five categories i.e. 9 General ICT knowledge modules, 8 modules in Storage/Retrieval Technologies, 7 modules in Network Technologies, 3 Communications modules, and 2 Library Automation modules (*see Appendix A*). These modules form the aggregate of ICT knowledge and competencies that were deemed by this study to be necessary in modern library and information service provision. From the curricular of the various respondents, it was noted that the actual ICT module titles differ among schools and/or specific programmes. However, the study assumed that heads of LIS schools would be able to recognize the content implied in each of the 29 modules even if the specific course/module titles varied from those used within their particular department or programme. Generally, the responses indicated that 88% (23) of the responding LIS schools offer more than 50% of the 29 modules identified in this study. But institutional and module differences abound as specified below.

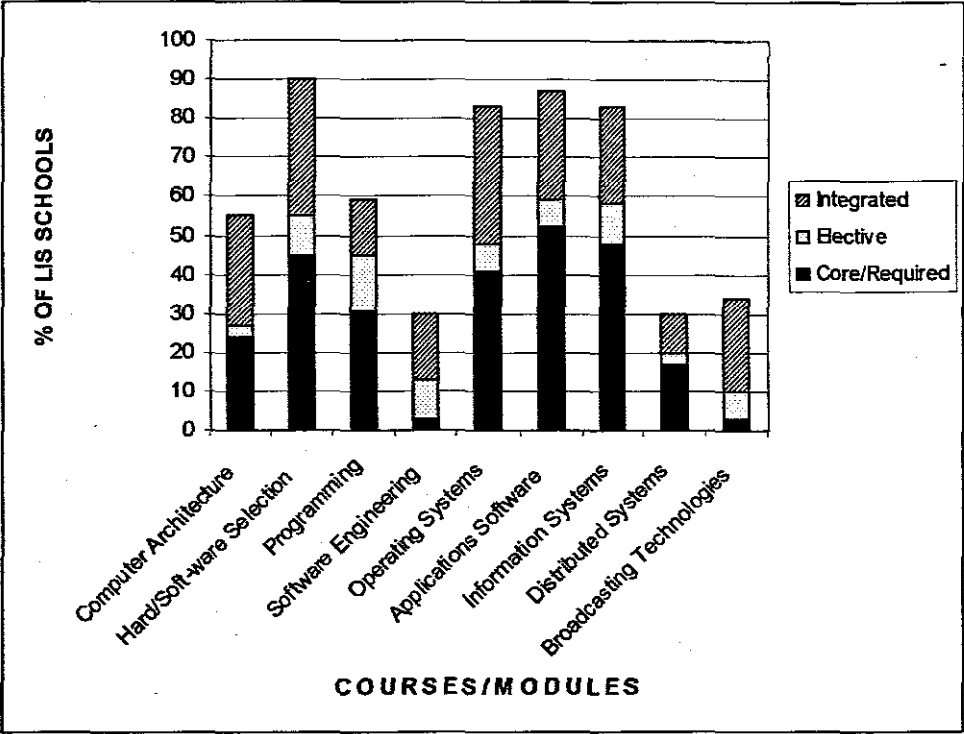
5.3.1. General ICT Knowledge Courses/Modules

It is not always expected that a LIS graduate should master all the disciplines that form the Information Science field. However, the nature of the jobs in LIS market currently require a fairly broad knowledge of the basic functioning of computers and the related technologies that facilitate information handling. General ICT Knowledge modules are those that provide such general basic understanding of a range of information and communication technologies.

Respondents were required to indicate whether or not they offered the specified modules/content. At the same time respondents were expected to indicate, by a tick in the appropriate space, whether they offer the module as core/required or elective, or integrated (i.e. when the content of the given module has been incorporated as topics in other core courses). The purpose of these two-sided questions was to reveal the extent to which LIS school curricula in Africa offer general ICT knowledge and the implicit importance accorded each module. The study assumed that the highest significance is attached to core modules as representing the competencies that cannot be done without, while individual electives represent competencies that although useful, can be skipped.

Figure 5.3 shows the generalised percentage of LIS schools that offer modules that provide General ICT knowledge and competencies.

Figure 5.3: Percentages of LIS Schools offering General ICT Knowledge Modules N=29



From the results, it was found that:

- 5.3.1.1 Sixteen (55%) of the respondents offered a module or content in Computer Architecture. However, of those 16 institutions that offered Computer Architecture, less than half (7, 44%) offered it as a core module, while only 1 (6%) offered it as an elective, and 8 (50%) had integrated aspects of the subject in other modules. These results indicated that most LIS programmes considered it useful for graduates to have some knowledge of computer architecture.
- 5.3.1.2 Twenty-six (90%) of the respondents offered a module or content on Hardware and Software Selection. Out of the 26 institutions that offered Hardware and Software Selection, 13 (50%) offered it as a core module, 10 (38%) had integrated aspects of the subject in other modules while 3 (12%) offered it as an

elective. These results positively indicated that a lot of significance is attached to the knowledge of Hardware and Software Selection for most LIS graduates.

5.3.1.3 Seventeen (59%) of the respondents offered a module or content in Programming of which 9 (31%) offered it as core/required, 4 (14%) offered it as integrated and another 4 (14%) offered it as an elective. But viewed from the perspective of the 17 institutions that offered Programming, 52% considered it important enough to be offered as a core module, while 24% offered it as an elective. Another 24% had integrated aspects of the subject in other modules.

5.3.1.4 Nine (31%) of the respondents offered a module or content in Software Engineering. Of these 9 institutions that offered Software Engineering, only one (11%) offered it as a core module, while 3 (33%) offered it as an elective and 5 (56%) had integrated aspects of the subject in other modules. This showed that knowledge of Software Engineering was not widely obtained in LIS programmes, and even where it was offered, most LIS programmes did not highly rate Software Engineering as important for LIS graduates. However, the low provision may also be as a result of lack of expertise in the subject.

5.3.1.5 Twenty-four (83%) of the respondents offered a module or content in Operating Systems. However, among the 24 institutions that offered Operating Systems, 12 (50%) offered it as a core module, while 10 (42%) had integrated aspects of the subject in other modules and only 2 (8%) offered it as an elective. This showed that competencies in Operating Systems were widely taught/provided and that most LIS programmes considered it important for graduates to have knowledge of operating systems.

5.3.1.6 Twenty-five (86%) of the respondents offered a module or content in Applications Software. Among the 25 institutions that offered Applications Software, 15 (60%) consider it valuable enough to be offered as a core module, but 8 (32%) had integrated aspects of the subject in other modules, while 2 (8%)

offered it as an elective. This indicated that the majority of LIS schools highly rated knowledge of applications software for LIS graduates.

5.3.1.7 Knowledge and skills of Information Systems was observed to be important for LIS graduates by 86% (25) respondents who offered a module/content in Information Systems Design and Analysis. Of these 25 institutions that offered Information Systems Design and Analysis competencies, 14 (56%) offered it as a core module, while 3 (12%) offered it as an elective and 8 (32%) had integrated aspects of the subject in other modules.

5.3.1.8 Nine (31%) of the respondents offered a course in Distributed Systems. Out of the 9 institutions that offered Distributed Systems, 56% offered it as a core module, while 11% offered it as an elective and 33% had integrated aspects of the subject in other modules. This suggested that most LIS programmes did not highly rate Distributed Systems as important for graduates. However, the low provision may also be as a result of lack of expertise on the subject. But where it was offered, the Distributed Systems module was considered important and hence offered mostly as a core module

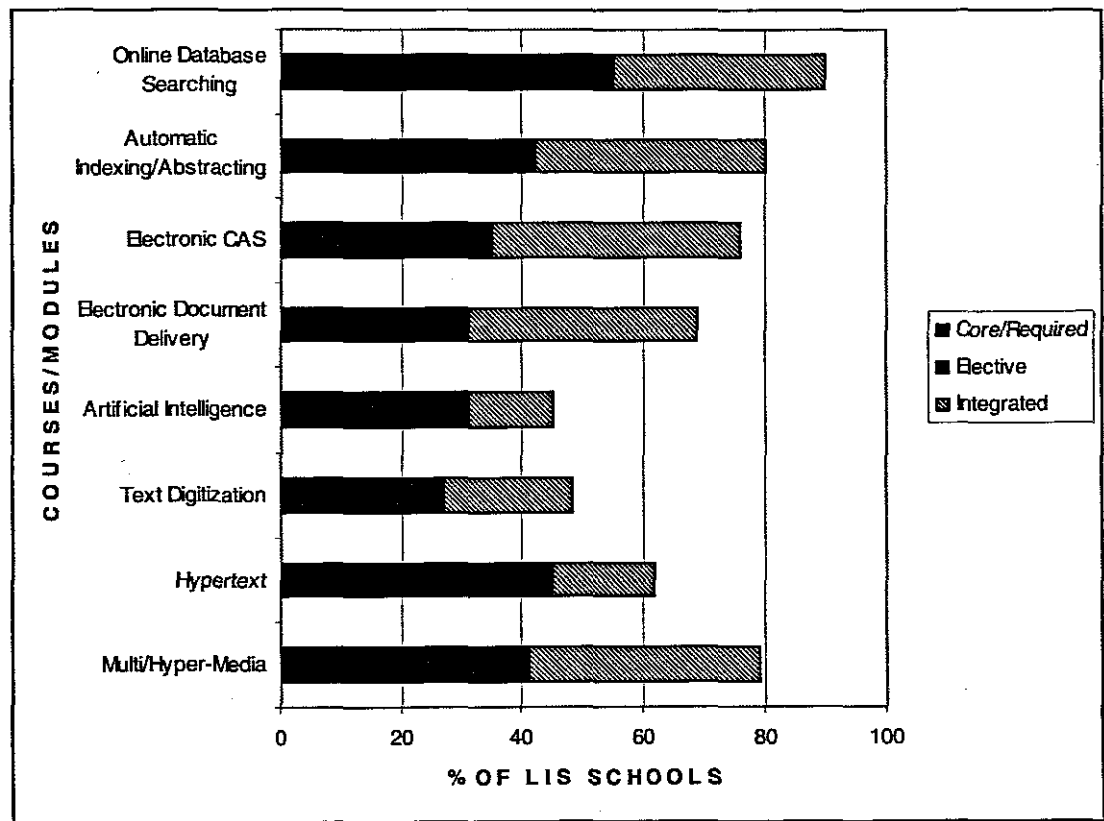
5.3.1.9 Ten (35%) of the respondents offered knowledge of Broadcasting Technologies in their programmes. Moreover, only one (10%) of the ten that offered Broadcasting Technologies, offered it as a core module, while two (20%) offered it as an elective, but the majority (19, 70%) had integrated aspects of the subject in other modules. This suggested that most LIS programmes did not highly rate Broadcasting Technologies as important for their graduates.

Thus six out of the nine (66%) modules identified by this study, are offered by more than 50% of the respondents. One other module with the title, Social Impact of ICTs, was provided by one respondent, but no one else identified a similar title.

5.3.3 Storage and Retrieval Technologies

The technologies that facilitate the storage and retrieval of information are perhaps the most widely used of the ICTs in library and information services, especially in the provision of library services. It was, therefore, expected that LIS schools had incorporated large components of such technologies in their curricular. The study identified eight areas/modules to represent the relevant knowledge in storage and retrieval within a modern library setting. Figure 5.4 shows the extent to which LIS schools in sub-Saharan Africa offer the eight modules of Information Storage and Retrieval.

Figure 5.4: Percentage of LIS schools offering Information Storage and Retrieval Modules



The results revealed that:

5.3.2.1 Twenty-six (90%) of the respondents offered a module on Online Database Searching. It was further revealed that of those 26 institutions that offered this module, 16 (62%) offered it as a core module, while none offered it as an

elective but 10 (38%) had integrated aspects of the subject in other modules. This indicated a very high rating of Online Database Searching knowledge and skills as important for graduates of most LIS programmes.

5.3.2.2 Twenty-three (79%) of the respondents offered a module on Automatic Indexing and Abstracting. Among the 23 institutions that offered Automatic Indexing and Abstracting, 10 (43%) offered it as a core module, while 11 (48%) had integrated aspects of the subject in other modules, and 2 (9%) offered it as an elective. These results indicated that Automatic Indexing and Abstracting competencies are considered important for graduates of most LIS programmes. The relatively average score as core module may be ascribed to the fact that these competencies would usually be topics within the broader modules of Indexing and/or Abstracting, respectively.

5.3.2.3 Twenty-two (76%) of the respondents offered a module on Electronic Current Awareness Service. Out of those 22 institutions that offered Electronic Current Awareness Service, 10 (44%) and 12 (56%) had integrated aspects of the subject in other modules offered it as a core module, while none offered it as an elective. This indicates a high rating of Electronic Current Awareness Service knowledge as important for graduates of most LIS programmes.

5.3.2.4 Twenty (69%) of the respondents offered a course in Electronic Document Delivery Systems. This indicated that competencies in Electronic Document Delivery Systems are considered significant for LIS graduates. However, within those 20 institutions that offered Electronic Document Delivery Systems, most of them (11, 56%) had integrated aspects of the subject in other modules, with fewer (9, 44%) offering it as a core module, while none offered it as an elective.

5.3.2.5 Thirteen (45%) of the respondents offered a course in Artificial Intelligence, i.e. the mechanical and electronic devices and applications designed to closely mimic the human ability to learn, reason, and make decisions. Artificial

Intelligence is used in voice recognition technology, expert systems, natural language and foreign language processing, and robotics (ODLIS, 2003). This indicated that a fair number of LIS schools did not consider it important for LIS graduates to have knowledge of Artificial Intelligence. Additionally, of the 13 institutions that offered Artificial Intelligence, only 5 (38%) offered it as a core module, while 4 (31%) offered it as an elective and another 4 (31%) had integrated aspects of the subject in other modules.

5.3.2.6 Fourteen (48%) of the respondents offered a module on Text Digitisation, of which 7 (50%) offered it as a core module, while one (7%) offered it as an elective and 6 (43%) had integrated aspects of the subject in other modules. These results indicated that on average, the knowledge and skills of Text Digitisation are either not highly rated by most LIS schools, or there is a lack of resources to offer the module.

5.3.2.7 Eighteen (62%) of the respondents offered a module on Hypertext, i.e. software systems that link basic file units comprising text and graphics, with one another in creative ways (Hutchinson & Sawyer, 1994). The majority (13, 72%) of those 18 institutions that offered Hypertext, offered it as a core module, while 5 (28%) had integrated aspects of the subject in other modules. None offered it as an elective. These results revealed that most LIS schools consider it important for graduates to have some knowledge on Hypertext systems.

5.3.2.8 Twenty-three (79%) of the respondents offered a module on Multimedia and Hypermedia Technologies. Multimedia are more sophisticated than hypertext in that multimedia combines text, graphics, animation video, music, voice and other sound effects (Hutchinson & Sawyer, 1994). This indicated that most LIS schools considered it important for their graduates to have knowledge of Multimedia and Hypermedia systems. But it was noted that of the 23 institutions that offered Multimedia and Hypermedia, only 11 (48%) offered it as a core module, another 11 (48%) had integrated aspects of the subject in other modules and one (4%) offered it as an elective.

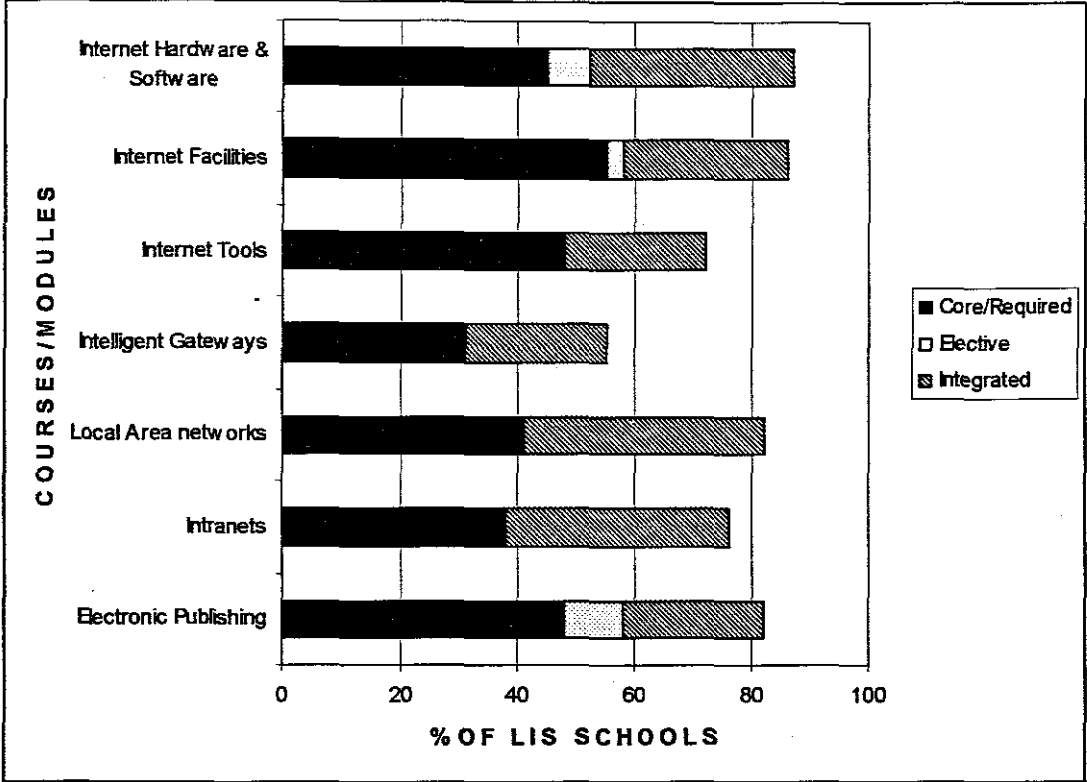
5.3.2.9 Three other areas of competency were suggested by respondents, namely Organisation of Data, Database Systems/construction and Web-based Imaging. In each of these three, only the suggesting institution offered the module.

It was noted from the above results that all the eight (100%) modules on Information Storage and Retrieval identified by the study, are offered by more than 50% of the respondents, and in most cases, these modules are offered as core, requiring all students to take them.

5.3.3 Network Technologies

It has become important that LIS practitioners understand and are able to function with the variety of network technologies that make it possible for information to be transmitted and shared. The modules that offer this knowledge are the subject of this section. Although other components such as Human-Computer Interaction, Telecommunication Services and Data transmission Services are also part of the network technologies, the study put them in a separate section - Communications - because of their unique specialities and nature. Figure 5.5 shows the extent to which sub-Saharan Africa LIS schools offer modules that relate to Network Technologies, and further analysis of the results is given after Figure 5.5.

Figure 5.5: Percentage of LIS schools offering Modules in Network Technologies



5.3.3.1 Twenty-five (86%) of the respondents indicated that they offered a module on Internet Hardware and Software. Out of the 25 respondents who offered the module, 13 (52%) offered it as a core module, 10 (40%) had integrated such content in other modules, while only 2 (8 %) of the 25 offered it as an elective. These results reflected the importance attached by many LIS schools to competencies in handling Internet Hardware and Software.

5.3.3.2 Twenty-five (86%) of the respondents indicated that they offered a module on Internet Facilities. Most (16, i.e. 64% of the 25) respondents offered the module as a core module, while 8 (32%) had integrated content on Internet Facilities in other modules and only one (4%) offered it as an elective module. The results thus reflect the importance attached to understanding the workings of the various Internet Facilities such as telnet, ftp, etc. by many LIS schools.

- 5.3.3.3 Twenty-one (72%) of the respondents indicated that they offered a module on Internet Tools such as search engines. This indicated that most LIS schools attach high importance to competencies in handling Internet Tools by LIS graduates. It was further noted that of the 21 respondents who offered this module, 14 (67%) offered it as a core module, none offered it as an elective while 7 (33%) had integrated the content of Internet Tools in other modules.
- 5.3.3.4 Sixteen (55%) of the respondents indicated that they offered a module on Intelligent gateways. Among the 16 respondents who offered the module, 9 (56%) offered it as a core module, none offered it as an elective, while 7 (44%) had integrated the content of Intelligent gateways in other modules. This reflects that only an average number of LIS schools consider it important for graduates to have competencies in Intelligent gateways. But considering the significance of Intelligent Gateways in information retrieval, these results indicate a possible anomaly on the part of LIS schools.
- 5.3.3.5 Twenty-four (83%) of the respondents indicated that they offered a module on Local Area Networks. This reflects that a lot of importance is attached to competencies in Local Area Networks by many LIS schools. Concurring, none of the 24 respondents who offered this module, offered it as an elective. However, of those 24, 12 (50%) offered it as a core module and another 12 (50%) had integrated the relevant content of Local Area Networks in other core modules.
- 5.3.3.6 Twenty-two (76%) of the respondents offered a module in Intranets. Additionally, it was revealed that 11 (50%) of the 22 institutions offered the module as a core and another 11 (50%) had integrated aspects of the subject in other modules. None of the LIS schools offered it as an elective. These results indicated that LIS schools considered it important for graduates to have knowledge of Intranet systems.

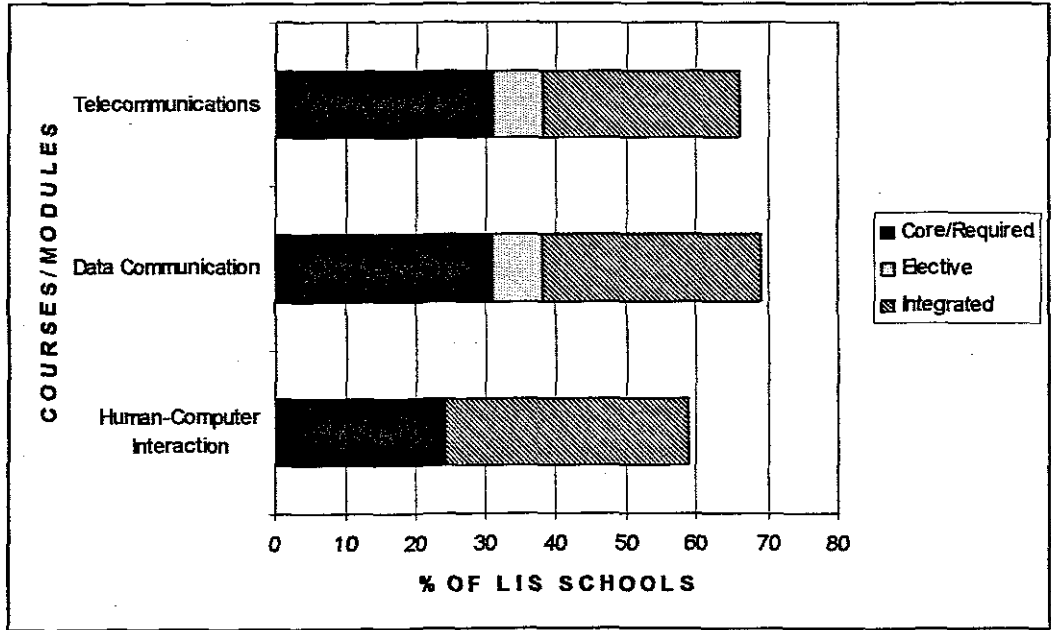
5.3.3.7 Twenty-four (83%) of the respondents indicated that they offered a module on Electronic Publishing techniques and systems, indicating that most LIS schools consider these competencies as important for LIS graduates. However, of the 24 respondents who offered Electronic Publishing module, 14 (58%) offered it as a core module, 3 (13%) offered it as an elective, while 7 (29%) had integrated relevant content in other modules.

One other module, Email Services, was suggested by one respondent, where it is offered as a core module.

5.3.4 Communications

According to WorldNet Dictionary (2000), communications is the discipline that studies the principles of transmitting information and the methods by which it is delivered as print or radio or television etc. Figure 5.6 shows the extent to which three identified modules related to Communications are offered in LIS schools.

Figure 5.6: Percentage of LIS schools offering Communication Modules N=29



The results revealed that:

- 5.3.4.1 Nineteen (66%) of the respondents offered a module in Telecommunications. This indicated a fairly high recognition by LIS schools, of the significance for graduates to have knowledge of Telecommunication systems. However, out of those 19 institutions that offered Telecommunications, only 9 (47%) offered it as a core module, while 2 (11%) offered it as an elective, but 8 (42%) had integrated aspects of the subject in other modules.
- 5.3.4.2 Twenty (69%) of the respondents indicated that they offered a module on Data Communications. This revealed that many LIS schools attach importance to knowledge of Data Communications. It was further observed that of the 20 respondents who offered the module, 9 (45%) offered it as a core module, another 9 (45%) had integrated the content of Data communications in other modules, and 2 (10 %) offered it as an elective.
- 5.3.4.3 Seventeen (59%) of the respondents offered a module in Human-Computer Interaction such as natural language processing, speech technology and virtual reality. Out of those 17 institutions that offered Human-Computer Interaction, 7 (41%) offered it as a core module, 10 (59%) had integrated aspects of the subject in other modules, but none offered it as an elective. This indicated that many LIS programmes considered it useful for graduates to have some knowledge of Human-Computer Interaction.

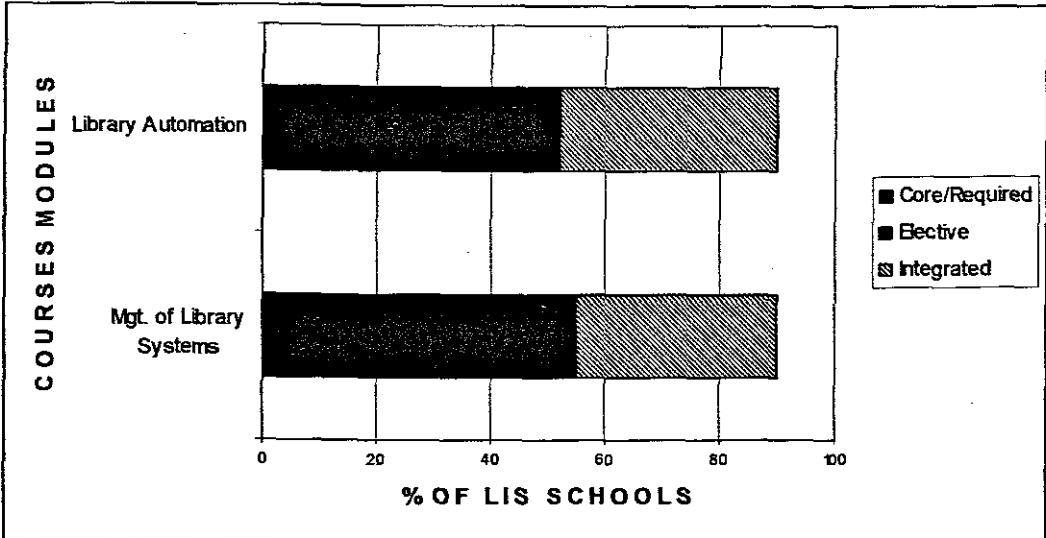
Thus it is noteworthy that a significant number of LIS schools offer modules/courses that provide knowledge and skills in modern communication technologies.

5.3.5 Library Automation Systems

The modules reflected in the previous four sections - 5.3.1, 5.3.2, 5.3.3 and 5.3.4 - are relevant for the provision of information services in a modern library/information centre. However, none of these modules bring together the responsibility of harnessing ICTs for and within a library or information service organisation. This section identifies two modules that serve this purpose. Figure 5.7 shows the extent to which LIS schools offer

the two modules, and further interpretation of the results are given after the figure.

Figure 5.7: Percentage of LIS schools offering modules on Computerised Library Systems



5.3.6.1 Twenty-six (90%) of the respondents indicated that they offered a course in Library Automation Systems i.e. software for automating the various operations and activities. It was further noted that 15 (58%) of the 26 respondents offered this as a core module, while 11 (42%) had integrated relevant content in other modules. No LIS school offered it as an elective. These results revealed that a lot of importance is attached to competencies in Library Automation Systems by most LIS schools.

5.3.6.2 Twenty-six (90%) of the respondents offered a course in Management of Electronic Information Services. A majority (16, 62%) of these 26 LIS schools offered Management of Electronic Information Services as a core module, while 10 (38%) had integrated aspects of the subject in other modules, and none offered it as an elective. This indicated that knowledge and skills in the Management of Electronic Information Services are highly rated as important for graduates of most LIS programmes.

5.3.6 Theory vs. Practical Delivery of Module Content

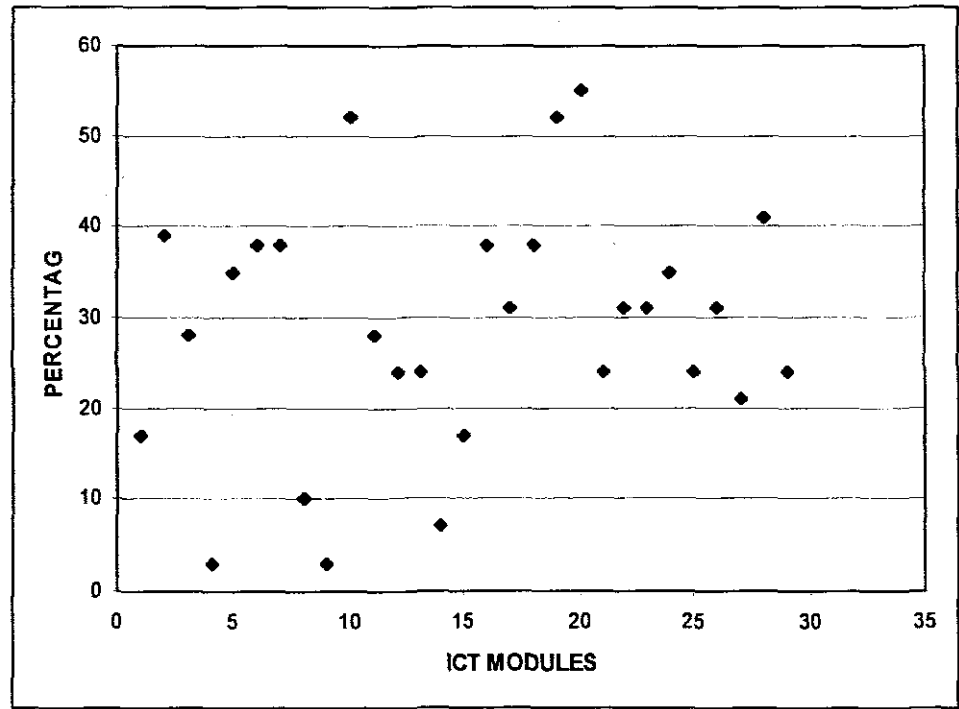
A balance between theory and practice can be considered the best approach because it enables the curriculum to respond to the need for extensive knowledge in information systems and technology, while at the same time addressing market needs for practical skills (Rosenberg, 2000). For each of the 29 ICT modules identified in this study, respondents were requested to indicate whether the module was taught as theory only, as practical only, and/or both. Using an ordinal scale whereby Theory = 1, Practicals = 2, and both Theory and Practicals = 3, Table 5.4 shows the mean ratings and standard deviations for each ICT module.

Table 5.4: Descriptive Statistics on Theory and Practical Teaching of ICT Modules N = 29

Modules	Mean	Standard Deviation
Online Database Searching	1.97	1.24
Internet Tools	1.83	1.42
Internet Facilities	1.76	1.41
Applications Software	1.66	1.32
Library Automation Systems	1.62	1.29
Information Systems	1.55	1.33
Operating Systems	1.52	1.33
Electronic Publishing	1.45	1.27
Internet Hardware & Software	1.45	1.35
Multimedia	1.31	1.31
Hypertext	1.31	1.44
Management of Library Automation	1.28	1.10
Local Area Networks	1.28	1.28
Hardware & Software Selection	1.28	1.36
Intranets	1.24	1.30
Automatic Indexing & Abstracting	1.21	1.24
Electronic Current Awareness Service	1.17	1.20
Data Communication	1.10	1.37
Electronic Document Delivery	1.10	1.23
Programming	1.03	1.35
Telecommunications	1.00	1.25
Human-Computer Interaction	.90	1.21
Intelligent Gateways	.86	1.27
Computer Architecture	.76	1.15
Text Digitization	.76	1.12
Artificial Intelligence	.55	.83
Distributed Systems	.48	1.02
Software Engineering	.34	.77
Broadcasting Technologies	.21	.62

Only seven (24%) out of the 29 modules were found to have a mean score of over half the scale that is 1.5. However, the standard deviations for each module showed that generally, there was great disparity among individual institutions. For instance, the module "Online Database Searching" which shows the highest mean score - 1.97 - has a standard deviation of 1.24, although comparatively better than the other nine modules, but nevertheless, rather high. The majority (23, 76%) of the modules have a mean score of less than 1.50 (i.e. half), indicating that even though offered, these modules may not be effectively delivered, especially by the use of practicals. Broadcasting Technology module has the lowest mean score (.21), followed by Software Engineering (.34) and Distributed Systems (.48), which are offered in only 10, 9 and 9 of the 29 institutions analysed respectively. However, in Figure 5.8 below, the scatter-gram shows that for most ICT modules, between 35% and 50% of the LIS schools achieve this balance.

Figure 5.8: Scatter-gram showing percentage of LIS schools that combine both Theory and Practice (per module).



In the scatter-gram, only 9 modules were observed to fall above the 50% mark, indicating

that many of the respondents teach them combining theory and practicals. Among those who offer each module, the best was Internet Tools (80%) followed by Internet Facilities (65%), Online Database Searching (63%), Hypertext (61%), Programming (53%), Library Software (51%) and 50% each for Internet Hardware and software, Operating Systems and Information Systems. Tables 5.5a – 5.5e show the percentages for each individual module.

Table 5.5a: Teaching of General ICT Knowledge Modules

Course	Number of Institutions offering module	Taught only as Theory	Taught only as a Practical	Both Theory and Practical	Un specified
		%	%	%	%
1. Computer Architecture	16	31	6	31	32
2. Hardware/software Selection	26	19	4	39	38
3. Programming	17	12	12	47	29
4. Software Engineering	9	33	22	11	34
5. Operating Systems	24	8	25	42	25
6. General Application Programmes/Software	25	4	28	44	24
7. Information systems design/analysis	25	16	16	44	24
8. Distributed Systems	9	33	22	11	34
9. Broadcasting Technologies	10	30	0	10	60

A combination of the fourth and fifth columns indicated that 72% of the respondents who offer the module on Applications Software use practicals in teaching this module. This is followed by 67% for Operating Systems, 60% for Information Systems, and 59% for Programming. The rest of the modules fall below 50%.

Table 5.5b: Teaching of Storage/Retrieval Technologies Modules

Course	Number of Institutions offering module	Taught only as Theory	Taught only as a Practical	Taught Both as Theory and Practical	Un-specified
		%	%	%	%
10. Online Database Searching	26	15	15	58	12
11. Automatic Indexing/Abstracting	23	39	4	35	22
12. Electronic Current Awareness Systems	22	41	9	32	18
13. Electronic Document Delivery	20	35	10	35	20
14. Artificial Intelligence and Expert systems	13	77	0	15	8
15. Text digitisation	14	50	0	36	14
16. Hypertext	18	6	11	61	22
17. Multimedia/Hypermedia	23	22	13	39	26

Cumulatively, the fourth and fifth columns indicated that 73% of the respondents who offer the module on Online Database Searching used practicals in teaching this module. This is followed by 72% for Hypertext, 52% for Multimedia/Hypermedia Technologies, and 50% for Electronic document Delivery. The rest fall below 50%.

Table 5.5c: Teaching of Modules of Network Technologies

Course	Number of Institutions offering module	Taught only as Theory	Taught only as a Practical	Taught Both as Theory and Practical	Un-specified
		%	%	%	%
18. Internet hardware and software	25	20	8	44	28
19. Internet facilities e.g. telnet, ftp, etc.	25	8	8	60	24
20. Internet tools e.g. Search Engines	21	5	10	76	9
21. Intelligent gateways e.g. Easynet	16	25	0	44	31
22. Local Area Networks	24	33	4	38	25
23. Intranet	22	32	5	41	22
24. Electronic Publishing	24	33	8	42	17

Cumulatively, the fourth and fifth columns indicate that 86% of the respondents who offer the module on Internet Tools, used practicals in teaching this module. This is

followed by 68% for Internet Facilities, 52% for Internet hardware, and 50% for Electronic Publishing. The rest fall below 50%.

Table 5.5d: Teaching of Communications Modules

Course	Number of Institutions offering module	Taught only as Theory	Taught only as a Practical	Taught Both as Theory and Practical.	Un specified
		%	%	%	%
25. Telecommunications	19	32	5	37	26
26. Data Communication	20	15	5	45	35
27. Human-computer interaction e.g. natural language processing, speech technology, GUI, virtual reality, etc.	17	35	6	35	24

Cumulatively, the fourth and fifth columns indicate that only 50% of the respondents who offer the module on Data communication, used practicals in teaching this module. This is followed by 42% for Telecommunications, and 41% for Human-Computer Interaction.

Table 5.5e: Teaching of Library Automation Modules

Course	Number of Institutions offering module	Taught only as Theory	Taught only as a Practical	Taught both Theory and Practical	Un specified
	No.	%	%	%	%
28. Library automation software	26	27	8	46	19
29. Management of Library Automation	26	54	4	27	15

Cumulatively, the fourth and fifth columns indicate that 54% of the respondents offer the module, Library Automation Software, and 31% for Management of Library Automation.

Comparatively, among the five categories of ICT modules in this study, modules of Networking Technology have the highest incidence averaging 49% of this balanced approach, followed by modules of Storage and Retrieval, averaging 39%. Modules of Communication average 39%, while modules of Library Automation modules average 37% and those of General ICT Knowledge average 31%. On the very general/combined average, only 39% of the ICT modules combined the necessary both theoretical and

practical approaches during the training.

5.4 APPLICATION OF ICTs IN TEACHING AND LEARNING

This study investigated the extent to which African LIS schools incorporate new approaches, methods, techniques and instructional resources/tools of teaching/learning during the delivery of LIS modules. Section 2.2 of the questionnaire, which focussed on the application of ICT in the teaching and learning of LIS programmes, targeted both the general teaching/learning activities, and specifically online teaching and staff expertise.

5.4.1 Activities

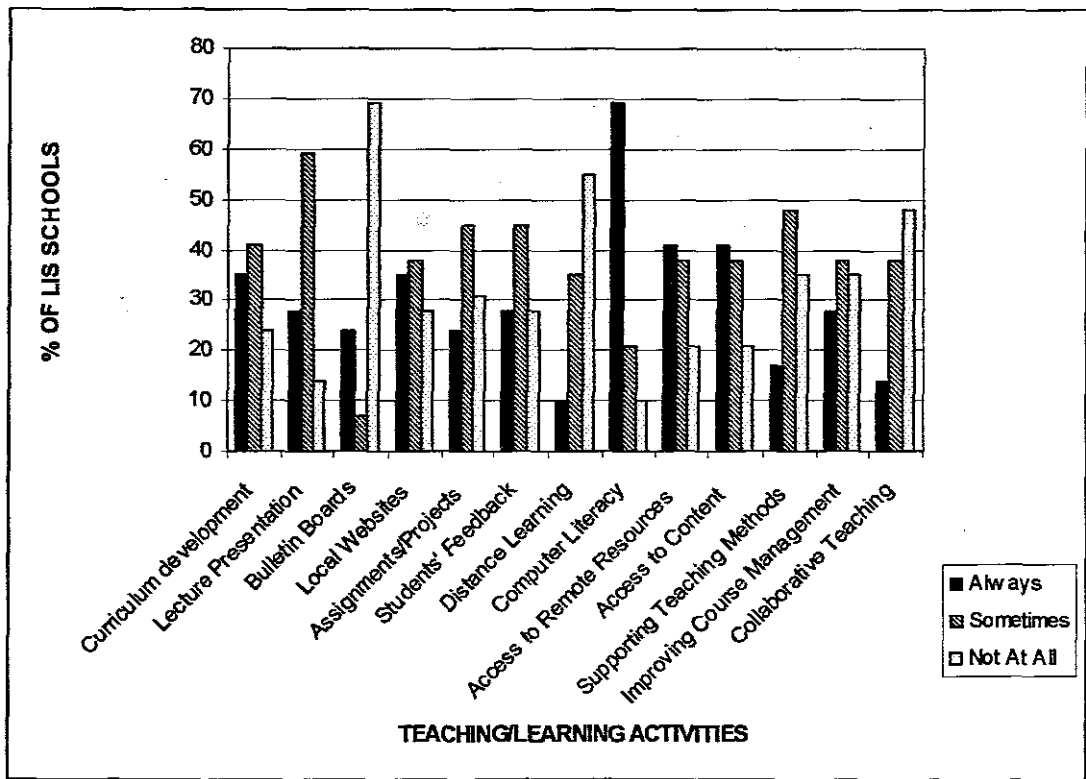
The study identified thirteen teaching/learning activities and requested respondents to indicate the extent to which ICTs are used in each using a Likert scale of three categories namely 'always', 'sometimes' and 'not-at-all'. In the coding of data, these responses were ordinally scored whereby Always = 2, Sometimes = 1 and Not at All = 0. Table 5.6 shows mean ratings in a descending order, and the standard deviations for each activity.

Table 5.6: Use of ICTs in Teaching and Learning

Teaching/Learning Activities	Mean	Standard Deviation
1. Computer literacy	1.59	.68
2. Access to content	1.21	.77
3. Access to remote resources	1.21	.77
4. Lecture presentation	1.14	.64
5. Curriculum development	1.10	.77
6. Local websites	1.07	.80
7. Students' feedback	1.00	.76
8. Improve course management	.93	.80
9. Assignments/Projects	.93	.75
10. Teaching method support	.83	.71
11. Collaborative teaching	.66	.72
12. Bulletin boards	.55	.87
13. Distance learning	.55	.69

Not surprisingly, Computer literacy with a mean of 1.59 tops the list as the aspect/activity in which ICTs feature most during teaching and learning, because it is expected that the teaching of computer literacy be always with the use of computers themselves. The other activities in which ICT use featured highly included Access to Content with a mean of 1.21, and Access to Remote Sources of information with a mean of 1.21. At the other end of the scale, the majority of respondents indicated that they did not use electronic bulletin boards, represented by a mean of 0.55, in the teaching/learning activities. Neither do many use distance learning, which had a mean of 0.55, nor in collaborative teaching, which had a mean of 0.66. Figure 5.9 shows average percentage use of ICTs for the individual teaching/learning activities.

Figure 5.9: ICT Use in Teaching/Learning Activities (N=29)



For Curriculum development, 76% of the respondents indicated that they used ICTS, but of these 35% always used ICTS, and 41% sometimes used ICTs. 86% of the respondents

indicated that they used of ICTs in lecture presentation, of which 28% used it always and 58% used it only sometimes. Bulletin boards were reported as being used in only 31% of the LIS schools, of which 24% used them always and 7% used them only sometimes. The use of local websites in teaching/learning activities was indicated by 72% of the respondents, with one half indicating that they 'always' and another half indicating that they 'sometimes' used local websites. To give and work on assignments and/or projects, 69% of the respondents used ICTs, but only 24% always used them while 45% used them only sometimes. In 73% of the responses, students feedback was given and received by the use of ICTs, even though only 28% is always sent this way, while 45% is only sent/received students feedback some of the times. Only 45% of the respondents used ICTs for distance learning, of which 10% always did so and 35% only sometimes used ICTS. Approximately 90% of LIS schools in sub-Saharan Africa indicated that they used ICTs for hands-on teaching of computer literacy, of which 69% always used ICTs while 21% sometimes used ICTs.

For access to remote resources for the purposes of teaching and learning, 79% of the respondents used ICTS, of which 41% always used ICTS and 38% only sometimes used ICTs. 79% of the respondents indicated that they used ICTs to access academic content, of which 41% used ICTs always and 38% used ICTs only sometimes. As support to the teaching methods 66% of the respondents used ICTs, but only 17% always used them and 48% used ICTs only sometimes. The use of ICTS in for improving the management of courses was indicated by 66% of the respondents, with 28% who always and 38% who sometimes used ICTs in course management. In 52% of the responses, collaborative teaching was attempted by the use of ICTs, even though only 14% is always used this method, while 38% is only collaborated some of the times.

From the data, the general observation was that most of the LIS schools used ICTs, but mainly just sometimes. Thus for the majority of teaching and learning activities, LIS schools resort to manual and offline methods.

5.4.2 Online Teaching

Respondents were asked to list the modules that are taught online and specify whether each such module was taught partially or fully online. The purpose of this question was to find out whether or not the modern ICT tools of teaching were being used in LIS schools, and if so, the specific areas/subjects/levels that benefited more than others. Only a few (10, 34%) of the African LIS schools practice some online teaching and learning. These include University of Ghana (UG), Kenya School of Professional Studies (KSPS), Rand Afrikaans University (RAU), Stellenbosch University (SU), Technikon South Africa, University of Natal, University of Pretoria, UNISA, University of Zululand, and the Zimbabwe National University of Science and Technology. At three of these institutions (RAU, Stellenbosch and UP), all postgraduate courses are offered online. All undergraduate courses are at least partially supported by online courseware in four institutions i.e. at RAU, Stellenbosch, UNISA and UP. The Kenya School of Professional Studies was attempting collaborative distance education with a university in South Africa. At the University of Dar-es-Salaam (UDSM), it was observed that the Blackboard courseware had been obtained and that the LIS school was in the process of preparing course material for implementation. Table 5.7 provides the complete list of the courses/modules that were identified by respondents as being taught online:

Table 5.7: Modules Taught Online

Module Title	LIS Schools that teach Online	
	Fully	Partially
All undergraduate courses	-	5
All postgraduate courses	2	1
Advanced/Online Information Retrieval	1	3
Applied Information Science	-	1
Automation of Library and Information Services	-	1
Database management/Applications	-	1
Electronic/media Publishing/Production of Information	-	1
Information / Knowledge Management	1	1
Information Organization and Processing	-	1

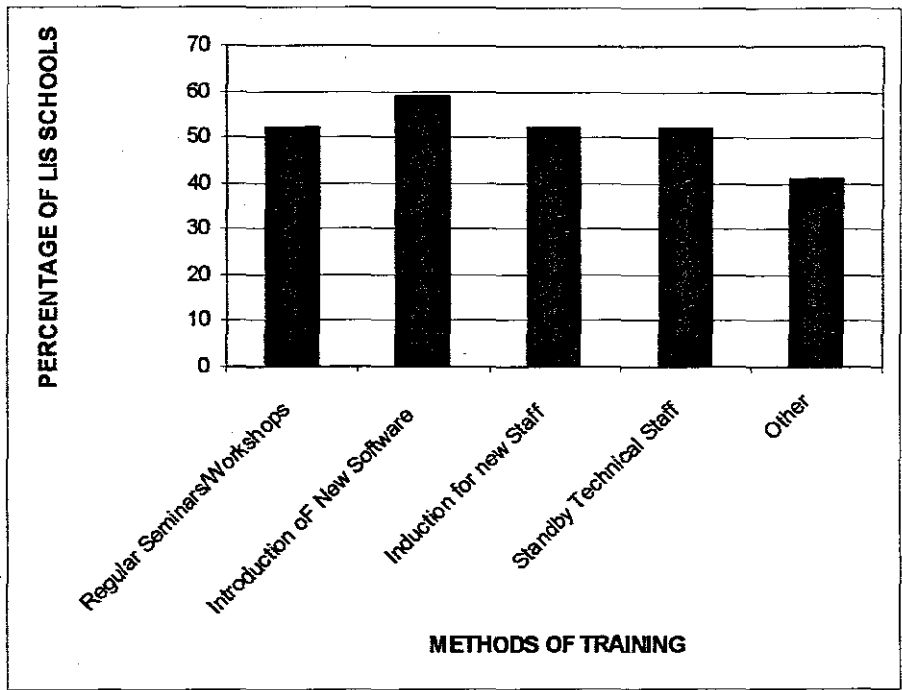
Information Storage and Retrieval	-	1
Information Service/Work	-	1
Information Technology (Tools, Applications, etc.)	1	3
Internet Searching	-	2
Internet Services	-	1
Library Automation	-	3
Management of Electronic Records	-	2
Web-based Information systems/ Online retrieval systems -		1

It was noted that full online teaching was not practised in many LIS schools, as the majority of the courses identified were partially online.

5.4.3 Staff Training

One of the reasons for poor use of ICTs in teaching, as noted in the literature review, was the lack of expertise by academic staff. Mchombu (2000), Kisiedu (2000) and Were, (2000) reiterate that to find and retain a lecturer who is proficient both in Library and Information Science as well as Information Technologies and/or adept at using ICTs in teaching is often a great difficulty. This study assumed that continuing education, mostly within the department is one way of tackling the problem. The study, therefore, sought to find out the type of training measures that LIS schools had put in place as a way of enabling their academic staff to improve their knowledge and skills in the use and teaching of ICTs. Respondents were requested to indicate the methods used to initiate academic staff in the development and application of ICT-based teaching. Figure 5.10 shows the level of usage of each method.

Figure 5.10. Methods of ICT Training for Staff



Most of the LIS schools train their academic staff on how to use ICTs, many of them using multiple techniques to do so. It was observed that each of the identified four methods were used by over 50% of the institutions. However, five (17%) of the respondents/institutions indicated that there were no specific arrangements for the training of academic staff.

5.6 APPLICATION OF ICTs IN RESEARCH

5.6.1 Research Activities

The study identified ten areas/activities of research in which ICTs are applicable. For each activity, respondents were required to indicate whether their school uses ICTs "always", "sometimes" or "not at all". Table 5.8 shows the use for each activity.

Table 5.8: Application of ICT in Research Activities of LIS Schools**(N = 29)**

Activities	Always %	Sometimes %	Never %
1. To 'advertise' research plans and/or find donors, etc.	28	31	41
2. To collect research information	52	38	10
3. As a research tool e.g. statistical packages, simulation software	45	31	24
4. To collaborate with other researchers world-wide	41	35	24
5. To disseminate research information	38	41	21
6 In national collaboration e.g. to create networks	31	35	34
7. In International collaboration e.g. to create networks	24	41	35
8. To provide conferencing/group work tools	7	38	55
9. For internal electronic publishing of the research outcomes, theses, etc. on an Intranet	21	31	48
10. For electronic publishing of the research outcomes, theses, etc. on the Internet	14	41	45

Table 5.8 shows that there is generally high usage of ICTs in research activities with the highest use being in the activity of information retrieval, that is, using the technologies to collect research information, for which 90% of the respondents indicated that they used ICTs. This is followed by disseminating research information 79%, ICTs as research tools 76%, for collaborating with other researchers, 76%, and for creating national and international research networks 66%. The lowest use was for the activities of group conferencing with 45% use and Intranet electronic publishing of research results/reports with 52% use.

5.5.2 Internet Access

The Internet is nowadays perceived to be of primary importance to research. This study sought to find out whether or not LIS schools in Africa have Internet access and also whether or not the entire LIS schools population, that is, staff and students, have access to the Internet. Responses showed that 22 (76%) of the LIS schools had access to the Internet and it was accessible to both staff (academic and administrative) and students. However, Internet access was not free in all institutions, that is to say, it was found that the cost of Internet use for the staff and students was not always met by the institution. Rather, some institutions provide Internet access but the cost/fee is met by each user on a pay-as-you-use basis. In such institutions, access to the Internet is provided in a café

rather than offices or laboratories. Thus 3 (10%) of the deans/directors of LIS schools indicated that they pay from their pockets for Internet use. Likewise, in 2 (7%) of the LIS schools, heads of departments have to pay, while academic staff in 3 (10%), students in 2 (7%) and administrative staff in 2 (7%) of the LIS schools have to pay individually in order to access the Internet.

5.5.3 Access to Databases

Apart from Internet access *per se*, the study sought to find out the types of online information resources that LIS researchers have access to, in terms of academic information via intranets, electronic databases, electronic document delivery services and virtual libraries or library networks. It was found that 18 (62%) of the LIS Schools had access to academic information through some intranet, 23 (79%) had access to electronic databases either through subject gateways, subscriptions or procured CD-ROMs, 17 (59%) had access to electronic document delivery services, and 17 (59%) had access to library networks that provide research information.

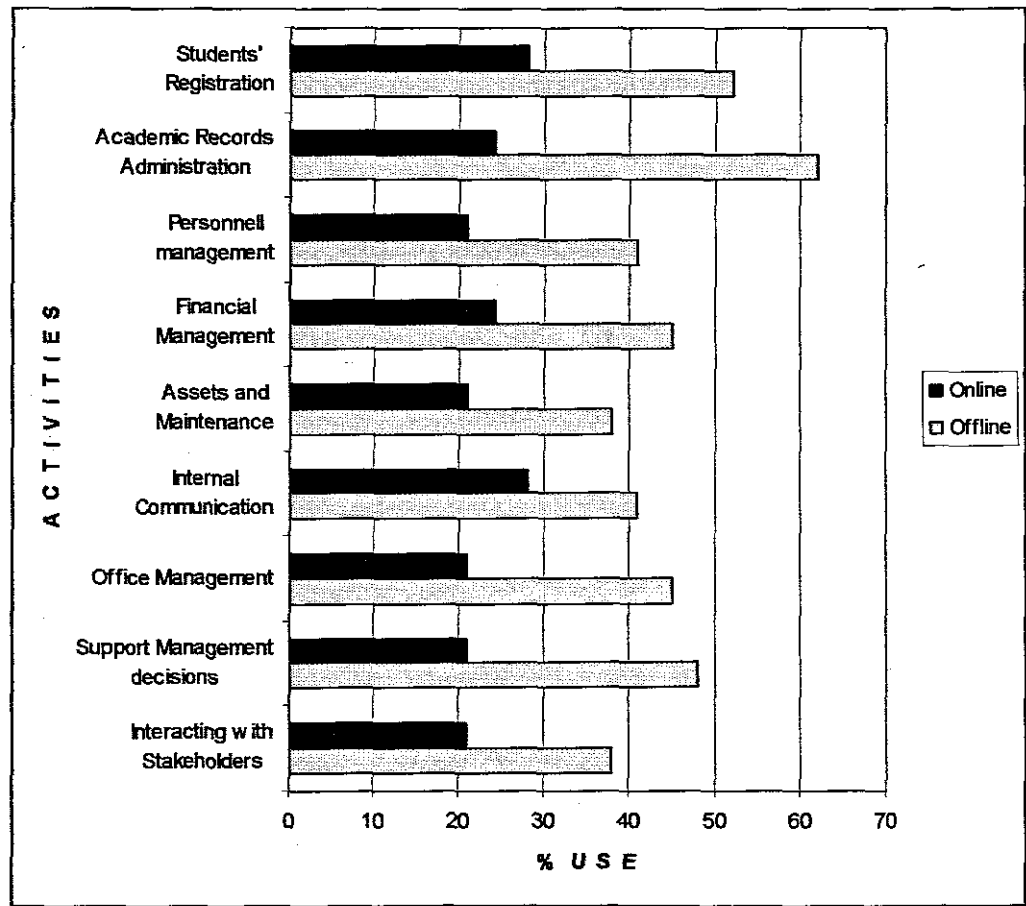
Asked to state whether or not the LIS school subscribed to international online databases, 11 (38%) indicated in the affirmative while 16 (55%) responded in the negative. Two respondents (7%) did not answer the question. However, most of those who did not subscribe stated that their institutional library services subscribed and provided access to a wide range of relevant databases. Respondents who subscribe to databases were also requested to provide the names of the databases or online services to which they subscribe. Four (14%) of the respondents cited EBSCO Host Information Services, three (10%) cited EmeraldInsight, two (7%) cited LISA (Library and Information Science Abstracts), and one (3%) each for AJOL (African Journals OnLine), Blackwell-SYNERGY, British Library, ERIC (Educational Resources Information Center), Gale Research, Ideal Library, Ingenta, ISI (International Science Index), NISC (National Information solutions Cooperative), PERI (Programme for the Enhancement of Research Information) and SABINET (Southern Africa Bibliographic Information NETwork). It was observed that 17 (59%) of the respondents provide specialised training for academic staff to retrieve information from these databases and from the Internet.

5.8 APPLICATION OF ICTs IN ACADEMIC ADMINISTRATION AND MANAGEMENT

5.8.1 Administrative Activities

The study identified ten areas/activities of academic administration in which ICTs can be applied. For each activity, respondents were required to indicate whether their school uses ICTs "always", "sometimes" or "not at all". Figure 5.11 shows the percentage use of ICTs for each activity. In each case, a distinction was made between online and offline use of ICTs with the former being the most desirable mode of operation.

Figure 5.11: Use of Computerisation for Academic Administration (N=29)



It can be observed from Figure 5.11 that for all the activities, there was a high rate of computerisation even though online use of ICTs is less than off-line use in all activities.

Academic records administration was found to have the highest computerisation rate, that is, in 86% of LIS schools. Students' registration activities have been computerised in 79% of LIS schools, financial administration in 69%, Internal communication in 69%, support to management decisions in 69%, office automation in 66%, personnel administration in 62%, interaction with stakeholders in 59%, and assets and maintenance in 56%.

5.6.2 Campus Networks

The study sought to find out if LIS schools have access to campus networks and whether or not academic staff and students have access to such a network where it exists. Responses showed that 21 (72%) of institutions with a LIS school have campus networks. At least 9 (31%) provide access to LIS academic staff at the office, while 12 (41%) provide access both from home and at the office. Eight (28%) provide access to LIS students on campus while 9 (31%) provide access both on campus and away from campus, that is through an Internet logon. Ten (35%) provide access to LIS administrative staff at the office, while another 10 (35%) provide access both at the office and from home. This suggests that about 72% of LIS academic staff, 59% of LIS administrative staff and 69% of LIS students make use of campus networks for academic administration.

5.7 ICT INFRASTRUCTURE

An ICT infrastructure is the backbone on which ICT use depends. According to the Association of African Universities (2000: section 2.6) a sufficient infrastructure should consist of equipment, carrier technology, functionality, accessibility and operating systems. This means that the presence or absence of the entire infrastructure or even part of it can result into the success or failure of implementing ICT use strategies. This study identified the following elements as significant for ICT use in LIS schools:

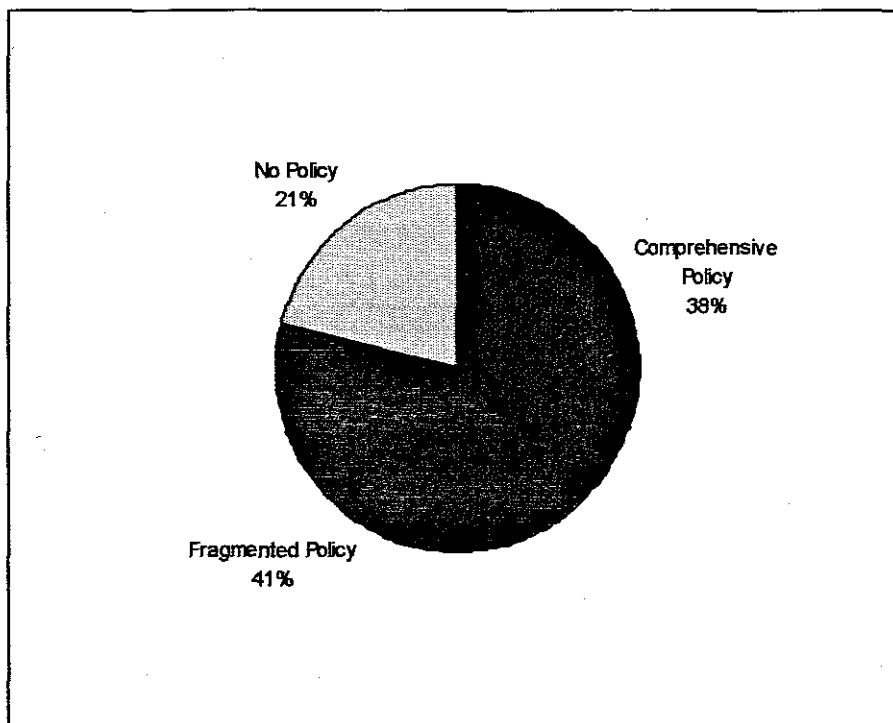
- An ICT policy
- Computerisation set-up
- Hardware availability
- Software availability

- Internet connectivity
- Telecommunication services
- Broadcasting equipment

5.7.1 ICT Policy

It was important for this study, to find out whether or not higher education institutions in sub-Saharan Africa have ICT policies. Respondents were asked to state whether or not their institution has an ICT policy and indicate the type of policy that has been formulated. A summary of the responses is captured in Figure 5.12.

Figure 5.12: Availability of ICT Policies in LIS Institutions (N=29)



The pie chart shows that 79% (23) of the institutions have ICT policies even though some, 41%, are fragmented. Asked whether the ICT needs of LIS departments are included in those institutional ICT policies, only 11 (38%) of the LIS schools indicated that the ICT policy of their institution had explicitly included LIS goals.

5.7.2 Computerisation Set-up

The study also sought to find out the types and levels of computerization set-ups within the LIS schools. This would indicate the level of networking and hence functionality of ICTs within the department, the institution as well as the rest of the computerised world. Respondents were also requested to provide quantitative figures of computers and networks.

It was found that stand-alone computers are found in 17 (59%) of the LIS schools. Departmental computer laboratories are available in 18 (62%) of the LIS schools, but 16 (55%) have campus/institutional laboratories as well. Fourteen (48%) of the LIS schools have departmental/LIS school networks, 14 (48%) have campus-wide local area networks (LANs), and 10 (35%) operate in a multi-campus network set-up.

5.7.3 Hardware

The study sought to establish the availability of the following hardware in LIS schools and institutions: computer i.e. PCs, communications hardware i.e. modems and routers, and data transmission media i.e. carrier channels/technology.

5.7.3.1 Computers

Asked to indicate the number of stand-alone computers, five (29%) of the 17 respondents with stand-alones could not provide the data. Among the twelve who provided the figure, they included 2, 3, 5, 10, 12, 14, 15, 25, 27, 33, 70 and 120 computers respectively. Computers in departmental laboratories range from 1 to 43 PCs, but PCs in campus laboratories ranged from 3 to 300. Three departmental networks indicated that they connect 3, 9, 25 and 32 PCs respectively, and one respondent indicated that their campus LAN connects over 100 PCs. Figures for multi-campus networks were not provided by any of the respondents.

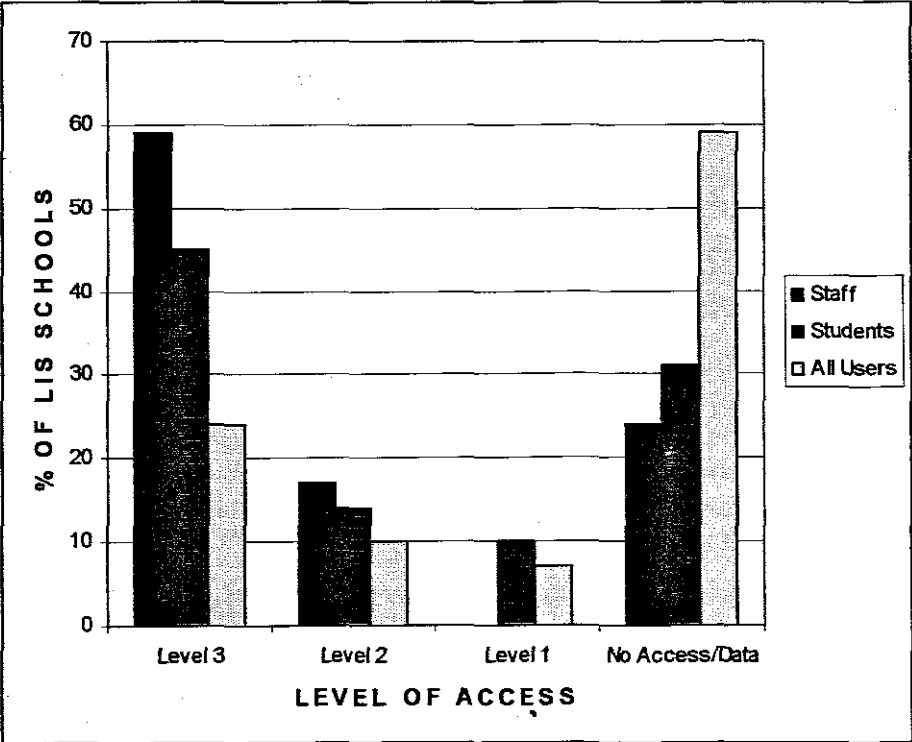
Respondents were also asked to indicate the computer-students ratio, the computer-staff ratio and the computer-all users ratio. This was meant to try and establish physical access to computers by LIS school members. Since this was an open-ended question, the

responses were categorised into three levels of physical access as follows:

	Computer-student ratio	Computer-staff ratio	Computer-all users ratio
Level 3	1:>5	1:1	1:>5
Level 2	1:6-20	1:2-5	1:6-15
Level 1	1:<20	1:<5	1:<15

This categorisation made the assumption that level three is the best or desirable state, level two tolerable even though not good enough, while level one is the worst scenario among those LIS schools that actually provide physical access to computers. 20 (69%) of the LIS schools/respondents provided the ratio for students, 22 (76%) of the respondents provided the ratio for staff and 12 (41%) respondents provided the ratio for all users. Figure 5.13 summarises the percentages, each calculated based on the entire sample of 29 respondents.

Figure 5.13: Computer:User Ratio in LIS Schools (N=29)



The computer-student ratio in 13 of 20 respondents fell in Level 3 physical access, four respondents fell under the Level 2, and three fell under Level 1 physical access. For computer-staff ratio, 17 out of the 22 LIS schools provide level three physical access while five provide level 2. No respondent recorded level 1 for staff. Among the 12 (39%) respondents who gave their computer-all-user ratio, seven provided level 3 access, three provided level 2 access and two provided level 1 physical access.

5.7.3.2 Communications Hardware

The study observed that data on modems and routers was scarce, with most of the respondents indicating that they could not easily obtain and/or ascertain this information because it was handled centrally, and in some cases confidentially within their parent institution. Only five (17%) of the LIS schools indicated that they had their own modems while another five indicated that they use institutional/university modems. Three (10%) LIS schools indicated that they have their own routers while eight (28%) indicated that they use institutional/university routers. The names and characteristics of these modems and routers are shown in Table 5.9.

Table 5.9: Names and Characteristics of Modems and Routers used in LIS Schools

	Owned by L/IS	Owned by Institution
.1 MODEMs		
Generic soft K56	X	
Hayes		X
Internal Lucent	X	
US Robotic 56K	X	X
Zoom		X
Other (unspecified)	X, X	X, X
.2 Routers		
Cisco		X, X, X, X
3 Com hubs & switches	X, X	
Other (unspecified)	X, X	X, X, X, X

5.7.3.3 Data Transmission Channels

Regarding Carrier technology for data transmission, respondents were required to indicate which of the six identified carriers/mediums that are used within their institution.

The study identified five carriers, these included:

- Unshielded Twisted Pair (UTP) cables i.e. primary telephone lines carrying electronic pulses in voice or data, usually requiring repeaters at every 1-2 miles in order to effectively transmit digital signals (Hutchinson & Sawyer, 1994).
- Coaxial or shielded cable i.e. high capacity cable used in the transmission of large volume data, often for locally connected networks (Hutchinson & Sawyer, 1994).
- VSAT (Very Small Aperture Terminal) is a satellite communications system that sends and receives signals from an earth station computer that acts as a hub for the system. VSAT handles data, voice, and video signals, offering total control of an organization's own communication system without dependence on another company, and providing higher speed reception than that of an ordinary telephone service or the Integrated Services Digital Network (Tech Target, 2003).
- Wireless radio, i.e. use of electromagnetic waves (rather than some form of wire) to carry the signal over part or all of the communication path. Some monitoring devices, such as intrusion alarms, employ acoustic waves at frequencies above the range of human hearing; these are also sometimes classified as wireless (Tech Target, 2003).
- Fibre-Optic i.e. insulated, very thin glass/plastic fibres through which signals that have been converted into light pulses are transmitted over long distances at high volume, low cost, low error rate and message security (Hutchinson & Sawyer, 1994).

It was found that 10 (35%) of the respondents use UTP, 9 (31%) use Fibre-optic, 4 (14%) use coaxial, 3 (10%) use Wireless radio, and one (3%) of the respondents uses VSAT. However, the study noted that many respondents were unsure of the type of medium used because 20 (69%) did not respond, neither selecting a 'Yes' nor a 'No' to the use of

VSAT, 19 (66%) did not respond regarding wireless radio, 17 (59%) did not respond regarding the use of coaxial medium, 15 (52%) did not respond regarding fibre-optic, and 12 (41%) did not respond regarding the use of UTP.

5.7.4 Software

The study sought to establish the types of software commonly used in LIS schools and/or institutions. In an open-ended question, respondents were required to provide a list of the operating and application software that they use. For each of the operations software, respondents were requested to indicate whether it is proprietary or freeware. Table 5.10 and 5.11 show the types of software and number of respondents who identified each.

5.7.4.1 Operating Systems

Table 5.10 shows that the most widely used operating system is Windows 98 in 17 (59%), while the least used is Ms-DOS, which is still used in only one institution.

Table 5.10: Operating/Networking Systems used in LIS Schools (ranked) N = 29

Operating System/Software and Version	Proprietary	Freeware
Windows '98	13 (45%)	4 (14%)
Windows 2000Pro/Workstation (networking)	14 (48%)	
Windows XP	7 (24%)	
Windows NT (networking)	7 (24%)	
Windows '95	6 (21%)	
Windows 2000server (networking)	2 (7%)	
Windows Millennium	1 (3%)	1 (3%)
Windows 3.1	1 (3%)	
Novell (networking)	6 (21%)	1 (3%)
Linux		5 (17%)
Macintosh	2 (7%)	
Unix	2 (7%)	
Ms-DOS	1 (3%)	

5.7.4.2 Applications Software

Table 5.11, on the following page, shows that a total of 39 software programmes and an indication of an un-named in-house software were identified, while one institution uses unspecified in-house software. It was noted that while some respondents separately identified the Microsoft range of software, i.e. Ms-Excel, Ms-PowerPoint, Ms-Access and Ms-Word, these programmes are also contained within the Ms-Office Suite 2000.

5.7.5 Internet Connectivity

The study sought to find out the type of internet connectivity available in LIS schools. Respondents were required to indicate the type of connection and the type of account. Respondents were also requested to give an indication of the reliability of their internet connection by indicating the average internet down times and causes of those down times.

Twenty (69%) of the respondents operated on group internet account usually subscribed by the institution. Six (21%) of the respondents indicated that they operated on the single domain account system. Regarding the type of connections, it was found that 9 (31%) used a Dial-up connection, 16 (55%) used a dedicated line connection, 3 (10%) used a satellite connection and 2 (7%) used radio connection. In some cases respondents indicated multiple connection modes, that is, the use of more than one option.

Respondents were required to give an indication of the number of times per week that the internet was down. Since the question was open-ended, the responses were summarised into 4 categories ranked on an ordinal scale i.e. (4) Never, (3) 1-2 times, (2) 3-6 times, and (1) more than 6 times. Two respondents (7%) reported that they never experienced down times, 13 (45%) experienced down time once or twice per week, 2 (7%) experienced down time between three and six times per week and none of the respondents reported to experience down time more than six times a week. Twelve respondents (41%) did not provide the information.

Table 5.11: Ranked list of Applications Software/Programmes used in LIS Schools

N = 29

Software	Users	Software	Users
General and word processing		Programming	
1. Ms-Office/suite 2000	17 (59%)	21. Visual basic/studio	2 (7%)
2. Ms-Office '97	9 (31%)	22. Turbo Pascal	2 (7%)
3. MsWord	7 (24%)	23. C++	1 (3%)
4. StarOffice	1 (3%)	24. Borland C++	1 (3%)
Spreadsheet		25. Ms.NET Framework	1 (3%)
5. Ms-Excel	8 (28%)	26. Delphi/SQL	1 (3%)
6. SPSS	5 (17%)	Web Tools	
7. Lotus Smartsuite	2 (7%)	27. Explorer	2 (7%)
Database Management		28. Netscape	2 (7%)
8. CDS/ISIS	8 (28%)	29. Macromedia	
9. Ms-Access	7 (24%)	Director/Studio	2 (7%)
10. dBase-5	2 (7%)	30. Macromedia Flash MX	1 (3%)
11. QRMS	1 (3%)	31. WinSpirs	1 (3%)
Library Automation		32. Novell Groupwise	1 (3%)
12. WINISIS	2 (7%)	Readers/Presentation	
13. InMagic	1 (3%)	33. Ms PowerPoint	8 (28%)
14. WinLIB 2000	1 (3%)	34. Adobe Acrobat	4 (14%)
15. Vubis	1 (3%)	35. Adobe Photoshop	1 (3%)
DTP		36. MS Binder	1 (3%)
16. Aldous PageMaker	6 (21%)	Miscellaneous	
17. Publisher	4 (14%)	37. Corel Office	1 (3%)
18. FrontPage	3 (10%)	38. QuickBooks (Finance Mgt.)	1 (3%)
GIS		39. 3D Studio UlaX (graphics)	1 (3%)
19. ArcView (GIS)	1 (3%)	40. (In-house software)	1 (3%)
20. Catalynx (GIS)	1 (3%)		

Asked to estimate the average duration of each down-time, 5 (17%) of the respondents reported that down-time lasted less than one hour, another five (17%) indicated that their down-time lasted between one to five hours, and three (10%) reported a down-time duration of over 5 hours. The rest (55%) of the respondents did not provide this information.

Respondents reported various reasons for Internet down-time, which cumulatively included: failures related to Telkom links - 28%, technical faults e.g. tower or switch failure - 17%, Network configuration problems and/or connectivity problems - 14%, bandwidth inadequacy or telephone line congestion - 10%, electricity supply - 7%, down-time during the internal/institutional up-grading of the system - 7%, Internet Service Provider failures/problems - 3%, and general infrastructural problems - 3%. It is important to note that these reasons may overlap because some respondents identified more than one of the above reasons.

5.7.6 Telecommunications

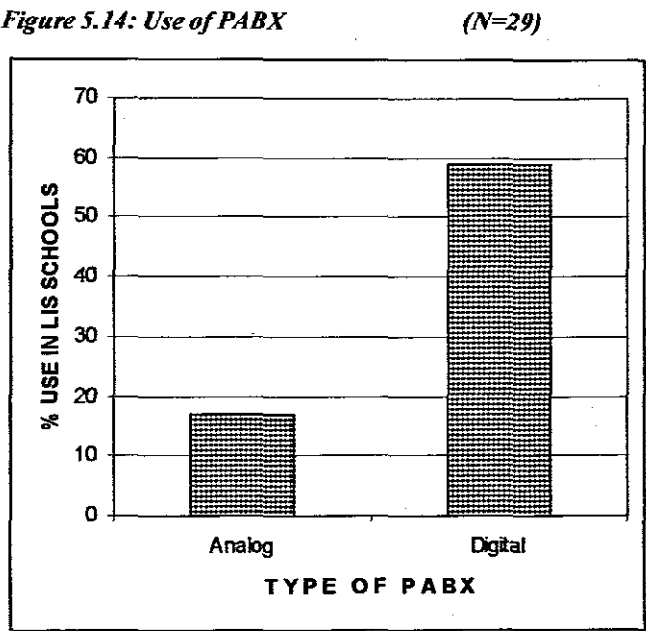
The study sought to establish the types and quantities of telecommunication facilities available in LIS schools and institutions. To map these facilities, respondents were required to provide information about their PABX used, telephone lines and fax lines.

5.7.6.1 PABX

Tech Target (2003) defines a private automatic branch exchange (PABX) as an automatic telephone switching system within a private enterprise and explains that originally, such systems - called private branch exchanges (PBX) - required the use of a live operator. "A PBX (private branch exchange) is a telephone system within an enterprise that switches calls between enterprise users on local lines while allowing all users to share a certain number of external phone lines. The main purpose of a PBX is to save the cost of requiring a line for each user to the telephone company's central office. The PBX is owned and operated by the enterprise rather than the telephone company, which may be a supplier or service provider. Since almost all private branch exchanges today are automatic, the abbreviation "PBX" usually implies a "PABX." Private branch exchanges

used analog technology originally. Today, PBXs use digital technology, i.e. digital signals are converted to analog for outside calls on the local loop using plain old telephone service” (Tech Target, 2003).

Respondents were asked to indicate the type of PABX used in their institution. Figure 5.14 summarizes the responses.



As shown in Figure 5.14, the digital PABX is more widely used in 59% i.e.17 of the LIS schools/institutions as compared to the analog, which is available in only 17% i.e. 5 of LIS schools/institutions. Among the above, one respondent indicated that they have both digital and analog PABX while eight (28%) did not respond to the question.

5.7.6.2 Telephone (Land) Lines

Respondents were requested to provide detailed information regarding the types of telephone lines used within their institutions. It was observed by most respondents that this kind of information was not readily available to the head of LIS school, because in most cases telecommunication services were centralized within the institutions. Thus 14 (48%) of the respondents did not provide data. However, the 15 (52%) respondents

attempted to respond to this question, but most could only indicate the type of line without specifying the number of lines. Table 5.12 shows the number and percentage of LIS schools that uses certain types of telephone lines.

Table 5.12: LIS Schools using various Types of Telephone Lines: N=29

Lines	Quantity	T y p e s				
		<i>Analog</i>	<i>Digital</i>	<i>ISDN</i>	<i>DSL</i>	<i>Other</i>
Local	205, 4, 2, 2, 1,	6 (21%)	9 (31%)	1 (3%)	1 (3%)	-
Extensions	499, 25, 12	3 (10%)	6 (21%)	-	-	-
Internet Data Distribution	-	1 (3%)	3 (10%)	1 (3%)	-	1 (3%)

ISDN = Integrated Services Digital Network; DSL = Digital Subscriber Line

Table 5.12 shows that only seven respondents provided data on the total quantity of lines, but without specifying the quantities of each type.

5.7.6.3 Telephone (Cellular and Wireless) Lines

Respondents were also asked to indicate whether cellular and wireless phones were provided officially by the institutions. Seven, representing 24% of the LIS schools indicated that they had cellular phones, and four, representing 14% had wireless phones.

5.7.6.4 Fax Lines

Respondents were required to provide, in a table, the types, quantity and thickness of fax lines used in their institution. As mentioned in 5.7.5.2 above, most respondents stated that this kind of information was not readily available to the head of LIS school because in most cases telecommunication services were centralized within the institutions. Thus, only 11 (38%) responded to the question and provided some, mostly minimal, data. Table 5.13 summarises the responses.

Table 5.13: Number/Percentage of LIS Schools using various Types of Facsimile Lines: N=29

Lines	Quantity	Types (quantity)		
		Analog	Digital	ISDN
Local	1, 1, 1, 1, 10	4 (14%)	6 (21%)	-
Internet Data Distribution	-	1 (3%)	1 (3%)	-
Group faxing services	-	-	1 (3%)	-

ISDN = Integrated Services Digital Network; DSL = Digital Subscriber Line

5.7.7 Broadcast Equipment

The study sought to find out whether LIS schools have broadcasting equipment such as radio production equipment, television production equipment and/or satellite equipment. It was observed by seven (24%) of the respondents that such equipment was owned centrally within the institution and, therefore, the LIS school did not have any, neither did the head of LIS school know the types and quantities of the centralized equipment. Nine (31%) respondents did not provide any answer while five (17%) indicated that they did not have and broadcasting equipment. The remaining eight (28%) had some equipment but this was observed to be mostly related to television. All the eight had at least one television monitor, one had a Digital Video/Compact disc (DVD/CD) player, one had a video cassette recorder (VCR), one had a video compact disc (VCD), one had video cassette player (VCP), and one respondent had a data projector.

Only one respondent indicated that they had access to satellite equipment, but this equipment was in Washington DC.

5.8 ICT FINANCING STRUCTURE

ICTs infrastructure and facilities require adequate and sustained funding. Respondents were requested to state whether or not they had a separate ICT budget and if so, whether the budget took into account the various ICT budget items separately. Seven ICT budget

items were identified by the study and these were: hardware acquisition, hardware depreciation, hardware maintenance, software acquisition, software licence/fees, systems development and the training of technical staff.

Eight (28%) of the respondents stated that they had a separate ICTs budget, 16 (55%) indicated that they did not have a separate budget, while 5 (17%) did not provide any information. Some respondents stated that ICT budget, as ICT administration, was centralized within their institution and thus the head of LIS school had no immediate access to the budget information. Figure 5.15 shows the percentage of LIS schools that have separate budget for each of the main ICT items.

Figure 5.15: Percentage of LIS Schools with separate budget for each ICT item

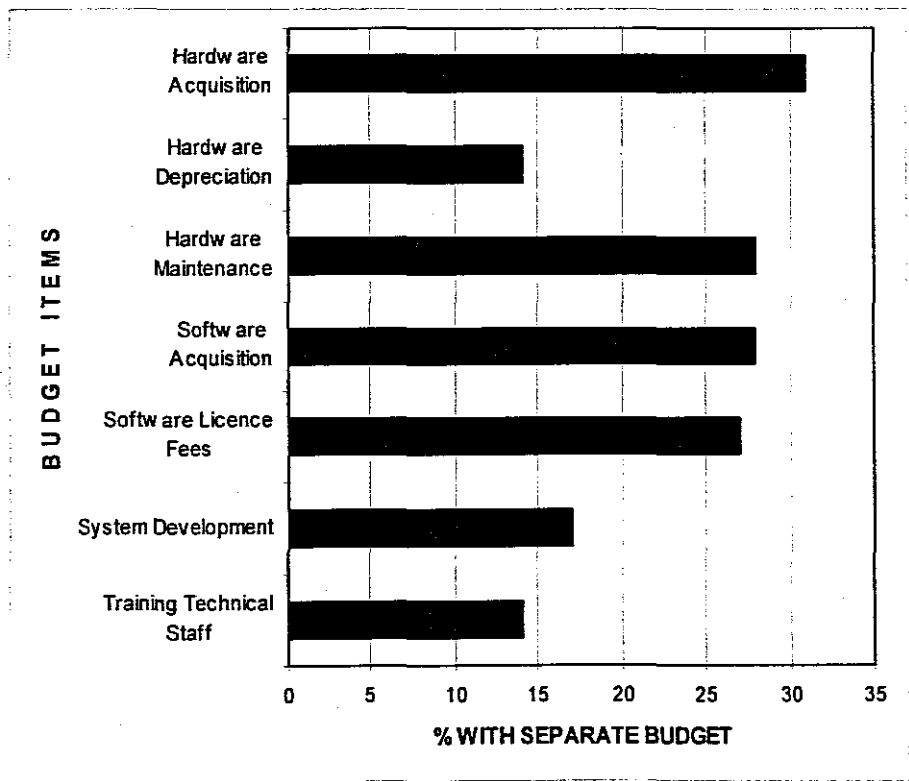


Figure 5.15 shows that hardware acquisition is often catered for in most of the ICT budget, even though only 31% of the respondents indicate this. Software acquisition is catered for by 28% of the respondents. Hardware depreciation and Technical staff

training are catered for in only 14% of the institutions.

Among the LIS schools that had separate budget for each item, it was further required that respondents provide the percentage allowed for each item. Only two respondents provided this information. In one case, each of the identified items (Fig. 5.15) gets 5% of the budget. In the second case, Hardware Acquisition gets 84% of the budget, Hardware Maintenance gets 10%, Systems Development gets 5% and Software Acquisition gets 1%.

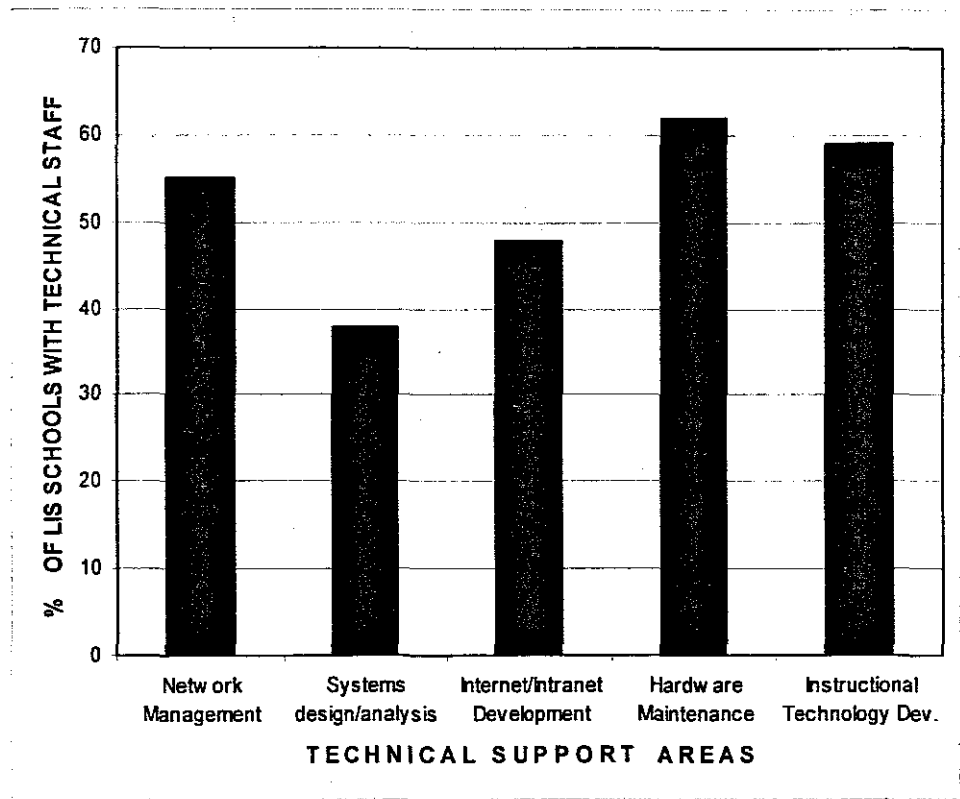
5.9 ICT SUPPORT SERVICES

Support services for ICT use include technical management, maintenance and development of hardware, software, networks and all related facilities, as well as the logistical and training facilitation. Respondents were required to indicate whether ICT support responsibilities in their institutions were centralized, decentralised to departments, or unavailable. It was found that ICT support services are centralised in 19 (66%) of the institutions, and decentralised in 6 (21%) of the respondents. Four (14%) did not answer this question.

The study identified five key areas of technical support that would be needed by LIS schools and requested respondents to indicate whether or not in fact they had staff for the required support. Figure 5.16 summarises the percentage of respondents who indicated that they had support staff for each of the identified tasks.

Figure 5.16: ICT Support Staff in LIS Schools

(N=29)



From Figure 5.16, it can be discerned that hardware maintenance received the greatest attention – by 62% of the respondents, closely followed by Instructional Technology support – 59%. Systems design and analysis is accorded the lowest priority of 39%.

5.10 ICT NEEDS AND CONSTRAINTS OF LIS SCHOOLS

The study assumed that LIS schools had ICT needs that were not currently being met. Additionally, problems and constraints are often experienced when organizations incorporate an innovation such as the use of ICTs in LIS schools. The study, therefore, sought to find out the types of ICT needs that had not yet been fulfilled and the constraints experienced by LIS schools in trying to satisfy those needs.

5.10.1 Unsatisfied Needs

The needs of LIS schools were categorised into five main areas, namely teaching, learning, research, networking and management. In a semi-open ended question, respondents were given these categories and requested to state, in their own words, their unmet needs in each category.

5.10.1.1 Academic staff's Unmet Needs for Teaching

In relation to the use of ICTs by academic staff in their *teaching activities*, the following needs were cited. The percentage of respondents who identified each need is indicated in brackets.

- a) adequate quantity of hardware so as to address limitations of physical access (24%).
- b) re-skilling lecturing staff to improve their ICT competency (17%).
- c) availability of suitable courseware (14%).
- d) up-to-date hardware (7%).
- e) development of web-based or online courses (7%).
- f) availability of web sources and/or Internet access (7%).
- g) development of email links to students (3%).
- h) availability of an efficient network (3%).

5.10.1.2 Students' Access and Use in Learning:

In terms of the use of ICTs by students in their learning activities, the following needs were cited. The percentage of respondents who identified each need is indicated in brackets.

- a) Increased physical access by providing adequate quantities of computers (28%).
- b) Improved epistemological access i.e. better students' competency (10%).
- c) Improved connectivity to the Internet (10%).
- d) Provision of enough and/or relevant software (3%).
- e) Increased access to relevant (e.g. subject based) databases (3%).

5.10.1.3 Research:

In relation to the use of ICTs by academic staff and students for their research activities,

the following needs were cited. The percentage of respondents who identified each need is indicated in brackets.

- a) availability of relevant software (7%).
- b) Improved/adequate Internet accessibility for academic information (7%).
- c) Improved and/or availability of a research budget (3%).
- d) Development of competence in using research software (3%).

5.10.1.4 Networking:

In terms of the use of ICTs Networking services, the following constraints were cited as needs. The percentage of respondents who identified each need is indicated in brackets.

- a) inadequate connectivity (7%).
- b) lack of campus-wide network (intranet) (7%).
- c) bandwidth limitations for video conferencing (3%).
- d) un/mal-functioning network (3%).
- e) poor infrastructure including electricity supply (3%).
- f) lack of expertise/Skills (3%).
- g) Equipment/Hardware (3%).

5.10.1.5 Management:

In relation to the use of ICTs for administration and management of LIS schools, the following constraints were cited. The percentage of respondents who identified each need is indicated in brackets.

- a) lack of resources and skills (14%).
- b) lack of systems manager/support/staff (14%).
- c) lack of policy and budget (10%).

5.10.2 Constraints/Problems

The study identified eleven common general constraints (*Fig.5.18*) and ten common technical constraints (*Fig. 5.17*), and requested respondents to indicate which of them was a problem in their LIS school. For each problem, Figures 5.17 and 5.18 provide ranked summaries of the percentage of LIS schools that indicated each problem as being

applicable to them.

Figure 5.17: Percentage of LIS Schools experiencing Technical Constraints N=29

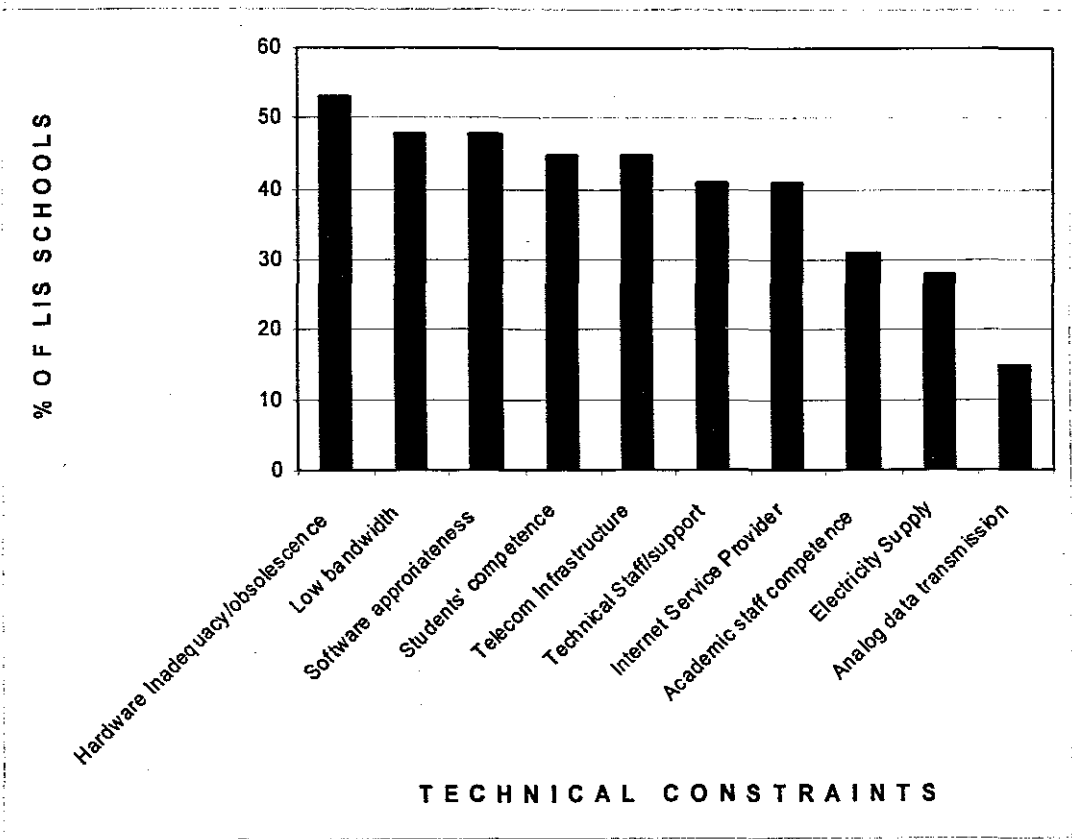
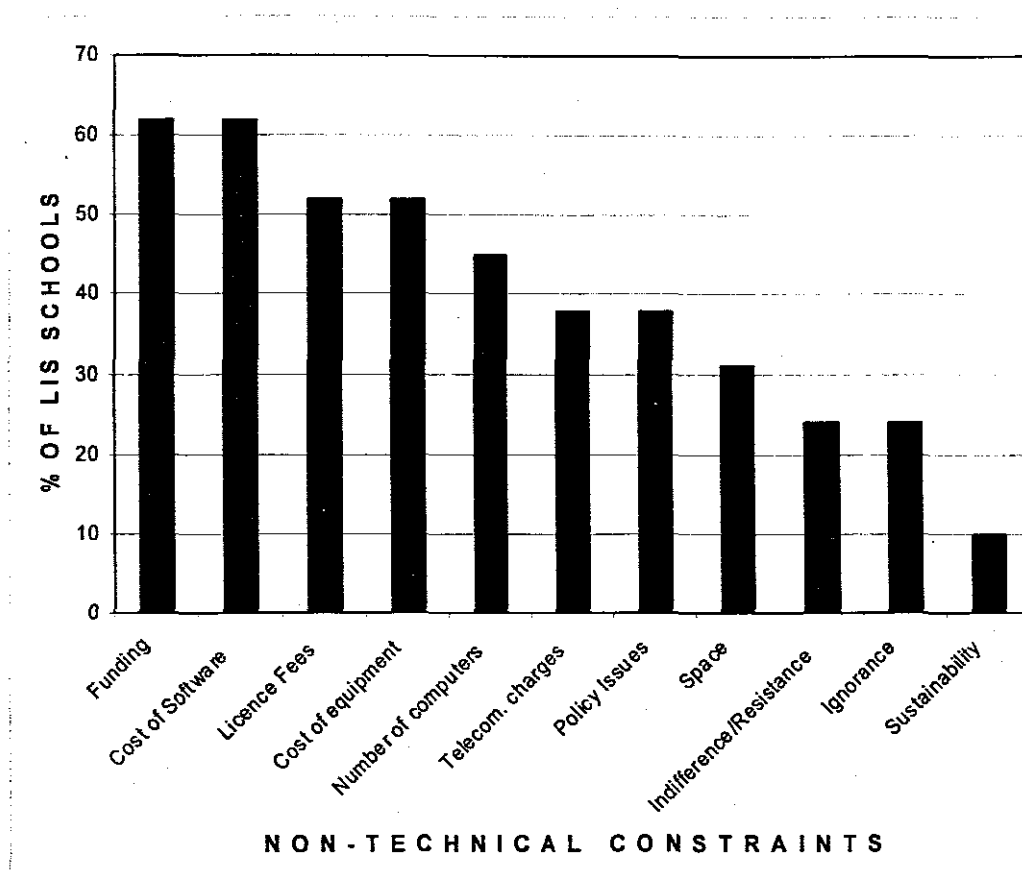


Figure 5.18: Percentage of LIS Schools experiencing Non-technical Constraints



5.11 FUTURE PLANS

The study sought to know any future plans relating to ICT development and use in LIS schools. Space was provided for respondents to list or describe any such plans, for instance, new programmes/courses, updating of infrastructure/systems, etc. Eighteen (62%) of the respondents answered this question, and their answers were summarised into 16 statements. The number and percentage of respondents who identified each aspect is also indicated.

- a. Procurement of more computers/scanners/printer/server - 8 (28%).
- b. Development of more course modules with ICT content - 6 (21%).
- c. Increasing the use of courseware - 5 (17%).

- d. Updating the infrastructure - 4 (14%).
- e. Procurement and/or updating of relevant software - 4 (14%).
- f. Curriculum review - 3 (10%).
- g. Improving the funding - 2 (7%).
- h. Establishment of a departmental/LIS laboratory - 2 (7%).
- i. Getting a dedicated LIS server for implementing online teaching/learning -2 (7%).
- j. Recruitment of lecturers who are ICT specialists - 1 (3%).
- k. Recruitment of systems manager - 1 (3%).
- l. Recruitment of ICT technician and/or student assistants - 1 (3%).
- m. Admission of more ICT students - 1 (3%).
- n. Implementation of an ICT policy soon - 1 (3%).
- o. E-learning policy soon to be implemented - 1 (3%).
- p. Creation and hosting of website - 1 (3%).
- q. Getting Internet connectivity through a wireless carrier - 1 (3%).
- r. Transcript processing - 1 (3%).
- s. Forging collaboration with industry - 1 (3%).

5.12 SUMMARY

This chapter has organised and presented the analysed data. The data was obtained from 29 respondents, who represent 57% of the entire population/sample of the study and includes representation from three regions of sub-Saharan Africa, that is, Southern, Eastern and West Africa. It was the anticipation of the study to include responses from Central Africa and a larger representation from West Africa, but the time, communication and logistical limitations could not allow.

Received data was categorised and summarised into percentages. Thirteen tables and eighteen figures were used to present some of the data, while other data was verbally represented, under thematic/suitable sub-headings. Analysed data indicated that LIS Schools in sub-Saharan Africa have generally incorporated ICTs both in their curricular and in their operations/activities, but the degree of adoption varies greatly among

individual institutions. ICT modules are largely regarded as core within curricular, but not many of the LIS Schools have attained a sufficient level of balance between theoretical and practical instruction, largely because of inadequate infrastructure and/or facilities. The next chapter, Chapter Six, will further interpret the data and discuss the findings drawn from this data.

Chapter Six

DISCUSSION OF THE FINDINGS

6.1 INTRODUCTION

This chapter discusses issues that arose from the results of the data that was presented in the previous chapter. The discussion serves to provide perspectives and an insight into the findings of the study, bearing in mind the aim of this study, which was to map and audit the types, nature and diffusion of information and communication technologies (ICTs) in library and information science (LIS) education and training programmes in sub-Saharan Africa. The various issues of discussion embody the specific objectives of the study, which include establishing the types of ICTs currently taught and used, determining the nature and extent to which ICTs are applied in academic research, teaching, learning, academic administration, establishing the levels of ICT support available in terms of policies, infrastructure, hardware and human resource, establishing problems encountered in the availability and use of ICTs, determination of ICTs needs, establishing the gaps between ICTs needed and ICTs available, and determining strategies for bridging the gaps.

The study has established that sub-Saharan Africa provides opportunities at all levels of LIS education ranging from certificate, through undergraduate diploma, undergraduate degree, postgraduate diploma, masters, up to doctorate levels. At the lower levels, there is a variety of programmes that include older names such as Library Studies, Archival Studies, Records Management/Administration, Documentation, as well as newer programme names such as Information Science, Information Technology, Knowledge Management and Media Studies. Seemingly, each institution combines, names and establishes programmes depending on the conventions of the parent institution and national needs, but also loosely adhering to international conventions. At the doctoral level, the major variation is between PhD and DPhil designation, emphasising the structure of the programme rather than the content. This may be ascribed to the importance placed on the actual topic/title of a research project within a broad disciplinary framework. There is growth in the number of LIS schools as each country

tries to become self-sufficient and current, and a diversification of programmes as the incorporation of ICTs increases.

6.2 ICT EDUCATION IN SUB-SAHARAN LIS SCHOOLS

Sub-Saharan Africa needs people with ICT (especially computer) skills in all areas, including systems analysis, programming, maintenance and consulting, and at all operational levels from basic use to management. Most countries decry the lack of educational and training facilities needed to help people acquire the proper skills and the few training centres that do exist have not always been able to keep up with demand. A few countries offer computer science degrees, but in many countries, programs available are mainly diplomas and certificates. As a result of lack of skilled and trained personnel, user organizations sometimes have to hire expatriate staff especially at the senior levels, but these expatriates often lack knowledge about local organizational cultures and thus end up designing or setting up inappropriate systems. It is, therefore, imperative that local ICT education be strengthened, not only in LIS but also in all other relevant areas of study.

On the other hand, Information and Communication Technology as a field of study is increasingly widening, not only because of its dynamic and rapid growth but also because of the variety of other disciplines that are associated with it such as Mathematics, Physics, Engineering, Library Science and Management Sciences (Massis, 2003). Being fundamentally impacted by such a diverse background, the challenge of offering core ICT competencies in LIS education can be enormous, more so because of the growing variety of these competencies and the dynamic nature of the ICT industry. According to Smith (2002) and Massis (2003), some of the competencies required for day to day operation in a modern information centre/service include a knowledge of the latest search engines, fluency in Internet searching, designing and maintaining websites, electronic information sources/materials and their location, ability and capacity, including patience, to work with patrons, some of who know "too much" and some "too little" of the electronic information world, and knowledge of terminology, delivery modes and legalities of

electronic information access.

Thus there is a variety of course/module titles that emerge in LIS curricula to represent certain knowledge, skills or competencies in LIS such as those identified by Ocholla (2003) and Kloppers (1996). This study identified and investigated 29 module titles and additionally, some of the respondents submitted other new titles such as Design and Realisation of Internet Information, Production and Publishing of Information Media, Database Applications, Email Services, and Social Impact of the World Wide Web. LIS schools in sub-Saharan Africa have incorporated a lot of these ICT course modules or ICT content in their programmes.

6.2.1 ICT Modules in LIS Programmes

The 29 modules identified in this study encompass all and more of the above competencies. The study presumed that these modules form a near aggregate of ICT knowledge and competencies that were deemed to be necessary for modern library and information service provision. From the curricular of the various respondents, it was noted that the actual ICT module titles differ among schools and/or specific programmes. However, the study assumed that Heads of LIS schools would be able to recognize the content implied in each of the 29 modules even if the specific course/module titles varied from those used within their particular department or programme. Generally, all these modules are offered in sub-Saharan LIS schools and the majority of the responses indicated that 88% (23) of the responding LIS schools offer more than 50% of the 29 modules identified in this study. Although there are disparities between institutions, 24 modules are widely offered and these include:

- 1) Hardware & Software Selection – 90%.
- 2) Library Automation Systems – 90%.
- 3) Management of Library Automation – 90%.
- 4) Online Database Searching – 90%.
- 5) Applications Software – 86%.
- 6) Information Systems – 86%.
- 7) Internet Facilities – 86%.

- 8) Internet Hardware & Software – 86%.
- 9) Electronic Publishing – 83%.
- 10) Local Area Networks – 83%.
- 11) Operating Systems – 83%.
- 12) Automatic Indexing & Abstracting - 79%.
- 13) Multimedia – 79%.
- 14) Electronic Current Awareness Service – 76%.
- 15) Intranets – 76%.
- 16) Internet Tools – 72%.
- 17) Data Communication - 69%.
- 18) Electronic Document Delivery – 69%.
- 19) Telecommunications – 66%.
- 20) Hypertext – 62%.
- 21) Human-Computer Interaction – 59%.
- 22) Programming – 59%.
- 23) Computer Architecture – 55%.
- 24) Intelligent Gateways – 55%.

The modules that top the list can be considered as being very central ICT components of LIS practice. For instance, Operating Systems and Applications software are basic to ICT knowledge and use, while Hardware & Software selection tackles an area that is fundamental for any information manager or even an ICT user. However, in some cases, it may be a matter of affordability and availability of expertise. For example, knowledge and skills in LANs and Intranets can be easily taught in institutions that have these networks, which is in 82% of the respondents in this study. Similarly, Internet Facilities and Internet Tools could be easily taught in institutions that are connected to the Internet. And a lot of applications software are easily available, especially the older versions, some being offered freely alongside the purchase of hardware. However, this should not be misinterpreted to mean that such modules are the only important ones, because such a conclusion would be an oversimplification of the dynamics of curriculum development.

An issue that arises in listing these modules and indicating their availability is that of standards for the competencies. The scope, depth and quality of coverage is very pertinent. However, this issue could not be resolved by the study and further research is necessary. Thus it is possible for LIS schools to have course modules with relevant names/titles, but with varying levels of scope and depth of coverage. A lack of consistency can be envisaged because most LIS schools are in independent institutions where quality control is vested in each institution's authorizing committee such as a *university senate*. *Although curriculum development practice often requires input from external sources, such contribution is not usually mandatory.* Thus whether or not, what is taught in the above modules, translates into comparable knowledge and competencies cannot be ascertained by this study, and would need further investigation. But the importance placed on each module was investigated by inquiring into which of the said modules are offered as 'core' modules as opposed to 'elective' modules and is discussed in section 6.2.2.

Five modules were not widely available in sub-Saharan LIS schools. These were, Text Digitization, which had 48% availability, Artificial Intelligence – 45%, Broadcasting Technologies – 35%, Distributed Systems – 31%, and Software Engineering – 31% availability in sub-Saharan LIS schools. This may be because some of these five areas are taught as topics within broader subjects. In other cases, the content is highly technical and largely hosted within computer science rather than LIS subjects. But it may also be because they are not vital competencies in the day-to-day activities of most LIS services since usually, another department within an organization usually handles broadcasting, IT systems, software development and text digitization. However, it should be noted that Text digitization is increasingly being recognized as a vital competency even for LIS graduates. Thus, sometimes, it may just be the unavailability of expertise in LIS schools to handle these subject areas that has led to their (subjects) absence from the curricula.

6.2.2 Core vs. Elective

Core or required modules are those that must be studied by all students. They reflect the importance placed on these modules. In most cases, such modules contain the knowledge and skills that are essential for the profession. In sub-Saharan LIS schools, most ICT modules are highly rated because the study reveals that whenever offered, most of the ICT modules are core and/or required within the programmes. Most of the modules are offered as independent modules, but even in cases where the ICT content/competencies are not offered as independent modules, the relevant content is integrated in other modules that are core. Table 6.1 shows the percentage of LIS schools, under each category, offering each module.

Table 6.1 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
Hardware/Software 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
E-mail Services	-	10	-	-
Organization of Data	-	7	-	-
Web-Based Imaging	-	7	-	-

However, while it is noteworthy that most of the 29 modules investigated in the study, were not offered as electives, it was equally noted that only five (17%) are popularly offered as independent core modules by the majority of the LIS schools. However, if it is to be presumed that the modules whose content is said to be “integrated” in other modules, is in fact integrated in modules that are core/required, then 17 (59%) modules offer competencies that are considered very important for LIS graduates in over 60% of the LIS schools for each module. The reasons why some modules are considered important could include their centrality in ICT operations/activities, prevalent expertise by staff, and affordability.

6.2.3 Theory vs. Practical

The teaching/learning of ICT modules needs to have an appropriate balance between theoretical and practical training and perhaps emphasize the aspect of practice because technologies by definition mean an application and represent practical ways of doing something. Thapisa (1999) observes a slant of LIS education in Africa towards more theory and argues for a general change from an overtly academic and theoretical orientation to workplace and hands-on IT-oriented education. It should be expected that LIS educators, when designing the scope, knowledge and skills for the curriculum, should place emphasis on practical skills because LIS is basically a practice-oriented discipline and many job advertisements require experience or practical skills (Ocholla, 2001).

The study reveals that the above balance is not easily achieved in sub-Saharan LIS schools and practical training, although used in almost all modules, does not feature very prominently. Only three modules scored over 50%. These included Internet Tools, which

is offered in 21 LIS schools, is by nature a practical module since, for instance, it encompasses the use of search engines, and hence many LIS schools (76% of those who offer the module) teach both the theoretical aspects and provide practical learning, with another 10% teaching only the practical aspects. A module on Hypertext is offered in 18 LIS schools, 61% of which achieve the practical/theory balance, with another 11 claiming to teach only the practical aspects. Likewise, a module on Internet Facilities, which are integral parts of Internet use, is offered both practical and theory in 60% of the 21 LIS schools that have it in their programmes. The rest and the majority of the modules (20) fall within the 30%-49% range in terms of theory and practical balance in presentation. However, there are three modules that stood out as being very theory-oriented than the rest. These were Artificial Intelligence – 77%, Management of Library Automation - 54% and Text Digitization 50%. Although the theory within each module is very important knowledge for information work, there is still much concern about the effectiveness of competence achievement, when no practical work is done. For instance Text Digitization, for all intentions and purposes needs to be handled practically if there is to be any meaningful learning. However, it can only be presumed that the lack of equipment could be the reason behind the inadequate practical orientation of the modules in the LIS schools that offer only the theoretical aspects of Text Digitization and other modules. It is in fact possible that for most of the modules taught, and LIS schools that teach only the theory, this problem is the prevailing cause rather than omission by design. As revealed in Figure 5.17 (section 5.10.3) of this thesis, the most prevalent technical constraint is hardware inadequacy or obsolescence (52%) followed by software inappropriateness (48%).

6.2.4 Continuing Education

Since most of the IT competencies often require continuous updating due to technological development, LIS schools, therefore, have the task of equipping LIS graduates, not only with current competencies, but also a firm yet flexible basis for learning/acquiring newer competencies as the need arises in the future. Massis (2003:8) proposes that LIS schools can best do this by offering many management courses including courses that deal with issues. These courses should be designed and taught in such a way that they prepare the

graduate to readily respond, adapt to and/or adopt changes in the work place. This study did not focus on this issue, and only one management module was included. This module, Management of Electronic Information Services, is offered in 90% of the LIS schools, but it is not possible to determine the extent to which it incorporates Massis's suggestion or prepares students for adapting newer technologies in the future.

6.3 ICT INFRASTRUCTURE IN SUB-SAHARAN LIS SCHOOLS

Certain prerequisites, such as reliable power supply to operate the computers, a well functioning telephone network to transmit data, foreign currency to import the technology, and computer literate personnel, are necessary for successful use of ICTs. Such infrastructural and financial elements remain inadequate in many sub-Saharan countries. Five of these elements were considered to be very important for the successful incorporation of ICTs in LIS education. These five are ICT policies, funding, hardware availability, software issues and Internet connectivity and are each discussed below.

6.3.1 ICT Policy

Several studies have underscored the importance of ICT policies as an empowering instrument at both micro and macro level investment (World Development Report, 1999/2000; Alemie, 1998; Raseroka, 1997). A good policy provides sufficient frameworks for ICT development and/or use in an organization or country, for instance, in areas of strategising implementation, staff development and communication. Odedra (1992a) observes that ICT policies and/or strategic buying plans should clearly identify the needs that are likely to bring overall benefit to a nation or institution, and establish what may be achieved with the available resources. Odedra further observes that although some regulatory policies covering procedures for the acquisition of hardware and software do exist in a few institutions, the aim of these policies is to typically mandate centralized acquisition of ICT products in the public sector, tax private companies and non-government organizations, in order to either discourage imports or to raise convertible currency for the state. These, therefore, only partially and indirectly address this issue. ICT implementation without policy, especially for a country or entire institution, is poor planning because it often leads to wastage through haphazard

implementation and misplaced priorities. As reported in chapter 3, section 3.3.3 of this thesis, policy issues at organizational level do not often attract much attention, yet the implementation of ICT use without a proper policy is often found to be haphazard, leading to duplication of efforts and increased costs.

Sub-Saharan LIS schools generally lack guiding policies for the development and use of ICTs. Even though only 38% cited policy issues as a constraint to the development and use of ICTs, only 38% respondents have comprehensive policies, and this can be presumed to be a reflection of the entire continent. Some LIS schools (41%) indicated that they have fragmented policies, that is, policies that are not comprehensive to the entire institutions but are formulated within and covering only individual departments. Fragmented policies are likely to face difficulties at implementation especially if there is institutional bureaucracy of approval, central financial management and centralized procurement and assets maintenance.

6.3.2 Financing

ICTs are a fund-intensive innovation, requiring not only careful budgeting, but equally important, sustained funding. With the cost of computers falling dramatically, and with systems becoming much easier to use and maintain, it is hoped that some of the prohibitive cost and infrastructural problems are being lessened. Thus an increasingly affordable and broadly applicable technology is available to play an essential part in the process of development. Nevertheless, funding of ICT projects is the major non-technical constraint in LIS schools (62%) as revealed in Figure 5.18 of section 5.10.3 of this thesis. Only 28% of sub-Saharan LIS schools have a separate budget and 16% have control over their own ICTs budgets. A number of other institutions have centralized ICT services that are properly funded and it is notable that 50% of LIS schools with centralized ICT services are satisfied with the financial arrangements. While centralized ICT services have the advantage of 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. In such a case, the LIS school may

consider a decentralized system, as long as there is adequate autonomy, authority and financial innovativeness.

6.3.3 Hardware Availability

Although the number of computers has increased rapidly in some sub-Saharan countries, the process of computerization has not been as successful as it should be in the majority of these countries. This situation is reflected in the number of computers or the computer-student ratios in universities or LIS schools. In one case, one computer is shared by 108 students. This means that a student may be able to access a computer only one hour in a week (assuming that the computer operates 16 hours a day for all the seven days). Similarly inconvenient, is a situation whereby inadequate computing facilities are centralized. The centralized system works best where there are adequate numbers and efficient maintenance of computers and related services, otherwise competition to accessing the facilities becomes a problem leading to inequitable access. Departmental LIS laboratories in a way ensure that LIS students have equal and relevant access to computers and it is noteworthy that 62% of LIS schools have this set-up, but the financial and maintenance burden have to be carefully navigated.

Apart from computers, other components of hardware such as communications hardware, which are equally important, are usually not within the control of LIS schools. For training in optimal information handling, especially online services, the use of latest communication technologies such as the satellite range is important. Negotiating for network licenses, with Internet Service Providers, for telecommunication tariffs, and the procurement and maintenance of requisite hardware are perhaps best handled centrally in an institution. Unfortunately, only 3% of LIS schools in sub-Saharan Africa use VSAT satellite communication system and 14% use fibre-optic cables. UTP which is more widely used, 35% requires repeaters, every 1-2 miles, which would be a difficult undertaking for remotely located institutions. Although most LIS schools in sub-Saharan Africa are in universities, which are in major cities, there are a growing number of geographically challenged institutions that would better utilize satellite communications. But with satellite communications, the challenge is on costs rather than logistics.

6.3.4 Software

The range of software used in LIS schools is a reflection of the general software market, which is teeming with variety and enhancement. In terms of operating systems, the Microsoft range of products rule the continent, with many institutions having one version or other of the MS Windows ranging from Windows 3.1 to Windows 2000. It is surprising that MS DOS is even still in the picture. Since additionally, the popular networking system is Novell, there is good basis for inter networking among LIS schools as none would have to radically reconfigure their systems in case of inter-country or inter-institutional online collaboration. The variety of applications software is even wider and the list in Table 5.11 in chapter 5 of this thesis attests to this diversity. Although the Microsoft applications are also prevalent, there are so many other software packages largely because most institutions take what they can get either as donations or with the hardware. As revealed in section 5.10.3, the major non-technical problems of ICT development in LIS schools are funding (62%), cost of software (62%) and license fees for software and networking (52%).

6.3.5 Internet Access

According to Abramson (2002), Internet connectivity refers to the unique ICANN¹⁰-overseen Internet Protocol number for duration of connection and the ability to exchange general Internet traffic (POP, http) with other ICANN-overseen IP addresses. Although *excluding private and closed networks, connectivity implies end-to-end interoperability*. Abramson (2002) identifies three alternative approaches, which include (1) bandwidth per person, but cautions that non-users are unlikely to produce bandwidth demand and so cannot claim market failure, (2) bandwidth per user, even though demand for international traffic varies by language, etc. and some countries produce more non-user (hosting) traffic than others, and (3) bandwidth per host, although this does not address international traffic mix.

¹⁰ The Internet Corporation for Assigned Names and Numbers

Internet access is now widely available, but the efficiency is poor as over 52% of the LIS schools experience downtime, several times a week. Besides, the majority of downtime lasts for an hour or longer, in some cases (10%) for more than five hours each time. Telecommunication services are the root cause of these downtimes in terms of, either, low bandwidth, technical faults and other network configuration problems. Intra-African communications still leave much to be desired.

6.4 APPLICATION OF ICTs IN LIS TEACHING AND LEARNING

The integration of new technologies in education can be said to be significantly promoting academic innovation and transformation, especially the teaching and learning paradigms. Educationists are advocating a paradigm shift from teacher-centeredness to learner centeredness, thus operating in the learning paradigm, whereby a wide variety of learning styles such as active learning, learning to learn, collaborative learning, problem-solving, role playing, etc., become the focus of formal education. In LIS education, professors should likewise be adjusting their instructional methods to incorporate the increased use of ICT-based tools such as tutorial software/courseware, which involve the integration of instructional devices that foster greater hands-on learning, richer simulations, provision of exploratory environments, flexi-time learning, in addition to automated pedagogy (Burbules, 2000:288).

Like in other disciplines, ICTs as teaching/learning tools can be used to enhance LIS instruction, especially through the diversified delivery facilitated mainly by the Internet. All forms of learning are enhanced by ICT, especially problem solving situations, which readily lend themselves to ICT, and students can learn to develop skills such as being systematic, logical and deductive through engaging with carefully selected computer based tasks and scenarios. 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.

There is a form of teaching/learning that includes conventional teaching practices and learning modes as well as alternatives and options provided by various media including, but not exclusive to the recent developments in communications and information technology. This form is referred to as 'flexible teaching/learning' and seeks 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.

6.4.1 Online Teaching/Learning

Online teaching/learning is a sub-set of flexible teaching and learning that not merely replicates traditional classroom events through the Internet, but also provides for different ways of learning and the construction of a potentially richer learning environment that using fresh approaches to learning, catering for different learning styles, as well as allowing for greater diversification in learning and greater access to learning. An online learning environment can include any or all of a number of aspects ranging from administration details relevant to the class to learning experiences mediated through interactive multimedia to a total course delivered via the Internet. According to University of Western Australia (2003), online teaching/learning can be:

- Web-Supplemented i.e. students have optional access, via the web, to information on the unit which is additional to the information available in the module handbook.
- Web Dependent i.e. participation on-line is a compulsory requirement, for any or all of the activities including interaction with the education content necessary for study and communication with staff and/or other students. However, some face-to-face component may be scheduled.

- Fully On line i.e. all interactions with staff and students, education content, learning activities, assessment and support services are integrated and delivered on line.

Online teaching does not always mean a total exclusion of class contact, but may reduce contact time. An online teaching/learning environment can supplement or complement a traditional face-to-face learning environment or it may provide a complete learning package that requires little or no face-to-face contact. However, it must be noted that some students may opt not to attend scheduled face-to-face classes in favour of the complete online delivery only. The only shortcoming has been the lack of the potency of human contact, but most of the recent research on the use of ICT in education is more or less explicitly considering technology's possibilities for facilitating social interaction between teacher and students and among students so as to make the learning situation complete.

Nevertheless, only a few (10, 34%) of the African LIS schools practice some mode of online teaching and learning. These include, Kenya School of Professional Studies, Rand Afrikaans University, Stellenbosch University, Technikon South Africa, University of Ghana, University of Natal, University of Pretoria, UNISA, University of Zululand, and the Zimbabwe National University of Science and Technology. At three of these institutions, Rand Afrikaans University, Stellenbosch University and University of Pretoria, all postgraduate courses are offered online. Four LIS schools, i.e. at Rand Afrikaans University, Stellenbosch, UNISA and University of Pretoria, partially support all undergraduate courses with online courseware. At the University of Dar-es-Salaam, Blackboard courseware had been acquired and the LIS school was in the process of preparing course material for implementation.

A unit is fully on-line if all interactions with staff and students, education content, learning activities, assessment and support services are integrated and delivered on line. Individual modules that are fully taught online at some of the LIS schools include Advanced/Online Information Retrieval (NUST), Information/Knowledge Management (3%), Information Technology (Tools, Applications, etc.), Library and Information

Technology (TSA), and Web-based Information systems/ Online retrieval systems (NUST).

Modules that are partially taught online include Advanced/Online Information Retrieval (10%), Applied Information Science (3%), Automation of Library and Information Services (3%), Database Management/Applications (3%), Electronic/media Publishing/Production of Information (3%), Information / Knowledge Management (3%), Information Organization and Processing (3%) , Information Storage and Retrieval (3%), Information Service/Work (3%), Information Technology (Tools, Applications, etc.) (10%), Internet Searching (7%), Internet Services (3%), Library Automation, (10%), and Management of Electronic Records (7%).

6.4.2 Distance Education

Distance education is offered online by only one LIS school, UNISA, but the Kenya School of Professional Studies is currently attempting collaborative distance education with Technikon South Africa. So far only selected modules are offered online at distance, with the rest being offered locally in a computer-assisted environment. Considering the flexibility for work-bound learners, the potential of online distance education is enormous in sub-Saharan Africa. Currently, a student who identifies a suitable LIS programme in a different country, town or institution from his/her own, must physically relocate in order to pursue his/her studies. Such relocation is often disruptive to the individual and family, as well as to the employer, often at great financial and psychological cost. Since most sub-Saharan students are not financially well off, such a student must try and obtain the scarcely available scholarship to enable him/her to relocate. Many of the difficulties associated with relocation could be overcome by distance education.

Another way in which distance education could be exploited is for inter-institutional collaboration, such as cross-registration of students or cross-teaching by lecturers. Since one of the reasons why certain ICT modules are not offered in some LIS schools is the lack of expertise, students could be encouraged to register for the module(s) in a LIS school offering it. Although attended with many logistical issues, online teaching can

extend the boundaries of lecturers, who could offer their expertise and services to other institutions that have infrastructural, but not human capacity.

6.4.3 Computer-assisted Teaching/Learning

Computer-assisted teaching/learning refers to any situation where computers have been involved in any of the stages of teaching, be it merely during preparation, during delivery, during assessment or any combination of the above. Thus computer-assisted teaching/learning may not necessarily be online. It would appear that this is already happening in many of the LIS schools. From the data in chapter 5 section 5.4.1, the general observation was that most of the LIS schools used ICTs, but mainly just occasionally. Thus for the majority of the teaching and learning activities, LIS schools resort to manual and offline methods.

6.5 APPLICATION OF ICTs IN LIS ACADEMIC RESEARCH

The development of scientific research networks on a world-wide basis using the Internet, has helped to empower research programmes even in developing countries, whereby virtual research groups - composed of interconnected specialists from different parts of the world - allow databases to be shared, conferences to be organised, papers to be circulated and discussed, and collaborative research and reporting to be undertaken. ICTs are generally used in research activities of sub-Saharan Africa LIS schools, with the highest use being access to research information, followed by dissemination of research findings/reports. ICTs are also used as research tools - collecting data, analysis and report compilation - and for communication with other researchers. LIS Schools have access to academic information through intranet - 79%, electronic databases either through subject gateways, subscriptions or procured CD-ROMs - 59%, and electronic document delivery services or library networks that provide research information - 59%. It must be pointed out that the boost in the above figures came largely from the South Africa component of respondents because these LIS schools are in well endowed ICT environments.

However, although 86% use ICTs in collecting research information, a large majority of this use is infrequent, yet most current research information can only be effectively accessed on the Internet. For instance, an estimated 90% of data on Africa resides in foreign databases (Zwangobani, 1995) and besides, many universities in sub-Saharan Africa lack access to the latest books or journals. Thus although the infrequent use may be as a result of the cost of Internet use, especially for those academic staff who do not have free access to the Internet as reported in chapter 5, section 5.5.2 of this study, one of the consequence is that academics are often unable to produce and publish internationally accepted/up-to-date papers. As the data revealed, electronic publishing of research outcomes on the Internet is only in 14% of the LIS schools. The other reason behind the infrequent use of ICTs for research purposes is the inadequate infrastructure. This could be the reason why the technology that is least used, is group teleconferencing, which normally requires high level infrastructural set-ups that are lacking in many of the institutions.

6.6 APPLICATION OF ICTs IN LIS ACADEMIC ADMINISTRATION

ICT is a vital tool for academic administration/management because computerisation has permeated into all aspects of educational administration such as students' registration, academic records administration, financial administration, human resource management, internal communication, administration of assets, office automation and interacting with external constituents. As observed by Alexander (2001), ICT use provides solutions for part of management issues such as the need to reduce costs so as to make higher education accessible to the financially challenged, and the need to expand higher education opportunities so as to cope with increased demand that has resulted from higher populations and improved basic education availability. ICT use also provides solutions to the need to provide high quality education to satisfy the current demand for broad yet industry ready knowledge and skills, and the need to address the diversified needs of a pressurized clientele who need flexibility in time, space, courses and methods of learning.

In sub-Saharan LIS schools, many of the academic administrative activities are

computerized. Academic records administration has the highest rate of computerization (86%) followed by Students' Registration (79%), Financial Administration (69%), Internal communication (69%), support to management decisions (69%), office automation (66%), personnel administration (62%), interaction with stakeholders (59%), and assets and maintenance (56%). Effective use of ICTs in the activities of academic management requires the use of intranets and/or local area networks. Such a network not only connects the various constituents of academic administration such as admission and registration, students' finance, course offerings, examinations and even students' accommodation, but a network also facilitates the sharing of data, thus minimising costs and errors. An intranet or campus internal network provides a cheaper and easier way of sharing information at institutional level, without which a lot of duplication in services results. Many institutions with a LIS school (72%) have campus networks, some (41%) of which go all the way and provide access to academic staff both on and off campus. This is an encouraging development because it empowers academics to operate flexibly and since many of them, for instance, mark assignments at 'home', it is convenient to complete the task by recording marks on the institutional systems instantaneously. Students in some (28%) institutions likewise have access to the campus network both on and off campus. This means that activities such as checking on one's performance or getting in touch with a lecturer can be accomplished at any time. However, for off-campus use, a campus network is only part of the set up because lecturers and students often must have their own hardware and software (at home) that they can use to log onto the campus network. In some countries, the prevalence of Internet cafes often provide a partial solution. Thus although the current world trend is towards such increased online usage, online use of ICTs in sub-Saharan LIS schools is generally less than the off-line use in all activities. Online activities are usually hampered by inadequacies in the infrastructure and funding. For instance, although 72% of the institutions with a LIS school have campus networks, half of these are in South Africa, which has a well developed infrastructure and is economically better than most of the other sub-Saharan countries.

An important area in academic administration is the provision of flexibility in education

programmes and modules as discussed in section 6.4 1 above. Thus ICTs are not widely used to provide wider access to LIS education, for instance through distance education and/or online programmes/courses. Distance education was reported in only three (10%) LIS schools while online teaching was in 10 (34%). Most of the online was partial, indicating that LIS educators still favour the class contact methods.

6.7 PROBLEMS AND CHALLENGES OF INCORPORATING ICTs IN LIS EDUCATION

It has sometimes been argued that ICTs have been a mixed blessing in different sub-Saharan countries because of their drain on the scarce foreign currency for the procurement of equipment that is not fully used. Alternatively, there is often increased dependency on multinational corporations and expatriate personnel. Odedra (1992b) *opined that Africa was not experiencing IT transfer but transplantation - the dumping of boxes without the necessary know-how – that results in more socio-cultural conflicts than developmental solutions.* The above arguments highlight the underlying challenges and problems associated with ICTs in sub-Saharan Africa.

6.7.1 Funding

Many of the problems identified in the study have a direct result to the ability of LIS schools or their parent institutions to provide adequate and sustained funding of the ICT project. Constraints such as adequate quantities of hardware, obsolete hardware, non-availability of suitable software and/or courseware, limited Internet access, non-subscription to relevant (e.g. subject-based) databases, and even the lack of expertise e.g. of systems manager and/or support staff, have a relationship to the financing. Thus, it is often not the lack of knowledge of (determining) what is required, but rather the lack of funds to get what is required. Among those LIS schools that have separate ICT budgets and who cater for some of the above needs separately, it was found that hardware acquisition and maintenance are often given priority (see Figure 18 in chapter 5). In one LIS school, hardware gets 84% of the ICT budget. However, since the actual figure was not provided, it is not possible to tell what this translates into in real terms. Suffice it to note that, there is need for fairly large sums of money, whether in a centralized or

decentralized financial structure, so much so that even if 50% went to hardware acquisition, there is enough left over for software acquisition and license fees, systems development/upgrading, and training. Even though the prohibitive cost and infrastructural problems are being lessened, the current average prices are still quite high for many sub-Saharan Africa institutions, given the institutions' financial bases and the value of their national currencies. Hence funding of ICT projects is a major non-technical constraint in LIS schools (62%) as revealed in Figure 18 of chapter 5, section 5.10.3 of this thesis and discussed in section 6.3.2 above.

6.7.2 Infrastructure

According to the results of this study, ICT infrastructure is the second biggest challenge to LIS schools in their attempts to increase the use of ICTs. A sufficient infrastructure should consist of equipment that may include stand alone and/or networked computers, modems, local area networks, intranets or campus wide backbone connecting LANs and multi-campus networks. The infrastructure should additionally include the carrier technology such as satellites technology that includes VSATs and wireless radio/television, fibre-optic technology, unshielded twisted pair, coaxial technology, as well as functionality structures such as email, Internet access, conferencing tools and multimedia tools. Furthermore the infrastructure should consist of adequate connectivity i.e. sufficient bandwidth and routers available for ensuring that the wide variety of information products can be accessed efficiently, and operating systems that may be freeware or proprietary. Although only thirty percent of the respondents indicated that there was need to improve infrastructure, the inadequacies of the infrastructural capacity of sub-Saharan is manifested in the data on most of the above-mentioned elements and as discussed in section 6.3 of this thesis. Jensen (2002) observes that existing computer resources in Africa are commonly underutilized because of the preponderance of many standalone PCs in the same office with no use of Local Area Networks (LANs). Thus a department may have many machines, but only one with a modem connecting to the Internet often creating competition for such a machine. Added to the problem of having a shared email account, the situation is not conducive to effective use of the Internet.

6.7.3 Expertise

Among the problems cited by respondents was the issue of re-skilling lecturing staff so as to improve their ICT competency (20%), lack of systems manager/support staff and/or ICT experts (17%), and the need to improve epistemological access i.e. better students' competency (10%). Integrating ICTs into the LIS education fabric requires expertise at various levels. Without the right human capacity, there is likely to arise a situation of underutilization of available ICTs for lack of someone to operate them, use them or make minor repairs. Academic staff are required to have a fairly broad and extensive knowledge of ICT, as well as be effective users of the technologies. As revealed in chapter 5 section 5.4.3, most LIS schools employ a variety of methods to re-skill academic staff. Thus the problem of unskilled or under-skilled academic staff is likely to be of attitude and/or time rather than the absence of opportunity. Students, on the other hand, need epistemological access to ICTs i.e. a certain level of computer literacy, confidence and informed judgement (Broekman, Enslin & Pendlebury, 2002). It would seem that this problem of students' ICT skills is being addressed because data revealed that computer literacy is offered practically to many students. Lastly there is need for technical support staff with high level expertise in the maintenance aspects of ICTs. As Odedra (1992a:3) observes, "... seeing a broken fileserver (and the unusable workstations) in an LDC is somehow very different from seeing this in the so-called first world – because it should take but a little labor and a few parts to fix, but this is unlikely to happen because the skills are not available and there are no parts in the local electronics store." This issue is largely unattended to, and falls out of the control of LIS schools. It is expected that the many ICT training facilities in most countries, plus institutional ICT service departments will provide solutions.

6.8 SUMMARY

The development 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.

Chapter Seven

Summary, Conclusions and Recommendations

7.1 INTRODUCTION

One problem with investigating about ICTs in sub-Saharan Africa is that Africa itself is a very diverse continent whereby the differences among countries in their economies, politics, education, languages, underlying cultures, and history, all have considerable effects on the likely success in the diffusion of an innovation such as the current new technologies. Besides, the unprecedented, phenomenal and multifaceted growth and development of the ICTs themselves pose another challenge. Thus the analysis of this immensely complex scene can only be done from a perspective of limited experience and inevitable subjectivity. The aim of this study was to map and audit the types, nature and diffusion of information and communication technologies (ICTs) in library and information science (LIS) education and training programmes in sub-Saharan Africa. This chapter summarizes the salient outcomes of the study, provides conclusions and recommendations arising from this study and those that need to be addressed by future studies.

7.2 SUMMARY OF FINDINGS

The specific objectives of the study were to (1) establish the types of ICT competencies currently taught, (2) establish the types of ICTs currently used; (3) determine the nature and extent to which ICTs are applied in academic research, teaching, learning and academic administration; (4) establish the levels of ICT support available in terms of policies, infrastructure, hardware and human resource; (5) establish problems encountered in the availability and use of ICTs; (6) determine ICTs needs and establish the gaps between ICTs needed and ICTs available; and (7) determine strategies for bridging the gaps. This section (7.2) addresses the findings of objectives 1 to 5, while section 7.4 addresses objectives 6 and 7.

7.2.1 Types of ICT Competencies offered in sub-Saharan Africa LIS Education

It is evident from the study that a wide variety of ICT competencies have been incorporated in LIS curricula and most of the ICT modules are core. Most LIS schools offer a wide range of ICT modules covering many aspects including general ICT knowledge (*Fig. 5.3*), information storage and retrieval (*Fig. 5.4*), network technologies (*Fig. 5.5*), communication technologies (*Fig. 5.6*) and library management technologies (*Fig. 5.7*). The emphasis was found to be on Information Storage and Retrieval and Library Management Technologies, and this could be ascribed to the fact that they are vital for daily activities in current library and information centre services. Modules that fall under these two categories are offered in the majority of the LIS schools.

7.2.1.1 ICT Modules

Specific modules that stood out as receiving much attention include Hardware and Software Selection, Operating Systems, General Applications Software, Local Area Networks and Intranets. These modules are offered in 90% of the LIS schools. Modules that do not rate highly include Software Engineering, Distributed Systems and Broadcasting Technologies. These three are offered in relatively few LIS schools i.e. 31%, 31% and 35% respectively. Artificial Intelligence and Text digitization receive an average rating, being offered in 45% and 48% of the LIS schools.

7.2.1.2 Core vs. Elective

ICT competencies are regarded as very important for LIS graduates because most of the modules offered are core modules or integrated in core modules.

7.2.1.3 Theory vs. Practical

Most LIS schools fail to achieve a balance or combination of theory and practical teaching of the modules. Only four modules showed a high percentage of this desirable combination. These were Internet Tools – 76% of the 21 LIS schools offering the module, Hypertext 61% of 18 LIS schools, Internet Facilities – 60% of the 25 LIS schools, and Online Database Searching – 58% of the 26 LIS schools. The rest of the modules fell below 50% of the respective LIS schools offering each module.

7.2.2 ICTs in Use in sub-Saharan Africa LIS Education

ICTs include a variety of equipment/hardware and materials/software that operate both independently and integrated for information handling. These include computer hardware and software, telecommunication technologies and networks, broadcast technologies, and other components of intermediate technology based largely on analogue representation held in electromagnetic waves such as radio, television, telephone and facsimile.

7.2.2.1 Computer Hardware

The central component of ICT is the computer and the study found that many LIS schools have computers or access to computers, but the majority of them do not have adequate quantities or appropriate quality of computers. Generally, only 45% of students have reliable access within the ratio of one computer for less than five students. The majority of students (55%) share a computer with six or more colleagues. In the worst case, one computer is shared by 108 students, indicating that each student has only about 1½ hours per week to use the computer (assuming that the computer is functioning for 24 hours of each day). Additionally, computer hardware available is obsolete in many (52%) of the LIS schools and hence lacking the capacity to handle new and powerful software and other operations.

7.2.2.2 Computer Software

The prevalent operating system is Microsoft windows, with Windows '98 dominating the scene. This predominance of Ms Windows operating system is explained by Jensen (2000) as being a result of the predominance of the Intel and/or Intel compatible processors within Africa. The Linux operating system, although a freeware was only found in 17% of the LIS schools. It was not possible to establish why institutions have not taken advantage of the free software, but Ms Windows has greatly benefited from promising to be the state-of-the art software all the time, coupled with aggressive promotion (Wachira, 2000a). Other operating systems available but on a very small scale include Macintosh, UNIX and Ms-DOS. For networking, Windows Professional and Novell share the market.

A wide variety of applications software are found in the LIS Schools. For word processing, Ms-Office dominates but there is also Ms-Word and StarOffice in a few places. For spreadsheets and statistics there is Ms-Excel and the Statistical Package for Social Sciences (SPSS). The dominant database management software include the UNESCO's CDS/ISIS and Ms-Access. For DTP, Aldous PageMaker dominates, closely followed by Publisher and FrontPage. There are also software for library automation, programming, geographical information systems, internet navigation, readers/presentation and financial management (*see Table 5.11*). In institutions where web-based education is conducted, WebCT courseware is prevalent.

7.2.2.3 Communications Hardware

Information on communications software was not forthcoming from LIS schools mainly because Heads of LIS schools do not usually possess this data and hence it required consultation with relevant departments within the institution. However, five LIS schools have their own (departmental) modems and four have their own routers (*see Table 5.9 for modem/router names*). For data transmission, the most prevalent channels are UTP and Fibre-Optic, while Coaxial, wireless radio and VSAT are used to a much lesser extent.

7.2.2.4 Telecommunications

The digital PABX switching systems are more prevalent than their analog counterparts and in some cases institutions have both. Similarly, telephony and facsimile are shifting to digital even though analog lines are still available. However, not many LIS schools have dedicated lines for Internet data distribution (IDD), Integrated Services digital networks (ISDN) or digital subscriber lines (DSL). Cellular and wireless telephones are officially (i.e. excluding personal cell phones) used in a small fraction of LIS schools.

7.2.2.5 Internet Services

Internet is available in 76% of the LIS schools, with the majority of these (69%) operating on group internet account. Even though some institutions use multiple connection modes, the majority (55%) use dedicated line connection, while others use

dial-up (31%), satellite (10%) and radio connection (7%).

7.2.2.6 Broadcast Technologies

LIS schools do not generally have broadcast equipment except for very few of them that have television monitors and video and CD playback equipment. In some institutions (24%), broadcasting equipment for both production and receiving are centrally owned and hence the LIS school do not always have full data on types and quantities.

7.2.2.7 Electronic Resources

The majority of LIS schools in sub-Saharan Africa have access to electronic databases and other ICT supported information resources including the Internet, CD-ROM services, electronic document delivery services, library networks and subject gateways.

7.2.3 Use of ICTs in Teaching, Learning, Research, and Academic Administration

7.2.3.1 Instructional Technology

Although ICT application in teaching and learning has increased, the use is still rudimentary when compared to global developments in instructional technology. LIS schools make very limited use of ICTs as teaching/learning tools, in most cases applying these tools in areas that they (ICTs) cannot be avoided such as the teaching of Computer Literacy module. In most of the other teaching/learning activities, the application and use of ICTs is largely supplemental to traditional teaching methods and learning styles. Even in institutions that have facilities for web-supported teaching/learning, the online environment is not prevalent in LIS schools since most of them prefer to use offline procedures and stand-alone computers rather than active networking. Very few LIS schools offer online learning and where offered, it is highly selective of programmes and modules. In areas such as bulletin boards, distance education and collaborative teaching, sub-Saharan LIS schools are still a long way off from extensively using ICTs. For most of the other LIS schools, inadequate knowledge and skills in using these tools by academic staff, combined with inadequate resources, have made it difficult for the full power of ICTs as instructional technology to be exploited.

7.2.3.2 Research Resources/Support

In terms of ICT use in research, the study found that LIS schools use ICTs only occasionally and hence they have not yet exploited the full potential of the new technologies. Largely untapped are ICTs potential for collaborative research, especially between individuals in diverse institutions and/or countries, and for conferencing. Notably also, electronic publishing of research results on the Internet is low in sub-Saharan Africa LIS schools. But it was noted that a large part of these shortcomings could be mainly ascribed to the lack of ICT resources, especially when it comes to access to the Internet. For instance, some academic staff and students have to pay for Internet use from their pockets on pay-as-you-use-basis in Internet Cafés on campus, which creates a hurdle for academic research.

7.2.3.3 Academic Administration

For academic administration, most LIS schools have computerised many of the activities and approximately half the activities are conducted online. The majority (72%) of LIS schools are within a campus/institutional intranet, some (41%) of which can be accessed off-campus as well. Sixteen (55%) of the respondents in this study have websites, even though the scope of information provided on these web pages varies a great deal. However, when it comes to improving individual programmes or course management, ICT use is very poor. This may be attributed to the fact that many tertiary institutions favour the visibility of automating front-end activities, but lack the capacity to follow through with ensuring steady progress towards creating an electronic campus.

7.2.4 Levels of ICT Infrastructure in LIS Schools in sub-Saharan Africa.

General Infrastructure is poor because of the overall poor infrastructural base in most countries. Except for South Africa and a few other countries, the ICT infrastructure is inadequate in most sub-Saharan countries, both at institutional and national levels (Jensen, 2002). For instance, intra-Africa electronic connections like transportation connections are poor, even though connections between sub-Saharan countries and their former European colonial masters and the USA are often better and more frequent than direct connections across the continent. Moreover, in most sub-Saharan Africa countries,

satellite technology can only be used to access resources and no uplink and intra-African communications still leave much to be desired (Selinger, 2000). Thus there is need for general improvement of the infrastructure, creation of more efficient networks and the development of more email links to allow for more efficient communication.

7.2.4.1 ICT Policy

Generally, comprehensive and reliable ICT policies are lacking in most (62%) institutions. The importance of ICT policies as an empowering instrument for the implementation of the ICT project cannot be overemphasized. Thus the fragmented policies found in 41% of the institutions do not provide a stable base and plan for diffusion of ICTs.

7.2.4.2 Computerisation

The level of computerization may have increased but hardware and software in many LIS schools are generally quantitatively inadequate and qualitatively inappropriate as described in sections 7.2.1.1 and 7.2.1.2 above. There is need for more computers so as to increase the level of physical access, especially for students but also for academic staff in some institutions. There is also need for up-to-date hardware capable of handling more programmes, multimedia documents and complex activities. Alongside the hardware, there is need for relevant/enhanced/up-to-date software and suitable courseware for application in the LIS environment and for academic purposes.

7.2.4.3 Human Resources and Capacity/Expertise.

The competence of academic staff and students is a constraint and often requires that extra sessions are organized to provide them with both ICT literacy and advanced skills. Most LIS schools employ a variety of methods to re-skill their academic staff, including workshops, introduction to new software (e.g. WebCT, SPSS, etc.), induction sessions for new staff and availing a standby technical staff to whom academics can refer. Although it is not possible to comment on how well any or all of these methods have succeeded for lack of sufficient data on that issue, informal discussions suggest that the methods cannot be effective without strong motivation or pressure to bear upon academics. Such pressure

can include failure to achieve promotion, fear of loss of status or even probable dismissal. Alternatively, monetary gain can be used to motivate lecturers to improve their ICT skills. Thus the attitude of LIS academic staff is sometimes questionable. Most of them prefer to depend on technicians, 'young turks' or resort to old methods of handling their work.

7.2.5 Problems Impeding the Availability and Use of ICTs in LIS Schools in sub-Saharan Africa

The factors impeding increased and faster diffusion of ICTs in LIS education in sub-Saharan Africa are reflected in the conclusions above and include:

- a) Lack of ICT policies at institutional and national levels to map and the direction and benchmark the development of ICTs.
- b) *Inadequate infrastructure both at institutional and national levels thus affecting Internet connectivity, information flow/traffic and general access to the full range and power of ICTs.*
- c) Poor funding levels within tertiary and higher education institutions result in unsustainable ICT projects.
- d) Inadequate Hardware due to obsolescence and inadequate quantities.
- e) Inappropriate Software due to obsolescence and cost of updates.
- f) *Lack of ICT knowledge (epistemological access) among students because of poor ICT background in schools and home.*
- g) Inadequate expertise by academic staff and hence underutilization.
- h) Insufficiencies of technical support staff in terms of skills and numbers.

7.3 CONCLUSIONS

Information and communication technologies are widely viewed as having the power to narrow the gap between the developed and the less-developed countries, by providing the capabilities which will allow the less developed countries to "leap- frog" development, and hence tackle many social and economic problems. While this may be so, the ability for countries in sub-Saharan Africa to exploit existing and available ICT products

effectively depends on there being qualified people, among other things, who can effectively harness the power. Hence the presumption that, the development of LIS professionals, their needs and their potential, empowers these professionals to unleash the potential and the sophistication of technology for a growing information society within Africa.

Generally, sub-Saharan Africa has not been left too far behind in the adoption of information and communication technologies even though none of the countries can be said to be at the “cutting edge” of technological development. It is estimated that there are over 7.5 million PCs in Africa as a whole, with an average ratio of about 1 computer for every 500 people (Jensen, 2002). While this is an improvement, it is still comparatively low compared to developed countries. Jensen (2000) further observes that ‘outside of South Africa there are only handfuls of mini and mainframe computers, and most of these are confined to Ministries of Finance for government payroll, and a few of the larger parastatals, telecom operators, banks and insurance companies. IBM, NCR, Bull and ICL are the dominant suppliers of mini and micro-computers, although there are also some Fujitsu machines.’ Most of the PC equipment uses Intel or Intel-compatible processors and Microsoft Windows is the dominant operating system. In so far as the Internet is concerned, the current estimate of the total number of African Internet users is about 8 million. The shared/public access and the use of corporate networks is continuing to grow at a fairly fast rate, as seen in the deployment of international Internet bandwidth, which still expanding substantially – 1 500 Mbps outgoing bandwidth in 2002 (Jensen, 2002). According to Jensen (2002) there is comparatively low level of technology penetration in Africa because of irregular or non-existent electricity supplies especially in rural areas, and the limited and costly road, rail and air transport networks. This is further compounded by the view that computers and other new technology are luxury items and hence attracting heavy taxation. Furthermore, the scarcity of skills and expertise at all levels - from policy making down to end-user - which are exacerbated by the brain drain and generally low levels of education and literacy amongst the population, also contribute to the slow penetration of ICTs in Africa.

In the realm of LIS education, the curricula in many LIS schools include relevant ICT competencies, and institutions are trying to incorporate ICTs in their academic operations and/or activities. However, the diffusion and exploitation of ICTs is still comparatively low especially when viewed against global trends as seen in the literature review (Chapter 3). This study has established that LIS schools in sub-Saharan Africa have to contend with a number of issues and challenges that have rendered it problematic to fully incorporate the new technologies. 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. Certain prerequisites for the effective harnessing of ICTs such as reliable power supply to operate the computers, a well functioning telephone network to transmit data, foreign currency to import the technology, and computer literate personnel, are not up to required standards and hence there is need for attention to be paid to these aspects in many institutions. 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. Although infrastructural elements remain inadequate in many sub-Saharan countries, the infrastructure that is already in place offers enough opportunity for increased incorporation of ICTs in teaching, learning, research and administration of LIS education.

Based on the conclusions above, it is concluded that this study largely achieved its aim, the objectives were reached and all the research questions were addressed. The theoretical framework used for this study, the Diffusion of Innovations Theory by Rogers, provided a fairly suitable framework for addressing both the hard (i.e. the ICT products and services) and soft (i.e. innovative ideas) ICTs. However, though providing a good tool for descriptive research (and this study exploited this aspect of the theory), the theory did not adequately provide a basis for predicting outcomes as well as providing guidance as to how to accelerate the rate of adoption. Additionally, the theory's focus, which is on the socio-economic issues of ICTs - the "social system" defined by the theory (*see section*

2.3.1.5), was somewhat different from the pertinent issues in developing countries in sub-Saharan Africa such as funding, expertise, politics and culture. Nonetheless, the broad framework of the theory provided a platform for investigating the unique social system that is the sub-Saharan Africa's reality. Regarding the methodology used for this study, it was concluded the quantitative approach was effective and questionnaire administration using electronic mail was proved to be a viable method of data collection from most parts of Africa. However, constant follow-up and reminders were necessary and are advised.

7.4 RECOMMENDATIONS

It is apparent and noted that most of the shortcomings relating to the incorporation of ICTs in LIS education can be mainly ascribed to the lack of ICT resources. There are identifiable factors that influence the availability of these resources including policies that should facilitate and guide the development and use of ICTs, sustained funding, appropriate equipment and improved expertise and management. Thus any strategies to overcoming these shortcomings need to urgently address these militating factors at national, institutional and departmental levels.

7.4.1 Types of ICTs currently needed in sub-Saharan Africa LIS Education.

Since information handling is increasingly merging, it is pertinent for every LIS graduate to be as well versed in network and communication technologies as in Information Storage and Retrieval and Library Management technologies. Jobs that are in private organizations, for instance, may require an individual who can effectively function within all the ICT aspects related to information generation, capture, processing, transmission and dissemination strategies and solutions, as well as serve as the IT manager/specialist.

7.4.1.1 ICT Knowledge

Even though sub-Saharan Africa LIS schools collectively offer an adequately wide variety of ICT modules and these modules are accorded priority status as core/required modules, however, only few LIS schools offer the full range of ICT competencies and some of the individual institutions do not offer enough ICT modules. Thus it is

recommended that all LIS programmes ensure that adequate varieties and levels of competency are offered to students. Where necessary, LIS schools should continually review their curricula and/or infuse a stronger ICT component, especially considering the pace of developments in the ICT industry. Apart from the established procedures of curriculum review, LIS schools can find out the modules that are being offered in other similar programmes firstly by checking web sites other LIS schools in Africa and other parts of the world. A cursory glance at other curricula will easily highlight areas that may be missing in a particular LIS school's curriculum and lead to further investigation and hence updating of curricula. Secondly, 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. In other cases, 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 adequate ICT facilities are available, this can be achieved through distance education and/or online education. The example of collaboration between the Kenya School of Professional Studies and Technikon South Africa could be emulated, especially if the extend to which this venture is successful can be ascertained.

7.4.1.2 ICT Skills Development

Teaching the theory of an ICT module without practice is insufficient because most ICT competencies are not effectively learned in the absence of providing adequate coverage through practical orientation. *It is recommended, therefore, that LIS schools 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. While appreciating that the major reason for this problem could be the inadequacy of facilities, LIS schools should arrange/organize practical attachment/placement for students to work in particularly ICT-rich environments that can reinforce the theoretical knowledge. Such attachments should be well timed.

7.4.2 Use of ICTs in Teaching, Learning, Research, and Academic Administration in LIS Schools in sub-Saharan Africa.

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.

7.4.2.1 ICTs for Teaching/Learning

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. It is, therefore, recommended that the use and application of the full range of Information and Communication Technologies as tools for teaching/learning be increased in Library/Information Science education in sub-Saharan Africa. This can be done if academic staff take the initiative and are encouraged to exploit whatever ICT resources that are already in the department, such as computer laboratories, by posting course schedules, materials, notes, assignments and other communication to students through LANs, intranets or Internet. It is also strongly suggested that each LIS school should explore means and ways of offering more online classes/courses/programmes by investing in courseware such as WebCT and training academic staff and students to use it. Effort must be made by each LIS school to harness more technology, under the leadership of departmental Head. 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 (*see Chapter 2, section 2.3.2.2*) by allowing early adopters to provide guidance.

7.4.2.2 ICTs for Research

Access to the Internet should no longer be viewed as a luxury or privilege for only a few people. In academic circles, which are essentially knowledge/information intensive, access to the Internet and hence to the world's stores of knowledge is a necessity. Thus

cases where some academic staff have to pay individually for Internet use in their institutions, should be done away with. In the institutions where this is a problem, it is recommended that LIS departments lobby, together with other academic units within their institutions, to gain greater access to Internet resources for academic staff and/or research. Such lobbying should incorporate the framework and action plans of the African Information Society Initiative (AISII) (*see Chapter 3 section 3.3.1.6*), whose aim includes facilitate the establishment of affordable and widely accessible Internet services in Africa. Other avenues that can boost greater access to the Internet include the African Virtual University (AVU) Project, the Education for Development of Democracy Initiative (EDDI), the Regional Information Society Network for Africa (RINAF) Project, the United Nations University (UNU) Africa Network, and the USAID Leland Initiative (*see Chapter 1 section 1.2.2*). At the same time, academic staff and students should be encouraged to exploit ICTs for their research needs and activities. These tools can greatly improve the types, nature and level of research conducted in sub-Saharan Africa's LIS schools.

7.4.2.3 Academic Administration

Many tertiary institutions favour the visibility of automating front-end activities, such as establishment of websites. But further, other management activities such as online application and registration, online academic records administration, and intranet communication should also be increased and used to maximize efficiency and reduce some of the costs for students. This could be achieved through the digitisation of application and registration forms, which are then made available for completing and submitting online, or downloading. Furthermore, students' records could be made available online, so that each student should be able to access his/her financial records or academic records, as long as appropriate data security measures are incorporated in the system. Thus a student should be able to ascertain his/her situation, be it financial or academic, without necessarily taking a trip to the university, or to the administration block or to the Head of Department's office.

7.4.2.4 Academic Staff

For lecturers to be empowered to teach and research, they need greater access, training and use of appropriate hardware, software, networks and databases or resources, so as to keep abreast with developments in the ICT field. It is recommended that LIS schools must strive to improve the levels of access to computers and the Internet for academic staff, and offer opportunities for their training and re-skilling. Training can either be conducted internally within the institution/department, or by the provision of funding and leave to academic staff for attending short courses and/or workshops. However, it is also strongly suggested that LIS academic staff change their attitude towards ICTs and be positive towards change and learning new methods, techniques and skills of teaching.

7.4.2.5 LIS Students

LIS students must realize that in today's competitive world, learning is increasingly becoming their (students) responsibility and ICTs are the tools that can enable them achieve highly. It is recommended, therefore, that students should be made cognizant of the changes in the educational and work environments, and given all possible opportunities to take advantage of ICTs for their personal career growth. LIS schools need to strive to provide facilities and guidance for students through lectures, workshops and practice.

7.4.3 ICTs Project Support in LIS Schools in sub-Saharan Africa.

7.4.3.1 ICT Policy

A policy document is important, not only as a blueprint for expected development and action, but also as a basis and framework for negotiations for collaboration and sharing and services with other institutions, ISPs, government and cross-border data flows. There is a need for policies that deregulate satellite communication and other telecommunication links. 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. It is recommended that LIS schools jointly add their voice to effort being made by other professional ICT interest groups such as AISI, AAU, national ICT

groups/societies and other stakeholders, to lobby for improved ICT policies and infrastructure in their institutions and countries. AISI and AAU have already developed frameworks for such policies and can provide assistance/guidance and information for LIS schools and institutions.

7.4.3.2 Funding vs. Price of ICTs

It is suggested that LIS schools persuade their institutions to negotiate for friendly pricing of ICT products from the producers of these products. It is encouraging to note that although only a few of the international companies operate offices in Africa, some companies, such as Bull, Compaq, IBM, NCR, Oracle and Microsoft have reliable local representation in most countries and Microsoft now has its own offices in several African countries including Cote d'Ivoire, Kenya, Morocco and South Africa (Jensen, 2002). 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, 2002). At the same time it is recommended that LIS schools in sub-Saharan Africa 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.

7.4.3.3 Technical Support and Expertise

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. But secondly, in the case of Africa, there is the old problem of brain-drain when the few experts opt for better paying jobs overseas. Hence the solution to this problem is complex and may not be sufficiently addressed by this study. But in the case of LIS schools in sub-Saharan Africa, one strategy would be to ensure that everyone in the department, especially academic staff, has general skills for simple trouble-shooting and recovery. This can be achieved through regular seminars and workshops. Additionally, centres of excellence should be established within institutions and/or countries to tap, train and develop expertise as recommended by Addo (2001:149). The brain-drain problem could be solved if LIS schools and/or their parent institutions establish well-remunerated positions that can attract and retain the right expertise for specialist tasks.

7.4.4 Further Research

In the mapping and audit of ICTs in LIS education in sub-Saharan Africa, this study focused on the descriptive analysis and hence provides an inventory of both the soft and hard technologies. However, such inventory does not reveal the entire extent to which these technologies have diffused into LIS education, and to ascertain this, it is imperative that further and qualitative studies need to be conducted. Three areas that are recommended for such research include:

7.4.4.1 Standards i.e. the scope of ICT competencies that are offered in LIS schools. In this study, LIS schools responded to a list of modules by indicating whether or not they offer them in their programmes. Although titles of modules give an indication of what is offered, it does not clearly depict what is taught and to what level. Additionally, this study did not ascertain the level of study or specific programmes in which the modules are offered. Hence a module may have scored highly, when it is offered, say only at postgraduate level – hence leaving the

programmes in which the modules are offered. Hence a module may have scored highly, when it is offered, say only at postgraduate level – hence leaving the majority such as the undergraduates, or in only one programme which may similarly exclude many LIS students. It would be useful to find out the scope reached by the LIS schools for each module and thus further research is recommended.

7.4.4.2 Satisfaction Levels of Students and Staff can reveal much of the ICT situation in LIS education. This study relied on the views of one key informant in each LIS school. However, the actual implementers and consumers of ICTs in LIS education are the academic staff and students, whose views and observations provide deeper insights into the situation. The value of user studies cannot be overemphasized. It is, therefore, recommended that a study focusing on the perceptions, views and needs of LIS students and staff be conducted so as to complete the picture of ICTs in LIS education in sub-Saharan Africa.

7.4.4.3 The Rest of Africa. This study, like most studies, has investigated what is generally referred to as Africa South of the Sahara, but even then, predominantly focusing on Anglophone countries. Because of financial and time limitations, it was not possible for this study to stay on its original course of including all the above. Yet at this time of increasing regionalization within globalization, there seems to be a knowledge gap, within LIS circles, about Northern Africa as well as the Lusophone (majorly) and Francophone LIS schools. It is, therefore recommended, that further research be conducted, either focusing on these logistically excluded areas, or ensuring that they are included in any major studies.

7.5 Conclusion

In conclusion, it is noteworthy that ICT issues, like other socio-economic issues are being addressed by the African Union and their programme, the New Partnership for African Development (NEPAD), which is supported by the international community. This many-faceted effort is aimed at accelerating Africa's development and could, as a result, help to

create an environment more conducive to the rapid adoption of ICTs. Additionally, the AISI digital agenda, whose framework aims to build Africa's ICT capacity, provides strategies and plans for regional, national, sectoral and village approaches.

- National Information and Communication Infrastructure (NICI) policies and plans represents national response to facilitate the digital inclusion of Africa and its integration into the globalization process by developing national ICT policies, strategies and implementable programmes (AIS, 2003).
- Sectoral Information and Communication Infrastructure (SICI) policies and plans is a strategy to enable various groups and sectors gain identify their ICTs needs and devise the appropriate and corresponding applications (AIS, 2003).
- Village Information and Communication Infrastructure (VICI) policies and plans are developed to decentralize the NICI process after the formulation of the national policy as a way of democratizing access under the AIS framework and philosophy. VICI plans give a chance to the majority of the African people including those living in the rural areas, who constitute approximately 60-70 per cent of the national populations to become actors and identify their ICT needs (AIS, 2003).
- The Regional Information and Communication Infrastructure (RICI) policies and plans provide a facility for harmonizing national strategies at the sub-regional levels by Regional Economic Communities for consistency in regional economic integration goals in the area of ICTs. RICI strategies will also allow for harmonization of national regulatory frameworks as countries deregulate and liberalize their telecommunication markets. RICI policies also provide a framework for the development of information and communication infrastructure that can facilitate regional economic integrations goals of the African continent. This strategy aims to provide an impetus for strengthening capacity at the sub-regional level in ICT. So that a critical mass can be developed and built, to facilitate regional integration through ICTs (AIS, 2003).

However, professionals cannot leave this effort to politicians and corporate magnates alone. LIS educators, therefore, and the larger LIS fraternity in sub-Saharan Africa have

to add their individual, group and organizational efforts to improve the diffusion of ICTs in sub-Saharan Africa.

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Appendix A: Questionnaire

Questionnaire to assess the status, use and application of Information and Communication Technologies (ICTs) in Library and Information Science (LIS) Education in Africa.

SECTION 1: FACTS ABOUT YOUR L/IS SCHOOL

1.1 Name of the L/IS Institute/School/Faculty/Department/Unit¹¹

.....
.....

1.2 Address:

Postal

Telephone:

Fax:

Email:

Website/URL:

1.3. Date of establishment of L/IS School/Faculty/Department

1.4 Has the L/IS school/faculty/department undergone name changes since its establishment? NO/YES

If so please state the change(s), the year of change(s) and the reason for change(s)

.....
.....
.....
.....
.....

1.5 Population of the L/IS School/Faculty/Department/Unit:

.1 Students: undergraduates L/IS Other postgraduates L/IS Other

.2 Teaching staff/Researchers:

.3 ICT Staff (e.g. technicians)

.4 Administrative staff:

1.6 List of current departments (where applicable e.g. if yours is a School, Faculty or Institute):

.....
.....
.....
.....
.....

¹¹ *Note that different countries/institutions use different structures/designations. Please use the one which*

1.7 List the L/IS degree/diploma programmes offered (*you may alternatively supply a copy of your curriculum/syllabus*)

.1 Undergraduate (please specify whether certificate diploma or degree)

.....

.....

.....

.....

.....

.....

.....

.2 Postgraduate (please specify e.g. honours, diploma, masters or PhD)

.....

.....

.....

.....

.....

SECTION 2: THE USE AND APPLICATION OF ICTs

2.1. ICT Course content taught in your L/IS School/Faculty/Department programmes

2.1.1 General ICT knowledge (*you may tick more than one*)

Course	Not Taught	Core/ Required	Elective	Integrated in other course/module	Taught as Theory	Taught as a Practical
.1 Computer architecture						
.2 Hardware/software selection						
.3 Programming						
.4 Software engineering						
.5 Operating systems						
.6 General application programmes e.g. word processing						
.7 Information systems design/analysis						
.8 Distributed systems						
.9 Broadcasting technologies						

applies in your case for the education of Library and/or Information Science(s).

2.1.2 Storage/Retrieval Technologies (*you may tick more than one*)

Course	Not Taught	Core/ Required	Elective	Integrated in other course/module	Taught as Theory	Taught as a Practical
.1 Online database searching						
.2 Automatic indexing/abstracting						
.3 Electronic current awareness systems						
.4 Electronic document delivery						
.5 Artificial Intelligence and expert systems						
.6 Text digitisation						
.7 Hypertext						
.8 Multimedia/hypermedia						
.9. Other (please specify)						

2.1.3 Network Technologies (*you may tick more than one*)

Course	Not Taught	Core/ Required	Elective	Integrated in other course/module	Taught as Theory	Taught as a Practical
.1 Internet hardware and software						
.2 Internet facilities e.g. telnet, ftp, etc						
.3 Internet tools e.g. Netscape						
.4 Intelligent gateways e.g. Easynet						
.5 Local Area Networks						
.6 Intranet						
.7 Electronic Publishing						
.8 Other (specify)						
.9 Other (specify)						

2.1.4 Communications (*you may tick more than one*)

Course	Not Taught	Core/ Required	Elective	Integrated in other course/module	Taught as Theory	Taught as a Practical
.1 Telecommunications						
.2 Data Communication						
.3 Human-computer interaction e.g. natural language processing, speech technology, GUI, virtual reality, etc.						
.4 Other (please specify)						

2.1.5 Library Automation

Course	Not Taught	Core/ Required	Elective	Integrated in other course/module	Theory	Practical
.1 Library automation software						
.2 Management of Library Automation						

2.2. Application of ICT in teaching and learning

2.2.1. Does your L/IS School/Faculty/Department use ICT in teaching & learning:

	Always	Sometimes	Not at All
.1 To develop curriculum?			
.2 In the presentation of lectures?			
.3 For the Electronic Bulletin Board?			
.4 To develop local websites?			
.5 For assignments/projects by e-mail?			
.6 To provide feedback to students?			
.7 For distance learning?			
.8 To provide basic computer literacy skills?			
.9 To improve access to remote resources?			
.10 To provide content (e.g. CD-ROM's, www)?			
.11 To support teaching methodology (e.g. group work tools for group assignments/discussion on the Intranet)?			
.12 To improve course management (both in the regular curriculum and in distance education)?			
.13 To collaborate in online teaching and e-learning with other faculty and students from around the world?			

2.2.2 Which L/IS courses/modules (if any) are taught online? (please indicate whether partially or fully)

.....

.....

.....

.....

.....

.....

.....

.....

2.2.3 How does the L/IS School/Faculty/Department support academics in the development and application of ICT-based teaching and learning materials?

	Yes	No
.1 Regular seminars/workshops.		
.2 Training at the introduction of new software.		
.3 Induction for new staff		
.4 By provision/availability of standby technical staff.		
.5 A combination of the above.		
.6 No specific arrangements exist.		

2.3. Application of ICT in research

2.3.1 Does your L/IS School/Faculty/Department use ICT in research :

	Always	Sometimes	Not at All
1 To 'advertise' research plans and/or find donors, etc. on the www?			
.2 To collect academic/research information?			
3 As a research tool e.g. statistical packages, simulation software?			
.4 To collaborate with other researchers worldwide?			
5 To disseminate academic/research information?			
6 In national collaboration e.g. to create networks,?			
.7 In International collaboration e.g. to create networks?			
.8 To provide conferencing/group work tools?			
.9 For electronic publishing of the research outcomes, theses, etc. on Intranet ?			
.10 For electronic publishing of the research outcomes, theses, etc. on Internet ?			

2.3.2 Is the L/IS School/Faculty/Department linked to Internet? Yes [] No []

If yes, is the Internet accessible to the:

	Yes	No	Free	Fee/Charged
.1 Dean/Director?				
.2 Head(s) of Department(s)?				
.3 Academic staff?				
.4 Students?				
.5 Administrative staff				

2.3.3 Does the L/IS School/Faculty/Department have access to:

	Yes	No
.1 Academic information through an Intranet ?		
.2 Electronic databases e.g. through subject gateways, CD-ROMs, specialised databases?		
.3 Electronic document delivery services ?		
.4 Virtual libraries e.g. library networks?		

2.3.4 Does the L/IS School/Faculty/Department subscribe to international databases? Yes [] No []

If yes, please provide names of some of the databases

.....

.....

.....

.....

2.3.5 Does the L/IS School/Faculty/Department provide training for academic information retrieval on the Internet to the staff? Yes [] No []

2.4. Application of ICT in administration and management

2.4.1. Is the L/IS School/Faculty/Department linked to campus network? Yes [] No []

If yes, is this network accessible to the :

	At Office		At Home		Both	
	Yes	No	Yes	No	Yes	No
.1 Academic staff ?						
.2 Students ?			+21X			
.3 Administrative staff ?						

2.4.2. Is your L/IS School/Faculty/Department applying computerisation in the following areas?

	Yes		No
		Online	
.1 Students' Registration			
.2 Students' records administration?			
.3 Personnel/Human Resources Management?			
.4 Financial administration?			
.5 Assets and maintenance?			
.6 Internal Communication (e.g.-mail)?			
.7 Office automation?			
.8 Supporting management decisions (MIS)?			
.9. Interacting with stakeholders?			

2.5. ICT infrastructure *(please/kindly refer to Systems staff if necessary)*

2.5.1. Does your institution have an ICT policy? Yes ☐ No ☐

2.5.2. Does this policy explicitly include your L/IS School/Faculty/Department's goals?: Yes ☐ No ☐

2.5.3. What types of ICT infrastructure does your L/IS School/Faculty/Department have?

	No	Yes	Number	No. of PCs involved
.1 Stand alone computers?				
.2 Departmental Network(s)?				
.3 Departmental Computer laboratories?				
.4 Campus-wide laboratories?				
.5 Campus-wide backbone connecting LAN's?				
.6 Multi-campus backbone connecting LAN's?				

2.5.4. Provide the following accessibility ratios for the L/IS school/faculty/department:

.1 Computer-student ratio:.....

.2 Computer-staff ratio:.....

.3 Computer-all users ratio:

Hardware

2.5.5. Provide the name and characteristics of :

	Owned by L/IS	Owned by Institution
.1 MODEMs being used		
.2 Routers being used		

2.5.6. What types of carrier technology is being used:

	Yes	No		Yes	No
.1 VSAT			4 Unshielded Twisted Pair (UTP)		
.2 Wireless radio			.5 Coaxial		
4 .3 Fibre-optic					

Software

2.5.7 Provide a list of **operating systems (OS)** with their version in use in your L/IS
School/Faculty/Department:

OS System and Version (e.g. Linux, Unix, Novell, etc)	Proprietary	Freeware

2.5.8 Provide a list of all **application programs/software**, with their version in use in your L/IS
School/Faculty/Department

- .1
- .2
- .3
- .4
- .5
- .6

2.6. Internet connectivity

2.6.1. What type of Internet connectivity does your L/IS School/Faculty/Department have?

.1 Email: . Domain Account Yes ☐ No ☐

. Single Account Yes ☐ No ☐

.2 Internet : What types? (If Yes, provide Bandwidth)

Dial-up connection? Yes ☐ No ☐

Dedicated line connection? Yes ☐ No ☐

Satellite connection? Yes ☐ No ☐

Radio connection? Yes ☐ No ☐

2.6.2 Average number of times the Internet connection is down per week:

2.6.3 Average duration of down time per week:.....

2.6.4 What are the causes of down times?.....

.....
.....

Telecommunication

2.6.8. Type of PABX used at your institution: Analog ☐ Digital ☐

Telephone lines:

2.6.8.1 Provide in the following table the quantity of the types of telephone lines used in your institution:

Lines	Quantity	Types (quantity)				
		Analog	Digital	ISDN	DSL	Other
Local						
Extensions						
Internet Data Distribution						
Other						

VSAT = Very Small Aperture Terminal; ISDN = Integrated Services Digital Network; DSL = Digital Subscriber Line

2.6.8.2 Does your L/IS School/Faculty/Department have official cellular phones: Yes ☐ No ☐

2.6.8.3 Does your L/IS School/Faculty/Department have official wireless phones: Yes ☐ No ☐

Fax Lines:

2.6.8.5 Provide in the following table the types, quantity and thickness of fax lines used in your institution:

Lines	Quantity	Types (quantity)				
		Analog	Digital	ISDN	DSL	Other
Local						
Internet Data Distribution						
Group Faxing Services						
Other						

ISDN = Integrated Services Digital Network; DSL = Digital Subscriber Line

Broadcast communication facilities owned by your School/Faculty/Department:

2.6.9 Radio production equipment:

Description	Quantity
.....	
.....	
.....	

2.6.10 Television equipment:

Description	Quantity
.....	
.....	
.....	

2.6.11 Satellite equipment:

Description	Quantity
.....	
.....	
.....	
.....	

2.7. ICT Organisational/support infrastructure

2.7.2 Are the support responsibilities in your institution:

- .1 Centrally available? Yes [] No []
- .2 Decentralised in users' units and departments? Yes [] No []

2.7.3 Does your L/IS school/faculty/department have staff in the following technical/functional ICT areas:

	Yes	No
.1 Network management?		
.2 Administrative system analysis and design?		
.3 Intranet and internet application development?		
.4 Hardware maintenance and repair?		
.5 Instructional technology i.e. combining pedagogy with technology?		

2.8. ICT financing

2.8.1 Does your L/IS School/Faculty/Department have a separate ICT budget available? Yes [] No []

2.8.2 Does your ICT budget take into account the following items separately?:

	Yes	No
		% of ICT budget
.1 Hardware acquisition		
.2 Software acquisition		
.3 Hardware depreciation		
.4 Software license fees		
.5 Hardware maintenance		
.6 System development		
.7 ICT technical staff training		

2.8.3 State the approximate external/donor percentage of your budget on ICT for the past three-(3) years:

2002:..... 2001:..... 2000:.....

SECTION 3: ICT CONSTRAINTS AND NEEDS IN LIS SCHOOLS

3.1. Problems encountered in the application and use of ICT in your L/IS school/faculty/department

3.1.1 Technical constraints:

	Yes	No		Yes	No
1 Telecommunication and other relevant infrastructure:			.6 Electricity supply:		
.2 Low bandwidth:			.7 Human resources – academic staff competence		
.3 Analog data transmission			.8 Human resources – students' competence		
.4 Hardware inadequacy and/or obsolescence			.9 Human resources – support staff for development & maintenance		
5 Software currency/compatibility			.10 Internet Services Provider		

3.1.2.Non-technical constraints:

	Yes	No		Yes	No
.1 Telecommunication or ICT policy matters			7 Lack of awareness about the ICT in the university and in the country		
.2 Telecommunication charges			.8 Cost of software		
.3 Number of computers			.9 Network connection/License fees:		
.4 Cost of equipment			.10 Space		
.5 Indifference and/or resistance			.11 Others (please, specify)		
.6 Funding:			.12 Others (please, specify)		

3.2 What are the ICT un-met needs of your L/IS school/faculty/department in relation to?:

- 3.2.1 Faculty use in teaching:
.....
- 3.2.2 Students’ access and use in learning:
.....
- 3.2.3 Research:
.....
- 3.2.4 Networking:
.....
- 3.2.5 Management:
.....

SECTION 4: PLEASE WRITE IN THE SPACE PROVIDED ANY FUTURE PLANS RELATED TO THE DEVELOPMENT AND USE OF ICTs AT YOUR L/IS SCHOOL (e.g. new programmes/courses, updating of infrastructure/systems, etc.)

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THANK YOU FOR YOUR TIME AND CONTRIBUTION!

Appendix B LIS schools in Africa

- Botswana:** University of Botswana, Department of Library and Information Studies (est. 1979)
Private Bag, UB 00704, GABORONE, Botswana; Tel. +267-355-2627; Fax: 267-585098
Web-site: http://www.ub.bw/departments/humanities/library_mission
Email: lis@mopipi.ub.bw
Contact person: Dr. K. Moahi (HOD); moahikh@mopipi.ub.bw
- Cameroon:** Université de Yaoundé I
B.P. 337 Yaoundé - Cameroun
- DRC:** University of Kinshasa, School of Librarianship, Information and Archival Studies
B. P. 235, KINSHASA XI, Democratic Republic of Congo.
- Ethiopia:** University of Addis Ababa, Department of Library Science & School of Information Studies for Africa, P. O. Box 1176, ADDIS ABABA
Email: Sisa.aau@telecom.net.et
- Ghana:** University of Ghana, Department of Library & Archival Studies (est. 1961)
P. O. Box 60 LEGON, Ghana; Fax: 66770
Web-site: <http://www.ug.edu.gh/Dlas/index>
Email: dlas@libr.ug.edu.gh
Contact person: Prof. A. Alemna and Prof. P. Akotia (HOD): pinoakitia@yahoo.com
- Kenya:** Eldoret Polytechnic, Small Business Centre, (est. 1990)
P.O. Box 4461. ELDORET, Kenya; Tel.: +254-321-32661-4
- Kenya Polytechnic, Department of information and Liberal Studies, (est. 1987)
P.O. Box 52428, NAIROBI, Kenya; Tel.: +254-2-338231; Fax: +254-2-219682
Email: polymis@swiftkenya.com
Contact person: Ms. S. Kibugi (HOD).
- Kenya School of Professional Studies, Department of Information Science, (est. 1993)
P.O. Box 60550, 00200 City Square, NAIROBI, Kenya; Tel.: +254-2-3750255-8
Ext.128; Fax: +254-2-3750260
Web-site: <http://www.ksps.ac.ke>
Email: enquiries@ksps.ac.ke
Contact person: Mr. D. Gathage (HOD).
- Kenyatta University, Department of Library Studies, (est. 1984)
P.O. Box 43844, NAIROBI, Kenya; Tel.: +254-2-810901 Ext. 57414
Web-site: <http://www.ku.ac.ke/academic/faculties.asp?fcode=EHR>
Contact person: Mr. Mwathi (HOD).
- Moi University, Faculty of Information Sciences (est. 1988)
P.O. Box 3900, ELDORET, Kenya; Tel.: +254-321-43720; Fax: +254-321-43047.
Web-site: <http://www.mu.ac.ke/finform/index.html>
Email: deanfis@irmmoi.com
Contact person: Prof. C. N. Odini (Dean).

Sigalagala Technical Institute, Department of Information and Technology (est. 1990)
P.O. Box 2966, KAKAMEGA, Kenya; Tel.: +254-331-41001; Fax: +254-331-41226
Email: sigalagala@swiftkisumu.com
Contact person: Mr. Opiyo (HOD).

University of Nairobi, Library Department, (est. 1999)
P.O. Box 30197, NAIROBI, Kenya; Tel.: +254-2-33244; Fax: +254-2-336885
Web-site: <http://www.uonbi.ac.ke/jkml/user.htm#skills>
Contact person: Mrs. G. Irura (Co-ordinator); girura@yahoo.com

Liberia: Institute of Librarianship
P. O. Box 1850. MONROVIA, Liberia

Malawi: Malawi Library Association (MALA) (in collaboration with University of Malawi Libraries and the National Library Service) P. O. Box 529, ZOMBA, Malawi; Fax: +265-1-525225
Contact Person: Vuwa-Phiri (MALA President): dbvphiri@sdpn.org.mw

Mzuzu University, (est. 2003)
Private Bag 1, Luwingu, Mzuzu 2, Malawi; Tel. +265-333-575/579; Fax: +265-334-505
Contact Person: Prof J. Uta (HOD): juta@sdpn.org.mw

Namibia: University of Namibia, Department of Information & Communication Studies (est. 1995).
P. O. Box Private Bag, 13301, WINDHOEK 9000, Namibia; Fax: (061) 307-2444
Web-site: <http://www.unam.na/faculties/humanities/ILS/index.html>
Contact person: Prof. K. Mchombu (HOD). kmchombu@unam.na

Nigeria: Abia State University, Department of Library and Information Science (est. 1981)
P.O. Box 2000 Uturu, Nigeria; Tel. +234-88-220785
Contact person: Dr. E. Madu: evamadu@yahoo.co.uk

Ahmadu Bello University, Department of Library Science
P. O. Box 1044, Samaru, Kaduna State, Nigeria

Bayero University, Department of Library and Information Science (est. 1977)
P. O. Box 3011 KANO, Nigeria; Tel. +234-64-661480/601280 Fax: +234-64-660023
Contact person: B. Abubakar magaji02@yahoo.com

University of Ibadan, African Regional Centre for Information Science, (est. 1990)
P.O. Box 22133, U.I.P.O. IBADAN, Oyo State, Nigeria; Tel.: +234-2-8103610
Email: arcis@infoweb.abs.net
Contact person: Dr. M. A. Tiarniyu (Director).

University of Ibadan, Department of Library, Archival & Information Science;
P. O. Box 22133, U.I.P.O. IBADAN, Oyo State, Nigeria
Contact person: Prof. B. Alegbeleye (HOD): galegbe@mail.skannet.com

University of Maiduguri, Department of Library Science;
P. M. B. 1069, MAIDUGURI, Borno State, Nigeria

University of Nigeria, Department of Library Science;
NSUKKA, Enugu State, Nigeria. Email: misunn@aol.com

The Polytechnic Nekede - Owerri.
P. M. B. 1036, OWERRI, Imo State, Nigeria.

Senegal: University Chiekh Anta Diop - Dakar, Ecole Des Bibliothecaires, Archivistes et Documentalistes (EBAD)
B.P. 5005 DAKAR-Fann, Senegal; Tel 221-8257528; Fax 221-22-2695.
Web-site: <http://www.ucad.sn/tdmat.html>
Email: info@ucad.sn
Contact person: Prof. M. Thiam

Sierra Leone: University of Sierra Leone, Fourah Bay College, Institute of Library and Information Studies (INSLICS) (est. 1987).
Mount Aureol, FREETOWN, Sierra Leone; Tel. +232-22-224607; Fax: 232-22-224260
Web-site: <http://fbcul.sl.8k.com>
Email: Fbadmin@sierratel.sl (general contact) vesking@hotmail.com (principal)
Contact person: Prof. J. Magnus magnusjohn40@yahoo.com

South Africa: University of Cape Town, Department of Information and Library Studies (est. 1939)
P.O. Private Bag, Rondebosch 7701, South Africa; Tel.: +27-21-6503090; Fax: +27-21-6504545/3489
Web-site: www.ched.uct.ac.za/cil/dils
Email: cil@ched.uct.ac.za
Contact person: P. G. Underwood (HOD): pgu@education.uct.ac.za

University of Fort Hare, Department of Library and Information Science
P. O. Private bag X1314, ALICE 5700, CISKEI, South Africa; Fax: +27- -90404/31255
Web-site: www.ufh.ac.za
Contact person: Ms. Nkweta: nkweta.em@ufhcc.ufh.ac.za

University of Natal, School of Human and Social Studies, Department of Information Studies; (est. 1973)
P. O. Private Bag X01 SCOTTSVILLE. 3209, South Africa; Tel.: +27-033-2605095; Fax: +27-(033)-260-592
Web-site: <http://www.nu.ac.za>
Contact person: Dr. C. F. Stilwell (HOD); stilwell@nu.ac.za

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University of South Africa (UNISA), Department of Information Science (est. 1955)
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Contact person: Prof Johan Kinghorn, (questionnaire completed by Prof. Ben Fouche
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Web-site: [http://www.udsm.ac.tz/departments_is](http://www.udsm.ac.tz/departments/is)
Email: director@libis.udsm.ac.tz
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- Zimbabwe:** National University of Science and Technology, Department of Library and Information Science (est. 2000).
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Contact person: Mr. N. Chitsamatanga chitsamatanga@avu.org
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Appendix C: Population of LIS Schools in sub-Saharan Africa as at February-June 2003.

Name of Institution	Established	Undergraduates		Postgraduates	Academic Staff	ICT Staff	Admin Staff
	Year	L/IS	Other	LIS			
1. Abia State University (ASU), Department of Library and Information Science	1981	255	0	24	8	1	3
2. African Research Centre for Information Science (ARCIS)	1990	0	0	15 0	6	2	10
3. Bagamoyo School of Library, Archives and Documentation Studies (SLADS)	1989	47	0	0	6	0	5
4. Bayero University, Nigeria (BUN), Department of Library and Information Sciences	1977	1100	0	45	14	2	5
5. Durban Institute of Technology (DIT), Department of Library and Information Studies.	1987	120	0	3	7	1	1
6. Eldoret Polytechnic (EP), Small Business Centre	1990	60	0	0	6	0	1
7. Harare Polytechnic (HP), Department of Library and Information Science	1985	230	0	0	18	-	2
8. Kenya Polytechnic (KP), Department of Information and Liberal Studies	1978	+350	0	0	24	1	3
9. Kenya School of Professional Studies (KSPS), Department of Information Science	1993	300	200	0	6	2	-
10. Kenyatta University (KU), Department of Library Studies	1984	-	-	-	9	0	-
11. Makerere University (EASLIS), East African School of Library and Information Science.	1962	425	0	27	14	1	5
12. Moi University (MU), Faculty of Information Sciences	1988	397	0	8	24	1	1
13. Omdurman Islamic University (OIU), Department of Library and Information Science	1966	-	-	-	8	0	1
14. Rand Afrikaans University (RAU), Department of Information Studies	1969	-	-	-	4	-	-
15. Sigalagala Technical Training Institute (STTI), Department of Information and Technology	1990	-	-	-	-	-	-
16. Technikon South Africa (TSA), Department of Library and Information Studies	1993	400	-	80	5	-	2
17. University of Botswana (UB), Department of Library and Information Studies	1979	-	-	13	12	2	1

18. University of Cape Town (UCT), Department of Information and Library Studies	1939	0	0	40	6	0	1
19. University of Dar-es-Salaam (UDSM), Department of Information Studies	1997	0	0	24	10	4	0
20. University of Ghana (UG), Department of Information Studies	1961	1171	0	29	13	2	6
21. University of Nairobi (UoN), Department of Information Studies	1999	-	-	-	20^	3	4
22. University of Natal (UN), Department of Information Studies	1973	0	100	67	7	-	3
23. University of Pretoria (UP), Department of Information Science	1947	+300	+1000	+60	16	0	2
24. University of Sierra Leone (USL), Institute of Library, Information & Communication Studies	1987	80	-	2	8½*	1	3
25. University of South Africa (UNISA), Department of Information Science	1955	-	-	-	12½*	1	3
26. University of Stellenbosch (UoS), Department of Information Science	1958	200	-	100	9½*	0	2
27. University of Western Cape (UWC), Department of Library and Information Science	1960	+200	+400	+10	8	1	1
28. University of Zululand (UZ), Department of Library and Information Science	1969	+60	-	17	6½*	0	0
29. Zimbabwe National University of Science and Technology (NUST), Department of Library and Information Science	2000	60	0	0	8	1	1

Key:

Some abbreviations used here are created for this study only, i.e. not all of them are standard/approved abbreviations.

(^) These are senior library staff, who also teach, as this programme is run by the University Library rather than a designated LIS school.

(0) A zero denotes that the LIS school does not have people in the given category.

(-) Denotes that data was not provided.

(*) One temporary/part-time staff is regarded, in this study, as equivalent to ½ of the full academic staff.

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Department of Library and Information Science

20th January 2003.

Dear Colleague,

RE: Mabel K. Minishi-Majanja (PhD. Student: Reg. No. 020522)

This is to confirm that the above-named is a registered, full-time doctoral student in the Department of Library and Information Science, Faculty of Arts at the University of Zululand, South Africa.

I am the promoter of her research topic, "Mapping and Audit of Information and Communication Technologies in Library and Information Science Education in Africa." Attached please find her questionnaire for the said research. We will greatly appreciate if you could spare some time and respond to the questionnaire as best as you can.

Thank you

Prof. D. N. Ocholla

Professor and Head of the Department of Library and Information Science

Email: docholla@pan.uzulu.ac.za

Appendix D2: Letter to Respondents

Mabel K. Minishi-Majanja,
c/o Prof. D.N. Ocholla,
Department of Library and Information Science,
University of Zululand,
P. O. Private Bag, X1001, KwaDlangezwa, 3886
South Africa.
Email: khayisia@yahoo.co.uk

20th January, 2003.

Dear Respondent,

**RE: QUESTIONNAIRE TO ASSESS THE STATUS, USE AND APPLICATION OF ICTS IN
LIS EDUCATION IN AFRICA.**

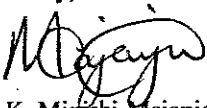
I am a lecturer in the Faculty of Information Science, Moi University, Kenya and currently a registered doctoral student in the Department of Library and Information Science at the University of Zululand, South Africa. The title of my research is **"Mapping and audit of Information and Communication Technologies in Library and Information Science Education in Africa."** This research is towards the fulfilment of my doctoral studies.

The aim of this study is to map and audit the types, nature and diffusion of Information and Communication Technologies (ICTs) in Library and Information Science (LIS) education and training programmes in Africa through a survey. The importance of this study stems from the revolutionary changes, which are taking place in both the ICT industry and in higher education. These changes are having a dramatic effect on the content of LIS education programmes and in the way LIS schools carry out their functions of teaching, learning and research. These ICT-related developments pose a big challenge to LIS schools in Africa, both as torchbearers of the LIS professions and as part of the higher education sector - a sector that contains the largest reservoirs of knowledge and talent, and therefore has a critical role to play in determining how well Africa can respond to the knowledge evolution. The findings of this study are expected to indicate the level of adoption, diffusion and use of ICTs in LIS education in Africa.

The purpose of this questionnaire is to solicit information/data that will lead to an analysis of the provision of ICT education and use of ICTs in teaching, learning and research within LIS education and training programmes. You are therefore requested to kindly spare some time from your busy schedule and respond as best and completely as you can, to the items in the questionnaire. If necessary, please involve your Systems/IT specialist. Then kindly return it to *Mabel K. Minishi-Majanja, c/o Prof. D.N. Ocholla, Department of Library and Information Science, University of Zululand, P. O. Private Bag, X1001, KwaDlangezwa, 3886, South Africa. Email: khayisia@yahoo.co.uk*. The information you provide will be treated with confidentiality and will be used only for purposes of this study. Your speedy response will be highly appreciated.

Thank you.

Sincerely,



M. K. Minishi-Majanja

Appendix E: Work Plan

A c t i v i t y		M o n t h s												
	2002	2002	J	F	M	A	M	J	J	A	S	O	N	D
1	Proposal development and presentation													
2	Chapter 1: Introduction													
3	Chapter 2: Theoretical Framework													
4	Chapter 3: Literature Review													
5	Chapter 4: Methodology													
	2003	2003	J	F	M	A	M	J	J	A	S	O	N	D
5	Chapter 4: Methodology (<i>continued</i>)													
6	Development of Research Instrument													
7	Field: Data collection													
8	Chapter 5: Data Presentation and Analysis													
9	Chapter 6: Discussion and Findings													
10	Chapter 7: Summary of Findings, conclusions and Recommendations													
11	Bibliography, collation and submission													
	2004		J	F	M	A	M	J	J	A	S	O	N	D
12	Thesis: Examination													
13	Thesis: Corrections and Binding													
14	Graduation													
15	Dissemination of Results													