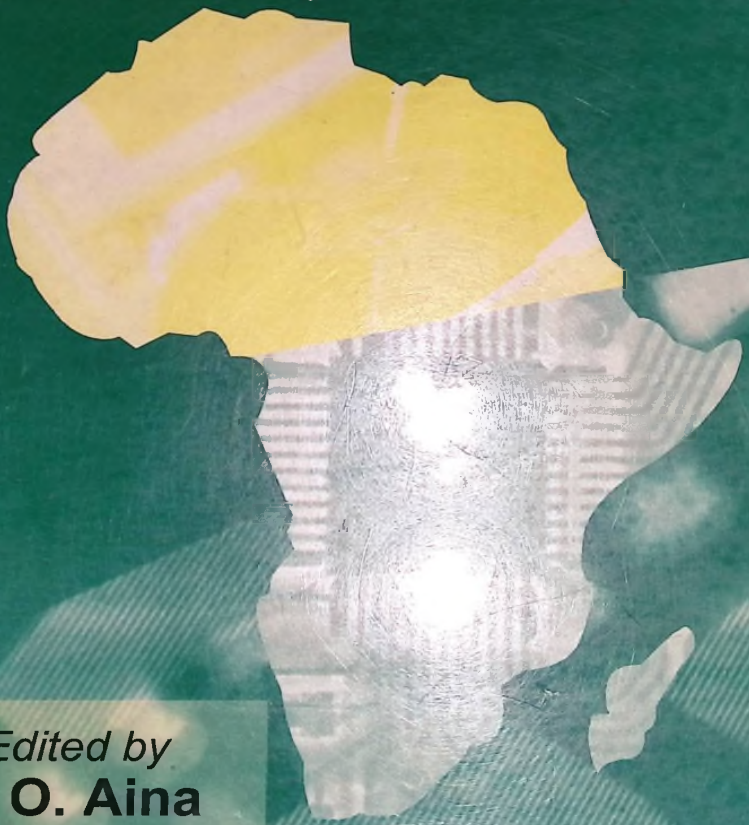
Information and Knowledge Management in the Digital Age

Concepts, Technologies and African Perspectives



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PREFACE

A distinguishing characteristic of information societies is the growing impact of Information on human activities. It is therefore not surprising that an increasing number of researchers and professionals continue to focus on the different aspects of information, including information management. Feather and Sturges (1999) have defined information management as "the application of management principles to the acquisition, organisation, control, dissemination and use of information to the effective operation of organisations of all kinds. Information management deals with the value, quality, ownership, use and security of information in the context of organisational performance." However, in discussing information management, it will be appropriate to explain the relationship that information has with data, knowledge and wisdom.

Data, information, knowledge and wisdom have always been discussed in terms of a continuum, one leading to the other. Data are a collection of symbols or discrete entities without any association with a specific human or social context. In other words, data are meaningless unless they are related to a specific context. Data would be transformed to information, when the relationship of the symbols to a context is identified thereby making the symbols meaningful. Knowledge arises from information; when a pattern relation exists in information, it becomes knowledge. The extreme end of the continuum is wisdom. Wisdom comprises an understanding of the principles for creating and using knowledge.

Owing to the importance of knowledge in societies and organisations, particularly in providing competitive advantage, knowledge management (KM) has emerged as a separate discipline. According to White (2004), KM is defined as "a process of creating, storing, sharing and re-using organisational knowledge (know-how), to enable an organisation to achieve its goals and objectives." Of recent, the term "content

management" has also been coined because of the advent of the Internet and the World Wide Web.

Information management and knowledge management are considered very important in the development agenda of most nations in their efforts to achieve information society status, bridge the digital divide and attain the Millennium Development Goals by the year 2015.

Given the importance of information management and knowledge management to nations and organisations, it is desirable for professionals and students of information science, library, archives, records management, information technology, publishing and related professions to have adequate understanding of the characteristics and uses of information and knowledge in the digital era. Also, progress towards achieving the eight Millennium Development Goals would be enhanced if the concepts and principles of information management and knowledge management are well understood and practised by all stakeholders in Africa's development.

The main drivers of information management and knowledge management are computers and communications technologies. Information and knowledge management technologies enable people in the digital age to create, use, disseminate and share information and knowledge more meaningfully and effectively. Accordingly, information management and knowledge management issues are interwoven with those of the development, use and management of information technologies.

It is in the above contexts that this book aims to provide a comprehensive single text on the concepts and principles of information management and knowledge management and the associated technologies, the challenges the technologies pose for African countries, and the policies and programmes that African information professionals and policy makers can implement to exploit the technologies to promote the development of their countries or organisations.

This book aims to fill the knowledge gaps that the rapid evolution of the global knowledge society is creating in the contents of existing texts for the training of information professionals in Africa. The evolving knowledge society is creating rapid changes not only in new information and communication technologies (ICT), but also in human development

needs and the social, information and knowledge management strategies required to meet such needs. As Africa continues to seek growth and development in the knowledge society, information management and knowledge management principles and practices in Africa also need to change in order to enable practitioners on the continent to overcome the emerging challenges. This book aims to assist in promoting this change.

This book consists of 18 chapters, beginning with an introductory chapter, in which information management and knowledge management in a digital society are presented from an African social perspective. The introductory chapter further discusses how information and knowledge management in the digital age can meet human needs and fulfil the visions of Africans. Other topics covered in the chapter are: role of the knowledge economy in employment creation, the impact of globalisation processes, and the roles of international stakeholders in information management and knowledge management in Africa. The chapter concludes with a discussion of some of the strategies that African countries and organisations can use to overcome the challenges of information management and knowledge management in Africa.

The remaining 17 chapters are grouped into five parts:

Part I: The Internet and the World Wide Web

Part II: Digital Resources, Technologies and Applications.

Part III: Information Infrastructure and Development

Part IV: Knowledge Systems

Part V: Policy and Management Issues

There are three chapters in Part I. It begins with Chapter 2, which concentrates on the Internet and World Wide Web. The requirements for connection to the Internet and gathering of information on the Internet are discussed. The chapter covers the status of Internet connectivity in Africa. The educational applications of the Internet in Africa are also highlighted. Chapter 3 covers the importance, sources and the challenges of local content development in Africa. The chapter provides institutional frameworks for local content development and how access to local content in Africa can be enhanced. The concluding chapter for this part, Chapter 4, presents the need for African web content and the challenges of developing and accessing such content. The requirements for web design and maintenance are discussed. The chapter

ends by discussing the various web design tools, such as editors, converters and generators, for creating web pages.

Part II of this book is concerned with the applications of digital resources, and how they can be harnessed for development in Africa. It begins with Chapter 5, which provides a treatment of the evolution of digital libraries, and explains the distinction between polymedia, electronic, digital and virtual libraries. The infrastructure and tools necessary for developing a digital library are presented. The challenges for establishing digital libraries in Africa are also discussed. The chapter concludes by discussing the global digital library initiatives and digital library projects in Africa. Chapter 6 traces the history of library automaton and the impact of technological developments on the transition from library automation systems to library information systems. The chapter provides a comprehensive treatment of planning for an automated library information system. A brief description of common software used for library automation in Africa is presented. The chapter concludes by discussing the challenges of library automation in Africa. Chapter 7 focuses on the importance of e-government in Africa and the various types of e-government interactions such as: government to government (G2G); government to business (G2B); government to citizens (G2C); and government to employees (G2E). The challenges of e-government for Africa, including data systems infrastructure, legal framework, institutional framework and human resources, are also discussed. The chapter also emphasises the importance of e-records as a prerequisite for e-government, and the need to ensure their accuracy, relevance, authoritativeness, completeness, authenticity and security.

Part III is on the existing information infrastructure, developments and constraints in Africa. The lead chapter for this part, Chapter 8, discusses the prospects of Africa reaching the information society status. The challenges of pursuing information society status for Africa are the enactment of relevant enabling legislations that would enhance the provision of ICT infrastructure and access to information on the continent. Chapter 9 discusses the nature and factors responsible for the digital divide. Among the factors listed, are economic, political, local, cultural and linguistic problems, HIV/AIDS scourge, telecommunication constraints, brain drain to countries outside Africa, inadequate education budget, limited education and literacy, lack of institutional level ICT policies, national ICT policy and regulatory frameworks, and inadequate

research and development. The initiatives and programmes aimed at bridging the digital divide in Africa at global, regional and national levels are discussed.

Chapter 10 discusses the two major bibliographic networks in Africa: Ain Shams in Egypt and SABINET in the Southern African region, as well as library consortia and free online databases that provide mainly African content and sources of information. The infrastructure for enhancing library/bibliographic networking in Africa is presented. The inhibitors to initiatives and availability of library networks are also listed, including under-utilisation of existing technology, digital illiteracy, lack of skilled and trained manpower, inadequate ICT facilities, lack of national IT policy, poor communication infrastructure, and inadequate appreciation of the benefits of ICT and networks, expensive ICT equipment, and resistance to change. Chapter 11 focuses on the challenges of digital material preservation. They include technological obsolescence, continuous migration, lack of legislative policy and strategy, lack of awareness, lack of collaboration and partnership, deterioration of the digital media, and disaster planning and recovery. The problems of digital preservation in Africa are enumerated. The chapter recommends that an enabling framework for sustainable digital preservation in Africa should be anchored on national policies, legislation, national coordination, human resource capacity building, standardisation, research and development, and disaster planning and recovery.

Part IV concentrates mainly on knowledge systems. Knowledge management is treated comprehensively in Chapter 12. The chapter discusses the nature of knowledge from the simplistic, subjective and objective points of view, and explores the relationship between information management and knowledge management. The chapter also describes types of knowledge and phases in the knowledge management process. Mechanisms for creating, sharing and transferring of information and knowledge are provided. The use of technology in these processes is highlighted. The chapter is concluded with a discussion of the challenges of knowledge management in Africa. Indigenous knowledge systems in Africa are well covered in Chapter 13. The chapter provides definitions of Indigenous knowledge and Indigenous knowledge systems. Types of indigenous knowledge and major areas of applications of indigenous knowledge systems are presented. The global interests in indigenous knowledge systems, as well as initiatives are covered. The challenges of managing indigenous knowledge in Africa are discussed.

Part V is concerned with the various concepts and issues in library and information science, especially in the digital era. Chapter 14 presents a comprehensive treatment of intellectual property rights and their administration. The challenges of managing intellectual property rights in the digital age are discussed. Chapter 15 examines the impact of Digital Rights Management (DRM) and Digital Millennium Copyright Act (DMCA), in protecting copyrights through licensing agreements and controlling access by using password and encryption. The chapter discusses how these have stifled fair use, competition, innovation and creativity; and preservation and conservation of information. Chapter 16 provides a comprehensive treatment of Freedom of Information and Privacy laws. It discusses the role of freedom of information in promoting access to information, as well as privacy laws, in limiting access to information. The impact of ICT on these two mutually exclusive laws to access to information is discussed. Given the technological changes in the management of information, Chapter 17 appraises the challenges involved in enhancing security in the collection, processing and transmission of information. The fundamental components in an information security management framework/strategy are discussed. Information security plans and disaster recovery are highlighted, and the chapter concludes, by discussing the challenges of information security management in Africa. Chapter 18, which concludes this part, concentrates on the basic strategies for searching information in online data bases, and the difficulties faced by African researchers. It provides various strategies for obtaining relevant information.

Each chapter of the book also provides review questions at the end to enable readers to do self-evaluation on the understanding of the chapter. In addition, comprehensive lists for further reading are provided.

This book is addressed to all those involved in the study and practice of library and information science, archives and records management, and the information technology and publishing professions in Africa, at all levels, whether as students or professionals.

This book is a product of the efforts of members of the Department of Library and Information Studies, University of Botswana. We are grateful to all the contributors of this book, either as lecturers or doctoral graduates of the department. It is our belief, that the contributors have made significant scholarly input to the development of information, research and professional practice in Africa, the emerging information

and knowledge society aimed ultimately at facilitating the attainment of UN Millennium Development Goals.

L. O. Aina
S. M. Mutula
M. A. Tiamiyu

Gaborone, Botswana
December 2007.

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Introduction

Chapter 1

Information and Knowledge Management in the Digital Society: An African Perspective

M. A. Tiamiyu and L. O. Aina

Introduction

Africa presently finds itself in a global community wherein human development and socio-economic growth is driven by the use of scientific information and digital technology infrastructure. However, Africa also finds itself as one of the least developed regions in terms of both human development and in the use of scientific information and digital technology infrastructure. On the human development side, Sub-Saharan Africa has been described as the *"epicenter of crisis, with continuing food insecurity, a rise of extreme poverty, stunningly high child and maternal mortality, and large numbers of people living in slums"*. (UN Millennium Project, 2006). On the technological development side, Africa is further described in 2007 as still having the heaviest concentration of countries with low ICT (information and communication technology) opportunity, measured by indices pertaining to ICT networks, education and skills, uptake and intensity of the use of ICT (International Telecommunication Union, 2007).

In the context of current dismal human and technological status of African countries, the topic of *"African perspectives on information and knowledge management in the digital age"* is a topic that is probably best discussed in terms of why and how information and knowledge management, as well as information technology management, could be used by African countries, organisations and peoples as an effective instrument to promote human development. This chapter therefore seeks to situate *information and knowledge management*, as well as *information technology management*, in the context of the *human needs and visions* of African countries and their peoples, for which appropriate *information and knowledge* need to be provided, and for which *information and*

knowledge technologies need to be developed and used. The chapter begins by elaborating briefly the interconnections among human needs, social processes, and information, knowledge and technologies, and the processes for their management. This is followed by a discussion of the nature of the human needs and visions from the perspective of African societies, as well as the information and knowledge requirements for meeting such needs in the global digital society. Thereafter follows a review of some implications of trends in the global digital society for information, knowledge and technology management in the African context. The chapter further explores the roles of different international stakeholders in information and knowledge management processes in Africa, and concludes with a discussion of some social management-related challenges for African countries and public organisations.

Some Definitions

We begin with some brief definitions of key concepts as used in this chapter. *Information* is defined as meaningful communication symbols transferred between any two points in human communication or machine networks. *Knowledge* is an organised accumulation of information at specific points in such networks, where a point could be a human being, a document, or a database. *Information and communication technology (ICT)* comprises pieces of equipment, networked infrastructure and the associated knowledge and skills for creating, manipulating, transferring and using information or knowledge. *Information management* is the process of facilitating the exchange and use of information. *Knowledge management* is the process of identifying, documenting, organising, storing and sharing knowledge, and *information technology management* is the process of developing and deploying ICT.

Role of Information and Knowledge Management in Social Development

Information and knowledge management, whether in personal, organisational or national settings, is essentially a derived process. It derives from the need to effectively and efficiently create and use information and knowledge for reducing uncertainty in human decision-making processes towards meeting human needs, desires and visions. In other words, the appropriate starting points for a meaningful

discussion of information and knowledge management are the human needs for which appropriate information or knowledge is required (Figure 1).

The effectiveness and efficiency of information and knowledge management in the digital society depends on the appropriate use of *information and communication technologies (ICT)* for creating, sharing and using information and knowledge which, in turn, also depends on the process of *information technology management*. As illustrated in figure 1, both information and knowledge management and information technology management, as processes, are integral aspects of more inclusive social management processes involving the formulation and implementation of policies and programmes in public and private institutions. In other words, *information and knowledge management* is interwoven with the following other important processes and variables:

1. Current and visionary human needs of communities, organisations or countries. Among such needs are solutions to endemic and devastating survival, environmental, political and socio-economic problems such as food shortages, epidemics, disasters and civil strife that often prevent attention to other current and visionary future human needs.
2. Social management processes (through policies and programmes in public and private sector organisations) for meeting current and visionary needs.
3. Information and knowledge that must be created, shared and used in social management processes towards defining needs, solving problems and attaining long-term visions. Such information could be socio-political, economic or technological, scientific or humanistic, formal or informal.
4. Information and knowledge management processes that must be undertaken to ensure that the required information and knowledge is created, maintained, shared and used.
5. Information and knowledge technologies needed to support social management, information and knowledge management, and technology management.
6. Information technology management processes to support the development and use of the appropriate information and communication technologies (ICT).
7. Global digital society developments.

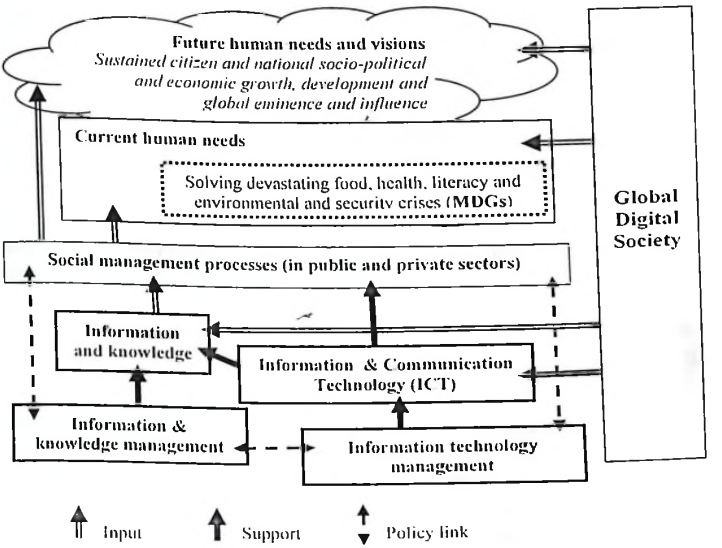

Figure 1: Interrelationships between human needs, social policies and information, knowledge and technology management.

African Human Needs and Visions

The human and socio-economic development of countries is now universally perceived in terms of the steady improvement in the level of satisfaction of a number of mutually complementary human needs. Howkins and Valantin (1997) categorise these needs as follows:

(i) healthy and secured quality life of citizens, which determine their physiological and mental capacity to function regularly in socio-economic activities in which they are interested;

(ii) literacy, education and skills development of citizens, thereby increasing their capacity for informed evaluation of personal and social choices, for gainful and sustained employment, and for effective participation in governance;

(iii) steadily improving income and economic welfare of citizens, which determines not only their living standards, but also their capacity for independent choice, while participating in economic and political activities;

(iv) choice and participation in socio-economic affairs by citizens, which presupposes fair economic rewards, availability of reasonable choice, and participation in democratic processes; and

(v) efficient and evolving knowledge systems and technology of the community of citizens as catalyst for sustained innovation and global cooperation or competitive activities.

Some of these human needs have, in the context of endemic and devastating global human crises, been articulated as global Millennium Development Goals (MDGs), the achievement of which is expected to elevate the human conditions of the world poorest nations, most of which are in Africa and other developing regions. The MDGs, eight in number, are: to eradicate extreme hunger and poverty; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other disease; ensure environmental sustainability; and, develop a global partnership for development. The MDGs are also described as *'basic human rights - the rights of each person on the planet to health, education, shelter, and security'* (UN Millennium Project, 2006).

One would notice that two of the five categories of needs summarised by Howkins and Valantin (1997), precisely those pertaining to literacy, education and skills development of citizens, and efficient and evolving knowledge systems and technology of the community of citizens, relate to the development and use of information, knowledge and technologies (including ICT) among citizens, organisations and countries for innovative, collaborative and/or competitive purposes. Many researchers and writers have suggested that satisfying these information-, knowledge- and technology-related needs could serve as lever for accelerating the achievement of the other categories of the human needs. It is in this context that Gates (1995) and Mansell and Wehn (1998) had suggested that information and communication technologies (ICT) provide windows of opportunity for developing countries to leap-frog intermediate developmental stages toward improving their socio-economic situation.

Most African countries have bought into these arguments, and have sought to satisfy the current and visionary human needs of their people by, firstly, articulating the developmental visions of their peoples (national visions), and secondly, formulating and implementing policies and plans to use ICT to promote the achievement of the needs and visions (national

ICT policies and strategies). Botswana's Vision 2016, for instance, sums up the country's growth and innovation framework and strategy, which is built around a long term vision for the country, based upon five key principles: developing a prosperous productive and innovative society; a just and caring society, an educated and informed society, an open democratic and accountable society; and a moral, ethical, and tolerant society (Botswana Vision 2016 Council, 2004).

Similarly, Nigeria's long and short term visions and needs are amply highlighted in the country's laws and development plans such as: the Vision 2010 Document (Nigeria Vision 2010 Committee, 1997), the constitutions, and the National Economic Empowerment and Development Strategy (National Economic Empowerment and Development Strategy, 2004) and with such statements as: peaceful, stable and secure polity; enlightened citizenry; morally just society; sustained national socio-economic growth; equitable sharing and use of societal resources; improvement in citizens' living standards; African regional and global collaboration; and so on.

Kwankam and Ningo (1997) argue for proactive and aggressive strategies in regard to how African countries should develop, exploit and use ICT, not only to achieve the human needs and visions of their peoples, but also to transit quickly from being mere consumer of information, knowledge and technologies produced elsewhere to being active developers and suppliers of competitive niche technologies. Botswana, for instance, appears to have adopted such approach because the overall objective of its ICT Policy is to assist in achieving the following three specific outcomes: an enabling environment for the growth of an ICT industry in the country; universal service and access to information and communication facilities in the country; and the country becoming a regional and globally competitive ICT hub (Republic of Botswana, 2007). These outcomes are, in turn, expected to help the country achieve its Vision 2016.

Information and Knowledge for Meeting Human Needs

Information and knowledge for meeting human needs can be divided into two main categories: (a) personal information needs, comprising information required by citizens in their personal lives, and (b) information and knowledge that support formal social management processes in public or private organisations.

Information and Knowledge as Personal Human Needs

Information acquisition, exchange and use are usually interwoven with the processes of satisfying human needs. Maslow (1970) postulated a five-level hierarchy of human needs that individuals seek to satisfy. At the lowest level are *physiological* needs (for food, drink, rest, etc). Next up in the hierarchy are *safety* needs (security of life and property, stability of attained status, etc); *love and belongingness* need (family, friendship, sense of community, social acceptance, etc); *self-esteem* needs (power, confidence, social status); and *self-actualization* needs (maximization of personal potentials, development of unique skills, etc). Maslow's model of hierarchy of human needs is often used to illustrate the types of needs that individuals might emphasise at different stages of their lives. A modified version of the hierarchy of needs model, by Chung (1977) identified four levels of needs - *physiological, safety, social* and *personal*. Social needs in the modified model comprise love and belongingness needs, along with some elements of self-esteem needs in Maslow's five-level model. Personal needs would then comprise the remaining self-esteem needs and the self-actualization needs.

As proposed by Tiamiyu (2003), the hierarchy of needs model can also be used to highlight the information and communication implications of human needs and social development in the context of the following question: What kinds of information and communication needs and activities would be associated with the different levels of personal or human development within the hierarchy of needs framework? Clearly, at all levels of human needs, individuals require information about the nature of their needs and about the resources they can or need to harness for meeting the needs. However, at the physiological and safety levels, individuals are likely to emphasise acquiring than providing information that would assist in the optimal satisfaction of those needs, unless they believed that they would be better off exchanging such information. In other words, the individual would emphasise information reception or acquisition, rather than providing information. By contrast, individuals must somehow exchange information with others - family members, friends, colleagues, peers, etc, - in order to satisfy their social needs. Such information exchange might also provide access to opportunities and resources for more optimally meeting their physiological and safety needs. Finally, personal needs would motivate individuals to develop themselves towards realising their full potential as unique beings. Individuals often seek to

achieve this by developing personalised information and other resources through knowledge and skills improvement, creativity and innovation, self-expression and publication activities, among others. By so doing, individuals might generate innovative ideas that not only set them apart from others, but also, might ultimately improve society.

One very important characteristic of information and knowledge for satisfying personal information needs is that such information is usually informal, unstructured, qualitative, tacit, and subject to highly personal preferences.

Information and Knowledge for Social Management Purposes

Information for supporting social management processes, unlike that for meeting personal information needs, is often formal, usually structured and documented by formal information systems, and constrained more by organisational than personal preferences. Such information can also be more easily classified along several dimensions, among which are: subject, topic or policy issue; type, structure and formatting of data (textual, numeric, graphical); quantitative or qualitative nature; scientific accuracy and validity; and nature of delivery media or channels. Formal information and knowledge management systems, such as records management systems, knowledge management systems, management information systems and decision-support systems, are usually designed and used within organisations to identify the nature and characteristics of the information that is or would be needed in social management processes, as well as acquire, organise, maintain, share and disseminate the information or knowledge to the processes. The continuous challenge for such systems, however, is how to remain effective and efficient in the face of new technologies and social management information needs. Some of these challenges are discussed in this chapter, and many others are discussed in the succeeding chapters of this book.

Knowledge Economy and Employment Creation

There is no doubt that knowledge acts as the main engine of economic growth, hence researchers have coined the term "knowledge economy" to describe the role of knowledge in the economy. It is often used alternatively to describe a modern information society. According to the World Bank (1999), "poor countries and poor people are left behind by

rich ones, not because they have less capital but because they have less knowledge". The more a human being is endowed with knowledge, the more productive he becomes.

It is also believed that information, knowledge and ICT would contribute to employment creation in Africa. The relationship between knowledge and employment creation is postulated as follows:

> "Access to information → knowledge and Capacity → Innovation→ Productivity → Growth → Employment → Poverty Reduction" (United Nations Economic Commission for Africa, 2007).

In a document entitled "African Regional Action Plan on the Knowledge Economy: A Framework for Action," the African Union and the United Nations Economic Commission for Africa (2005) advocated an African vision on the knowledge economy as follows to:

- use information to accelerate development; induce good governance and further stability;
- provide wellbeing and increase employment, reduce poverty and empower underprivileged groups;
- enhance the natural capital and human capacity of the region and minimise internal inequalities; and
- further benefit from information by fully becoming part of the global information society.

According to Azubuike (2007), research has identified the four preconditions of a knowledge economy. These are:

(a) An economic and institutional regime, which provides incentives for the efficient use of the existing and new knowledge, and the flourishing entrepreneurship;

(b) An educated and skilled population, which creates, shares and uses knowledge to innovate and create economic value;

(c) A dynamic information infrastructure to facilitate the effective communication, dissemination, and processing of information; and

(d) An efficient innovation system of firms, research centres, universities, and other organisations capable of tapping into the growing stock of global knowledge, assimilating and adapting it to local needs, and creating new technology.

For Africans to benefit from knowledge economy, it is therefore necessary for certain policies and programmes to be implemented, and for adequate ICT infrastructure to be put in place. These areas include establishing and enabling legal/regulatory framework for ICT development in Africa; providing infrastructure and access; capacity building of human resources for the knowledge economy; and development of national information and communication infrastructure (NICI) plans that are linked with the millennium development goals.

Small scale industries predominate in Africa, and the effective infusion of appropriate knowledge and ICT skills into such industries will also increase productivity and generate innovation, thereby creating more employment for the growing number of unemployed people in Africa. It is therefore important that the literacy level of Africans must be considerably improved in line with MDGs, and also that knowledge development and ICT skills be made part of the human development requirements in Africa. This will enable Africans to integrate and perform effectively in the global knowledge economy.

Digital Society Context for Information and Knowledge Management in Africa

The significance of the characteristics of the global digital society in the developmental efforts of African countries is underscored by the fact that scientific and technological knowledge is needed to improve the accuracy of policies and programmes that aim to improve human conditions in African countries. Such knowledge is presently in short supply on the continent, but available elsewhere in the global digital society. Furthermore, appropriate ICT from the global digital society is needed to facilitate more effective and efficient creation, use and management of the knowledge. The global digital society is, however, a highly complex and rapidly evolving mix of technological, economic and socio-political developments and forces, as elaborated, for example, by Bohlin et al. (2004).

The features of the global digital society of relevance here include:

1. Continuing convergence and miniaturisation of ICT, as well a continuously evolving information content products and services, which quickly renders obsolete earlier technologies, products and services.

2. Rapidly improving capabilities of ICT for enhancing the productivity of social processes when used appropriately by individuals, organisations, and countries. This which invariably also implies reduced comparative productivity of non-using individuals, organisations and countries.
3. Globalisation of ICT within or between organisations, countries and regions in the form of LANs, WANs, intranets, extranets, mobile and trans-border networks and, of course, the Internet.
4. Concentration of the global production, supply and use of ICT, and information and knowledge products and services in the developed countries of the North-South divide, and conversely, the almost total dependency of the African countries to the South of the divide on the importation and consumption of knowledge and technologies from the countries of the North.
5. Increasingly stiff competition among economic blocs, countries and organisations for the control and use of ICT, information and knowledge for economic, cultural and political dominance or influence in the global digital society
6. Growing universal recognition and acceptance of the demand for basic human rights by and for all peoples, including citizens' right of access to public information and democratic political participation, as well as ICT for accessing the information and actualising the participation.
7. Growing universality of standards, methods and best practices for information, knowledge and technology management, which creates opportunities for global dominance by historically advantaged regions, countries, cultures and religions and conversely, and poses threats to the survival of indigenous cultures, knowledge and niche products and markets.

These characteristics of the emerging global digital society are relevant to African perspectives on the information and knowledge management for development.

The continuing convergence and miniaturisation of ICT is expected to be beneficial to all the world's regions, countries, organisations and peoples because they would, in the long run, lead to declining production costs and prices of the technologies. However, the immediate impact of such developments, inevitably, is rapid obsolescence of the earlier

technologies, and the need for users of such technologies to find the resources to replace them. The newer technologies not only create new markets for the producer organisations and countries, as well as new sources of productivity for enterprising organisations, but also create serious challenges for poor countries and peoples, as well as for small or slow organisations.

The globalisation of ICT, much like the convergence and miniaturisation of ICT, also portends different effects on different countries and peoples. Actually, globalisation of ICT only makes emerging information, knowledge and technologies potentially sharable and accessible globally. However, such resources are available only to those who can effectively connect to the expanding digital infrastructure to tap freely available information and knowledge, and/or afford to pay for valuable but costly proprietary information and knowledge. Such proprietary information and knowledge are concentrated in the firms and countries in the North of the North-South divide whose profitability, economies and geo-politics are also fundamentally tied to the strategic use and global sale or donation of such resources. Global initiatives, such as the Open Access and Open Source Software, are consequently, being supported by the less advantaged countries in order to promote the sharing of knowledge resources, as well as reduce their dependency on proprietary information and technologies. *Open access* is the term used to refer to resources that are openly available to users with no requirements for authentication or payment, and is defined, in context of published information, as a publication model wherein users who access the information are not charged for access to articles or other resources, and are free to read, download, copy, distribute, print, search, or link to the full texts of these resources, provided they do not violate copyright rules (Budapest Open Access Initiative, 2002). The importance of the open access initiative to developing countries is discussed by Arunachalam (2004). *Open source software* refers to computer programs in which the source code is available to the general public for viewing, download, modification and/or use free of charge, as well as re-distribution in its original or modified form, provided the sources of all components of the program are acknowledged. The development of open source software usually entails collaboration among programmers in different organisations and countries to improve upon the software code and share the code within the community.

The globalisation of ICT, taken along with the concentration of the global production, supply and use of ICT, and information and knowledge products and services in the developed countries of the North-South divide, gives the developed countries substantial strategic advantages to set the agenda for the evolution of the global digital society towards safeguarding and reinforcing such advantages. Such countries are, consequently, more likely to support globalisation processes because they enable them to expand their global sphere of control, and would also tend to propagate through the global networks such information, knowledge and technologies in which they have significant comparatively advantages. Such are the strategies that are being used to win the increasingly stiff competition among economic blocs, countries and organisations for economic, cultural and political dominance in the global digital society. But some analysts, such as Marcuse (2000), do not agree that such advantages are being, or would automatically be, used for competitive purposes by the countries that possess them.

Marcuse (2000) noted further that globalisation as an omnibus term is used to describe different aspects of the ongoing transformation of social, economic, political, technical and cultural processes among the world's peoples and economies, including such trends as increasing trans-border information and fund flows, global corporate mergers, global mass marketing, multinational corporate power, and reduced power of nation-states. An important trend also is the global diffusion of not only tested scientific knowledge and productivity enhancing ICT, but also Western and Asia philosophies, socio-cultures, human rights, select languages (e.g. English), religions (Christianity and Islam), perspectives and fashions (e.g. Western food, music, etc). The trend has both desirable and undesirable effects on African peoples. One undesirable effect is the threat to global cultural diversity as a result of the gradual crowding out of the indigenous cultural identities of African and other peoples. Furthermore, unless there are effective programmes in African countries towards identifying, developing and promoting indigenous knowledge, African countries and peoples risk either losing such knowledge altogether or replacing useful elements of such knowledge with inappropriate elements of the incoming foreign knowledge, as ably articulated in Hamel (2004) in his analysis of the nature of, and strategies for, harnessing such indigenous knowledge.

Nevertheless, among the desirable effects of globalisation processes on the socio-political front is the growing universal recognition and acceptance of the demand for basic human rights by and for all peoples, including citizens' right of access to public information and democratic political participation, as well as appropriate technologies for accessing the information and actualizing the participation. A manifestation of this is the increasing number of African countries that have either enacted freedom of information legislation and/or are implementing e-government programmes, or have made provisions for such in their national development visions and plans.

Role of Global Stakeholders and Players

An important effect of globalisation processes is the trend towards universality of standards, methods and best practices for information, knowledge and technology management. This trend is occurring on many fronts, spearheaded by the initiatives of different international stakeholders and players in the global digital society. Among these are the efforts of: multilateral organisations such as the UN, UNESCO, African Union, SADC (Southern Africa Development Community) and ECOWAS (Economic Community of West African States) ; international information standards and regulatory bodies, such as the International Standards Organisation (ISO), World Intellectual Property Organisation (WIPO), and World Trade Organisation (WTO); international development assistance agencies, such as the World Bank, International Development Research Centre (IDRC), Danish International Development Agency (DANIDA), etc; and global summits and conferences, such as the African Development Forum, and the World Summits on the Information Society (WSIS). Also worthy of mention in this connection are the initiatives of specific information and knowledge management firms and projects, such as the Information and Records Management Trust (IRMT) projects in Eastern and Southern Africa countries, the BEANISH (*B*uilding *E*urope-*A*frica Collaborative *N*etwork for Applying *I*nformation, *S*cience and Technology in the *H*ealth Sector) programme in some African countries, as well as those of associations of information and knowledge management practitioners, teachers and researchers, such as the International Federation of Library Associations and Institutions (IFLA) and the Eastern and Southern African Regional Branch of the International Council on Archives (ESARBICA).

These efforts and initiatives are mostly collaborative, and motivated largely by consensus-seeking and resource-sharing considerations. However, there is also a competitive private sector dimension of the trend towards the universality of standards, methods and best practices for information, knowledge and technology management, in the form of competitive strategies by large multinational information technology companies, such as Microsoft and Vodafone, or multinational alliances, such as the MCI/British Telecom Concert venture and AT&T's WorldPartners. Such multinational companies and alliances often insist on particular information technology platforms for all their client organisations or countries, and may also create obstacles to the connectivity of their platforms to those of other firms. The global scope of such competitive practices is also growing, as a result of mergers of previously separate information, knowledge and information technology firms across countries. As noted earlier, the open source software movement seeks to provide more easily sharable and less costly alternatives to proprietary platform-specific software, controlled by such multinational information technology firms.

The growing universality of standards and methods for information and knowledge management create both opportunities and challenges for African countries. The opportunities are that African countries are enabled to participate in, benefit from, and possibly also contribute to, the development and use of global best standards and practices for information, knowledge and technology management. The challenge for African countries, however, is that such universal standards and methods are available to all, and can be exploited, adapted and further enhanced by more resourced and enterprising countries or organisations to out-compete their less resourced or enterprising counterparts in a global society characterised by increasing stiff competition among economic blocs, countries and organisations for the control and use of the global information, knowledge and technologies.

Information and Knowledge Management Challenges for African Countries

African countries and peoples are challenged by the trends in the global digital society (explained earlier), by the characteristics of their own societies and economies, and by the developmental distance that they would have to cover to become fully integrated into the global digital

society. Among the challenging features of African countries themselves, some of which are itemised by Shibanda and Musisi-Edebe (2000), are:

(a) high poverty rates (so most citizens cannot afford even low-cost ICT);

(b) low literacy rates (so most citizens cannot understand the languages and norms of the digital society);

(c) very limited Internet connectivity (which makes it difficult for African to tap into or contribute to global information and knowledge resources);

(d) technically-inefficient public institutions (which limits their absorptive and adaptive capacities to exploit new knowledge and technologies);

(e) stagnant or declining economic growth, heavy debt overhang and unfavourable international terms of trade (all of which limit the capabilities of African countries and organisations to access global knowledge and technologies, or quickly grow their own); and

(f) devastating humanitarian crises that African countries incessantly face – drought or floods, food shortages, epidemics and wars (which prevent systematic and sustained policy attention to the building of long-term information, knowledge and technology infrastructures).

African countries and peoples cannot afford to ignore emerging knowledge and technologies of the global digital society, unless they decide to resign themselves to falling further behind other regions in human development. Socio-economic researchers and analysts argue that, despite the challenges, and the caveat that the relationship between investments in ICT and socio-economic development is not deterministic, significant potentials still exist for African and other developing countries to use ICT to promote their development. What they all recommend is effective management of the scarce resources of African countries to ensure that the most appropriate information, knowledge and technological resources are developed and used to support social management processes towards meeting African human needs and visions. Therein lies the expected role of social management processes (in public, private and non-government organisations), as well as the supportive information, knowledge and technology management processes, in ensuring a proper connect between these processes and the human needs of African peoples.

Figure 1 is an attempt to model the interrelationships that should exist among human needs, social management processes, and the information and technology requirements of the needs and processes, as well as the processes of information, knowledge and technology management. As shown in the figure, social management processes provide the platform for linking information, knowledge and ICT to human needs. The following question is pertinent here: How effective and efficient are current social management processes, as well as information, knowledge and technology management processes, in African countries towards meeting human needs?

In most African countries, the public sector controls most of the social resources available for promoting development, apart from being also responsible for fostering the necessary policy and regulatory framework for social management processes in both public and private organisations. Much depends, therefore, on the effectiveness and efficiency of social, as well as information, knowledge and technology management in African public sector institutions, which are however mostly inefficient and non-transparent. Some of the related issues are considered next.

Frequent Failure of Innovative Information Systems

In the context of the global digital society, the effectiveness of social management processes in African countries depends critically on the deployment of innovative information technologies for managing information and knowledge in public sector institutions. The paradox however is that many of such innovative systems fail due to the entrenched nature of the inefficient bureaucratic systems that they are intended to replace. New systems are often incompatible with existing bureaucratic cultures, which in turn lead to opposition by middle level managers, inadequate institutional or political support, and inadequate provision for technical and managerial capacity to implement and maintain the systems (Peterson, 1998; Heeks, 2002). In other words, new systems tend to fail due to disconnect between the features of the existing and new systems. It is in this connection that Heeks (2002) proposes a model for reducing the failure risk of new systems by minimising the gaps that may exist or arise between assumptions and reality in public sector institutions in relation to such factors as information (content, structure and format), technology (level of sophistication), processes (level of formality), organisational objectives

and values, staffing and skills (adequacy), managerial structures and styles (rationality, strategy, delegation of authority), and time and money (adequacy, sustainability).

Disconnect Between Social, Information and Knowledge Management

Related to the above disconnect between existing and new information and knowledge management systems is also the frequent disconnect between social management processes and information, knowledge and technology management processes in public sector institutions. This point is effectively articulated by Bazimya (2005), who explains that:

"In principle, ... (public sector) policy initiatives are based on policy decisions, which in turn are based on sound information management systems... In practice, however, data rather than information are frequently the fodder of the policy function, and information on policy variables is rarely an explicit continuing concern of anyone or any group at any level of government."

Bazimya emphasises further that "there are cause–and-effect relationships among affairs of society, the policy function and effective information management", and that "better policy information requires better understanding of the public policy issues that underline, and are served by, effective information management."

Inappropriate and Inaccessible Information and Knowledge

One of the factors mentioned above that might be responsible for the frequent failure of new technology-based information and knowledge management systems in African public sector institutions is the divergence in the nature of the information provided by innovative information and knowledge management systems compared to the actual information needed or desired by social managers. But divergence is also possible between information required by the social managers and that produced outside a public institution's own information and knowledge management processes, such as the findings of research conducted in research institutes, which may be too technical to understand or too difficult to access.

In this regard, Heydon (1999) reports the findings in respect of a study of the policy support research information being generated and

provided by nine non-governmental organisations and research institutions based in Europe that work in the field of agricultural development in Africa. His main conclusions were that: (a) much of the basic research and information support for food security and environmental policy formulation in Africa is undertaken by the handful of organisations covered by the study; (b) the university institutes among the studied organisations may have difficulty in reconciling their academic objectives with the real needs of policy-makers in developing countries, and; (c) the volume of research results and documentation on the subject of policy formulation and information support services is already voluminous and this creates problems for policy makers who are able to identify information which is relevant to the specific problems and issues for which policy must be formulated. He therefore recommended the development of an electronic information support facility for policy-makers that will serve as a gateway to the most important and relevant information sources, along the lines of EUFORIC (Europe's Forum on International Cooperation), and Devline and ELDIS (of the Institute of Development Studies). This is a challenge for information and knowledge management initiatives in African countries. In this connection, Anderson et al. (2006) reports the strategic recommendations of an international workshop on strategies for promoting permanent access to scientific information in Southern Africa.

Too Much Public Sector Control of Social Management Processes

A challenge for African countries mentioned earlier is the domination of social management initiatives by mostly inefficient and non-transparent public institutions. This may be attributed to the absence, in most of the countries, of a culture of stable, democratic and transparent public institutions, which itself may be due to the historical evolution of most African countries from ancient kingdoms, sultanates and chiefdoms, through colonial control, and then through dictatorial civilian or military regimes. There is therefore a clear need to liberate the private sectors of African countries from the shackles of a domineering public sector. This would be in addition to strategies to improve the effectiveness, efficiency and transparency of African public institutions themselves.

Conclusions and Recommendations

The discussions in this chapter are summarised below, along with the corresponding recommendations for African countries, organisations and peoples:

- In the global digital society, information and knowledge, as well as the processes for their management, are closely interwoven with information technology and information technology management. These processes are, in turn, fundamental aspects of social management processes for attaining the human needs and visions of African countries. Policy makers in African countries and organisations should therefore ensure that information, knowledge and ICT management processes are at all times provided adequate policy attention and resources in social management processes.
- Trends in the evolving global digital society are creating opportunities for African countries to tap into growing global information, knowledge and technology resources. But the trends are also creating demands on African countries to hasten the development of their information, knowledge and ICT infrastructure to enable them benefit maximally from the opportunities. The globalisation of dominant foreign cultures and perspectives in the global digital society also threaten to crowd out valuable indigenous cultures and knowledge of African countries. African countries should therefore formulate and implement effective strategies for effectively promoting their own indigenous knowledge and culture in the global digital society.
- Developments in the global digital society are more and more being driven by both collaborative and/or competitive self-interest strategies of global organisations, regional blocs, countries and individual firms. African countries therefore need to adopt both collaborative and competitive self-interest strategies as appropriate towards developing information, knowledge and ICT resources for their own development, and/or contribute them to the global society.
- Social management processes towards meeting the human needs of African peoples are presently dominated by public sector institutions that are mostly inefficient and non-transparent, and often ineffective. African countries should therefore combine strong and sustainable economic liberalisation policies that empower their

private sectors with failure-safe public institutional reform programmes that exploit the opportunities for dramatic productivity improvements provided by ICT.

- Innovative information and knowledge management systems often fail in African public institutions, due partly to disconnect between the policy-making aspect of social management processes and the supportive information, knowledge and technology management. Such systems might also fail because of significant gaps between the nature of the information required in social management processes and the nature of the actual information produced or provided by new system. There is therefore strong need for strong connection between policy making, information and knowledge requirements of policies, information technologies for creating and using the information and knowledge, and policy-making in respect of information, knowledge and technology resources in African countries.

Review Questions

1. Explain the interconnections between information and technology management, social management processes and the information needs of African peoples.
2. Itemise the important trends in the global digital society, and discuss the implication of one of the trends for information and knowledge management in African countries.
3. What challenges do African countries face towards ensuring effective and efficient social management to meet the human needs of their peoples?
4. Discuss the role of international stakeholders in creating opportunities and threats for information and knowledge management in Africa.

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Part I: The Internet and the World Wide Web

Chapter 2

Internet Facilities and the Status of Africa's Connectivity

Oduronke T. Eyitayo

Introduction

The Internet is made up of millions of computers linked together around the world in such a way that information can be sent from any computer to any other, 24 hours a day. These computers can be in homes, schools, universities, government departments, or businesses. They can be any type of computer, and may be single personal computers or workstations on a school or a company network. A network is simply a group of two or more computer systems linked together. The Internet is often described as 'a network of networks', because all the smaller networks of organisations are linked together into one giant network called the Internet.

In technical terms, the Internet is the worldwide, publicly accessible network of interconnected computer networks that transmit data by packet switching, using the standard Internet Protocol (IP). It is a network that consists of millions of smaller domestic, academic, business and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked web pages and other documents of the World Wide Web Internet. (Hutchison and Sawyer, 2000; Capron and Johnson, 2004).

When people talk about getting online, it means being connected to the Internet. The Internet is sometimes called the Net or Information Super Highway. The Internet is a massive network of computers, which allows users access to vast quantities of information and communication with everyone around the world. There are resources available on the Internet for almost everything of interest.

This chapter looks at Internet, tools and services, and how they are currently being used in Africa.

Internet and WWW

The Internet and the world wide web (WWW or simply the Web) are not the same. The Internet is a collection of interconnected computer networks, whereas the Web is a collection of interconnected documents and other resources residing on computers on the Internet. The Internet provides many facilities including world wide web and electronic mail. The web refers to the collection of information that is accessible on the Internet. The information is in form of text, pictures, and sound, which are arranged logically and stored on computers known as web servers. The web is a very popular service on the Internet. Internet applications, such as the web, are based on the concept of client/server architecture. In client/server architecture, some application programs act as information providers (servers), while other application programs act as information receivers (clients). The client/server architecture is not one-to-one. That is, a single client can access many different servers, and a single server can be accessed by a number of different clients. Usually, a user runs a client application, such as a web browser, that contacts one server at a time to obtain information (Hutchison and Sawyer, 2000).

Three common components associated with the web include: web browser, web page and website. A web browser is a software program that enables one to view and interact with various resources on the web. An example of a widely used web browser is the Internet Explorer that displays both text and graphics. A web page is a document on the web. It is a formatted text document that a web browser can display. A web site is a collection of one or more web pages that reside on a single server. A server in this case is a computer or device on a network that is dedicated to managing the web pages, and is connected to the Internet. The first web page that is displayed when one accesses a website is known as the home page. Every website has a unique home page. To be connected to the Internet, a computer must be assigned a unique number, known as its IP (Internet Protocol) address. Users almost never need to enter or view IP addresses directly. Instead, to make it easier for users, each computer is also assigned a domain name, and protocol software automatically translates domain names into IP addresses. A website for a domain is accessed with the help of a unique alphanumeric address known as the web address. The web address is also known as the Uniform Resource Locator (URL), which specifies the protocol to be used and the exact location of the website on the Internet. A protocol is a standard method of transferring data between different computers. In the example

http://www.cnn.com, *http* indicates what protocol to use and *cnn.com* specifies the exact location of the web page.

What is required to Connect to Internet?

In order to get connected to the web, there is need for some hardware and software. What is required is determined on what the user wants to do, and how much the user can afford to pay. In this section, only the hardware requirements will be considered. In order to connect to the Internet, there is need for a computer, a connection and a connection device.

In general, there are two ways to get a connection to the Internet: one is to have a permanent connection to the Internet, and the other is to use the telephone line to connect, whenever the user wishes to gain access. For the second option, there is a need to sign up with an Internet Service Provider (ISP). Usually, a telephone line and a modem are required to connect one's computer to the ISP's server computer, which is connected to the Internet. The connection device is determined by the type of connection. It could be a modem, ISDN (Integrated Services Digital Network) terminal adapter, cable modem, DSL (Digital Subscriber Line), wireless broadband, among others. Modem (Modulator-Demodulator) connects one's computer to your ISP over a regular telephone line. ISDN terminal adapter is a digital device that works in an entirely different way from a modem. It requires a special kind of connection with a telephone company, which will cost extra. The main advantage is that it operates at a much higher speed of data transfer than with a modem. Cable modem uses the cable TV wire to send data at very high rates, but the speed depends on how many other cable TV users are using their cable modems where you are. There is no need to dial, it is a permanent connection. DSL allows one computer to be permanently connected to the Internet, using telephone lines. There is no need to dial any number. To connect to a wireless broadband, one needs a wireless adaptor and one can configure one's computer and search the net without any cable within a certain distance from the server.

Once connected to the Internet, it is possible to access a wide range of services from around the world. In the next section, we will look at just some of the services available on the Internet.

Internet Services

The Internet is used for services such as electronic mail, World Wide Web, remote access, chatting, file sharing, streaming media, voice telephony, leisure and marketing.

Electronic mail, sometimes called email, is a computer-based method of sending messages from one computer user to another. Originally, email messages were restricted to simple text, but now, many systems can handle more complicated formats, such as graphics and word processed documents (Hutchison and Sawyer, 2000).

The *World Wide Web* is a major part of the Internet. Many use the World Wide Web to access news; weather and sports reports; to plan and book holidays; and to find out more about their random ideas and casual interests (Hutchison and Sawyer, 2000)..

The Internet allows computer users to connect to and use other computers easily, wherever they may be across the world. This is known as *remote access*. An office worker away from his desk, perhaps the other side of the world on a business trip or a holiday, can open a remote desktop session into his normal office PC, using a secure Virtual Private Network (VPN) connection via the Internet. This gives the user complete access to all normal files and data, including e-mail and other applications, while the user is away. This is a new way of working from home or collaboration and information sharing in many industries.

Internet chat, whether in the form of Internet Relay Chat (IRC), 'chat rooms' or channels, or via instant messaging systems, allows people to stay in touch in a very convenient way, when working at their computers during the day. Messages can be sent and viewed even more quickly and conveniently than via e-mail. Extension to these systems may allow files to be exchanged, 'whiteboard' drawings to be shared, as well as voice and video contact between team members.

A computer file can be e-mailed to customers, colleagues and friends as an *attachment*. The file can be uploaded to a website or FTP server for easy download by others, or it can be put into a "shared location" or onto a file server for instant use by colleagues.

Many existing radio and television broadcasters provide Internet 'feeds' of their live audio and video streams (for example, the BBC). Internet 'feeds' allow the user to receive automatic updates on information

available in their area of interest. These providers have been joined by a range of pure Internet 'broadcasters', which never had on-air licenses. This means that an Internet-connected device, such as a computer or something more specific, can be used to access on-line media, in much the same way as was previously possible only with a TV or radio receiver. vTuner.com is an example of an Internet broadcast content organisation. It delivers an exciting and Internet radio and TV experience to end users. vTuner.com in South Africa links 23 stations http://www.vtuner.com/vtunerweb/static/staticSouthAfricaoverall1.html. Another example is Spirit World Channel, http://www.spiritword.org.za/ Broadcast.htm that also broadcasts the TV stations online through the Internet.

VoIP stands for Voice over IP, where IP refers to the Internet Protocol that underlies all Internet communication. This phenomenon began as an optional two-way voice extension to some of the Instant Messaging systems that took off around the year 2000. In recent years, many VoIP systems have become as easy to use, and as convenient as a normal telephone. VoIP services allow people all over the world to communicate using voice. Two examples of providers of such services are Skype (www.skype.com) and Voipcheap (www.voipcheap.com). The benefit is that, as the Internet carries the actual voice traffic, VoIP can be free, or cost much less than a normal telephone call, especially over long distances. The main motivation to use VoIP comes from the huge cost saving that can be achieved in comparison to the exorbitant calling rates charged by many of the actual or de-facto monopoly Public Telecom Operators (PTOs) in Africa. Nevertheless, many African countries still have restrictions on the use of VoIP; some have laws completely prohibiting its use; while others have legislated to restrict its provision to the (usually state-owned) PTO. Some examples of countries with restrictions are Cote d'Ivoire, Egypt and Madagascar (AfrISPA, n.d). The pioneer examples for VoIP liberalisation were set by Mauritius, South Africa and Kenya (Africa - VoIP Telephony, 2006).

The Internet is also a major source of leisure, tools and services. Today, many Internet forums have sections devoted to games and funny videos, and short cartoons in the form of flash movies are also popular. For example, over 6 million people use blogs or message boards as a means of communication and for sharing of ideas. Many use the Internet to access and download music, movies and other works for their enjoyment and relaxation. An example of an African-based movie site is: http://www.africast.tv/index.html.

The Internet has also become a large market for companies. Some of the biggest companies today have grown by taking advantage of the efficient nature of low-cost advertising and commerce through the Internet, also known as e-commerce. It is the fastest way to spread information to a vast number of people simultaneously. The Internet has also subsequently revolutionised shopping; for example, a person can order a CD online and receive it in the mail within a couple of days, or download it directly in some cases. The Internet has also greatly facilitated personalised marketing, which allows a company to market a product to a specific person or a specific group of people more so than any other advertising medium. This is limited because many African countries can still not use credit cards.

Gathering Information on the Internet

Information is available on the Internet; however, skills are required in order to be able to gather information on the web. Apart from going directly to the URL, there are four major ways to source for information on the web. They are search engines and meta-search engines, information gateways, subject directories directory portals, and online databases.

Search Engines and Meta-Search Engines

Search engines are huge databases containing web page files that have been assembled automatically by machine. There are two types: Individual and meta-search.

Individual search engines compile their own searchable databases on the web. Examples are:

(i) All the Web: http://alltheweb.com

(ii) AltaVista: www.altavista.com

(iii) Google: www.google.com

Meta-searchers do not compile their own databases. Instead, they search the databases of multiple sets of individual engines simultaneously. This could result in a multiple lists or a single list. Multiple lists display search results in separate lists, as they are received from each engine. Duplicate entries may appear. Single list displays multiple-engine search results in a single merged list, from which duplicate entries have been removed. Examples are:

(i) Vivisimo: http://vivisimo.com
(ii) SurfWax: http://surfwax.com
(iii) ixquick: http://www.ixquick.com

Search engines and meta-search engines are good for precise searches, using named people; or for organisations and for searching quickly; and widely topics that are difficult to classify. They are not good for browsing through a subject area.

All search engines have tips and tricks to be able to use them effectively. For example, to enable one to use Google effectively, one needs to learn Google tips and tricks. The details can be found on the website http://www.google.com/help/features.html.

Figure 1 shows these features. They allow one to directly search for images, news, groups, etc. Table 1 shows some tips to search google: http://www.google.com/help/cheatsheet.html

Table 1: Tips on how to search Google

Google Images	images.google.com	Find images related to your search term.
Google News	news.google.com	Read the most up-to-date news stories about your search term.
Froogle	www.froogle.com	Find sites selling the exact product you're looking for.
Google Groups	groups.google.com	Usenet discussion group archive dating back to 1981.
Google Catalogs	Catalogs.google.com	Search hundreds of online catalogues.
Google Labs	labs.google.com	Test-drive potential future Google products and services.
Blogger	www.blogger.com	Start your own online journal (or 'blog') with this free self-publishing service.

- Ask ERIC (educational information): www.eduref.org
- SearchEdu (college & university sites): http://www.searchedu.com

There is a large portion of the web that search engine spiders cannot, or may not, index. It has been dubbed the "Invisible Web" or the "Deep Web", and includes, among other things, password protected sites, documents behind firewalls, archived material, the contents of certain databases, and information that is not static, but assembled dynamically in response to specific queries.

Web profilers agree that the "Invisible Web", which is made up of thousands of documents and databases, accounts for 60 to 80 percent of existing web material. This is information one probably assumes one could access by using standard search engines, but that is not always the case. According to the Invisible Web Catalogue, these resources may or may not be visible to search engine spiders, although today's search engines are getting better and better at finding and indexing the contents of "Invisible Web" pages.

In order to access so-called "Invisible Web" sites, one needs to point one's browser directly at them. That is what many library gateways and subject-specific databases do. They are good sources for direct links to database information stored on the "Invisible Web."

Examples of web pages in the invisible web are:

- University of Botswana Library: Medupe http://medupe.ub.bw/
- University of Botswana online databases:
- http://medupe.ub.bw/screens/databaselist.html , e.g. EBSCO host.

Subject directories/portals subject directories, unlike search engines, are created and maintained by human editors, not electronic spiders or robots. The editors review and select sites for inclusion in their directories on the basis of previously determined selection criteria. The resources they list are usually annotated. Directories tend to be smaller than search engine databases, typically indexing only the home page or top level pages of a site. They may also have a search engine for searching their own directory (Chamberlain, 2006). *Examples are:*

(i) Excite: http://www.excite.com
(ii) Microsoft Network (MSN): http://www.msn.com
(iii) Netscape: http://www.netscape.com
(iv) Yahoo!: http://www.yahoo.com

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Froogle	www.froogle.com	Find sites selling the exact product you're looking for.
Google Groups	groups.google.com	Usenet discussion group archive dating back to 1981.
Google Catalogs	Catalogs.google.com	Search hundreds of online catalogues.
Google Labs	labs.google.com	Test-drive potential future Google products and services.
Blogger	www.blogger.com	Start your own online journal (or 'blog') with this free self-publishing service.

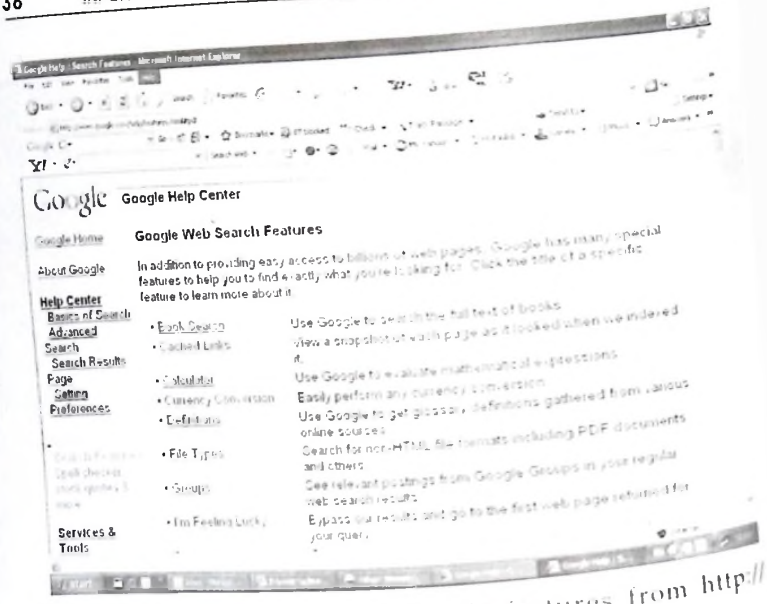

Figure 1: A screenshot showing Google features from http://www.google.com/help/ features.html.

Information Gateways

There are two kinds of gateways: Library gateways and Subject directory/ Portals. Library gateways are collections of databases and informational sites, arranged by subject that have been assembled, reviewed and recommended by specialists, usually librarians. These gateway collections support research and reference needs by identifying and pointing to recommended, academically-oriented pages on the Web. They include subject directories and virtual libraries gateways.

Examples are:

- ELDIS the gateway to Development Information: http://www.eldis.org
- Development Gateway: http://www.developmentgateway.org
- WWW Virtual Library: http://www.vlib.org
- SOSIG (Social Science Information Gateway): http://www.sosig.ac.uk

- Ask ERIC (educational information): www.eduref.org
- SearchEdu (college & university sites): http://www.searchedu.com

There is a large portion of the web that search engine spiders cannot, or may not, index. It has been dubbed the "Invisible Web" or the "Deep Web", and includes, among other things, password protected sites, documents behind firewalls, archived material, the contents of certain databases, and information that is not static, but assembled dynamically in response to specific queries.

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(i) Excite: http://www.excite.com
(ii) Microsoft Network (MSN): http://www.msn.com
(iii) Netscape: http://www.netscape.com
(iv) Yahoo!: http://www.yahoo.com

Like the yellow pages of a telephone book, subject directories are best for browsing and for searches of a more general nature. They are good sources for information on popular topics, organisations, commercial sites and products. When a user wants to see what kind of information that is available on the web in a particular field or area of interest, one should go to a directory and browse through the subject categories.

Information gateways are good for topics that fall into a thematic area that has a subject directory for guided browsing in a subject area; they are not good for quickly finding information on widely varying themes.

Other Useful Internet Tools

Many Internet services are available on the web, but one needs to be aware of the facilities available for them to be fully utilised. This section therefore looks at some of these services, such as online help, blogs, RSS and Internet Forum.

Live Online Help from Librarians

Live online help enables a user to connect to a librarian at any time. The librarian will communicate with the user employing Internet chat, and may take the user to various websites. An average session lasts 15-20 minutes. It may take several minutes for the librarian to search and send the user answer. The librarian may ask the user questions to get a better understanding of what the user needs, and may offer to follow-up by e-mail if the question cannot be answered online. By sending e-mail messages back and forth, the librarian would be able to give the user answers, articles and more. Examples are:

(i) NCKnows is an online help from North Carolina http://nc.247ref.org/wescgi/CDM.exe? VIRTCATEGORY= STATELIB_NC&SS_COMMAND=CUST_SUP&CATEGORY

(ii) Government Information Online (GIO) is a free national online information service supported by nearly thirty public, academic and state libraries throughout the United States http://govtinfo.org/

(iii) LiveRef(sm): A Registry of Real-Time Digital Reference Services. It is divided into various categories and you can find help on different subject areas. http://www.public.iastate.edu/~CYBERSTACKS LiveRef.htm.

Blogs

A blog is one easy-to-use website, where one can quickly post thoughts; interact with people; and more. All for free. A blog is a user-generated website, where entries are made in journal style and displayed in a reverse chronological order. Blogs often provide commentary or news on a particular subject, such as food, politics, or local news; some function as more personal online diaries. A typical blog combines text, images, and links to other blogs, web pages, and other media related to its topic. The ability for readers to leave comments in an interactive format is an important part of many blogs (Ng, 2007; Rowse, 2005).

Reading other blogs is an excellent way to learn - not only about the content being blogged, but also about the process of blogging. Selecting a variety of blogs and writing styles affords a broad perspective of how to use the medium. Some bloggers of note are:

(i) News: Online Learning Update - http://people.uis.edu/rschr1/onlinelearning/blogger.html; Scripting News- http://www.scripting.com/ ; Doc Searl http://doc.weblogs.com/;

(ii) Art: 101-365 - http://radio.weblogs.com/0101365/

(iii) Editorial: InstaPundit - http://www.instapundit.com/

(iv) Audio: Audioblog News - http://radio.weblogs.com/0100368/

(v) Sports: Baseball News Blog - http://baseballnews.blogspot.com/

(vi) Faith: blogs4God - http://www.blogs4god.com/

(vii) Personal: kottke.org - http://www.kottke.org/

To start a blog a user can use: http://www.blogger.com/ or http://www.blog.co.uk/srv/register/register.php. These bloggers are free, they allow the user to publish ideas, share photos and search and read blogs. They also allow the user to receive feedback on one's blogs.

RSS

RSS stands for two acronym extensions - Really Simple Syndication and Rich Site Summary. RSS is used to publish frequently updated digital content such as blogs, or news. Users of RSS content use programs called feed 'readers' or 'aggregators'. The user 'subscribes' to a feed by supplying to their reader a link to the feed; the reader can then check the user's

subscribed feeds to see if any of those feeds have new content since the last time it checked, and if so, retrieve that content and present it to the user.

The idea of creating RSS feeds for search terms is especially interesting. Suppose for example that a student is doing a project or a paper on global warming. That student could actually create an RSS feed that would bring any news about global warming to his aggregator, as soon as it was published. For example, through www.bbc.com one could personalise news, and the user will receive e-mail on only the user's area of interest.

Internet Forum

An Internet forum is a facility on the World Wide Web for holding discussions and posting user generated content. A sense of virtual community often develops around forums that have regular users. Technology, computer games, and politics are popular areas for forum themes, but there are forums for a huge number of different topics.

Internet forums are also commonly referred to as web forums, message boards, discussion boards, (electronic) discussion groups, discussion forums, bulletin boards or simply forums.

Internet forums make it easy for groups of people to communicate on the Internet. It makes it possible to stay in touch with friends, family and colleagues, as well as discuss sports, health, news, and more. It basically connects people who share similar interests. One can join an existing forum or create one's own forum and invite others to join.

Some examples are:

(i) Yahoo discussion list: http://groups.yahoo.com/

(ii) Google discussion list: http://groups.google.com/

(iii) Microsoft Discussion list: http://www.microsoft.com/communities/newsgroups/en-us/default.aspx

(iv) A general list on discussion groups for various subjects. http://www.tlg.uci.edu/index/listservs.html

Status of Africa's Connectivity to the Internet

The world population was estimated to be 6.5 billion people in 2006. Out of this population, roughly 1 billion are using Internet (Tofocus.info, 2006). Table 2 shows Internet users by world region in March 2007. Asia has about 36% Internet users in the world. This is closely followed by Europe with 28%; North America has 21 %; Latin America/Caribbean with 9 %; with only 3 % in Africa. Middle East and Oceania/Australia have less than 2% each (Internet World Statistics, 2006; 2007).

Table 2: Internet Connectivity by Regions

World Regions	Population (2007 Est.)	Internet Usage	Usage% of World
Africa	933,448,292	33,334,800	3.0 %
Asia	3,712,527,624	398,709,065	35.8 %
Europe	809,624,686	314,792,225	28.3%
Middle East	193,452,727	19,424,700	1.7 %
North America	334,538,018	233,188,086	20.9%
Latin America/ Caribbean	556,606,627	96,386,009	8.7 %
Oceania/ Australia	34,468,443	18,439,541	1.7 %
WORLD TOTAL	6,574,666,417	1,114,274,426	100.0 %

Source: http://www.Internetworldstats.com/stats.htm

In 2002, there were 38 African countries with 1000 or more dialup subscribers, 19 countries with more than 5000 and 11 countries with more than 20,000 subscribers - Algeria, Botswana, Egypt, Kenya, Mauritius, Morocco, Nigeria, South Africa, Tunisia, Tanzania, and Zimbabwe. Other countries bubbling under the 20 000 subscriber mark which could have as many effective users, due to the extensive use of wireless links and university networks include: Cote d'Ivoire, Ghana, Madagascar, Mozambique, Namibia, Senegal, Uganda and Zambia (Jensen, 2002). Table 3 shows the rate of use in some countries in Africa in March 2007. South Africa has the highest usage in Africa with 15.3 %; this is closely followed by Egypt and Nigeria with 15%; Morocco

with 14%; Sudan with about 8%; Algeria with 6%; and the other countries have below 4% each.

Table 3: Internet Connectivity in Africa for Countries with more than Four Percent Users

AFRICA	Population (2007 Est.)	Internet User	(%) users in Africa
Algeria	33,506,567	1,920,000	5.8 %
Egypt	72,478,498	5,000,000	15.0 %
Morocco	30,534,870	4,600,000	13.8 %
Nigeria	162,082,868	5,000,000	15.0 %
South Africa	49,660,502	5,100,000	15.3 %
Sudan	36,618,745	2,800,000	8.4 %

Source: http://www.Internetworldstats.com/stats1.htm

Despite these low Internet usage rates in Africa, the Internet can now be accessed virtually anywhere by numerous means within Africa. Public places to use the Internet include libraries and Internet cafes, where computers with Internet connections are available. Many hotels now also have public terminals, though these are usually fees-based. Mobile phones users also connect to the Internet from anywhere there is a cellular network supporting that technology. High-end mobile phones such as smart phones generally come with Internet access through the phone network. Web browsers are available on these advanced handsets, which can also run a wide variety of other Internet software.

While the total number of Internet users is difficult to measure, ISP subscriber accounts across the continent in early 2006 are estimated at between 5.5 and 6 million (up significantly from around 2 million a year earlier), most of which are based in Northern Africa and South Africa. However, each computer with an Internet or e-mail connection in Africa on average supports 3 to 4 users. Given the very low PC penetration rates, most users access Internet services through Internet cybercafés or kiosks, community telecentres, community phone-shops, schools and other types of public Internet access. However, the ratio of users per

Internet subscription has reduced to about half during 2005, indicating improved affordability of personal Internet access (Research and Markets, 2006)

Irregular or non-existent electricity supplies are a common feature and a major barrier to use of the Internet, especially outside the major towns. Many countries have extremely limited power distribution networks which do not penetrate significantly into rural areas, and power sharing (regular power outages for many hours) is a common occurrence, even in some capital cities such as Accra, Dar es Salaam and Lagos. Furthermore, most tax regimes still treat ICTs as luxury items, which makes these almost exclusively imported commodities all the more expensive, and thus unobtainable by the majority (Jensen, 2002).

Another serious constraint to Internet access and usage in Africa is the high cost of accessing the Internet in Africa. In more than half the countries in Africa, one year of Internet access costs more than the average annual income. Only in Egypt, Libya and Mauritius is the annual cost less than 10% of the average income. Lower prices result from deregulation, competition and foreign investments in the ICT sector, and in some cases government subsidies. Although substantial numbers of cybercafés have been established in most countries over the last few years, the Internet has so far had the greatest impact at the top end of business and in well-educated, wealthy families, primarily in the major urban areas (Budde.com, 2006).

Applications of the Internet in Africa

Internet has found its way into many sectors in Africa. This include e-commerce, telemedicine and education.

The major area of Internet application in Africa is in education. In spite of the challenges of technology, online learning has become a common practice in some African countries. Some of these educational applications of the Internet are described here.

The University of Namibia's e-Learning centre has established an e-Learning Centre (eLC). eLC is a multi-stakeholder centre that hosts all e-activities of all educational institutions in the country on one common learning management system, under the auspices of Namibian Open Learning Network Trust (NOLNet). The University of Botswana also has a well-established e-learning Support Centre that has been used to

train more than 30% of its academic staff in various educational technologies. The University of Cape Town has a similar e-learning initiative (Waimbui, 2006).

In Ethiopia, all the 500 secondary schools and all twelve universities have been networked. Educational institutions in South Africa have led a pioneering role in e-Learning for many years. Countries such as Botswana, Cameroon, Gambia, Ghana, Guinea, Ivory Coast, Mauritius, Mozambique, Namibia, Nigeria, and Tanzania have introduced a variety of ICTs in their already established distance learning programmes and universities. Multi-purpose community tele-centres, regional study centres, faculties and corporate training centres across the continent are also connected with African educational providers such as the "African Virtual University" and international programmes from development cooperation agencies abroad. In many countries, schools have been equipped with PCs and are gradually being linked, forming national and cross-border school networks. One prominent example is "SchoolNet Africa", which provides support to practitioners, education policymakers, teachers and learners in 31 African countries (eLearning Africa, 2006).

Africa stands to be a great beneficiary of the Internet, in areas ranging from communication to education, health to trade, and governance to knowledge creation. The case of how Africa embraced the mobile phone when conditions were created for more players to come in, and when technology allowed connecting thousands of people at lower costs, could be a learning example.

Review Questions

1. Distinguish between Internet and World Wide Web.
2. How is Africa doing, in terms of Internet connectivity?
3. Discuss Internet services and their growth in Africa.
4. Describe with examples, the four major ways of gathering information on the Web.
5. How can one use blogs and RSS for information gathering?
6. How is chatting on the Internet different from Internet forums?

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Some Other Internet Sites to Check
(Links valid as at January 2007)

Annotated Directories
http://scout.cs.wisc.edu/addserv/toolkit/searching/annodirecttxt.html

Basic Tutorial on Searching the Web
http://www.sc.edu/beaufort/library/pages/bones/bones.shtml

Blogging
http://www.elearnspace.org/Articles/blogging_part_1.htm
http://www.elearnspace.org/Articles/blogging_part_2.htm
http://crookedtimber.org/2004/03/16/academics-and-blogging

Computer and Internet Dictionary
http://www.pcwebopedia.com/

Electronic Journals available through UB
http://www.ub.bw/library/public_html/ubjlist.htm

Glossary of Web Hosting Terms
http://www.phd-designs.com/glossary.php

Internet Dictionary
http://www.netlingo.com/

RSS
http://www.downes.ca/files/RSS_Educ.htm
http://weblogg-ed.com/wp-content/uploads/2006/05/RSSFAQ4.pdf

Scientific Databases
http://www.nist.gov/srd/online.htm

Subject Portals
http://www.osti.gov/subjectportals/

WebRings
http://www.webring.org/rw

Web Search Engine FAQs
http://www.infotoday.com/searcher/oct01/price.htm

Chapter 3

Local Content and Africa's Presence on the Web

Stephen M. Mutula

Introduction

Content may be taken to refer to one or many of the following: text, e-journals, images, graphics, video, sound, documents, records (e-records), movies, iconographies, websites, online databases and emails, news, advertisements, software, and animations. On the other hand, local content refers to locally-owned, locally adapted, produced or published content. In the context of Africa, local content may be taken to refer to among other things: artefacts, traditional medicine, architectural design, music, governance systems, art, handcraft, attire, etc.

Local content can be accessible though academic and research institutions, libraries, museums, archives, electronic and mass media, national governments, financial institutions, international organisations, non-governmental organisations (NGOs), large and small business institutions and news agencies. Often, local content is confused with indigenous knowledge (IK). However, whereas indigenous knowledge is know-how of local people, that is not universally available, local content is all inclusive and result from the codification of IK in appropriate format targeting different audiences.

Importance of Local Content

The importance of local content in the lives of communities is well articulated by Raven (2005) on his *San Francisco NGO Equal Access Web site*, where he underlines its importance by observing that local content enhances equal access and engages communities by creating customised communication strategies and outreach solutions, that address the most critical problems affecting people in the developing world.

Harnessing of local content is crucial in bridging the digital divide through empowering the people to link and communicate with the rest

of the world. Absence of local content can lead to capital flight in terms of goods and services purchased from abroad. For example, in Nigeria, the National Committee on Local Content Development in a report noted that local content of goods and services in the oil and gas sector in 2003 was less than 5%, and about 95% of the yearly expenditure of about US$8 billion (N880 billion) flowed out of the country through technical services and goods procurements (Ugwuanyi, 2003).

UNECA (1996) in the context of Africa's contribution to global information noted that such content would: make African peoples producers of indigenous information and knowledge and not simply passive consumers of imported information; enable Africa to export information and knowledge, and to participate pro-actively in the development of the global information infrastructure; provide African researchers and scientists with access to information on Africa generated from within the continent; enable African researchers and scientists to collaborate on equal footing with their peers around the world, irrespective of distance; and promote African cultural heritage, including the modern cultural sector of its rich and growing film and music industries.

Moreover, contributing to the information and cultural content of the global information could be achieved in many ways such as:

- Putting local information content on websites;
- Creating subject-based information gateways;
- Creating electronic databases;
- Digitalisation of documents and artifacts; and
- Indigenous language orientation;

Additionally, local content is very important, and by and large, it enhances productivity, competitiveness and lower costs; it is useful for accountability; it enhances adaptation, skills and technology transfer; it bridges knowledge gap; and it promotes learning. Local content has also lots of potential, not only to local communities, but also beyond. Local content is valuable, because it provides the means of satisfying internal needs; it enhances self reliance; it facilitates bridging digital divide by providing relevant content; it enhances community access to content; it mirrors real life situation and operations; draws on local resources, and makes people less dependent on outside supplies, which may be costly,

scarce and irregularly available. It promotes social justice, so that every man or woman, no matter his or her race, age, background, religion, ability or disability, should have the same opportunities. It provides a basis for access and participation by all in the information society and improves service delivery especially by government, NGOs and other development agencies.

Access to relevant local content by communities in sub-Saharan Africa, as well as provision of such content to all in the information society would enable Africa to make a contribution to the stock of global knowledge. Local content development is a critical component in improving service delivery, especially by government, NGOs and other development agencies, as these agencies are able to communicate and relate with people better on the basis of their needs. Local content can enable people of sub- Saharan Africa to benefit from technology transfer from developed countries, as such technologies can be adapted to local needs.

Similarly, local content can be used to enhance the visibility of a people's culture and their way of life, and consequently provide them with an opportunity to link with the outside world. In addition, publication of local content electronically is bound to make it possible to enhance access to knowledge and information that is crucial in resolving problems that are situation-specific. Moreover, access to local content creates opportunities for positive change for people, especially in developing world such as sub-Saharan Africa, by providing them with needed information and education through locally produced goods and services.

Through the use of local content, it is possible to design and produce local language audio and multi-media programmes that can be used to educate and catalyse behaviour change in target audiences, for example, in the fight against HIV/AIDS pandemic. Similarly, local content can enable a people to determine relevant and appropriate infrastructure and technologies, in order to develop the best practices to address issues that relate to the community such as sanitation, literacy, community self-help projects, entrepreneurship, theatre, music, dance, etc. Moreover, local content is one sure way of introducing the youth to their cultural values, before learning foreign content. In Africa, paucity of information resources in the form of journals, published books, research output, and online databases makes access to locally generated

knowledge important. Local content, by and large, is relatively inexpensive, and yet, one of the most powerful tools to mobilise and empower remote and under-served communities. In some remote communities, local content may provide the only means of gaining access to knowledge and information, which can help to bridge the knowledge divide with other communities.

Local content when disseminated widely allows members of a community to express their values and be identified as unique entity, thus enhancing their political and economic bargaining power. Likewise, local content provides sources of entertainment for the people, e.g. drama, song, dance, etc. It also enhances relevance, especially in learning, where the learner can easily understand examples from local settings than when they are foreign. Through local content, it is easy for communities to share information, as such information is understandable to a wide range of people and tends to address common concerns such as development. It also enhances literacy and lifelong learning, as this culture can be instilled earlier in the lives of individuals.

Through local content, it possible to promote African languages and a positive attitude towards technology use. The best example that one can draw from is the initiative by the African Languages Technology Initiative (ALTI) of Nigeria, which developed the Yoruba keyboard, which won second place in the 2003 AISI IICD Local Content Applications Award. This award recognises innovative features that apply ICT to the local content development. The Yoruba Keyboard is designed, as explained by Egbokhare et al. (2003), to nativise technology, so that it is no longer seen as belonging to foreign cultures and peoples. Consequently, the keyboard will influence the thinking process and attitude towards technology. Similarly, it will increase the sense of pride and value in local languages and cultures, and thus help to preserve them. ICT becomes something that can be owned and appropriated when perceived as locally developed tool with the needs of people in mind. Moreover, the keyboard is expected to enable Yoruba people engage in the Global Information Infrastructure, and provides a means of keeping local knowledge alive and dynamic. Harnessing and making local content available and accessible through such adaptive technologies as the Yoruba keyboard is one way of encouraging access to and use of ICTs by local people.

Sources of Local Content

There are various institutions and entities involved in content generation and management. They include but are not limited to: the media; Internet service providers; artists; publishers; mobile operators; community information gatekeepers; bloggers; researchers; government; the private sector and NGOs. Similarly, Chisenga (1999) outlines institutions and means of local content creation to include: libraries, museums and archives; non-governmental organisations; universities and research institutions; governments; news and media agencies; individuals; and electronic bibliographic databases.

Moreover, local and international non-governmental organisations operating in sub- Saharan Africa are known to produce quite a lot of information materials with a large local content for public consumption. These organisations conduct research and work on projects whose end result is basically information on local issues of development. Sub-Saharan Africa has a large number of universities and specialised research institutions that have the capacity to produce and publish information on the web with a large local content. Similarly, virtually all governments of sub-Saharan African states have already set up Internet websites, where they provide information about government departments. Though the quality and comprehensiveness of these sites vary with most of them just having brochure-like information, they can provide basic local content, albeit on a small scale.

By and large, national television and radio networks are established to serve the local populations. These institutions often have the infrastructure to collect news and information from around the country and disseminate such information to both local and international audiences. Using the Internet infrastructure, they can reach millions of people around the world, and thus afford the people around the world a rare opportunity to access a wide variety of original and first hand news stories from sub Sahara Africa. They have in their archives a lot of information collected over the years that represent local content. Increasingly, a number of newspapers on the continent have online versions that provide great potential as sources of local content. They need, however, to review their policies to ensure that as much local content as possible is catered for. Chisenga (1999) points out that several websites created by individuals in sub-Saharan Africa are also slowly coming up. These sites could also be used as sources of local content. He

gives examples of sites of artists such as Lucky Dube (South Africa), Yousour N'dour (Senegal), Salif Keita (Mali), Baba Maal (Senegal), Khalid (Algeria), Astere Aweke (Ethiopia), Kofi Olomide (Democratic Republic of Congo), Angelique Kidjo (Benin), Papa Wemba (Democratic Republic of Congo) that have large component of useful local content. Likewise, digital libraries (e.g. African online digital library), information gateways, libraries and documentation centres, databases of local theses and dissertations in universities, bibliographic utilities such as SABINET, digitisation projects (e.g. University of Natal, Rhodes University, University of Botswana); national libraries, museums and archives are other sources of local content.

Local Content in Africa

Sub-Saharan Africa with about 950 million people is estimated to have more than 2,000 different languages constituting about a third of all the languages spoken in the world.. In these languages lie a rich cultural diversity and heritage in the form of local wisdom and values of the people built over several years.

Africa has long suffered from paucity of information resources, arising out of undeveloped information and book trade infrastructure. Moreover, despite the fact that in the last two decades, there has been a dramatic increase in the global production and dissemination of information through electronic means spurred by the Internet and the World Wide Web, the majority of people in sub-Saharan Africa still lack access to critical information needed to address problems affecting their livelihood. Even where efforts have been made to bring about Internet connectivity, access does not necessarily guarantee the production and availability of relevant information (Adam, n.d.). The tremendous potential for sharing knowledge on the Internet is hardly being exploited by people of sub-Saharan Africa for various reasons, including lack of relevant content and limited access to relevant digital technologies, notably the Internet.

Sub-Saharan Africa, more than any other part of the developing world, faces also several problems such as poverty, malnutrition, high infant mortality rates, wars, ethnic strife, environmental degradation, political, economic and social instability that require in many ways home grown interventions to solve. Access to information, education as well as access to established knowledge and practices is a vital resource required to alleviate these problems.

As already pointed out, the term local content refers to knowledge and practices generated locally or adapted locally and owned by the local community. Local content is by and large reflected in the community's way of life and mannerisms such as language, attire, traditional regalia, artefacts, embroidery skills, traditional medicine (e.g. dental care), architectural design, music, dance, community theatre, governance systems, communication systems, knowledge systems, conflict resolution mechanisms, handcraft and technology (e.g. the Yoruba keyboard in Nigeria). Specific forms of local content may include, for example, market prices, health information, cost of farm inputs such as fertilisers and seeds, health information (on for example, HIV/AIDS), information for small businesses, local business models and case studies, agriculture information and government information.

Challenges of Local Content Development in Africa

Local content has increasingly become a topical issue that continues to preoccupy African governments, development agencies, civil society and local communities. The rapid growth of the Internet has been accompanied by the dominance of English language content, which largely targets the needs of users who are English speaking and mainly from America, Asia and Europe.

Concerns for the paucity of local content arise from its potential. There are various compelling reasons why local content development and its presence on the web are essential. Africa faces the problem of limited availability of information and knowledge systems that address African needs. Most consumption of information is external. For example, the United Nations Economic Commission for Africa (UNECA) indicated that surveys had shown that Africa generated only 0.4% of global content, and if South Africa's contribution was excluded, the figure was a mere 0.02% (UNECA, 1999). Comparatively, it was estimated that Americas had 79.6% Internet hosts, 10.84% for Europe, and 7.5% for Asia. Other problems faced by sub-Saharan African communities in accessing information on the web include lack of user-friendly interfaces, limited use of local languages, and limited interfaces for illiterate people. Moreover, though indigenous knowledge (IK) has been widely used in different parts of sub-Saharan Africa to improve agricultural practices and transfer of relevant technologies and cultural practices to farmers, little has been done in the past to harness this treasure. In Uganda, for

example, IK has been applied in cultural management of the Matoke crop to reduce harmful effects of sigatoka disease.

Jensen (1997) discussed in detail the following constraints that hinder Africa's contribution to global content:

- Low level of computerisation in most countries;
- Scarcity of computers;
- Lack of proper guidelines on the use of computer facilities;
- Limited training and lack of skilled manpower;
- Lack of mechanisms to improve collaboration in areas of electronic networking;
- Vandalism of network infrastructure (i.e. telephone lines);
- High import duties on computer and communication equipment;
- High prices of Internet services in some countries; and
- Inadequate Internet bandwidth.

By and large, technological capacity in Africa is largely imported and often, such technology is implanted rather than transferred because of several constraints including, inadequate or complete lack of indigenous mechanisms to adapt such technologies. Pushing ICTs to communities without adequately integrating them in the community's socio-economic milieu stands little chance of success. It is also important to integrate technology with practical local content and applications that mirror the communities' real life situations. Moreover, Africa's local content, especially indigenous knowledge, has for a long time been exploited by the developed world, especially in the area of environment and biodiversity, at the expense of local people. The rapid increase in globalisation has awakened many countries and development organisations to the threat of losing their knowledge and cultural values. In addition, local content draws on local resources and makes people less dependent on outside supplies, which may be costly, scarce and irregularly available.

Africa has very limited presence of websites that address the needs of rural communities. In addition, electronic mailing lists and UseNet newsgroups on the Internet that discuss issues relating to Africa are often associated with organisations in the US or Europe. This is also evident by the fact that these lists and newsgroups are largely hosted off-continent, except for a few lists and newsgroups that are hosted in South Africa, North Africa and Kenya. For example, AFRIK-IT is a notable public

list on IT, but it is run from Ireland by the University College of Dublin. Other lists such as the African Information Society Initiative's AISI-HITD-CL and its associated African Technical Advisory Committee ATAC-CL, the PICTA-CL and SCAN-ICT-CL mailing lists are also hosted out of Africa (Chisenga, 1999).

Other constraining factors for developing local content in Africa include:

- *Lack of access to electricity and telephony*: Most sub-Saharan African communities do not have access to electricity and telephone services. These have hampered development of local content for the web. Moreover, where electricity power supply and telephone infrastructure are available, high costs of telephony and charges by Internet service providers hamper use.
- *Illiteracy and limited skills*: Illiteracy in some parts of sub-Saharan Africa, especially those areas that have been ravaged by civil wars such as Somalia, Angola, Democratic Republic of Congo, Rwanda and Burundi, limits capacity to create and use local content.
- *Language barriers*: Local languages of sub-Saharan Africa are not languages of the web, and consequently those who want to create content must create it often in English, French or Portuguese. The description of local cultural artefacts in a foreign language makes them vulnerable to the danger of losing authenticity or original value.
- *Low technology penetration*: Though the use of the Internet has grown relatively rapidly in most urban areas in sub Saharan Africa, the gap with developed countries remains high. Africa is estimated to have about 13% of global population of six billion people, but in 2001, it was estimated that only:
  - 1 in 4 had a radio (205 million).
  - 1 in 13 had a TV (62 million).
  - 1 in 35 had a mobile phone (24 million).
  - 1 in 40 had a fixed line (20 million).
  - 1 in 130 had a PC (5.9 million).
  - 1 in 160 used the Internet (5 million).
  - 1 in 400 had pay-TV (2 million).

  (Association for Progressive Communications, 2002)

- *Low PC density*: In 2001, the number of PCs in Africa was estimated at 7.5 million for a population of about 900,000, 000 people. Even with this low PC penetration (1 PC for every 100 people), cross under-utilisation of existing computer resources was reported to be common, often caused by many standalone PCs in secluded office with no use of local area networks.
- *Lack of content developers:* Generally, there are very few well-established local content developers on the continent. Moreover, though institutions such as universities are high consumers of Internet content, they create very little content for the Internet. Most research publications are produced in the West, and universities in sub-Saharan Africa use them for teaching research and publications. This is attested to by the recent global rankings of universities based on, among other things, research output, which put sub-Saharan African universities in the lowest ranks of the league tables.
- *Lack of appropriate policies*: Most governments in sub-Saharan Africa have no deliberate or conscious policies to enhance the African content on the Internet.
- *Diversity of languages:* There are various languages in sub-Saharan Africa that are not standardised. The standards are necessary to facilitate communication, using various versions of Africa's languages in the digital world, so that the different communities can make a significant contribution to the global information society. Moreover, diversity of languages spoken in Africa raises many challenges that call for technologies that can facilitate communication and access to information in as many languages and scripts as possible.
- *Lack of cultural policies*: In sub-Saharan Africa largely, no cultural policies are in place to harness the rich cultural practices of the people. Consequently, traditional ways of life, knowledge and know-how are disappearing with the onslaught of foreign cultures through globalisation.
- *Poor reading habits:* Within sub-Saharan Africa, the attitudes of the people towards information are poor. This is exacerbated by the shortage of publications that are generated locally. Local writers and playwrights have done fairly well outside the continent of Africa but have done little to promote indigenous knowledge. Western knowledge systems that have largely been deployed within sub-

Saharan Africa were developed and tailored to solve problems of specific environments and cannot effectively be applicable without being repackaged for indigenous consumption.

- *Brain drain:* For a long time, sub-Saharan Africa has suffered from the problem of brain drain of high calibre skills in search of more decent life overseas, especially in Australia, Britain, Canada, New Zealand and the United States. This outflow of key skills hampers critical human resources that would be involved in content development.
- Other factors constraining sub-Saharan Africa's presence on the Web include as outlined by Chisenga (1999): low level of computerisation in most countries; lack of proper guidelines on the use of computer facilities; lack of mechanisms to improve collaboration in areas of electronic networking; vandalism of network infrastructure (i.e. copper telephone lines); high import duties on computer and communication equipment; and lack of Internet bandwidth.

Other problems affecting local content creation and management in Africa include:

- Inadequate infrastructure, including access to the Internet;
- Weaknesses in content organisation, consistency and management;
- Lack of institutional framework for managing content;
- Under-utilisation of content;
- Lack of preservation plans for content;
- Lack of tools for content creation and sharing;
- Lack of content capacity building strategies,
- Lack of standards – metadata and best practices;
- Security issues and thefts of content; and
- Problems of communicating content associated with integration, inter-operability and scalability of technology.

Requisite Infrastructure for Enhancing African Content on the Web

Africa needs appropriate and adequate ICT infrastructure, in order to enhance the availability of African local content on the web. These efforts include, but are not limited to:

- Shared/public access and the use of corporate communication networks;

- Expansion of both international and national bandwidth;
- Liberalisation of telecom sector, including VOIP and Internet services;
- Growth in use of public access facilities, such as cybercafés;
- Reduction in the price of international bandwidth;
- Improvement in Internet connectivity for the rural areas;
- Increased literacy level and skills development to produce content;
- Access to funding for local content development projects;
- Use of open source software for creating and sharing local content;
- Use of low-cost consumer oriented two-way VSAT services for taking Internet services to rural areas where laying cables may not be feasible because of hostile terrains;
- Local peering of ISPs through which national Internet Exchange Points (IXPs) are interconnected and all of the ISPs transfer local traffic, in order to reduce traffic delay and costs. This model worked well in Kenya, Mozambique and South Africa (Africa Internet Status Report, 2002).

Institutional Frameworks for Local Content Development in Africa

The United Nations General Assembly designated the 1980's as the industrial decade for Africa and emphasised the need for the African continent to develop a local machinery capability as a means of satisfying internal needs. It also envisaged creating indigenous capability for modifying and adapting foreign technologies to peculiar conditions and economies of the continent. Additionally, the Organisation of African Unity in 1980, through the Lagos Plan of Action, placed great emphasis on locally generated information to solve Africa's development problems. The Plan recognises that the strength of the indigenous information systems lies in content of valuable social, scientific and technological information, as well as traditional channels of information exchange. The Plan recommends that African countries should enact policies that reflect adequately socio-cultural values, in order to reinforce cultural identities. The Plan stresses the importance of basic industries, and the need to move towards technological capability and self-reliance in the region.

Similarly, the G8 Digital Opportunities Task Force in its 2001 Genoa Plan of Action defined an approach to increase access and use of ICT in countries and, in particular, proposed the development of local content through making software applications available, encouraging

participation of local stakeholders and expanding the languages available on the Internet (DOT Force, 2001). Furthermore, during the Kananaskis Summit of G8, African leaders made the use of ICTs a priority. They made a declaration to commit resources for developing basic telecommunications infrastructure in their countries to provide universal access to content. During the same Summit, Canada undertook to make a contribution to the DOT Force agenda for Africa by declaring its intent to promote community access through network connectivity and support for the creation of local content. Similarly, UNESCO's actions in the cultural arena in Africa stress among other things, making information and communication technologies available to all, while working to increase the production and dissemination of local content in the media and via electronic networks. Similarly, the New Partnership for Africa's Development (NEPAD) has made commitment in its principles of intent to develop ICT programmes, including local content in order to empower Africans to make a unique contribution to the information society.

Similarly, governments and development agencies should be involved in helping to create local content. For example, French-speaking countries generally have a higher profile on the web than their non-French speaking counterparts, because French-based agencies have provided strong assistance to French-speaking countries, in order to counter the dominance of English on the Internet. On the other hand, radio can be a very important tool for enhancing local content in sub-Saharan Africa. This is because, it is still by far the most dominant mass medium in Africa, with ownership of radio sets being much higher than for any other electronic device. Estimates for radio ownership in Africa in 2002 were 200 million, compared with only 62 million TVs (Africa Internet Status Report, 2002). Likewise, the dramatic growth of cellular telephony should play a significant role in local content sharing in Africa. Most countries in sub- Saharan Africa have more cell phone lines than the fixed lines. In Kenya, for example, during 2006, the number of cell phones users was estimated at six million (population 33 million); Nigeria, 16 million (population 130 Million); Botswana, 600, 000 (population 1.7 million); and South Africa, 26 million (population of 44 million).

African governments should consider providing incentives for interested individuals or organisations to become content providers. Such individuals or institutions could include the media, Internet service providers, artists, publishers, mobile operators, and community

information gatekeepers. Similarly, African governments should address the needs of the disadvantaged people in society such as women, children and the disabled with visual and hearing problems. Moreover, respective governments should put in place local content applications development and media awards that recognise innovative or pioneering applications of ICTs to local content development, such as recognising an outstanding story, campaign or project, in which the significance of local knowledge and content is highlighted. In addition, efforts should be made to develop a framework that encourages partnership between private sector and government agencies in translating and adapting foreign content into Africa's local languages.

It is important to promote universal access to education, which has been elusive to many countries in sub-Saharan Africa. Similarly, universities in sub-Saharan Africa should be well-resourced, in order to promote scientific publications in areas that promote local content. Additionally, through e-governance, local content could be developed and made accessible to communities in languages understandable to a majority of the people through government electronic infrastructures.

It is important that sub-Saharan African countries invest in the revitalisation of indigenous information systems as one way of enhancing local content development in Africa. Similarly, there is need to explore ways of using indigenous languages at universities for science and scholarship and for the publication of local content. The use of English as the lingua franca of scholarship and science has often been suspected to contribute to the low pace of industrialisation in Africa.

Enhancing Access to Local Content

Access to local content can be facilitated through a number of strategies that include:

- Enhancing human computer interaction;
- Digitising content to enhance its ubiquity, and continuity of access;
- Providing single searchable point to contents;
- Providing conducive environment for accessing information using ICTs;
- Taking cognisance of linguistic diversity and multilingualism in developing local content;

- Promoting digital inclusion;
- Providing systems that cater for diverse abilities, skills and preferences;
- Promoting literacy and support for digitally challenged;
- Providing diversity of interfaces;
- Offering online education and support;
- Promote user centered methodology in building systems;
- Providing high bandwidth for multimedia content;
- Building institutional capacities to collect, organise, store and share information and knowledge; and
- Stimulating the creation, processing, dissemination of information to all people.

Other means of promoting access to local content include: using wireless application protocol (WAP) portal and number portability; cyber-mentoring; providing local content online; integrating ICTs in the cultural milieu of a people; enabling consumer education and protection; providing interactive content; preserving local content; putting in place human resource development strategies; creating public awareness on the capabilities of ICTs; providing education and training programmes in ICTs; facilitating free flow of information; eliminating illiteracy; bridging the digital divide; using open standards; providing technical assistance and support; enhancing universal and free access to information; developing skills for searching and retrieval of content; and promoting investment in new technology.

Similarly, access to local content can be enhanced through:

- Providing affordable or free-of-charge access to the Internet;
- Providing incentives to enhance content creation;
- Providing technical support;
- Enhancing, connectivity and quality of access;
- Providing electricity grid infrastructure;
- Enhancing online security, privacy and confidentiality;
- Providing diversity of technology;
- Promoting standardisation of applications, interfaces, software and hardware; and
- Addressing obsolescence issues.

Content Management

Content of any nature needs to be effectively managed for it to be used to achieve desired outcomes. Content management can be defined as a set of processes and technologies that support the generation, dissemination and use of content. It may also be perceived as the means by which an organisation efficiently plans, collects, organises, uses, controls, disseminates and disposes its content and through which it ensures that the value of that content is identified and exploited to the fullest extent.

There are various ways of managing contents that are facilitated by technology such as: e-mail; bulletin board; discussion boards; mailing lists-mass; newsgroups; web forums; portals; blogs; websites; web directories; subject gateways; online databases; OPACS; institutional repositories; digital libraries; and search engines/federated search engines. Such content should be reviewed, reformatted and uploaded into the web to have a wider reach.

Conclusion

The provision of local content on the web is critical in the development agenda of sub-Saharan Africa. To develop and nurture local content will require multi-pronged approaches involving governments, development agencies, academia, etc. There are different kinds of infrastructure in sub-Saharan Africa that can be used to enhance content development such as government websites, online media houses, Internet service providers, cellular phone providers, community radios, and community telecentres.

For sub-Saharan Africa's local content to be of use to its people, it is important, first and foremost, that Africa's information resources presently lying fallow should be revitalised and harnessed. This would be achieved through a number of strategies, including harnessing local knowledge from gatekeepers in local communities, who are the custodians of community information. Moreover, local content creation should just not target the elite, but must cater for all with emphasis placed on local communities. Information professionals need to take the lead in the documentation and repackaging of information, while the media can help to disseminate such information. On the other hand, the private sector can be encouraged through social responsibility

obligations to continue to come forward and fund community initiatives, aimed at creating local content. The digitalisation of documents, as well as creation of electronic databases that are of use to local communities, should be encouraged. It is important to invest in training of information professionals in web design, digitalisation of documents, setting up and maintaining information gateways, and using software that addresses different languages, as well as strengthening copyright and intellectual property laws. Preservation of community knowledge demands effective government interventionist programmes that recognise the rights of traditional intellectual efforts. The development of sub-Saharan Africa's information and content infrastructure remains a challenge that must be continuously addressed for the people of the sub-continent to be equal participants in the global information society.

Review Questions

1. Using appropriate examples, define the concept of local content and explain how it differs from the concept of indigenous knowledge.
2. Why is putting Africa's local content on the web important?
3. Why do you think sub-Saharan Africa's local content on the web remains very low?
4. What can be done to improve Africa's content on the web?
5. Discuss examples of what constitutes Africa's local content.

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Chapter 4

Towards Developing African's Web Content: Challenges, Strategies and Tools

Ayoku A. Ojedokun

Introduction

Information is widespread and incomplete at any single resource. Users would therefore, in most cases, be required to collate information from various locations in pursuit of a single goal. This suggests that sophisticated users will require multiple distributed/disjoint bits of information to accomplish a single task. The World Wide Web (WWW) simply referred to as the 'Web', a graphical client-server information system, which uses hypertext to organise, connect, and present information and services throughout the Internet, now makes this possible.

The web, as was its purpose, is a massive resource of information to which anyone anywhere can connect or from which anyone anywhere can receive. It is the communication medium of choice for many people today. One major advantage of the web is that many people can access a single online resource simultaneously.

However, Africa has a low score-card with regard to locally produced content on the Internet. This chapter discusses web content collection and the challenges of Access to content in Africa.

Africa's Web Content Resources

Almost all the 54 countries in Africa are now on the Internet. Of the estimated 2007 Africa population of 933,448,292 (which is 14.2% of the world's population), 33,421,800 African are Internet users. This is a 3.6% penetration of the percentage population, and 3.0% of the percentage users in the world (Internet World Statistics, 2007). This, among others, may have been informed by the deficiency of local content on the web in spite of its vast pool of local content such as political institutions, rites,

art and drama, etc. Most of the content on the web are generated either in Europe or the United States. The position paper commissioned by the African Internet Service Provider's Association (AfrISPA) revealed that Africa's claim to Internet domain space is 0.2% for a population of 14% of the global population (African Internet Service Provider's Association, 2005). Although this shows an increase from 0.04% of the global web content as estimated in 2001 (Mutula, 2002), Africa remain deficient in web content. Unfortunately, the majority of the countries studied by AfrISPA have no Internet content development plans. Indigenous knowledge and content from Africa is therefore yet to reach millions of users on the 'net'. Education, sciences and community development sites have the lowest content. The situation is exacerbated by the fact that Africa's content on the web is mostly in English, which is spoken only by the educated elite. Indeed, English still functions as the *lingua franca* on the web. English is by far the most frequently used language. However, there are also substantial non-English content on the web. Some indicative figures on the distribution of web content over languages are shown in Table 1 (Sigurbjomsson, Kamps, and Rijke, 2005). The demand for the use of the Internet in Africa is not only reduced by the lack of local content in a widely spoken and understood language, but also limited only to those who can see and read as the visually impaired are not catered for (Mutula, 2002; Global Reach, 2004). Content on African sites is also relatively poor, with the exception of public information sites (Chivchanga, 2000).

Table 1: Chart of Web Content by Language

Language	Internet Pages	% Web Content
English	1142.5	56.4
Non-English	2024.7	43.6
European (non-English)	536.9	26.5
Dutch	38.8	1.9
French	113.1	5.6
German	156.2	7.7
Italian	41.1	2.0
Polish	14.8	0.7
Portuguese	29.4	1.5
Russian	33.7	1.7
Scandinavian (total)	17.4	1.3
Spanish	59.9	3.0

Source: Sigurbjomsson, Kamps, and Rijke, 2005
http://staff.science.uva.nl/~mdr/Publications/Files/jdim2005-webclef.pdf

Making Africa's knowledge available on the web is one way of raising awareness about Africa's cultural identity, values, practices and innovations. Its strength, however, lies in the content of valuable social, scientific and technological, as well as traditional channels of information exchange. Of immediate need are information for survival, education, business, research and politics. Local content could be of value to researchers, who wish to undertake studies on diverse subjects in Africa. Local content draws on local resources and makes people less dependent on outside supplies, which may be costly, scarce and irregularly available. It is important in conflict resolution, environmental conservation, and community development. Readily available sources of local online content include grey literature in the form of government documents, theses and dissertations, accession lists, specialised bibliographies of local information. These may be found in libraries and government departments (Mutula, 2002). Others are business information, that is, information about institutional activities, products and services, and news. Many governments and institutions are already digitising the content of these sources for online access.

Africa's web content is currently in various forms. African content covers the following areas: civil society issues (such as peace and security, socio-economic policy analysis, gender, health and population, sustainable development, the social sciences, human rights, civil society and community development), education, science, technology and statistics, e-governance (to improve administration and governance), e-business, media, arts and culture (which represent the biggest area in African web content to promote African music, museums and galleries, to assert national cultures and identities, and keep track of history), travel and tourism, and electronic mailing lists and web-based E-mail. Although many large and small companies in Africa have discovered that the Internet can serve as a global marketing tool, other public and private organisations/institutions (socio-cultural and scientific) in Africa also need to be encouraged to put their content on the web. In terms of design methodologies, one approach to developing a successful website in an Africa setting is by groups (socio-cultural and scientific) organising discussions/workshops. This revolutionary approach was used by Women's Net (http://womensnet.org.za and http://flamme.org) in the development of their website. Their workshop was for women from different gender groups in Southern Africa to 'brainstorm what a women's information and communications network could offer the women'. They developed a framework for sourcing, organising and

making information available centrally from a website. They also developed an impact assessment approach that involves feeding information to the resource on a regular basis, with the strategy team meeting on an annual basis to review how far the goals and objectives of the website are being met. Thematic approach is another method that could be used. The thematic approach was used by a group focusing on 'content to educate', provide information and a platform for communication. The cornerstone of their endeavours hinges on "access, content and training" (Chivhanga, 2000). Themes may also include but not limited to educating Africans on issues of HIV/AIDS, child abuse, small-scale business enterprises, agriculture, people's culture and way of life, resources in Africa, etc.

The Challenges of Access to African Web content

Status of Information

The poor status of information - both electronic and non-electronic in Africa, has been a subject of concern for many years. It remains a problem, even now. The information, no doubt, is there, but in many cases locked up in people's heads, or just lying around; that is, not collated, classified and stored in an easily accessible manner. It is also sometimes a result of deliberate suppression of the free flow of information in a given locality because of the political consequences of making people fully aware of the state of affairs around them. In some political circles, it is even said that the Internet is bad for the African people (Chivhanga, 2000). Some governments view the Internet as a threat to African culture and national security, which results in restriction of public accessibility (Ngwainmbi, 2000, cited in Roycroft and Anantho, 2003). It is thus obvious that political intransigence has to a large extent contributed to the slow growth of the technology in Africa. The apathy to provide universal access to communication services therefore largely explains the low telecommunications infrastructure, such as telephone lines and personal computers (PCs) in many African countries. The challenge is for everyone devoted to Africa's development to become more vigilant and stand up against reactionary forces. This can be done through the initiation of sustainable positive action programmes that demonstrate the good about the technology, such as access to a library of educational material and savings on communication through email (Chivhanga, 2000).

Capacity for Web Content Development

Africa also appears to lack capacity for content development and policies for content creation. While the web space is expanding with all countries now having some form of local or internationally hosted web servers, the degree of comprehensiveness and the quality of the increasing number of websites vary. Key to improving African development and the growth of content on the web is Information management. Information gathering and production in digital format (text, graphics, audio and motion pictures) must therefore be encouraged. It is important to continue to focus on information management – its collection in digital format and qualitative processing and dissemination. It is a prerequisite to information dissemination on the web. Information cannot be disseminated if it is not organised. African governments must encourage the establishment of local and global web presence through Intranet and Internet. This must, however, not be mortgaged for quality. Information consumers have become more selective and are demanding quality and reliability. They do not want to lose time on sites offering incomplete, inaccurate, outdated, or difficult to access content. Africa's slowly growing Internet sector thus needs to become fiercely competitive. In an attempt to improve its web content and to achieve highest user satisfaction therefore, the quality of web content must receive serious consideration. Quality must be encouraged through cooperatively developing, maintaining and promoting a website based on peer review systems. This is very important for institutional survival in the information age. Measures of web content quality include interactivity with users, dynamic content, community centric content, regularly updated content, and downloadable content and rich and accurate content (Economic Commission for Africa, 1999; InterPress Third World News Agency, 1999; Jensen, 2000 and Mutula, 2002).

Enabling Policies

Policies to guide content development must also be put in place by respective governments. In addition, they must create enabling regulatory, legal and policy frameworks to protect security, privacy and copyright ownership, and must encourage accessibility and competition at affordable prices. These must receive support at the highest level of political leadership. The policies must address such issues as infrastructural development and rural connectivity (using the VSAT

technology). Others, which must be addressed to encourage Internet accessibility, include liberalisation (of telecommunications networks and Internet service provision), unrestricted market access, eradication of under-investment and inefficiency through privatisation and private sector involvement, and tariff reform (Economic Commission for Africa, 1999; Mutula, 2002; World Bank, 2001 cited in Roycroft and Anantho, 2003).

Local Languages

Much of a people's cultural and intellectual heritage, especially in rural areas, is contained within and expressed through the local language. Thus, limiting people to the use of ICTs in a foreign language tends to exacerbate the "digital divide"; makes ICT adoption long, difficult and expensive; and impoverishes local cultures. Many languages are spoken in Africa. While a great deal of adapted software and content already exists in Arabic, very little has been localised to the needs and cultures of rural Africans (Global Envision, 2007). Generating content in local languages therefore poses a challenge. Effort must however be made to generate content in national languages spoken by many people. Speeding up localisation of web content in African languages will encourage adoption of ICTs in Africa (Mutula, 2002).

User Disability

One group of potential users who may experience access problems are those with functional blindness; that is, people who are blind (either totally blind or no useful sight). Efforts must be made to cater for this group, as well as to encourage ICT adoption among this group. Visually impaired people can use a variety of assistive tools. These tools are divided into three categories: enlargement enhancement, substitution for sight by sound and substitution for sight by tactile displays. Enlargement enhancements are especially helpful for people with limited sight. Hardware that has been developed in this category are oversized screens, closed circuit television, projectors, etc. Substitution for sight by sound, and substitution for sight by tactile displays are especially helpful for completely blind people. Tactile devices use refreshable braille displays, which consist of a line of soft pins which can be moved up and down to form braille characters. A braille translation software converts characters on the computer screen into braille characters on the braille display.

Substitution for sight by sound comes in form of screen readers. These are software programs which use text-to-speech synthesiser technology to read out the text displayed on the computer screen through headphones or speakers (Tan, 2004; Brophy and Craven, 2006).

Security Threat

Issues of security threat to information on the Internet are of much concern. A number of Internet abuses are already widely known. Known abuses include: privacy infringement such as unauthorised acquisition of data, and subsequent usage of the data for crime commission; dysfunctional e-behaviour, such as posting pornographic materials on the net, etc.; and hacking such as unauthorised penetrations into computer networks and unauthorised reading, correction or destruction of data. Many cases of these abuses have been reported in Africa, prominent of which are cyber swindles and posting of phoney business opportunities. Efforts are being made to combat these crimes through technology-based security measures (e.g. Surfwatch, Cybersitter, Net Nanny, Cyber Patrol, etc.) and enactment of cyber laws, requiring the setting up of cyber courts with exclusive jurisdiction over the Internet (Ojedokun, 2005). The challenge, however, is achieving effective enforcement of the latter to preserve basic civil rights in the electronic environment. There must be a concerted effort by African governments to ensure security of local content on the Internet.

Infrastructure

Internet is a physical infrastructure made of public and private sector networks and content providers. In the context of Africa, infrastructure is inadequate. These include: lack of Internet backbone facilities, small fraction of Internet 'host' computers, dearth of international bandwidth, and limited Internet access facilities (Roycroft and Anantho, 2003). This poses some challenges to web hosting in Africa. As a result of these challenges, there are not many hosting sites in Africa to promote specific industry and service sector.

For instance, whereas there are multiple nationwide backbone providers in the US, a major impediment to Internet development in Africa is the lack of Internet backbone facilities. South Africa/Lesotho/Swaziland network and a link between Mauritius and Madagascar remain

the only regional backbones between neighbouring countries in Africa, no other. This is because of the high international tariffs charged by telecom operators, which discourage ISPs from establishing multiple international links. Internet backbone facilities provide high-capacity network connections. Without backbone networks, the interconnection of networks is more difficult, and may require extensive backhauling of traffic from interconnection points located elsewhere in the developed world (Jensen, 2000; Roycroft and Anantho, 2003).

Another critical aspect of Internet infrastructure are Internet "host" computers – computers connected to the Internet, which provide content, information, and e-commerce activities. Unfortunately, the vast majority of all global Internet hosts are physically in North America. The number of Internet hosts located in the US results in a host penetration rate of approximately 2.4 persons per US Internet host. The number of hosts is one indicator of the extent of Internet connectivity. The number of Internet hosts in Africa is only a tiny fraction of that of the US, which results in approximately 3700 persons per African host (Roycroft and Anantho, 2003). Among the increasing number of organisations having a website with basic descriptive and contact information, many are hosted by international development agency sites (Jensen, 2000; Jensen, 2001 cited in Roycroft and Anantho, 2003). The existence of Internet hosts in Africa is very important for the following reasons. First, it is more likely to associate locally produced content with domestic Internet hosts. The availability of locally produced content can provide unique and beneficial information that would make Internet subscription more attractive to the local population. Second, it is more likely that locally produced content would be in local languages. Finally, local hosts can serve to store information retrieved from other remote computers. This is commonly referred to as 'caching' of content, which is critical as the amount of international bandwidth connecting an African Internet Service Provider (ISP) to the rest of the world is limited (Roycroft and Anantho, 2003).

The issue of bandwidth is indeed very critical. Bandwidth refers to the range of frequencies that an electronic traffic uses on a given transmission medium. The medium could be fibre optic cable, satellite or copper cable infrastructure. The vast majority of global Internet infrastructure is based in the US. As a result, developing nations are heavily dependent on international bandwidth to access valuable Internet

content. Unfortunately, there is a dearth of international bandwidth in Africa. The limited service bandwidth affects the ease and speed of access. It is common to get lines disconnected intermittently and wait long hours before getting connections. It can take half an hour to draw a web page on a screen. The high international tariff and lack of circuit capacity is a major problem in obtaining sufficient international bandwidth for delivering web pages over the Internet. Engvall and Hesselmark, (2007) share the view that low-cost and widely available international bandwidth is a prerequisite for ICT services to take off in sub-Saharan Africa. Most Governments in sub-Saharan Africa that have developed ambitious national ICT policies and plans also hold this view. Thus, the growth in international bandwidth which is now being driven principally by voice traffic is a result of lowered tariffs for effective competition against the new entrants. The deployment of broadband access networks is also creating additional requirement for international bandwidth, and its uptake amongst cyber cafes and telecentres is triggering a second phase of growth in Internet usage in sub-Saharan Africa (Balancing Act News Update, 2005). Tariffs therefore still need to be lowered further to encourage acquisition of international bandwidth as subscribers continued to experience delayed connections.

Other challenges include problem of power supply and telephone infrastructure. Power supply is irregular in many African countries, and the telephone lines are inadequate. In Africa, electricity breakdowns cause prolonged power outages that disrupt business operations and increase costs. And with only 17 million telephone lines installed, the teledensity is only about one telephone line for every 200 people or 2 per cent of the World telephone connections (Shibanda, 2000; Roycroft and Anantho, 2003). Until Internet infrastructure is improved upon, especially in rural Africa, content development from grassroots communities will continue to suffer. In addition, there is the need to create adequate information and communications technology (ICT) awareness within communities, as well as encouraging attitude change to enhance technology pull, content creation and access to ICTs (Mutula, 2002).

Web Publishing and Maintenance

Web publishing/authoring is a rapidly growing form of content dissemination in Africa, and has become a valuable global marketing tool. However, the web's major benefit is not limited to bringing access

to content; it is also the best tool for getting feedback on the quality and utility of information. Unfortunately, websites maintenance in Africa is often poorly managed, due to the lack of resources, expertise and adequate processes. Thus, the interactivity between visitors and publishers of the sites is often limited to e-mail, with limited use of web interactivity. Most African websites also do not use digital content; they rely mainly on paper-based information production processes such as scanning. (InterPress Third World News Agency, 1999 and Economic Commission for Africa, 1999). It is therefore important that human resources in Africa be developed not only in community content generation, but also in packaging and dissemination in digital formats for quality assurance. Discussed below are fundamental issues in web design for the benefit of would-be designers in Africa.

Web Page Design Fundamentals

Web design is the arrangement and creation of web pages that in turn make up a website. The key to building an excellent website, and doing it in the least amount of time, is *planning*. Without planning and organisation, one will end up with chaos (Breal Web Design, 2003). Planning the proposed website design (i.e. the look and feel of the homepage, the navigation or flow chart of the various pages of the entire website) on paper is vitally important. Although time-consuming, it is also important to plan what will be delivered and how it will be delivered. It results in effective design, which in turn results in the successful communication of the message to the intended audience.

A web design plan must ask the following questions and/or do the following (Donnelly, 2001; IBM Web Guidelines, 2000), among others:

- What is the main purpose or the reason for the site? One should try to state in one sentence the overall goal or purpose for the website.
- Who are the audience and what are they looking for? The audience need to be defined. The site will not appeal to everyone; so it is best to choose a particular segment of the population and focus the efforts on attracting and engaging these users. The audience definition will influence every aspect of the design such as the *languages* that will best serve the audience, the appropriate levels of complexity and formality, *placement* i.e. where to advertise the URL, key words to include so that the site will turn up in the target

audiences' search results, the *approach* i.e. whether playful or scholarly, pictorial or language-oriented, the *input and output media* i.e. voice, visual, or both, and *participants* for user *testing, focus* groups, task surveys.

- What layout should be used? One should explore what one wants to deliver and design the information to be delivered over the web. One should try to choose the places where the graphics and other media elements would be implemented, as well as how the information would be placed on web pages. A look at other websites may be helpful in taking a decision.
- What items – text, images, and data – should be included in the web page? One should investigate the resources to work with, and to determine the best method for developing the content for the target audience.
- What colour should be used? Are these colours complimentary (that set each other off) or in harmony (i.e. that go together well)?

Requirements of a Successful Web Page

The following must be taking into consideration for effective Web design and publishing:

Content

The most important requirement is the content. Content is the heartbeat of any exceptional website. It is just as important as the design and layout of the site. Although the ability to take a common subject and give it some interest and originality is a rare talent, it is necessary to keep visitors coming. Poor unrelated content drives visitors away. The use of the right words entices visitors to stay and read the information provided. Also, use short sentences. One should ensure that the text is broken into paragraphs. Bullets and lists should be used to make the point. It is important to create textual variation with heading size and colour, while avoiding making text too small to read easily (Breal Web Design, 2003). The content must be original, motivate, inspire, educate or provide a solution to a problem for which the visitor is seeking an answer (Roger, 2006). Content of text must be made easy to read. The more unique the content is, the better it will be for keeping customers interested and repeatedly returning to the site on a regular basis. Information must be

carefully evaluated to make sure it is in keeping with the purpose of the site. The most up-to-date data in respect of the subject matter must be created. Keeping the site current will not only attract new visitors, but will also motivate them to becoming customers who want to return to the site again and again.

Effective Communication

Communication is the most important aspect of web page or site. One of the ways to ensure that the web page communicates effectively, apart from the content, is by sincerely looking at the audience, and how best to communicate the content to them. All good websites are audience-centred. The questions to ask are: why are they coming to the site? what are they looking for? what will satisfy most of their needs or reasons for coming to the site? and what is the best way to present the content to them? The whole point in identifying and analysing the audience is to custom-tailor the web site around the needs of the audience. Looking at the audience is vitally important to determine the look of the pages, as well as what content is delivered and how it is delivered. Successful communication occurs, when the text, graphics, and any other element transfer a message from sender to receiver in its entirety (Mohler and Duff, 2000). The compilation of graphics, text, and other media elements therefore contributes to effective communication.

Good Presentation

Good presentation is important. Good websites do not keep the visitors guessing. The purpose of the website must be made immediately evident (Franz, 2004), and must present an easy to follow navigation system. The visitor needs to know immediately if they have landed on the right site. They also need to know what is in it for them to stay in the site. The "About Us" page must explain to the user about the website, what it holds, who it is that is hosting the web, what the organisation/company/individual does, how long it has been in business, the address and phone numbers. In other words, the objectives of the site and a brief abstract describing the site must be stated. These two elements help when deciding what will be included in the site, and how it will be integrated into the overall mix of pages. A site feature is also important, as it gives visitors the ability to search for exactly what they are looking for, if they have something exact in mind. A site feature is best place in the navigational system, so that it shows up on every page.

Design of the Site Navigation

The website, in its design, must be thought of as a pyramid with the homepage as the pinnacle of the pyramid. The home page must be simple but attractive. Interactive design, the design of navigating information, is important. Navigation must be designed in a way that the visitor is not overwhelmed with choices. It must be designed, so that it occurs logically, clearly, and concisely. There should be no more than five choices at one time. Visitors can navigate from the homepage to the 2nd tier pages, and then to the 3rd tier pages. The homepage might offer five category links at the top of the page, each of which might lead to five more 2nd tier links, adding up to 25 pages, plus the homepage (Fig. 1). To make visitor's experience easy and pleasurable, the navigation bars (a simple set of buttons or text) should be placed in the same place on every web page, usually at the top, left, or bottom. Every navigation bar should also include a home page button and contact information. If the page scrolls down more than one and a half screen view, simple text navigation (e.g. 'Top') must be added to the bottom so that visitors do not have to scroll back to the top to make another selection. A large site will require an index page or a site map for visitors to know about the website (Donnelly, 2001 and Perkins, 2006).

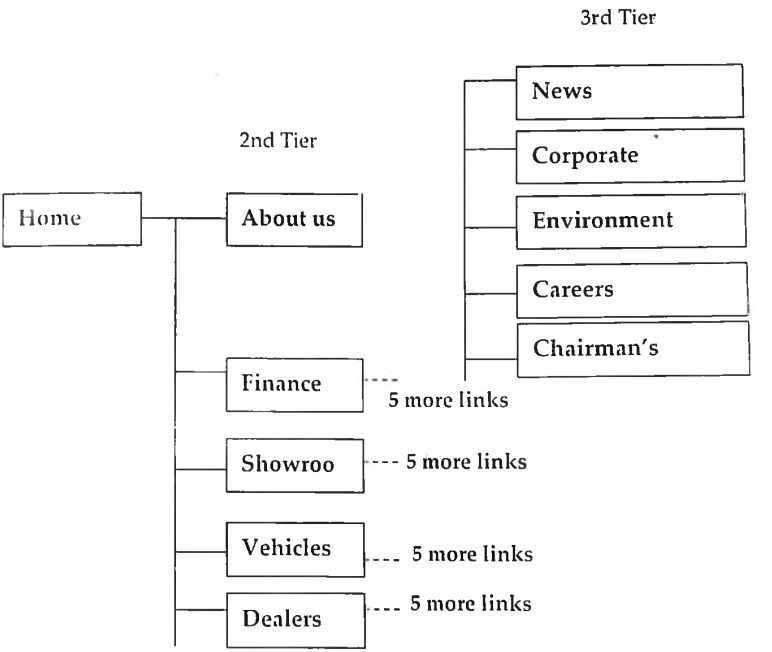

Fig. 1: Typical navigation model of a motor company website.

Visual Component

One of the most important aspects of the web is the visual component. Great graphics, if properly used can enhance a website and its content. Graphics play an important role in setting the mood, as well as the tone for a site. Visual component design skill requires learning what makes good graphic composition, what makes an effective graphic, and what the appropriate time is to use those graphics. Without graphics and other media elements (such as sounds, animations, and videos), the web would be nothing more than a glorified Gopher menu (Mohler and Duff, 2000). Graphics should, however, not be overused, or they take forever to load, can drive visitors away before they even see the content. While multimedia elements (i.e. animations, sounds, and video clips) can be used on the web, it should be to a limited extent because of the bandwidth restrictions. Pages must be quick and easy to load.

Choice of Colour

The choice of colour is very important in designing graphics. Colour conveys a message, even if not realised. Colours have an effect on emotions within 90 seconds of viewing. Colour choices can motivate, impress, persuade, intensify item, and thus influence visitor's behaviour (Paul, 2004). Designers must make careful use of colours.

Every colour has three dimensions – hue, value, and saturation (Mohler and Duff, 2000). The word *colour* is synonymous with *hue*. The names used – red, green, blue, etc. – are the hues. Hue is a property of the wavelengths of light.

The value of the colour refers to the amount of white or black in the colour. The difference between pink and red is an issue of value. To create pink from red you add white to the hue. This creates a tint of the red, pink. To create dark red, add black to the red hue. This creates a shade of the red hue, a dark red. The common term used when referring to the value of colour is *contrast*. It is perceived, due to the changes in value. It is used to describe the value differences between two or more adjacent colours. The higher the contrast, the greater the differences in values. The use of contrasting values or colours is one key characteristic of good graphics. Good graphics have good contrasts.

Saturation of a colour describes the purity of a hue, e.g. red is more saturated than pink, because pink has white added to red. Saturation is affected by the amount of black and white in a hue and, also in how much of another hue is mixed together with it. Each colour or hue can be thought of as a mixture of a particular hue with other hues. The portion of the pure hue determines the saturation level. To determine the level of saturation for a particular pink, the amount of red in the hue will have to be determined. The pink may have a saturation of 45 percent, meaning that 45 percent of it is red, while the remaining 55 percent is white.

Every colour can be measured or defined by its hue, value, and saturation. However, the same method will not work for every device such as computer monitor, application, or television screen. This means for every device, the designer must be able to define the number of colours that it can use, called "the *gamut*" or range of colours for the particular device (Eaton, nd; Mohler and Duff, 2000).

Designers can use varying tints and saturation levels to achieve a pleasing combination of colours and sufficient contrast for legibility of

graphical text. But, the easiest way to develop familiarity and comfort with colour is to spend time to study the *colour wheel*. The colour wheel is the most common tool used for introducing basic colour principles because it is fairly intuitive. The colour changes incrementally, as one goes around the wheel. One can create the wheel by mixing the primary hues or colours. The designer is advised to choose colour that go together or complement each other. A beginning designer should keep colour scheme simple in the beginning. He/she should experiment with the colour wheel, and one needs to study the colour schemes used by other designers (Navarro, 2001). As the designer experiments, he will begin to get a feel for working with colour.

Colour differences, in terms of value and saturation, also occur from one platform to another. For example, colour display is different between PC and Macintosh. (Mohler and Duff, 2000).

The Delivery System

This is often overlooked during the development process. However, it is important to consider the type of network access and machine configuration the user has for efficient delivery.

Connection (slow or fast) is one of the most important aspects that determine the delivery speed of web content. The end user's connection (the client), the designer's server connection (the server) and the path or connection between the client and server (the channel or the cabling, e.g. twisted-pair, Co-axial, Fibre Optics), all contribute to the delivery speed. For example, the Fibre Optics has the highest data transmission rates over a distance of several kilometres without loss of signals. It is only when the server, client, and cabling (the connection between the two) support the same speed that the designer is assured of "fast" delivery. However, it is the end user connection that usually limits web delivery. Most end users are household users who cannot financially justify a fast Internet connection and therefore usually opt for the slow affordable connection via a modem. It is thus important to examine the audience to the various methods of connection. The faster the audience's connection, the more graphics and multimedia elements can be provided. If a significant number of elements is provided on the pages for clients whose connection is through a modem, some of the audience will be lost, due to significant download times. The modem speed is very important. There are a few modem speeds at 14.4, 28.8, and many at

33.6 kbps (kilobytes per second). The new modem speed is 56 kbps. However, for dail-up connection through an Internet Service Provider (ISP), unless the ISP has a 56 kbps modem (or greater) on the other end of the line, the additional power at the end user end does little good. Both ends of the connection must have equivalent modem speeds (Mohler and Duff, 2000).

Web Design Application Programs

We witness today the emergence of tools that enable almost anyone to publish materials on the World Wide Web (WWW). They range in complexity, capability, and price. These include, among others, editors, converters and generators. Some of these tools require the knowledge of Hypertext Mark-up Language (HTML), while others draw on experience with other applications such as word processors and spreadsheets.

Editors can be used for web page creation and publishing. Web pages are simply ASCII text files, and any text editor is also a web authoring tool. An ASCII text editor is included in every operating system from Mac to Unix (Cortes, 1998). Editors are stand-alone programs that make creating the ASCII text - HTML files - easier (Mohler and Duff, 2000). With editors, designers have direct control over the character and structure of his/her documents. Since HTML is a simple ASCII text file, almost any word processor can be used to generate Web documents. The 'Save as HTML' feature of Microsoft Word allows developers to more quickly create web pages. However, knowledge of HTML is required for it to be effective. For example, by simply typing in the text that should appear in the web pages and using styles to set the HTML characteristics, Word is able to generate a viewable HTML document. Other commonly used editors for PC are *TextPad*, *Notepad* (Fig.2), and *Allaire Homesite*. Editors available for Macintosh are *BBEdit*, *Text-Edit Plus* and *SimpleText* (Navarro, 2001). There is also the Microsoft's free *Active-X Control Pad*. These are Notepad-like programs that include rudimentary page layout functions, HTML syntax help, and some scripting tools. The ASCII text editor approach has its advantages and disadvantages (Cortes, 1998). Among its advantages are existing familiarity with the software, zero investment in new software tools, and the ability to exercise complete control over HTML tags. Disadvantages include having to type out every single HTML tag, the absence of spell-checking and HTML syntax/link

checking, difficulty in viewing an evolving page, and the absence of website management features. Ways of getting around these include toggling between a web browser in one window and the editor in another. An HTML page can also be loaded into a full-fledged word processor to do spell-checking.

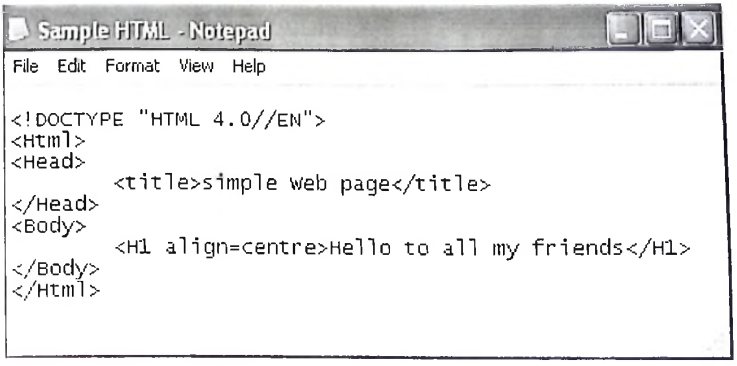

Fig. 2: Notepad listing HTML code for a simple Web page

Individuals who do not have the time to learn HTML can use *converters*. These are simple plug-in utilities that convert standard application documents such as Microsoft Word, WordPerfect, Excel, or other files to HTML code for distribution on the web. Examples include: *AscToHTM*, *Text2Html* (Fig. 3a & b), *Easy Text To HTML*, etc. Many of these are freeware available on the Internet. Some converters require the use of intermediate file formats such as the Rich Text Format (RTF), for the conversion to occur correctly. The capabilities of the converters are however quite limited. Many software programs now come equipped with HTML Converter feature. For example, an HTML converter is included in the latest versions of Microsoft Office programs like Microsoft Word, Excel, and PowerPoint.

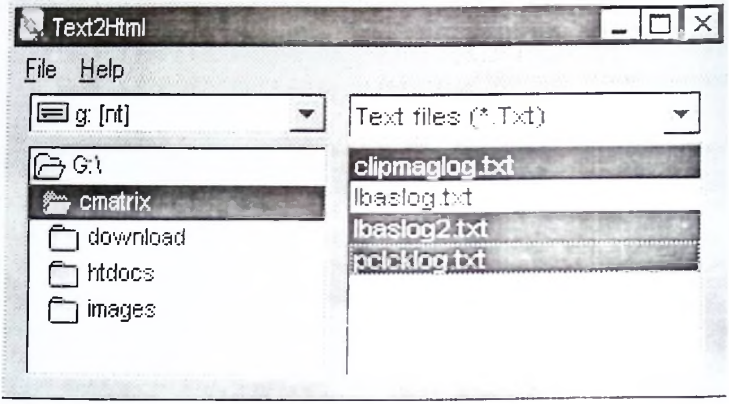

Fig. 3a: Screen shot of Text2HTML converter
(Source: CyberMatrix Corporation Inc. Site : http://www.cyber-matrix.com/screens/thmain.gif)

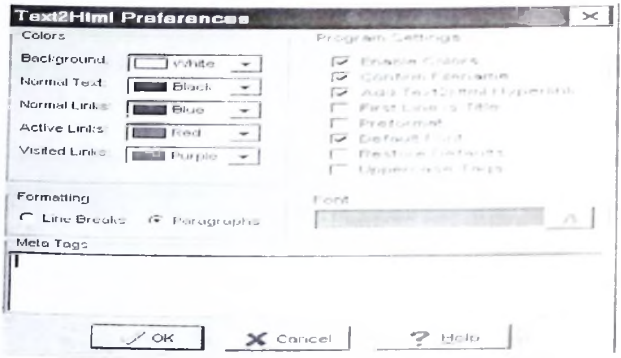

Fig. 3b: Configuration screen shot of Text2HTML converter
(Source: CyberMatrix Corporation, Inc. Site : http://www.cyber-matrix.com/screens/t2hpref.gif)

As the development tools become more sophisticated and support more of the HTML tags and attributes, it becomes easier for the novice to generate pages of information. However, knowledge of HTML is still needed to create special designs and special effects.

Generators are the most powerful tools available for publishing on the World Wide Web (Mohler and Duff, 2000). Commonly referred to as WYSIWYG (What You See Is What You Get) web page generators, the advantage is that they are graphical in nature. Pages are designed similar to laying out pages in a word processor. Charts and tables can be easily drawn, while graphics can be inserted without having to worry about the code behind them. The limitation however is that most generators do not support the ability to drag elements around on the page. Most generators, however, allow the designer to create an entire website visually. Using graphic icons and lines, the application displays the web site like a chart, which makes managing it much easier. By manipulating the site graphically, the designer can create links to and from the pages in the site visually. Changing the page order is also easy – the user simply drags a page from one location to another. Many generators provide the capability to run an entire web site from any computer connected to the Internet (Mohler and Duff, 2000). Examples of WYSIWYG generators include *Netscape Composer* - component of Netscape Navigator 3.0 Gold and Netscape Communicator (available for Windows 95/NT, Macintosh, and UNIX), *Adobe PageMill* and *Claris Homepage* (available for Windows 95/NT and Macintosh). They allow designers to create web pages and sites with little knowledge of HTML.

Site builders work in similar ways as generators. However, site builders are essentially designed to build and manage entire web sites. All that is required is a little Internet skill. Examples of site builders include *Microsoft FrontPage* (available Windows 95/NT and Macintosh), *Macromedia Dreamweaver* (available for /PowerMac), and *NetObjects Fusion* (available for Windows 95/NT and Macintosh) (Northeastern Ilinous University, 2000), *1 and 1 Instant Website, Squarespace, Site2You, Website Wizard, Site Build It,* and *Site Studio* (BuildWebSite4u.com, 2007). Figures 4-6 show the design page, the coding and the design for "University of Botswana", and the simply webpage for University of Botswana, using the Microsoft FrontPage.

Fig. 4: Microsoft FrontPage – Design page

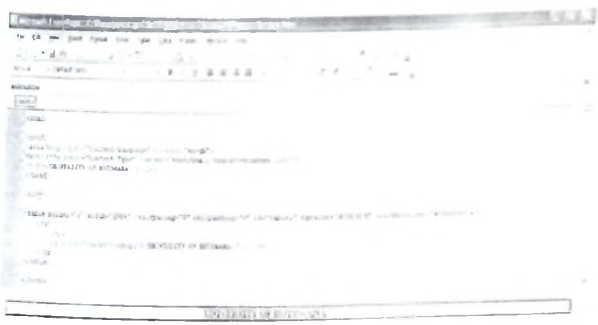

Fig. 5: Microsoft FrontPage – Split showing the coding and design for the simple design for the University of Botswana

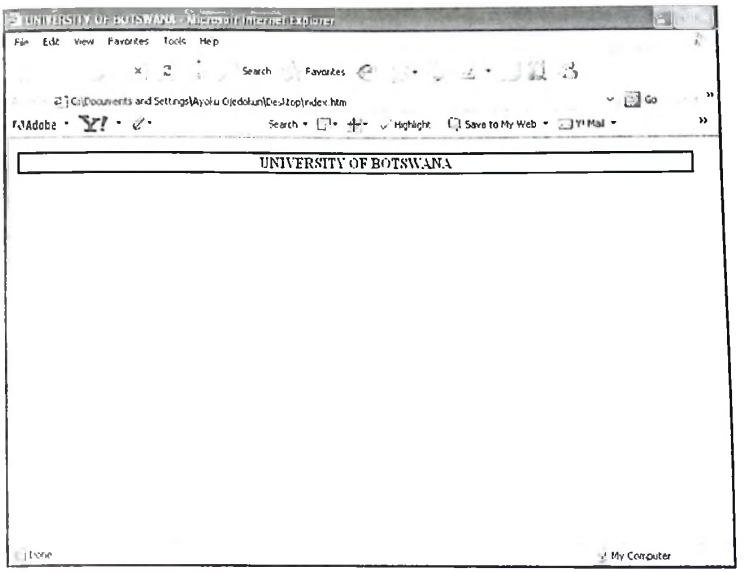

Fig. 6: Simple Webpage for the University of Botswana

Choosing a Web Design Application

Web design application decision should be based on what an individual is trying to accomplish. To determine the best application one should :

- Create a list of the features to be created;
- List the features of HTML to be utilised in the development tasks;
- Critically analyse one's knowledge of HTML;
- Determine whether the ability to manage a website from one's personal computer is needed. If the institution has a server, the capacity may not be needed; and
- Match the applications to the list of needs and skills. The level of one's proficiency with HTML will determine whether a generator, an editor, or a converter will be needed. The list will help determine which specific application best suits what are needed.

Common Mistakes to Avoid

The mistakes below must be avoided when carrying out a web design. The designer must avoid:

- A slow loading website. Most visitors are impatient to wait for a website loading for more than 10 seconds. Therefore, one should avoid high-resolution images, lengthy movies or flash animation or appealing music.
- A complicated and difficult to understand navigation system. one should not make navigation/menu bar too complicated, otherwise visitors will be scared away from the web site.
- Low quality content. Content is king on the Internet. People use the Internet to search information they need and information is shared through the content. If the information provided is of poor quality nobody will have the patience to read it.
- A website without focus. Focus is the key in designing a good web site. one should try and build the website on one main theme.
- One should avoid graphics that do not fit on the screen, large graphics files that take forever to load, as well as animations that never stops.
- One should avoid complicated frames, too many frames, and unnecessary scroll bars in frames.
- One should avoid text that is too small to read and multiple things that blink.
- One should avoid colour combinations of text and background that make the text hard to read.
- One should avoid cluttered design (i.e. with little alignment of elements).

Some Examples of African Web Resources of Interest

Economic Commission for Africa (ECA) - http://www.uneca.org/index.htm

The mandate given to ECA is to promote the economic and social development of its member States. It focuses on: regional integration, trade and infrastructure, meeting the Millennium Development Goals (MDGs) with a special emphasis on poverty reduction and growth, sustainable development and gender, promoting good governance and popular participation, ICT, science and technology for development, statistics and statistical development.

African Information Society Initiative (AISI) - http://www.uneca.org/aisi/

African Information Society Initiative (AISI) action framework is the basis for information and communication activities in Africa. Established in 1996, the focus is about giving Africans the means to improve the quality of their lives and fight against poverty. Its mission is to create effective digital opportunities to be developed by Africans and their partners, and to speed the continent's entry into the information and knowledge global economy.

African Medical and Research Foundation (AMREF) - http://www.amref.org/

The mission of AMREF is to improve the health of disadvantaged people in Africa, as a means for them to escape poverty and improve the quality of their lives. It focuses on six priority intervention areas (PIAs) viz: HIV/AIDS, TB and sexually transmitted diseases; malaria; safe water and basic sanitation; family health; clinical services, disaster management and emergency response; training and health learning materials.

The African Conservation Foundation (ACF) - http://www.africanconservation.com/

The focus of the African Conservation Foundation is to preserve Africa's wild heritage by supporting and linking conservation initiatives throughout the continent as well as by conducting field projects. The site provides in-depth information about ACF project network, as well as conservation databases, interactive knowledge base and discussion forums and many other resources.

Africa Research Central (ARC) - http://www.africa-research.org/mainframe.html

Africa Research Central is a gateway to the archives, libraries, and museums with important collections of African primary sources. It is the clearinghouse for Africa primary sources. The searchable database allows visitors to locate primary source repositories in Africa. The information available may include, in addition to contact information, access and holdings information, full-text articles, brochures, or photographs.

Explore Africa - http://www.pbs.org/wnet/africa/explore/index_flash.html

The site shows the geographic regions of Africa, the people that live there, animals and natural resources, stories of children from the area, video clips, slide shows, etc. It also has a lot of links.

Africa Resource Center (ARC) - http://www.africaresource.com/

Africa Resource Center is an educational portal that develops and distributes content. It is an educational gateway for products and information on Africa. The site offers academic research materials and products on Africa and African Diaspora. It publishes peer-reviewed journals, bibliographies, scholarly essays, art exhibitions, poetry, profiles, autobiographies, syllabi, multimedia, a who's who directory and much more.

Africa Business Information Services (AFBIS) – http://www.afbis.com/

Africa Business Information Services is an online source of information and analysis on business and economics in Africa. Formed in 1998, it is an independent private organisation, providing online information on African economies that will help companies and individuals around the world come to a better understanding of these nations, and make decisions about them. Its objective is to promote trade and investment in Africa.

African Crafts - http://www.africancrafts.com/

This is a portal dedicated to promoting the arts and the artisans of Africa. It is an avenue for all African artisans to showcase their work, the outcome of which is expected to lead to a site that reflects the great variety of ideas and techniques found in the arts of Africa - both traditional and modern.

African Energy Policy Research Network (AFREPREN/FWD) and Foundation for Woodstove Dissemination (FWD) - http://www.afrepren.org/

The objective of African Energy Policy Research Network (AFREPREN/FWD) and Foundation for Woodstove Dissemination (FWD) is to strengthen Africa research capacity and to harness it in the service of energy policy making and planning. It is a collective regional response

to the widespread concern over the weak link between energy research and the formulation and implementation of energy policy in Africa.

Review Questions

1. Discuss two approaches to content collection in Africa.
2. Discuss the challenges of access to Africa's web content.
3. Discuss the requirement of a successful web page.
4. Name the web authoring tools discussed in this chapter. How different are they from each other?
5. Apart from those identified in this chapter, identify other examples of African web resources on the Internet.

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Part II: Digital Resources, Technologies and Applications

Chapter 5

Digital Libraries

Stephen M. Mutula and Ayoku A. Ojedokun

Introduction

The World Wide Web (WWW) is a powerful platform for providing access to multimedia information. Consequently, the WWW has been used as the platform for the deployment of digital libraries (DLs). The concept of digital library refers to collections of electronic resources consisting of text, audio, visual, graphics, and animations in nature that are accessible through the aid of digital technologies. Ideally, a digital library should provide users access to electronic information resources via electronic means. However, this definition also includes electronic resources (such as databases on stand alone PCs, information on CD-ROMs, etc) that may not be accessible through the Internet or other networks. Digital library collections may be born (digital originated or through the process of digitisation from existing print materials).

Digital libraries are increasingly being implemented by several agencies, both in government and the private sector. This impetus is attributed to, among other factors, the fact that DLs might make research easier for scholars, and may also ease budgetary constraints associated with the acquisitions of print resources. Moreover, DL might solve preservation problems, or help libraries extend collections into new media. In addition, it is believed that DLs will help society to make information more available, raise its quality, and increase its diversity.

There are several examples of digital libraries. For example, Bartleby Library - Great Books Online (http://www.bartleby.com/) is the pre-eminent Internet publisher of literature, reference and verse. Similarly, Library of Congress (http://www.loc.gov/) provides entrance to the catalogue and a number of collections, projects and a large directory of links. On the other hand, the Collaborative Digital Reference Service

(CDRS) (http://lcweb.loc.gov/rr/digiref/) is a DL project involving several institutions, and provides professional reference service to researchers through an international, digital network of libraries and related institutions. The other well-known digital library is the New York Public Library (http://digital.nypl.org/), which provides a rich site, mostly concentrating on digitised special collections of texts and images. Similarly, the United States National Library of Medicine (NLM) (http://www.nlm.nih.gov/hinfo.html) is the world's largest medical library and online system. It includes MEDLINE, MEDLINEplus, and links to numerous other health-related resources, including research programs for computational biology and medical informatics. Similarly, University of California, Berkeley (http://sunsite.berkeley.edu/), provides a wealth of digitised collections.

Evolution of Digital Libraries

Digital libraries emerged largely in the 1990s, because of the revolution in Internet and WWW technologies. However, the foundation stone for digital libraries may have been laid in 1945 when Vannevar Bush envisioned an automated system that would store information, including books, personal records and articles. Bush developed a system known as memex system that would allow a user to view stored information from several different access points and look at several items simultaneously. Similarly, in 1950, while driving to work, Douglas Engelbert started thinking about how complicated civilisation had become and what humans were going to do about managing this complex new world that technology had helped create. He hypothesised at the time that computers could be used to automate symbol-handling tasks, and thus help people think faster, better, about more complex problems. The ideas of Bush and Engelbert led Ted Nelson to coin the term hypertext to describe a system that linked bits of knowledge in the ways that people think, rather than in hierarchical groupings (Allard, 2000). The evolution of the digital library is tied to hypertext searching.

Digital libraries emerged in the early 1990s, as a result advances in computer technologies particularly WAIS (Wide Area Information Server) and Gopher (Ballard, 2000). Wide Area Information Server is an information retrieval application that allows indexing of large quantities of information, which is accessible through networks such as the Internet.

WAIS gives users the ability to retrieve information from multiple hosts, using one interface. It queries the remote servers, and returns results. On the other hand, Gopher is one of the pioneering distributed information retrieval systems, similar but though much simpler than the World Wide Web, as it did not offer a way to create hypertext documents. Gopher presents information in a hierarchical format, similar to web-based subject directories using text menu interface.

The development and growth of digital libraries has been given impetus by the proliferation of electronic information, decreasing budgets for acquisitions, need to access remotely stored information; need to enhance collaboration, partnerships and resource sharing; ever increasing costs of preserving decaying print media; and advances in telecommunications, computing and standards such as TCP/IP, etc. The development of digital libraries can be easily explained along a continuum, comprising four levels as follow:

Polymedia: The polymedia or conventional library has information and knowledge stored in variety of media types such as: paper, microfilm, computer disks, video, etc. This type of library occupies physical space, where users visit to gain access to information services. Largely, the core processes of acquisition, cataloguing, circulation, public access and other information retrieval functions are manual-based. In addition, most of the information resources are largely in paper format. In this library, users have high levels of interaction with library staff.

Electronic Library (EL): In the EL, the core library processes of acquisition, cataloguing, online access, circulation, and information retrieval are computerised. However, the information resources need not be in digital formats. Users have access to librarians but attempts are made to minimise such contact. This type of library by and large also occupies physical space.

Digital Library (DL): A DL may be perceived as an information service or a collection of electronic information resources, in which all the information resources are available in computer processable form. In addition, the functions of acquisition, storage, preservation, retrieval, etc., are carried out using digital technologies such as computers, networks, etc. A DL contains no conventional printed information resources, but electronic books, journals, and newspapers. Access to the librarians may also be through electronic means such as email. The DL

may or may not occupy a physical space, where users need to go to gain access to its electronic resources.

Virtual Library (VL): A VL refers to an information service or collection of electronic resources whose collections are entirely in virtual or digital form and information is accessed over a network. Such library provides access to virtual indexes, catalogues, and books. VL does not have physical space, where users visit to access information resources. Instead, access is distributed and virtual. It is sometimes referred to as 'paperless library', 'library without walls', 'networked library', 'seamless library' and 'library of the future'. Virtual libraries are characterised by the following features:

- They provide remote access to information over network;
- They exist as a virtual, i.e. not as physical entity;
- They give the illusion of access to much large collection of information than actually present through connections to other libraries;
- They facilitate immediate and simultaneous access to information;
- They are distributive because they can be accessed from anywhere anytime subject to restrictions that may be imposed by standards, firewalls, and other infrastructure;
- They are interactive, and supports 2-way communication with the users;
- Their content is separable from media (unlike print documents); and
- They exist as multimedia objects in the form of text, video, sound, graphics and animations.

Virtual libraries, like electronic and digital libraries as defined above would have all or some of the following information resources:

- Databases;
- Electronic Journals;
- Electronic Newspapers;
- Electronic books;
- Reference resources in electronic format;
- Selected websites;

- Online public access catalogues;
- E-mail and discussion forums;
- Newsgroups: resources offering site-based one-to-many, small group, and public interaction;,
- Web Conferencing: a public interaction in web-based environments whose features may vary from Internet mailing lists, web messaging systems, chat, and file, photo, or music sharing;
- Internet Relay Chat: live one-to-one and one-to-many interactions with the assistance of chat client software on a local computer system;
- IPhone: Internet telephone and audio-conferencing for one-to-one or one-to-many and Internet radio; and
- Internet Radio: it allows anyone to host a free international Internet radio station in real time or a free two-way phone conversation on the Internet.

Organisation of Digital Libraries

Activities carried out in a digital library include creating documents through, for example, electronic publishing, digitisation, indexing, classification, cataloguing, information storage and retrieval, updating and annotating documents, searching and browsing, and the whole array of information management operations. However, certain issues often arise that need to be addressed. For example, issues of how to accommodate networked electronic information when the cataloguing rules are designed to describe physical items owned by and residing in specific libraries. Moreover, the issue of how to provide access to information, needs addressing, given that some of electronic materials may not be physically described, pointed to on a shelf, or checked out to patrons. Machine Readable Catalogue (MARC) was developed as an international cataloguing framework for exchange and sharing of bibliographic data. MARC enabled the migration between systems less laborious and allowed libraries to build up a machine-readable catalogue of current acquisitions of national imprints, without incurring the cost of keyboarding every record (Australian Advisory Council on Bibliographical Services, 1967).

The OCLC's Office of Research, the Library of Congress, and the Online Audiovisual Cataloguers have been involved in initiatives

regarding the cataloguing of electronic data resources and finding out which electronic information resources are available over the Internet. These initiatives have revealed that though the existing USMARC computer files, format may be used for remote data resources, it is inadequate in describing computer files as it was largely deigned to deal with statistical data sets and microcomputer software. The OCLC's efforts have resulted in some modifications to the AACR2, with regard to the cataloguing of Internet resources. For example, existing MARC field 'File Characteristics (256)' is governed by AACR2, and specifies that one of three terms must be used: computer data, computer program, or computer data and program. Modification extends the set of allowable terms to include such descriptors as: electronic document, electronic journal, bibliographic database, graphic, and computer sounds. Moreover, the modification recommends a parallel set of coded values defined in a fixed field data element to allow retrieval or reporting, using the same concepts. The rationale here is to give brief, clear, descriptive information to the library patron, who might not think of an e-journal, for example, as a computer data.

There are also other issues that have to be considered, when electronic resources are to be catalogued, especially those that are Internet-based. For example, does it make sense for libraries to be cataloguing Internet materials in the first place? Moreover, is MARC the way to go about cataloguing such resources? These questions often arise, because a vast number of data resources available via the Internet are uncontrolled, unverified, and of limited or ephemeral interest. Moreover, libraries are likely to have interest in only a small subset of these resources, which they will want fully described and the resulting description made available in the same online catalogue systems, as the rest of the libraries' holdings.

One other issue relates to the fact that electronic addresses change often as documents move from server to server, and from format to format. The question therefore arises as to whether it makes sense to actually insert location information in the descriptive record itself. The emerging Universal Resource Identifier (URI), a scheme that is more like the ISBN, can be assigned to each object by the originating agency. Similarly, Universal Resource Locator (URL), which is similar in concept to the Electronic Location and Access field, can be used to identify a location.

Infrastructure and Techniques for Developing a Digital Library

The design and implementation of digital libraries require a robust and elaborate infrastructure involving PCs/servers, web authoring languages, browsers, different application programs, Internet connectivity, content, information architecture, standards, etc. The World Wide Web provides the platform for creating and providing access to digital library collections for large group of users. On the other hand, networks such as the Internet and intranets enable digital libraries to be accessed, rather than users having to physically visit the library to consult electronic documents.

In developing digital libraries, content need to be collated and organised. One way of generating content for digital libraries is through digitisation. Through this process, old materials in paper format are converted online, while others are directly generated as electronic documents such as word processed documents, e-mails, information by-products and end-products, image files. On the other hand, the information architecture consists largely of websites and associated hyperlinks. The information architecture should be designed taking care to develop suitable user-interaction features, so that the DL can be used effectively. Moreover, development of DLs requires an understanding and conformance to various standards to cater for a wide range of formats such as graphics, dynamic, web pages, audio, still and moving images, etc. Key to developing effective DLs is a good grasp of trends, information organisation, user interface principles, site management and usability evaluation. Once digital libraries have been developed, they have to be maintained to keep pace with the rapid changes in hardware, software and user needs.

The design and implementation of digital libraries demand enhanced user interfaces that support interaction between users and information. Developing user acceptable DLs requires a focus on human-computer interface and visualisation design techniques. A well designed information system interface should allow users to better find and more fully use the information in the system, and do so in a more timely and effective way (Mitchell, 1999). Also, a good interface enhances the quality of interaction with DL systems. The design must therefore take into consideration the physical, mental, emotional, and the social and cultural context of the users. In addition, the design of DL interfaces should involve assessing human information needs, putting into consideration the intended contexts of use (user requirements, needs, goals); the important classes

of users; reasons for accessing the digital library and the frequency of visits; experience and expertise of the users; types of cultural differences existing among users; type of information being looked for; the formats in which they use the information and the kinds of hardware and software used.

The design of DL must also employ powerful information visualisation techniques that transform information into a visual form, in order to enable the user to observe it (Costabile and Semeraro, 1998). The premise behind this is that user's perceptual abilities can be more fully used to understand information. Information visualisation paradigm is driven by trends in computing, such as the explosion of digital information, the reduced cost of faster and larger storage, increasing computing power, increasing bandwidth, and the rapidly expanding connectivity between systems. Visual user interfaces exploit powerful human vision and spatial cognition to help humans mentally organise, electronically access, and manage large, complex information spaces (Geisler, 1998).

Suitable information visualisation seeks to increase speed and effectiveness in finding information and to decrease the mental effort put into each search (Costabile and Semeraro, 1998). By visually presenting information, we exploit the visual perception potentials of human beings. For example, by presenting information more graphically, we make it possible for human brain to use more of its perceptual system in initially processing information, rather than immediately relying entirely on the cognitive system. Visual presentations allow users to activate perceptual procedures to quickly obtain the desired result.

Considerations in Developing a Digital Library

Developing digital libraries is akin to developing a website. Therefore, principles of web design should focus on the following:

Currency: The website for accessing DL content should be up to date and regularly reviewed and redesigned.

Credibility: The website is the front office, and says a lot about the organisation. A professionally designed website should avoid, for example:

- Textured backgrounds,
- Bordered tables,

- Large and peculiar fonts,
- Very bright harsh colours,
- Twitching, twiddling gifs,
- Still under construction messages.

Home Page: The home page should clearly indicate the name of the site along with a prominently displayed logo. Other key features of the home page include: directory / menu of main contents; summary of important news; search facility, no scroll to get to content on the home page.

Layout: Should remain very simple. Content should occupy about 60-80 % of the space. Apply consistent colours from page to page; provide visual cues that allow movement forth and backwards:

- It is advisable to design the information architecture (the hierarchy of pages) first. Similarly, if the site is large, make a directory structure that mirrors the information architecture. It is advisable to put all images in a separate file within each directory.
- It is advisable in organising the page to use headings, lists, and consistent structure.

Speed: The page should be designed to download fast. Page size should be limited to about <34kb. Nested tables should be avoided, they unnecessarily delay the loading of the page. Similarly, absolute references, such as URLs, delay loading of page. Instead, use word links. Images should be kept small as large images delay loading. It is important to test the website on different browsers, to ensure it displays in similar manner, as the display may be distorted in some browsers.

Benefits of Digital Libraries

Digital libraries present several benefits to the users far beyond what conventional libraries can provide. Digital libraries have global reach through international networks, such as the Internet. For example, using web access, it is possible to search the OPACs of many of the world's libraries and to utilise a number of their online resources. Digital libraries have the potential to supplant many of the services provided by traditional libraries, and also extend them. Digital libraries have the potential of

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improving and promoting information-related activities (Ojedokun, 2000). They contain a wealth of simple information of direct applicability, and are ubiquitous (i.e. accessible anytime from anywhere subject to the availability of requisite resources). Also, digital libraries enable users to access a single electronic copy simultaneously from many locations. Copies can also be delivered with high speed, saving time, and reducing the need for proximity to information resources. Electronic information can be reformatted to the specifications of the reader. In addition, readers can get a screen display of the electronic information object thus, reducing loss rates by theft. The object can also be copied without error, thus offering preservation advantage.

The DL has the potential for dealing with preservation issues of library materials. Digital library offers solution to problems of storage and maintenance costs; provides ubiquitous access, where a single electronic copy can be accessed from a great many locations, and to many simultaneous users, notwithstanding copyright permission. Copies can be delivered with electronic speed, and it may be possible to reformat the material to the convenience of the reader, and loss rates by theft are much reduced. Preservation in a digital world does not depend on having a permanent object and keeping it under guard, but on the ability to make multiple copies. Digital storage also permits libraries to expand the range of material they can provide to their users.

Similarly, digital libraries offer great user satisfaction; offer several ways in which libraries can improve services, while reducing cost; provide instantaneous access to online information; offer all time everywhere access to information, so long as requisite access infrastructure is in place and obviates deterioration associated with print media.

In theory, DLs provide seamless (i.e. easy connectivity and access) to electronic resources. However, there may be constraints related to technology that may hamper ubiquitous access to such libraries. For example, explicit decisions such as the use of firewalls to protect institutional information resources or other intellectual assets from outside limit the flexibility of accessing DLs. Other restrictions arise from varying standards of information coding and access. For example, uneven or inconsistently coded metadata may lead to portions of a collection not appearing in a search.

Challenges for Establishing Digital Libraries

As we exalt the virtues of digital libraries, it is important to take note of the challenges they pose. Digital libraries are associated with the following challenges:

- Technological obsolescence of hardware and software may pose problems of access to information in digital form, unless urgent interventions are taken;
- There is worry about funding for regular refreshing and preservation of digital resources; and
- High infrastructure costs associated with design and implementation of DLs.

DLs occasion several challenges of economic, technical, legal, organisation and usability nature. Resources in digital libraries are partly created through the process of digitisation, that is expensive and labour-intensive. Similarly, long term costs of digital preservation are difficult to predict, though they are likely to be significant, because of the proliferation of both paper and electronic resources. In addition, legal issues of copyright need to be addressed, especially during digitisation. It is also possible for electronic resources to be copied with impunity, without this being noticed.

Within organisations, the design and implementation of digital libraries require commitment of sufficient resources. Additionally, adequate and regularly available skills are needed to ensure that the content is properly collated, organised and then digitised. There is also need to work with publishers, authors or holders of other copyrighted material to ensure observance of legal issues involved in digitisation. Tools that integrate advanced search features with the existing systems in libraries. Issues of technical nature would involve appropriate selection and use of tools for digitisation, especially with regard to indexing of non-English language texts. The choice of tools should take cognisance of the needs of users, with regard to ease of finding materials.

Digital libraries in general are yet to be rooted and institutionalised in people's cultural life. They pose challenges of use-ability nature. Despite the fact that many users are gaining high-level of familiarity with computer and web searching, they are still unable to see the value of DLs, due to their poor design, especially with respect to navigation, support and usability. Users generally perceive usability as poor and one

that obligates them to keep up with training and retraining. By and large, digital libraries provide simple searching support, and on the whole, lack integrated support for information gathering and organisation. Poor system design in principle provides information that is available, but which in practice is inaccessible (Adams, Blandford, and Lunt, 2005). In addition, digital library design should adapt to individual and group needs. Additionally, they should be designed to allow all users with varying abilities to feel able to utilise the resources.

Digital libraries in their current form require the intervention of intermediaries to make them more effective and usable. It is important that interface design of digital libraries should take into account people's cognitive and spatial abilities. The digital libraries of the future are expected to be designed around user needs, and consequently obviate the need for search intermediation.

The user friendliness of most DLs has been limited to screen display and functional capabilities. Finding a way to provide powerful search without overwhelming novice users is a current challenge. Digital libraries interface design should among other things be human-centred, in order to enhance universal access; easy to understand; easy to learn, tolerate search input errors; be flexible and adaptable; appropriate and effective for the task; powerful and efficient; secure, reliable, information-centred, and pleasant to use. The design should, also, take into consideration the type of people that will be served, what levels and types of information needs will be supported, and what contextual influences will be at play (Marchionini, Plaisant, and Komlodi, 2003; Borgman, 2003).

Searching in Digital Libraries

There are a number of things that must be done to enhance access to and use of digital libraries. There is need to build institutional capacities to collect, organise, store and share information and knowledge; enable access to information through the use of ICTs; develop high quality ICT networks; build public awareness on the capabilities of DLs; put in place education and training programmes in ICTs; eliminate illiteracy; bridge the digital divide; enhance universal access; use open standards to enhance affordable access to ICTs; and provide technical assistance and support. IFLA submissions to the World Summit on Information Society (WSIS) underlined the following information readiness issues, as pre-conditions for participating in an information society: universal and free

access; effective environment for making use of ICT to access information; learning the skills required for effective searching and retrieval of information; providing affordable or free-of-charge access to the Internet; and specific training programmes in the use of ICTs (IFLA, 2003).

Chan (2005) poses some questions, to which appropriate answers may contribute towards adequate understanding and effective use of DL. Some of the questions include: What are our options when a medium or technology fails to deliver a message? When connection isn't available or is unreliable? What can we do when a medium or application fails to deliver the message accurately, or when the medium is excessively noisy? What kinds of failures does a medium tend to generate? How long does it take to address and repair a failure? What kinds of consequences does this have for adoption of a technology for particular uses? In what ways do we accommodate this into the practices we develop around a technology or application? Do we tend to avoid interactions that might suffer should their delivery fail? Are there affective costs to failure, for example if participants feel insulted, interrupted, or cut off?

Salomon (2000) identifies five competencies that are required for a facilitator of online interaction, they include: understanding of online process; technical skills; online communication skills; content expertise; and personal characteristics. Similarly, Costabile and Buono (2001) note that a user-centred methodology is needed, in order to build systems that satisfy clear usability objectives. The basic principles of user-centred design include analysis of users and tasks; design and implementing the system iteratively through prototypes of increasing complexity; evaluating design choices and prototypes with users.

Global Digital Library Initiatives for Africa

There are a number of digital library global initiatives aimed at Africa. For example, the Africa Journals Online (AJOL), an initiative of the International Network for the Availability of Scientific Publications (INASP), based in the United Kingdom, offers access, via the Internet, to tables of contents and abstracts of African-published journals in agriculture, social sciences, humanities, health and science and technology. Aina and Mutula (2007) noted that as at July 2003, 170 journals published in 21 countries in Africa, including Francophone Africa, were available on the Internet through their service, the African

Journals OnLine (AJOL). Most of the journals are published in South Africa and Nigeria with the two countries accounting for 62% of the journals. Of the journals on AJOL, 62 were available in full text online through other websites. Some of these were free to view, and some require a subscription with an option for non-subscribers to view individual articles online by making a credit-card payment (pay-per-view). One of the journals on AJOL is only available online, as the journal does not publish in print.

Similarly, Bioline International, an online publishing initiative, enables some African journals to be available electronically on the web. It is a collaborative initiative of the University of Toronto Libraries, Canada, the Reference Centre on Environmental Information (Brazil) and Bioline/ UK, managed by scientists and librarians. It is a non-profit electronic publishing service committed to providing access to quality research journals published in developing countries. Through this initiative, abstracts and full-texts of several African journals can be accessed electronically on the Internet. Journals include among others: African Crop Science Journal (Uganda), African Journal of Food and Nutrition Security (Kenya), African Journal of Neurological Sciences (Kenya), African Population Studies (Senegal), Central African Journal of Medicine (Zimbabwe), East African Medical Journal (Kenya), Ichthyology Bulletin (South Africa), Ichthyology Special Publications (South Africa), Insect Science and Its Application (Kenya), Journal of Food Technology in Africa (Kenya), and Zimbabwe Science News (Zimbabwe). Similarly, the African e-journals Project (AJEP), an initiative of the Michigan State University, in collaboration with the Association of African Universities (AAU), African Studies Association (ASA), and CODESRIA, assists some journals in Africa to be available online.

Apart from some journals appearing electronically on the web, there are also other journals that are available on CD-ROM. ExtraMed is a CD-ROM service that provides abstracts and full texts of more that 300 health and medical journals published in developing countries. Additionally, a publishing company, Stacos North America Inc., has developed a database of the African Universities Dissertations Abstracts (AFUDA) to cover current dissertations that have been accepted for the award of higher degrees in African Universities (Ubogu, 2000).

Digital Libraries Projects in Africa

There are several DL projects being implemented in Africa. ISAP online, the *Index to South African Periodicals* (ISAP), provides abstracts and bibliographic information to more than 680 periodicals and journals published in South Africa. The National Inquiry Services Centre (NISC), South Africa, provides indexes to South African periodicals and the 135 African published journals listed in the 1997 edition of African Periodicals Exhibit Catalogue at the Zimbabwe International Book Fair in CD-ROM format. On the other hand, there are a number of theses and dissertations that are available online. For example, Rhodes University in South Africa has an on-going project of publishing electronic theses and dissertations (ETD). The project undertakes the digitisation of doctoral dissertations and makes them available on the University Intranet. Similarly, the African Association of Universities has an on-going project to create database of African theses and dissertation (DATAD) on CD-ROM. Also, South Africa's bibliographic Network (SABINET) and Ain Shams University Network (ASUNET) in Egypt are two major bibliographic utilities that are involved in electronic publishing on the African continent. SABINET publishes online the Union Catalogue of Theses and Dissertations at masters and doctoral levels. On the other hand, ASUNET has all its theses published online.

With books in short supply, the introduction of digital libraries in Africa can play a major role in promoting knowledge and enhancing education. Access to digital libraries has the potential to achieve unprecedented gains in economic and human development (Ojedokun, 2000). There are currently a few digital library initiatives in Africa. The *African Online Digital Library – AODL* is a project funded by the International Development Research Centre and the National Science Foundation (NSF). Begun in 2000/2001, it is the pioneer African digital library development. It produces multilingual, multimedia materials for both scholarly research and public viewing audiences. AODL serves scholars and students conducting research and teaching about West and South Africa, as well as teachers and students of African languages in both the United States and Africa. The partners in this initiative include: Institut Fondemental d'Afrique Noire (IFAN), the West African Research Centre (WARC) in Dakar, Senegal, MATRIX: Center for Humane Arts, Letters and Social Sciences Online, and the African Studies Center (ASC) at Michigan State University (MSU).

On the other hand, *The Digital Imaging Project in South Africa (DISA)* is a non-profit making initiative for co-operation among research libraries and archives in Southern Africa on digital imaging. This project is sponsored by the Andrew W. Mellon Foundation. The Project, which was initially expected to last three years, is to make accessible to scholars and researchers world-wide South African material of high socio-political interest that would otherwise be difficult to locate and use, and provide South African archivists and librarians with knowledge of, and expertise in, digital imaging. Its key objectives were to advance technologically to build the capabilities of human resources, and to provide access to scholarly research materials on a sustainable basis. It is also addressing the digital divide by relying on open source software and calculated platform independence to provide a digital library model relevant to the African context and appropriate to developing countries. The effort is being supported by UNESCO (Peters and Pickover, 2001).

Similarly, *African Digital Library* (ADL) was established by Technikon South Africa's Centre for Lifelong Learning, in collaboration with the Association of African Universities. It is a free public library for users in Africa (only) who have access to the Internet. Encryption ensures only one user will access a book at any one time, and loan periods is a few hours, as users work with the books. Anyone wishing to use the service will need to complete an online application form, which will include a username and password to open a free account. Likewise, *African Virtual University* (AVU) Library belongs to the African Virtual University (AVU), an innovative educational organisation established to serve the countries of Africa. The objective of the AVU is to build capacity and support economic development by leveraging the power of modern telecommunications technology to provide world-class quality education and training programs to students and professionals in Africa. The digital library initiative is thus an interactive-instructional telecommunications network for the countries of sub-Saharan Africa, designed to use modern information technology to increase access to educational resources throughout sub-Saharan Africa.

Database of African Theses and Dissertations (DATAD), is an initiative of the Association of African Universities, in association with the Nairobi-based Project for Information Access and Connectivity (PIAC) and supported by a number of donor organisations. The DATAD database is expected to provide a comprehensive source for African theses and

dissertations. Each record in the database is expected to include full bibliographic information, including contact information for the university, degree and date, a statement of availability, abstract, and keywords.

Challenges of Digital Libraries in Africa

Digital library development is slow in Africa, and the digital divide is increasingly evident with imbalances in the distribution of information technologies, exacerbating existing north-south economic gaps and marginalising educators, researchers and students. Barriers that hinder DL programmes in Africa include:

- Severe financial constraints;
- Inadequate infrastructure (i.e. electricity, telephone lines, buildings, etc);
- Outdated or non-existent hardware, software, and network connectivity;
- Inadequate staff training opportunities and facilities;
- Harsh environmental conditions accelerating equipment degradation;
- Inadequate salaries and difficult working conditions; and
- Inadequate skills in strategic planning and in writing grant proposals for DL projects.

Similarly, a number of questions associated with DL pose great concern including

- How can we justify costs of digital libraries?
- How can we measure usage of digital resources?
- How can we extend use beyond the physical library?
- How can we integrate digital resources with the rest of information resources?
- What level of cataloguing is adequate?
- How do we deal with issues of intellectual property?
- How should the selection be done, by who and how?
- How do we ensure inclusiveness?
- How do we cope with amounts of e-documents?

Future Trends and Directions for Digital Libraries

As the Internet continues to grow, it is envisaged that the Next Generation Internet will be fast; always on; ubiquitous; seamlessly integrated; intelligent; and trusted, in terms of security (Nelson, 2001). From the perspective of libraries, Ardern (2006) notes that there is increasing need for context-specific information management than before, because information will have to be placed in a specific context to make it valuable to the user. Libraries are likely to continue to experience significant changes propelled by continuing revolution in technology, convergence of systems and increasing sophistication of the users. The digital library will likely continue to attract a lot of interest as budgetary constraints tighten. With attention focusing on digital libraries, issues that will have to be addressed include: transition from mediated to un-mediated user access; the extreme vulnerability of digital materials to loss and destruction, due to technological obsolescence; and issues revolving around intellectual property rights management in a digital environment, as well as web-based information literacy education .

The capacities of storage devices will continue to get larger and larger, thus helping to reduce cost of archiving and storing materials. However, the paperless society predicted several decades ago is unlikely be realised anytime soon. This is because rote learning is dependent on print. Moreover, libraries are unlikely to transit completely from print to electronic; rather print media and electronic media will coexist and complement each other. Likewise, despite the impact of technology in libraries, we are likely to see some libraries deciding to remain traditional or going both ways, based on such factors as cost of purchases, costs of print vis-à-vis electronic, easy of access to the resources, the preferences of the users, infrastructure outlay costs for accessing electronic resources, options available for delivering resources to users, etc. Similarly, with proliferation of electronic resources and the increased complexity of the Internet, there will be need to address issues of information or digital literacy.

Review Questions

1. Discuss the future of print-based libraries, given that digital libraries are gaining a lot of recognition and acceptance the world over.
2. What challenges should African academic institutions overcome, in order to implement and make effective use of digital libraries?
3. Do you in your opinion believe that digital libraries will solve the problem of constrained book budgets in Africa?
4. What infrastructure is required to effectively implement a digital library project?
5. How effectively can digital libraries be integrated with the printed media?

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Chapter 6

Transition to Automated Library Information Systems and the Challenges for Libraries in Africa

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Introduction

The term Library Automation (LA), introduced by D.S. Harder in 1936, refers to the computerisation or mechanisation of all library activities. American Library Association (ALA) Glossary of Library and Information Science (1983) defines automation as "the performance of an operation, a series of operation or a process by self activating, self controlling, or automatic means. It implies the use of automatic data processing equipment such as a computer or other labour saving devices".

The goal of Library Automation is to free library/information professionals from the routing clerical work, and force librarians to pay attention to the end-users i.e. provision of information resources to the customers. It is more important to make materials available to users as quickly as possible, than it is to worry about how the call number is formatted on a particular card. With the rapid, efficient computer services, library customers are no longer satisfied with any kind of library response that shows signs of being laborious or bureaucratic. The needs of library customers are constantly changing. People want information now, not tomorrow, next week, or next month. Many libraries are therefore doing away with the idea of local self-sufficiency in collection – a fact which requires cooperation and which, in turn, dictates the need for fast-response computerised union catalogues and their ancillary network apparatus. Similarly, self-sufficiency in library automation development has also come to an end. Economic and technical realities now require network and consortium participation if success is to be achieved (Veaner, 1975).

Brief Historical Development of Library Automation

A definitive international history of library automation is yet to be written. This chapter therefore focuses on the foundations laid by American and British libraries, followed by its development in Africa.

American and British libraries began experimenting with modern computers in the 1950s, and in the 1960s began automating internal processes in earnest. Automation in these countries built on long traditions of shared and distributed cataloguing, resource sharing and cooperation, and ready access to a highly developed telecommunications infrastructure. The motivating factors were efficiency, productivity, and changes in library economics and the increasing availability of computer systems. The latter two factors led to a gradual shift in mission from a focus on collections to a focus on access to information. The automation goals of American and British libraries evolved through three phases: efficiency of internal operations, access to local library resources, and access to resources outside the library. The goal of the fourth phase, which is continually being developed, is to achieve the interoperability between information systems necessary to build a Global Information Infrastructure (GII) (Borgman, 1997).

The concept of an automated library started as early as the mid 1930s,when punched-card equipment was used in library circulation and acquisition at the University of Texas at Austin (Riggs, 1991; Kochtanek and Matthews, 2002). It is the first known application of automated techniques to library systems (Parker, cited in Kochtanek and Matthews, 2002). Parker later set up a more sophisticated circulation control system at the University of Missouri in 1959, based on punched-cards and IBM mainframe technologies. However, library automation first flourished in the 1960s, with the earliest library automation projects being the computerisation of core library operations for local collections: circulation, acquisitions, serials, and cataloguing (Borgman, 1997). Thus, libraries gained efficiencies through automation, both by improving workflow within the library and by sharing data between libraries. Services to customers, defined as access, thus became the most important and critical issues in library automated systems (Pitkin, 1991). The period from the late 1970s to early 1980s was however marked by rapid growth in the number of libraries automating their operations, as a result of the emerging market for automated library systems.

The 1980s saw the evolution of these routing activities into online public access catalogues (OPAC) (Pitkin, 1991). Online catalogues first came into existence for on-site use in libraries in the middle to late 1970s, reached critical mass by the early 1980s, became available on local area networks and by dial-up modem by the mid-1980s, and were accessible via the Internet starting in the late 1980s (Borgman, 1997).

African libraries have not maximised the potential of computers to enhance the quality of information service (Garcha and Buttler, 1996). Thus, full-scale automation of library operations is rare in Africa (Rosenberg, 1998). Major constraints to library automation among others include the low level of infrastructural development, inadequate finance, and inadequate technical support. It is however on the increase. University libraries championed the use of information technology (IT) in libraries, although the adoption and use differ widely between libraries (Rosenberg, 1998). In Nigeria, computerised catalogues, particularly of serials collections in academic libraries, represent the most common use of computers, at least during the 1980s, with many aborted attempts at automated circulation and acquisition processes. By 1996, only nine university libraries among the libraries in Ghana (6), Kenya (3), and Nigeria (0) had automated their card catalogues (Garcha and Buttler, 1996). The extent of IT applications in the eight government-owned university libraries from 1987-1997 in East Africa (Kenya, Tanzania, and Uganda) is also limited. By 1997, only one had automated its library catalogue and books circulation control (Mulimila, 2000). And of all the research and special libraries in Nigeria, only the International Institute of Tropical Agriculture (IITA) had a fully automated library (Garcha and Buttlar, 1996). The integrated system was launched in 1984 (Lawani, Azubuike, and Ibekwe, 1992). Many fully automated university libraries can be found mostly in Southern Africa. Most countries in Southern Africa have fairly developed infrastructural facilities, which have encouraged automation in libraries. For example, the operations of the University of Botswana library are fully automated. The library's holdings are offered on OPAC, the acquisition and the serials modules have been in operation since 1993, and the circulation module, the final process to be automated (Rosenberg, 1998), is now fully operational. The OPAC is accessible over the Internet.

The Transition to Library Information Systems (LIS)

The term *Library Automation (LA)* encompasses only early automation activities. Library automation has however moved beyond the automation of existing processes within the library. It now includes access to materials not held by the library but available in electronic form. Parker (cited in Kochtanek and Matthews, 2002) coined the new developments *Library Information Systems (LIS)* to encompass all types of computer technology applications in the library, including those that are yet to be fully developed. Kochtanek and Matthews (2002) identified the new developments as including: integrated library systems (ILS); online databases; web-based resources; digital library collections; and eBooks and eJournals.

A typical integrated library system includes functionality in support of acquisitions, cataloguing, circulation control, materials reservation, serials control and online catalogues. Online database service is a service closely coupled with and/or grafted to integrated library systems solutions to provide end users desktop access point for materials held both locally and licensed internationally. Web-based resources are portals (via the Internet) that offer access not only to information held or licensed by the library, but also to information readily available on the web. Specialised collections are also now being developed into digital format, and are aimed at end users. The notion of eBooks ushered in a new distribution medium – directly from author to the end user. Authors and publishers are already competing in this arena. Both online full-text databases and eJournals are examples in this direction.

The areas of development mentioned above form the basis behind LIS. The extent to which each area is developed makes libraries distinct from one to the other.

Impact of Technological Developments

Hardware, software and telecommunications have had an impact on the transition from *Library Automation (LA)* to *Library Information Systems (LIS)*. The developments are briefly described below:

Hardware Development

Three generations of computer technology (the mainframe computer, the minicomputer, the microcomputer – personal computers) have had

strong influences on what new information products and services were created, and how human interactions with information evolved. As the technology advanced, so did the library automation systems.

The development of the computer progressed substantially from 1946 to 1961, moving quickly through a succession of vacuum tubes, transistors and finally to silicon chips. In 1961, Robert Noyce of Intel and Jack Kirby of Texas Instruments, working independently, invented the integrated circuit. All the components of an electronic circuit were placed onto a single chip of silicon. The invention of the integrated circuit and the newly developed disk and tape storage devices gave computers the speed, storage and ability needed for online interactive processing and telecommunications (Nelson, 1990; Pitkin, 1991; Duval and Main, 1992).

The late 1970s and the early 1980s saw the development of the microcomputer, which enabled many libraries and information units to acquire their own computer systems. By the mid-1990s, Personal Computers (PCs) have become commonplace in libraries and information units worldwide, and many people also have PCs at home (Tedd, 1997; Kochtanek and Matthews, 2002). With the development of more advanced silicon computer chips, enlarged storage space and faster, increased capacity telecommunication lines, the ability to quickly process, store, send and retrieve information is causing the current information delivery services to flourish.

Software Development

This can be broken down into two distinct categories, *systems* software and *applications* software. Systems software includes operating systems, such as Microsoft Windows, Linux, and programming languages/ environments (e.g. Java, C++, etc.). Applications software is a program that performs specific tasks such as word processing, database management, graphics, etc. Library applications software includes some of the functionality mentioned earlier, i.e. shared cataloguing, circulation control, and online public access catalogues. Software development was also in progress during the period of hardware development. Operating systems and programming languages were developed for the computers being built.

The initial software development by turnkey vendors of the 1970s was primarily proprietary in nature. The Independent Software Vendor

(ISV) developed or selected the programming language and the operating system that would, in their estimation, best support the applications they were developing, and subsequently wrote specific code that performed those tasks on computing devices selected to optimise performance for their intended library customers (Kochtanek and Matthews, 2002).

In the 1980s, the UNESCO started distributing Micro CDS/ISIS through its distribution centre in every developed country. This freely available software, developed specially for library applications, proved helpful for the librarians in developing countries. Several integrated library package also began to appear in the market place during this period. The LibSys was launched in India towards the end of the 1980s. Other software which also became available to librarians included spreadsheets and databases for use in library administration and information dissemination

Telecommunications Development

Three phases of telecommunications development impact transition to library information systems. These include: the *Host Centric*, the *Network Centric*, and the *End User Centric* (Kochtanek and Matthews, 2002).

In the *host centric* phase, a single processing unit was the basis of all computing, and users were connected to this device through dumb terminals. Dumb terminals are keyboards connected to cathode ray display tubes, but without memory or disk storage capability. The computing model of this phase was referred to as host computing, the mainframe. In other words, the network configuration consisted of a single powerful computer and a network of dedicated terminals that were connected directly to that central computer. The system is proprietary in nature. The same manufacturer made all the equipment, including the host computer and all the peripherals.

The *network centric* phase emphasis shifted to connectivity. The distribution of computing devices about the network, along with a diversity of terminals and other devices that could be introduced into the network environment, resulted into a more open design of architecture and computing platforms. This phase witnessed the rise of smaller, cheaper, yet powerful computing devices, known as mini-computers. This phase was a key to lowering the cost of computing down to levels that could be afforded by smaller library systems.

The *end user centric* phase was a result of the development of the personal microcomputers in the late 1970s and the widespread use of personal computing in the 1980s and 1990s. In this phase, which is the current phase, users are distributed across vast geographic distances, connected to resources stored on a number of computing devices called servers. An example of such distributed network environment is the Internet. The Internet is capable of connecting both people and resources together, regardless of location. The efforts of Tim Berners-Lee and others who collaborated in developing the World Wide Web (a graphical user interface) have resulted in widespread use of the Internet for connecting end users directly to content marked up in a hypertext authoring environment. We are now witnessing the weaving of services with modern library services – access to licensed databases, digital libraries, eBooks, eJournals, and Web-based library portals.

The Impact of Consortium Participation

Libraries in Africa continue to find themselves in very challenging economic circumstances. They have encountered serious reductions in funding, coupled with increasing costs of information resources. For example, the number of journals being published and the average subscription rate for those journals continue to rise considerably. The political approach of successive governments in Africa is also not helping, as it continues to force public institutions to compete in an environment of decreasing funding. Meanwhile, the cost of providing effective information services continue to be on the rise, in parallel with the increasing role that information plays in day-to-day activities of organisations. The budget constraints for libraries are thus forcing academic libraries to start looking for alternative ways of providing services at a much reduced cost.

One of such ways is consortium formation. Consortia are formed in order to share resources and to bring their combined purchasing power to negotiate advantageous terms. The idea for the formation of consortium arose from the realisation of the inherent advantage in libraries exploring common needs, the possibility of purchasing common library software, and the opportunities for cooperation, before deciding to purchase new systems individually among others. This has proved beneficial for consortium members, in terms of costs and time saving. Skill development through well-supported human resources workshops

and through a variety of training initiatives undertaken by workgroups in the various consortia is another example of benefits of participating in a consortium arrangement.

Consortia formation, especially in Southern Africa, has enabled many academic libraries to automate their operations quite easily. A number of consortia in South Africa provided examples of success stories. They include: Gauteng and Environs Library Consortium (GAELIC) – formed by ten universities and six technikons (polytechnics), Free State Libraries and Information Consortium (FRELICO) – formed by three universities, one technikon, one public library, and one technical library, South Eastern Academic Libraries' System (SEALS) – formed by seven universities and technikons in the Eastern Cape province, Cape Libraries Cooperatives (CALICO) – formed by five universities and technikons in the Western Cape, and Eastern Seaboard Association Libraries (ESAL) – a partnership of three universities and three technikons in the KwaZulu Natal province. The consortia are engaged in developing the information resources of their indiividual region for the purpose of promoting education, research and lifelong learning, with a vision to create a virtual library by linking together autonomous libraries via networks. While members of GAELIC, FRELICO, and SEALS opted for the systems of Innovative Interface - INNOPAC, CALICO and ESAL opted for ALEPH 500 software and URICA system respectively (Ojedokun and Lumande, 2005).

Planning for Automated Library Systems: The Approach in Practice

Careful planning must precede successful development of an automated library system. It is a product of prolonged period of deliberations. In practice, it is best to set up a structure for the system selection process. It is important that the library establishes a library automation advisory committee. Membership of this committee should include library representatives of stakeholders in the university, especially the faculties, staff of the library automation unit (if any), and top members of the library management team. This committee is to advise on the need for a new system or system migration based on the vision and mission of the institution. This committee creates the process. Once the decision is to implement a new system and/or migrate to a new system, the library administration is to clearly convey the decision of the advisory committee to all staff.

The setting up of an automation system search committee should then follow this. Membership of this committee should include the systems librarian, key library staff from sections of the library, which will be affected by the new system, and staff with expertise and/or interest in information systems. This committee is to spearhead the selection process. The responsibility of this committee will also include identifying focus groups, drawn from all levels of library staff, faculty and students (if possible, or otherwise carry out a questionnaire survey) to identify desirable features of a library system. Each group is to focus on a specific module. Each volunteer may participate in two groups, but not more, in order not to allow their voice to carry too much weight in determining selection criteria. The committee must consider the needs of staff and the library users, carry out work flow analysis (i.e. analysis of operational procedure), analysis of the data structure and processing requirements, the nature of input or output, and budget limitations. This should assist in preparing Request for Information (RFI) to be sent to vendors. Osborne and Nakamura (2000) describe RFI as a request that the vendor supplies information on its system. It usually includes details of the library environment (e.g. size of collection, number of circulation, etc.), as well as anticipated schedules, which the library feels the vendor might find useful. The set of specifications supplied by the vendor in response to the RFI can provide a description of a system that may make the prospective buyer aware of additional desirable features. Often, vendors respond with information on any of their system configurations that might be useful. They are usually designed to favour what the vendor feels is important. Occasionally, however, they respond that none of their systems would be suitable. The RFI later helps in preparing the Request for Proposal (RFP), also sometimes termed variously as a specification, or statement of operational requirements (OR), or Invitation to Tender (ITT). It must be kept in mind that the RFI is for information gathering only; no vendor should be excluded from the RFP process. A typical RFP is one consisting several sections, which includes: a section describing the library and its environment, a tentative timetable, contact persons, etc.; a section containing the specifications for the system that is to be purchased; a section detailing standards which must be adhered to and definitions for terms used; and an administrative section explaining how bids are to be submitted, what the deadlines are, whom to contact for clarification, etc.

The library should then request the Director of Information Technology in his/her institution, together with a representative from the purchasing department of the institution, to handle contract negotiation. Once a system has been selected, the library can go ahead to appoint an implementation team. This team is to get the system up and running successfully.

Systems Analysis and Design

The concern of library managers is to acquire either a turnkey package of hardware and software, or the hardware and software as two separate components, and then to configure elements of the system to suit specific requirements. While they are not concerned with the analysis and design of a system, and the subsequent programming to create a tailored system, but rather with the identification of functional requirements; the choice of a system that most closely meets those functional requirements, and the negotiation with suppliers to arrive at an appropriate specification; and the adjustment and implementation of systems, it is important to be familiar with the systems analysis and design. Semprevivo (1982) cited in Osborne and Nakamura, 2000) defines *systems analysis* as "the process of studying the network of interactions within an organisation and assisting in the development of new and improved methods for performing necessary work". Osborne and Nakamura (2000) describe it simply as a means of viewing circumstances realistically and designing practical solutions.

To better understand this concept, it is important to define each of the component parts. Osborne and Nakamura (2000), in refining Semprevivo's definition, define a *system* as "a series of interrelated elements, which can be considered complete, that perform some business activity, business function, or business operation". Capron (1990, cited in Osborne and Nakamura, 2000) defines it as an organised set of related components established to accomplish a certain task. Inherent in these definitions are the essential factors of interrelatedness of the elements (as the separate elements do not comprise a system), its completeness (in the sense that it offers logical boundaries), and its purposefulness (as the elements must combine to meet some purpose if the system is to be productive). The elements or the set of related components, in this case, may include people, procedures, funding, and equipment. These definitions can be further refined to define a system as "a series of

interrelated elements such as people, procedures, funding and equipment, which can be considered complete, that have been established to accomplish a task". This definition thus goes beyond hardware and a set of software, though may be so defined in some other contexts. Osborne and Nakamura (2000), define *analysis* as the study of a problem prior to taking action. It is believed that honest study should precede and guide useful action.

Systems analysis thus involves concepts and methods. It is also a way of thinking about the real world and its problems. It is not just about equipment, networks, wires, and computers, but also about communication and people, and about finding suitable and organisationally acceptable solutions to particular problems. The design phase, is however, where decisions have to be made as to how the problem can be solved.

The process of acquiring or replacing a system is a key professional activity to ensure appropriate functionality, accuracy in processing and ease of use. A would-be analyst should therefore be a problem solver. Such a person should: be familiar with a wide range of technology; serve as a link between implementation of a new system and users of the old system, making the transition as smooth as possible; and at ease with people and be able to recognise their real, their perceived, and their expressed needs; be able to find the underlying logic in a situation and to develop logical plans for correcting the problem; be able to communicate well, to help other people articulate their needs, and to present the design effectively; be able to make a quick study of an unfamiliar field and be able to deal with ambiguity, uncertainty, and adversity. These attributes, in reality, cannot be found in one individual, hence Osborne and Nakamura (2000) recommend relying on several team members in systems analysis, so that the strengths of each member can contribute to the effectiveness of the whole. Librarians, network administrators, or database administrators can serve as systems analyst. The title holder is charged with the specific tasks of investigating problems, designing solutions, and sometimes overseeing the implementation of the design.

Steps in System Analysis and Design

There are seven steps in systems analysis and design here referred to as "Systems Development Cycle". These are:

- Problem definition
- Feasibility study
- Analysis
- System design
- Detailed design
- Implementation
- Maintenance

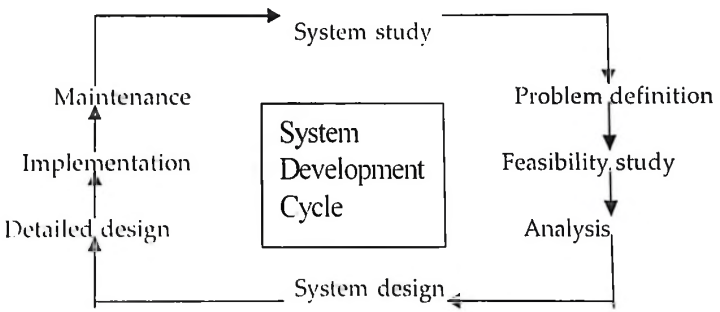

Fig. 1: Systems Development Cycle

Problem Definition

What the problem is with the current system must be defined at this stage although may seem obvious. Someone must recognise that a problem exists. Often the user will encounter difficulties (e.g. in keeping circulation statistics, etc.) and ask for help. Management will identify an area of poor performance within the user's function (e.g. long queue at the circulation desk, inability to monitor overdue fines, etc.). Sometimes, it is the analyst spotting a problem. The initial discussion of problem is usually informal but it reaches a point where the user, management and the analyst agree that there is a problem that needs attention.

Feasibility Study

The objectives of a feasibility study are to find out if an information system project can be done (...is it possible?...is it justified?) and to suggest possible alternative solutions. Essentially, the goal of this study is to provide a go/no go decision about whether to proceed with the project. The key question to be answered therefore is whether there is a feasible solution. During the feasibility study, the problem definition is brought into sharper focus, and specific system objectives are set. Aspects of the problem that will be excluded from the system are also clearly identified. This phase usually includes a study of the present organisational system, including users, policies, functions, objectives, etc.; problems with the present system (inconsistencies, inadequacies in functionality, performance...); objectives and other requirements for the new system (what needs to change?); constraints, including non-functional requirements on the system; possible alternatives (the current system is always one of these) - the alternatives usually represent one, a basic improvement in the current system with minimum investment of resources; two, substantial changes in the current system; and three, the design of an ideal system, given unlimited resources; and advantages and disadvantages of the alternatives. The conclusion should be the feasibility of the project and the preferred alternative (Castro and Mylopoulos, 2002). The feasibility study usually ends with a formal presentation to the user and management. This is a crucial decision point in the life of the project. Many projects die at this stage, only those promising a significant return on investment are usually pursued further. If management approves any of the alternatives, then the feasibility study represents an excellent model of the systems analyst's understanding of the problem and provides a clear sense of direction for the subsequent development of the system (Osborne and Nakamura, 2000).

The types of feasibility study include *operational, technical, economic and schedule* (Castro and Mylopoulos, 2002). *Operational feasibility* defines the urgency of the problem and the acceptability of any solution. In other words, if the system is developed, will it be used? It includes people-oriented and social issues: internal issues, such as manpower problems, labour objections, manager resistance, organisational conflicts and policies; also external issues, including social acceptability, legal aspects and government regulations. *Technical feasibility* asks whether the project is feasible within the limits of current technology, whether the technology

for the project exists at all, and if it does, whether it is available within given resource constraints (i.e., budget, schedule,...). *Economic (Cost/Benefits Analysis) feasibility* asks if the project is possible, given resource constraints, and whether the benefits that will accrue from the new system are worth the costs. Osborne and Nakamura (2000) identify the categories into which costs can be broken as immediate, projected or project-related, and operational (on-going). Castro and Mylopoulos (2002) identified project-related costs to include development and purchasing costs and installation and conversion costs: purchasing (hardware, software, office furniture), customising software, training, system installation and file conversion, while operational costs include maintenance: hardware (maintenance, lease, materials,...), software (maintenance fees and contracts), facilities; personnel: operation, maintenance. The authors also classified benefits into the following categories: *Monetary,* when currency values can be calculated, *Tangible,* (Quantified), — when benefits can be quantified, but currency values cannot be calculated, *Intangible,* when neither of the above applies. Examples of particular benefits: cost reductions, error reductions, increased throughput, increased flexibility of operation, improved operation, better (e.g., more accurate) and more timely information. In other words, it asks about the savings that will result from the system, including tangible and intangible ones, and what the development and operational costs would be. *Schedule feasibility* studies the constraints (e.g. availability of skills required, reasonability of deadlines, etc.) on the project schedule and whether they could be reasonably met.

Analysis

This is a logical process (specifying *what* the system is to do). The objective is not to solve the problem, but to determine exactly what must be done to solve the problem. The user knows what must be done, but does not know how to do it. During analysis therefore, the analyst works with the user to develop a logical model of the system, using such tools as data flow diagrams, an elementary data dictionary (a repository of information about data, i.e. an authority file for data, consists primarily of definitions but may also include charts and diagrams), and rough description of the relevant algorithms (clear-cut statements of procedures and predictable outcomes). This logical model is subject to review by both the user and management, who must agree that the model does, in fact, reflect what should be done to solve the problem.

System Design

The system design stage is a movement from the logical to the physical design (*how* the system is to do it). The question to be answered in system design therefore is how, in general, should the problem be solved? Should the problem be solved through computerisation or a manual process? At this stage, general statements are replaced with specific statements of action. The system design normally should end with a choice. In other words, if the system is worth supporting, one alternative will be selected. The analyst's description of this alternative is then used as a high level model for developing the physical system.

Detailed Design

This phase suggests that management, the user and the analyst have agreed on a general strategy for solving the problem. They know what programs will be needed by the system, that a program will be needed to perform certain functions, and the hardware that will be required. The key question therefore is how, specifically, should the system be implemented. This phase requires the analyst to develop a set of specifications for each program with the help of the programming department. The specifications must contain enough detail to support writing the actual code. If new hardware is needed, hardware specifications must be written in a form acceptable to the purchasing department. The analyst must define each component of the system to whatever level of detail is required for the implementation step. With detailed specifications, it is possible to generate highly accurate cost estimates and implementation schedules, which are very important to management.

Implementation

Implementation is the phase of a project during which theory is turned into practice. During this phase, hardware and software are installed, staff training (such as how to execute the package, how to enter the data, how to process the data (processing details), how to take out the reports) is completed, a conversion team implement final change over to the new system, and the documentation is prepared for system maintenance.

Maintenance

Maintenance is necessary to correct incorrect data, to fix bugs in software, and to install upgrades and new versions of software. This requires maintaining a list of what hardware and software has been installed, along with its version or release number. Maintenance specification should include detail on system maintenance issues, such as backup routines for system data, upgrades of software, and procedures in the event of system failures, etc. A schedule of maintenance and a maintenance log of actions taken must be kept for each piece of hardware.

The System Selection Principles

Systems selection involves the identification of the specific systems and software to meet the specified requirements and costs. It is the most difficult step in the planning process, due to current proliferation of computer hardware and software.

Osborne and Nakamura (2000) identify four options in system selection. One option is to produce custom software and then purchase hardware to operate it. In this case systems selection simply means hardware selection. The second option is to select software that is compatible with existing hardware; in which case, compatibility with existing hardware would be one of the system specifications. The third option is to buy the hardware and software separately and then merge them. The fourth approach is to select a turnkey system, buying the software and hardware from the same vendor. Here, the vendor assumes responsibility for successful implementation of the system.

When library managers come to the point of selecting a system among some different choices, it is always very important for them to rely on some reliable process. The chosen process must however be attuned to the special needs and features of the individual library. This section details some principles that can guide a library manager through the creation of an appropriate process for his/her library. The needs of the library will guide the library manager on how to include the various basic components of any selection process into his/her own selection process. The principles include the following (Manifold, 2000):

- A Focus on the needs of the institution;
- Choosing long-term over short-term benefits; and
- Staff and users involvement.

Focus on the Needs of the Institution

The system selection process should be a part of a larger, on-going process of organisational change that manifests itself in many ways throughout the library, and often through the larger institution of which the library is a part. It should be born out of the vision and mission of the institution. The transformation of the institution should serve as the context, in which all decisions regarding a new system are made. This not only results in a functioning system, but also in meeting the needs of the institution as a whole. It must focus on the final outcome. True success in selecting and implementing a library automation system is demonstrated by the complete integration of the new system into an organisational structure and environment prepared for and attuned to its particular features and approaches.

Choosing Long-term over Short-term Benefits

Throughout the selection process, the library manager should maintain focus on the long term, rather than on the short-term. It is, for example, more to the library manager's advantage to choose the system that seems most likely to continue to evolve and develop at a reasonable pace in the directions most suited for his/her library. While it is unlikely that the library will continue to use the same system forever, there is always the temptation to want to minimise the pain of normally chaotic and painful transition period by taking shortcuts and making compromises with normal quality standards for cataloguing, acquisition, circulation control, serials check-in or other processes. Such compromises, even if they successfully reduce the stress of the system migration, are not at all in the library's best interest.

At many points in the selection and migration process, there may also seem to be no really good options available after comparing two or three finalist systems. That is, it is discovered that some innovative and customer-focused service that the library has recently initiated cannot be supported by a new system. At this point, the library may have to give up a share of control over its own future, and put it in the hands of the vendor. It is, however, essential to keep focus on the long term, as well as accept the realities of the situation and move on. For instance, the library can develop a long-term association with the vendor of choice, and life will be easier, if the library can work with the vendor as a partner, rather than as an adversary.

Staff and Users Involvement

The systems available today bring together the entire range of operation of a library, from technical services to circulation to interlibrary loan. This has made the number of possible combinations of settings so large, that no one person can understand and take care of them all. The solution for handling this complexity has been to push the responsibility for some of the customisation to the users, particularly as the look and feel of the system, to some extent, is controlled directly on the user's desktop. This suggests that, much more than before, the end-user of the system is a full partner in the successful implementation of the system. To ignore this fact is to invite an unsuccessful outcome to the implementation process. Therefore, the users themselves, particularly the library staff members, must be fully included in the process from start to finish, so that they will respond well to taking on their part of the responsibility for making the system operate properly. All staff members of a library (including the support staff, whose knowledge of day-to-day processes often far exceeds that of their professional supervisors), and library customers, must be partners to some degree in the automation process. This ensures that staff members and the library customers are, as much as possible, involved in decision-making in the planning process, and, encourages their commitment to the new system.

Careful planning and coordination of the selection and migration process, as well as a constant focus on communication among all parties, can help to ensure a happy outcome.

Components of the Selection Process

Certain elements, which do not need to be seen as necessarily distinct steps, can be identified from the various pieces and parts of the selection process (Manifold, 2000). These include:

- Educating participants on the systems market;
- Identifying features for a new system;
- Getting information about features in various systems;
- Evaluating the vendors;
- Securing bids;
- Negotiating a contract;
- Communicating; and
- Managing stress.

Educating Participants

All library staff needs to be made aware of the state of the art of library automation, in order to involve them in the process of selecting a new system. It is important to recognise that while library professionals often have opportunities to attend conferences, read professional journals, or network with colleagues at other institutions to keep abreast of the latest developments in automated systems, the support staff does not usually share those privileges. Even, most professional librarians outside of the systems field do not thoroughly know the system market or the offerings of all of the vendors. Staff and librarians who previously ignored the whole arena of automation must also be pulled into the process, as the new system will affect them much more than current systems.

Identifying Features of a New System

After the education phase, it is necessary to create a list of required and desired features in the new system. Many libraries have assigned specific rankings to each feature. They have classed features as required, strongly desirable, desirable, and optional, or some such scheme. Although this can be helpful when it comes to determining which system best meets the needs of the library, care must be taken. The needs must be carefully analysed, including differentiating between needs and objectives (Adogbeji, Onohwakpor, and Sylvester, nd). This is because, if a feature is marked required, one or more vendors may choose not to bid on the system, feeling that they would not be able to meet your needs. It is therefore probably better to know generally what the priorities are, but not spend exorbitant amounts of time ranking specific features or marking items as required and desirable.

Getting Information about Features in Various Systems

With the list of features in hand, there is the need to get information about which features are supported by which systems. While there are many ways of doing this, such as the use of scripted demos, site visits, exhibits at library conferences, request for information, and system manuals or handouts, the most common, although far from standard practice, is to submit a 'Request for Proposal (RFP)' to the vendors, which asks them to indicate which features their systems currently support or

will support in coming releases. The vendors then reply with a proposal. The proposals are then used as a basis for selection. Preparing a RFP or specification should thus be seen as a key part of the procurement planning process. A good RFP ensures that the library manager observe, the principle of open and effective competition, which is a requirement of all procurement activities (Fisher, Delbridge and Lambert, 2001). Apart from the identified vendors, it is also proper to advertise the existence of RFPs in library periodicals and local newspapers to allow additional vendors an opportunity to respond (Osborne and Nakamura, 2000).

Where the decision is to use RFP, there is the need to strike a balance between specificity and brevity. The more specific the features listed are, the more likely it is that the answers given by the vendor will be useful. The RFP must also not be made too long for any vendor to want to reply. This is because vendors may perceive that their system is not a good match for your needs, or the RFP seems to be written specifically to favour a different system. It is also quite expensive for vendors to reply to an RFP, and they may choose not to respond, based on the size of the document or the extent to which you dictate specific solutions to problems, rather than simply stating problems that must be solved (Manifold, 2000).

Broad consensus on the elements which should or may be present in a specification or RFP includes (Porter, nd., Cohn and Kelsey, 1996., Fisher, Delbridge and Lambert, 2001): background information on the library (e.g. library vision statement, the library context/environment, library statistics, etc.); functional requirements, including mandatory and desirable system functions; hardware and software platforms; networking requirements; a description of how the proposals should be arranged and submitted; response time required; instructions on receiving vendor business and financial information; criteria (prioritised) the library will use to evaluate vendor proposals including the evaluation procedures; timetable for the evaluation process; questions regarding vendor support and training, technical documentation and user manual; the library's functional and technical specifications; timetable for implementation; and contract conditions. Since the library will be selecting a vendor, as well as a system, further information about the vendor is important. Vendors must also be asked to provide its annual report; state its vision, mission and philosophy (vendors must have appropriate vision and strategies, if they are to be successful); describe

how they will create bibliographic item and borrower databases; their system maintenance programs and services; their site preparation requirements; their delivery and installation methodologies; their system performance guarantees; and their pricing and cost strategies, in detail; its financial viability (i.e. whether it has set aside sufficient resources to new development, to support, to training, to documentation); its personnel, skill mix and track record; whether it includes the library manager's type of library as part of their primary target market; its intention to keep current with emerging standards; whether it has other customers with libraries like his/her library; whether it has enough customers to support their continued existence and growth; whether it has the capability to provide support to the library at its location from time to time; whether there is an active users' group with which the library can share information and questions about how best to use the system, as opposed to how it works; whether it is prepared to release new versions of the software frequently enough to address any problems that slip through testing; whether it has trustworthy, knowledgeable, forward thinking, sympathetic and responsive people in charge; whether it has organisational depth and staying power. Additionally, invite vendors in for demonstration of software, interview potential finalists, and, finally, make the selection.

Evaluating and Selecting the Vendors

The information received in response to an RFP must be scrutinised carefully. It is important that an evaluation method be developed before the RFP is sent out. If a numerical analysis of the responses provided must be included in the evaluation guidelines, it must not be the only criterion on which the final decision is based. Evaluation of library systems needs to be both objective and subjective (Genaway, 1989, cited in Manifold, 2000). Results must be crosschecked with any narrative that is provided and with information gained through other means.

However, while an RFP may be sufficient to eliminate candidates, it is not by itself sufficient to select one. The best strategy is to get further information through a mix of activities. The most common activities include: an in-depth, onsite demo; visits to sites using the software; and interviews with other users. All of these activities reinforce each other and give the library manager confidence in selecting one system over the others.

Upon the receipt of vendor proposals, the process of system evaluation and selection can then begin. The following numbers of key steps are suggested (Cohn and Kelsey, 1996): formation of a project team of persons, to assist with the evaluations and the selection, who have some knowledge of automation, or who work in the area(s) being automated (people involved in the strategic planning process would be a good choice); weeding of proposals that are "fatally flawed", e.g., where the vendor fails to reply to any of the functional specifications or the system is missing a module for a high-priority function; in-depth reading of the "surviving" proposals, carefully noting both deviations from the requirements as defined by the RFP and any aspect that is handled unusually well (making a list of any parts of the response that are not clear and require further clarification); scheduling of system demonstrations (a very important component of the evaluation process). Allow the vendors to show off their systems in the most attractive light; however, be prepared with a list of what you want to see along with questions you would like answered. Use the same list with each vendor. This permits more effective cross-comparisons. Additionally, consider using computerised spreadsheet software in order to compare and evaluate vendor cost proposals (costs may not be what they seem at first glance). Contact some of each vendor's current clients — sites of the same library type, and of similar size, where the hardware and software modules that have been proposed to you are currently in use. Assign point values to the criteria listed in the RFP and assign scores to the different proposals. The system with the highest score becomes the number one finalist, the system with the second highest score, number two and so on. However, to maintain a negotiating edge, consider cutting to two vendors rather than one. It must be noted that the selection process is not over, until the contract is signed. Until that point, the library manager is advised not to let any vendors know that they have been eliminated, including those with fatal flaws.

Securing Bids

It is certain that at some point the library manager needs to get a specific bid for the system of choice. If an RFP is going to be used, the library manager will need to include it in the bid. It could also be a separate request. It is however best to make the request for bid a separate process, including only those systems that have already passed the test of the

features inventory and vendor evaluation. The vendor's bid should include hardware and software configuration that meets the library's stated needs, and includes pricing for each separate hardware and software component. The library manager must ensure the vendors provide specific hardware configuration that they are willing to certify is adequate to support the usage goals that have been delineated. He/she must keep in mind that purchase price is only one component of the cost of the system. Other costs include the cost for training, possible network upgrades, new staff, site preparation, and other one-time costs associated with bringing up a new system. Ongoing costs such as hardware and software maintenance, travel to users' group meetings, hardware upgrades, and workstation replacement must also be considered. The library manager's decision should not be based on one-time purchase price, but on the total cost for up to seven years (Matthews et al., 1987, cited in Manifold 2000).

Negotiating the Contract

Once you have made a selection, a contract needs to be negotiated. However, it is important to understand what drives costs of library automation. Profit for library automation vendors is largely derived from three revenue sources: *the sales of hardware, software (which most vendors write themselves)*, and *services*. It is against these that they must be able to pay the substantial costs associated with developing, selling and supporting those products. The hardware cost to vendors is in terms of the value-added features provided as part of the turnkey sale, including design of the configuration, installations, training, response time and capacity warranties. The cost, in terms of the software, is the increasing complexity created by the growing functional needs of the customer. This means that production, testing and quality assurance have also increased by the same factor of complexity, which then creates increased costs in development tools, staffing and quality assurance programs. The services costs are in terms of increased costs in selling their product to the library market, represented in cost of responding to RFP, on-site demonstrations and request for additional services. These are what drive costs up (Grant, 1999).

The reality in contract negotiation therefore is that neither vendors nor the library manager can lower the cost of automation acting alone; rather they must work in concert. The library manager must not allow his/her ego at negotiating get in the road of achieving his/her objective.

The library manager, as the buyer, must come to the table, willing and able to articulate the goals of the library, and to identify, with the vendor, those that are in common, those that are not, and how best to address the needs of both to succeed in contract negotiation. Verbal commitments and agreements are often made during this process. All of these must also be documented. The documentation should include: specific itemisation of any hardware and software products to be delivered, specific itemisation of association and software provider obligations and responsibilities, fixed costs for the term of usage, defining of acceptance testing of hardware and software, guarantees of vendor performance, conditions for exit or release from the contract. (Porter, nd., Grant, 1999, and Manifold, 2000).

The vendor may be asked to provide a standard contract, which would serve as a starting point for negotiation. A consultant may also be used for this process (Manifold, 2000). The library manager must weigh the consultants' advice for his/her situation, and use that which is appropriate and discard that which is not (Grant, 1999). It is however important to know what his/her library can afford in one-time and recurring costs. Depending on his/her library's budget and/or level of support, it may be found necessary to spread costs more evenly to later years (Manifold, 2000).

Communicating

Complete and on-going communication in system selection and migration is very important. Communication must take place within the library, as well as with the vendor. For selection process to be a complete success, an environment must be created in which any communication is acceptable and encouraged. This is because during the process of system selection, migration and early use, it is easy to be hurt by incorrect or ill-founded assumptions. However, while communication must be run through proper channels, it should also be okay for a library faculty member to have a direct conversation with support staff in technical services, even if they are in separate divisions. There are enormous benefits in keeping communication running through proper channels, as well as breaking down the barriers between departments.

Managing Stress

It is obvious that automating a library for the first time has the potential to cause enormous stress on the staff. This is because every process and practice they have learnt over the course of their employment may change. Their comfort zone, the areas in which they feel competent, will shrink, sometimes almost to nothing. Similarly, migration from one system to another can be just as stressful. The expertise that the staff have developed in exploiting the features and design of the automated system disappears overnight, as they have to learn the new system. Staff members recognise well in advance of implementation that they will no longer be expert and that their competence will decrease. The stress therefore starts building, the moment the announcement is made that a new system will be selected.

A good selection and migration process takes this natural stress into account. For example, most people define a large part of themselves in terms of what they do. They think their jobs are important, and they try to do them well. An impression must therefore not be given that a job is pointless, unimportant, or unnecessary (even when it is) (Osborne and Nakamura, 2000). It can also make a significant difference in a person's stress level to know that those in charge recognise and honour the expertise that these staff members possess. Making sure that each person can participate in the process of system selection and migration to the extent of their ability, and the desire to do so is often quite a relief. This participation is a tacit acknowledgement that their level of competence, and thus their comfort zone is not, in fact, as small as they might think, but large enough to allow them to bridge the gap to the new system (Manifold, 2000).

Adapting to the new system can and probably will be hard for at least some of the staff members. Similarly, some time-honoured procedures and policies will no longer work, and staff will have to learn entirely new ways of doing business. Some of these new ways are likely to be difficult, and some features they relied on are likely to be missing. Some staff members will be hard-pressed to maintain the level of quality to which they are accustomed. It will therefore make a world of difference to give them an accurate picture of what to expect with the new system. Some members of staff are also likely to be resistant to change in any form. This category must be reassured that they are still valuable and effort made to ease their pain. However, those who resist change must

not be permitted to derail the transformation process. The negative effects of their resistance must be neutralised, even as their real personal needs for reassurance and comfort are being met (Olsgaard, 1985, cited in Manifold 2000).

Success of Automated Library Systems

A number of criteria will inform the success of automated library systems. These criteria grouped under four sub-scales include: management of the system; technicalities of the system; usage of the system; and boundary issues (Farajpahlou, 2002).

Under the management issues, libraries wishing to automate must note that a successful automated library system is usually based on a well-prepared automation plan, and usually does not depend on carefully considered contractual commitments with the vendor. It should save staff time; should not require extensive courses of library staff training programmes; and should not require extensive teaching of users. The integration of the automation planning process into library activities also does not usually have any impact on the success of the resulting automated library system.

Under the technicalities of the system, it must be noted that a successful automated library system will usually: allow increase of quality of library services without increase in the number of staff; allow increase of quantity of library services without increase in the number of staff; depend on its technical compatibility with other automated processes in the library; and have a fast response rate. It is usually capable of continued development and enhancement, and is not usually judged on the length of time that the system lasts, and should have minimum downtime (say 1 per cent).

Similarly, under the usage of the system, it must be noted that a successful automated library system is usually user-friendly, in terms of its interactive interface, "self instructive", that is, it will have tools like help, tutorials, etc., by which it will itself instruct people how to use it, easy to use, and should provide good management information.

The boundary issues covered three areas: political issues, usage of the system, and costing of the system. Under these areas, a successful automated system is expected to increase the library's influence in getting status from other departments in the university; increase the library's

influence in getting resources from the university; and help increase the library's status in the library and information profession.

It must also be noted that the number of libraries, which buy and install the system, is a factor in the success of an automated library system, and that the overall costs of an automated library system do not usually count in the success of the system.

Library Information Systems Marketplace

The integrated library system (ILS) marketplace started in 1971, when Computer Library Systems Inc. (CLSI) offered its first circulation control system, the LIBS 100, as a turnkey option for libraries. It offered its first version of a turnkey online public access catalogue (OPAC) in 1982. The CLSI was later joined by companies such as DataPhase Systems Incorporated, Data Research Associates, and others to form initial ILS marketplace (Kochtanck and Matthews, 2002). The year 2000 witnessed newcomers, Endeavor and Ex Libris, into the library systems marketplace, as they made their presence felt. Their next generation systems, Voyager and Aleph 500 respectively, captured the attention of many libraries. Systems already established by 2000 were Ameritech (now Dynix), Geac, and Innovative Interface's Millennium (Felstead, 2004). The marketplace is now witnessing several vendors being bought, sold, and merged, thus starting a period of vendor instability. The current status of the ILS marketplace can be characterised by the following properties (Kochtanck and Matthews, 2002):

One, it is generally mature, meaning that both long-standing and newly formed ILS vendors have settled on the group of key functionalities; and two, it exhibits rich features for basic operations (e.g. cataloguing, circulation control, online catalogues). Most of the basic functions and features regarding library operations have been successfully identified, and procedures for implementing solutions to these basic library operations have been coded and refined several times over. Although, there are new and exciting things to look forward to, the current marketplace struggles to extend the physical library into global, digital environment where information takes on new forms and delivery possibilities. Experimentation, is however, over. The focus is now on new services, primarily those based on access to remote information services such as databases and access to digital collections. Major challenge is to provide integrated access to collections, both paper and electronic, and

to effectively link to electronic or paper copies. This, in addition to the transition to a web-based library system, suggests that the library community is confronting another period of serious change. Three, the majority of installed systems are older "legacy systems". That is, systems that were developed and implemented more than a decade ago. Although, many of them are still operating and supported by the ILS vendors that originally developed them, they lack connectivity or extension to the new, remote information services described above. However, they continue to provide access to local collection, check out materials, etc. They were often designed as centralised solutions based on a single computing device, with little functionality at the end user or dumb terminal side. Although, some libraries have opted to remain with these earlier systems for a number of reasons, one of which might be replacement cost, the number is diminishing. Four, newer installations are based on distributed network technologies, and are predominantly web-based in the approach to user-interface.

Some Common Software in Use for Library Automation in Africa

A number of library systems have made in-road into libraries in Africa. Many libraries are turning their attention to software in use and have a support base. These include: Inmagic, Caudra Star, Stylis, and MICRO CDS/ISIS (Adeniran, 1999). Others are: INNOPAC, ALEPH, MINISIS, and TINLIB (Adedigba, 2003 and Ojedokun and Lumande 2005).

ALEPH: The ALEPH 500 integrated library system was developed by Ex Libris to meet the technological challenges libraries face. Its multi-tier client/server structure guarantees that ALEPH 500 will meet the needs today and in the future. It offers the ultimate in resource-sharing capabilities, full connectivity, and seamless interaction with other systems and databases. It also offers complete array of reliable, flexible, and user-friendly features (Matovelo and de Smet, 2005).

CAUDRA STAR: Caudra Star is an integrated library system that can take in full text and images. With Caudra Star, the library can build separate databases. The user/search interface is very friendly. The web interface is built, in and comes with the cost of the software (http://listserv.buffalo.edu/cgi-bin/wa?A2=ind9709&L=syslib-l&P=5780).

MICRO CDS/ISIS: Computerised Documentation System Integrated Set for Information System is advanced non-numerical information storage and retrieval software developed by UNESCO. Since it was introduced in 1985, CDS/ISIS has become one of the most widely used software tools for library information storage and retrieval, especially in developing countries, including Africa. Many have used the software to digitise their catalogues, thereby improving access to their holdings. Many of these libraries continue to use CDS/ISIS software to administer their catalogues and to manage other library operations (http://ictupdate.cta.int/en/feature_articles/cds_isis_software_for_libraries).

INMAGIC: Developed by Inmagic Inc, is flexible and easy to use. The applications are based on Microsoft SQL Server and .NET technology that utilises web services. They can thus be integrated with and interoperate within the organisation's overall information technology infrastructure (http://www.inmagic.com/).

INNOPAC: Innovative Interfaces Online Public Access Catalogue developed by Innovative Interfaces Inc, offers web- and Java-based integrated library systems with multi-tiered system architecture, object-oriented design, and complete scalability. Innovative's Millennium integrates future-forward technologies. Offers complete array of reliable, flexible, and user-friendly features (http://www.iii.com/mill/index.shtml).

MINISIS: MINISIS is a bi-lingual (English and French) relational integrated library system offering acquisitions, cataloguing, circulation, serials, and WEB OPAC modules. It is an information management system product of the MINISIS Systems Group, sponsored by the International Development Research Centre (IDRC). It offers the ability to manage and retrieve data in the language of the user. MINISIS appears very flexible. A library can design worksheets, query forms, and reports for each module's functions that define local needs (http://www.ilsr.com/minisis.htm).

STYLIS: Stylis Library Management System is an integrated software package developed in the Republic of South Africa. Stylis is capable of handling all library functions from acquisitions to the provision on Online Public Access Catalogue (OPAC) services.

TINLIB: The Information Navigator for LIBraries. TINLIB uses the TINMAN database management system developed by the Information Management and Engineering Limited (IME). It is an integrated library system. TINLIB systems have been portated on Linux, Microsoft and SUN platforms, as a consequence of the scalabilities policy of the company (http://www.ime.ro/info.php?content=4.2).

Challenges of Library Automation in Africa

In Africa, there are a number of challenges to library automation. The challenges include:

Information and Telecommunications Infrastructure

This is very essential, especially at the level of computer networking. However, information and telecommunications infrastructure is poor in many African countries.

Funding

Library automation requires enormous funding, due to frequent hardware and software upgrades, increasing cost of subscription to electronic databases, etc. A well funded automation project assures new and improved services, as well as sustainability of the project. However, many libraries in Africa are poorly funded. Major funding usually comes from international aid agencies or governments of the developed countries. The provision of computers and purchase of e-resources are heavily dependent on external funding.

Computer Phobia/Inadequate IT Skills

Many librarians, especially those trained in traditional librarianship, are conservative and have a phobia for computers. Because of generation gap between the new and old school professionals, computers are perceived as a threat to their status as experts. Thus, they find it difficult to cope with the requirements of the electronic age, and are reluctant to jettison old practices for new ones. Many also lack IT skills and are unwilling to make some investment in learning to use them effectively.

Technical Expertise

Inadequate technical expertise is prevalent in many countries in Africa. There are shortages of trained personnel. Few librarians with computer science qualifications work in libraries. It has, however, been impossible to retain these few, as many libraries are unable to pay for their technical skills. The consequence is frequent disruption of services, as a result of computer and/or network breakdowns.

Power Supply

In many African countries, frequent power outages constitute a serious bottleneck to automation. Where there are generating plants, the cost of running them is prohibitive.

Experiences of Library Automation in Africa – A Review

Although university libraries in Africa have progressed towards library automation, experiences and challenges are wide ranging. For example, shortage of qualified personnel, costs, lack of reliable telecommunications network, power supplies, lack of cooperation among university libraries, and perceived poor image of librarians are the challenges facing East Africa university libraries in utilising IT (Mulimila, 2000). Lack of managerial capabilities; technical know-how and expertise; fund to finance the training of library staff and hire a project manager; and fear of loss of job (leading to some staff treating the system with suspicion); dealing with staff de-motivation were specifically reported in Kenya's Moi University in their automation project (Ondari-Okemwa, 1999). No doubt as a result of lack of expertise, Copperbelt University, Zambia's computerisation project resulted in inaccurate costing of the library computerisation project, faulty selection of software, Stylis, used for the project, as limitations in the proposed automated library system were later discovered. There was also lack of cooperation between the two major libraries in Zambia (Nkhoma, 2003). With particular reference to Balme Library of the University of Ghana, Legon, financial problems, attitudinal problems, lack of co-operation among university libraries, hardware and software problems and personnel problems were identified as barriers militating against successful university library automation in Ghana (Amekuedeet, 1995). Kashim Ibrahim Library, Ahmadu Bello University, Zaria, provides example of the experiences and challenges of

library automation in Nigerian universities. There is lack of reliable LAN in most universities in Nigeria. Many of the staff of university libraries are also not computer- literate. Thus, technical expertise and support is lacking. The state of power generation and maintenance and update culture is also poor (Nok, 2006). The above experiences in university libraries are representative of the type of challenges library project managers face in Africa. Some of these challenges are better addressed through participation in consortia arrangement with adequate institutional support. It is, however, the responsibility of African governments to address the challenges of telecommunications infrastructure and power supply. There must be strong commitment of all stakeholders.

Conclusion

The concept of library automation has come a long way with its transition to library information systems through developments in hardware, software, telecommunications, as well as increased technical expertise. It is, however, instructive of a library manager to note criteria for a successful automated system, which should be a culmination of following a reliable selection process, in which the pieces and parts (the elements) are seen as interdependent and inseparable. In practice, a structured approach, which involves the setting up of committees, is appropriate. Although, cost could be a challenge in library automation, entering a consortium arrangement has been seen to reduce cost and save time. Consortium arrangement is therefore an option for cash strapped libraries wishing to automate. However, while the challenges of technical expertise and funding may be addressed through consortia formation, telecommunications infrastructure and power supply challenges are best resolved by the various African governments.

Revision Questions

1. Explain the concept of Library Automation? How would you define a successful automated library system?
2. You have been asked to champion the library automation project in your library. Explain how you would ensure a successful automated library system?

3. Briefly discuss the components of the system selection process.
4. Briefly discuss the developments impacting the transition of Library Automation to Library Information Systems.
5. Discuss the elements of the Systems Development Cycle.
6. How would you explain consortium arrangement? Explain how beneficial it is in Library Automation project.
7. Discuss the experiences and challenges of Library Automation in Africa.

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Chapter 7

E-Government and E-Records Management

Nathan Mnjama, Justus Wamukoya and Stephen Mutula

Introduction

E-Government means different things to different people. To some, e-government is simply a way of engaging in digital transactions with the government. To others, e-government is the creation of a website, where information about the government is posted. The World Bank (2007) defines e-government as "the use by government agencies of information technologies such as telephone, facsimile, video, television, radio, computer-based and computer-mediated modes of communication such as e-mail, chat and news groups, list serves, electronic teleconferencing, CD-ROMS, Local and Wide Area Networks, that have the ability to transform relations with citizens, businesses, and other arms of government". The World Bank (2004) further states that these technologies can serve a variety of different ends such as:

- Better delivery of government services to citizens;
- Improved interactions with business and industry;
- Citizen empowerment through access to information;
- More efficient government management.

"The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions". The World Bank (2007). A similar definition of e-government has been given by the Centre for Technology in Government (2004), which views e-government as *the use of information technology to support government operations, engage citizens, and provide government services. The use of ICT tools is crucial in e-government environments, as they transform the way governments interact with citizens and the business community around it.*

Types of E-Government Interactions

As can be seen from the above definitions, *e*-government uses Internet-based technology to make it easy for citizens and businesses to interact with the government. E-government targets four main groups in society as follows:

- Government to government (G2G): This involves government's relationships with other governments within and outside the country. G2G initiatives transform the way in which governmental agencies interact with one another nationally and internationally; for instance, the interaction between central government, municipal government, and local councils. This type of interaction allows better coordination of activities and makes communication and sharing of data and information between them easier and more effective.

- Government to Business (G2B): This type of e-government links government to the business community around it. This type of relationship consists of electronic transactions between government departments and the business community in such areas as lodging of tax returns, procurement of forms, etc. G2B e-government initiatives normally seek to improve the relations between government and businesses by providing accurate information that can be accessed by all anytime and anywhere. This leads to more transparency and substantial reductions in corruption, as the business community can conduct its business with the government in a more efficient and cost effective way.

- Government to Citizens (G2C): This type of e-government allows the government to communicate with citizens and provides certain services online such as the provision of general information and the ability to download and lodge various government application forms and other requests. G2C initiatives enable government to deliver services to citizens more promptly and effectively.

- Government to Employees (G2E): This type of e-government relates government to its employees. It deals with the interaction between the government and its workforce. Through G2E, the government can offer a variety of services to its employees such as e-learning and

the sharing of knowledge and information about itself, government policies, projects and programmes, among others.

E Government Services and Functions

E-government encompasses four key functions of government, which are:

- *E-services:* This involves electronic delivery and provision of government information, programmes, and services often over the Internet.

- *E-democracy:* Entails the use of electronic communications to increase citizen participation in the public decision-making process such as voter registration, electronic voting, suggestions and comments, etc.

- *E-commerce:* This is about the electronic exchange of money for goods and services such as payment of taxes and utility bills, renewing vehicle registrations, etc.

- *E-management:* This may simply be referred to as e-administration. It involves the use of information technology to improve the management of government, by streamlining internal business processes, maintaining e-records and improving the flow and integration of information in the workplace.

A study conducted by the Centre for Technology in Government (2000) revealed that most citizens in US preferred e-government when requesting for services relating to:

- Applying and renewing driving licenses;
- Voter registration;
- State park information and reservations;
- Voting on the Internet;
- Access to one stop shopping (one portal) for all government services;
- Ordering births, death and marriage certificates;
- Filing state taxes;
- Applying and renewing hunting and fishing licences; and
- Accessing medical information from the National Institute of Health.

Benefits of E-Government

There are a number of benefits to be derived from e-government, compared to walk-in offices. These include:

- Faster response: With e-government, the response is round the clock 24 hrs per day, 7 days per week. This is in contradistinction to walk-in offices, where citizens have to walk long distances to government offices and wait for long hours to be served. E-government makes it easy for the citizens to receive services at any time of the day and, in many instances, in the comfort of their own environments such as homes and offices without having to visit government offices.

- Lower costs: Studies conducted in the Western World reveal that e-government computer systems are cheaper to run compared with situations where the government employs a large work force to handle the same services. Also, in terms of office accommodation, computer systems occupy less space than offices occupied by staff. As a result of this, it is generally accepted that e-government is much cheaper.

- More up-to-date and complete information: Because they are supported by real-time computer databases, e-government systems can provide efficient access to millions of database records and other documents, some of which are updated on a daily basis. In this way, it can be safely said that e-government is capable of providing timely, accurate and more reliable information for effective decision making. However, it must be noted that this particular benefit is largely dependent on the computer systems being supplied with current data and information collected by those responsible for doing so.

Historical Evolution of E-Government

The emergence of the e-governance paradigm is largely the result of the worldwide revolution in information and communication technologies (ICTs) especially the Internet, the personal computer, the mobile phone and other modern communication devices.

Similarly, the history of using information and communication technology in government operations, especially in developed countries, spans several decades. In Britain, the Technical Support Unit of the telecommunication services was engaged by government to evaluate and advise on the use of computers as far back as 1957 (IDABC, 2005).

In Europe, the European e-government observatory that has the responsibility to provide a synopsis of the e-government situation and progress in Europe notes that the concept of e-government became more pronounced in the 1990s, due to development of the Internet and WWW, and was aimed at enhancing progress towards an information society status (IDABC, 2005), as customers increasingly expected government to be accessible and convenient.

Similarly, in North America, e-government efforts were pioneered in the late 1990s. In Canada, for example, the Government On-Line strategy that paved way for e-government was created in 1999 (Public Works and Government Services Canada, 2004). On the other hand, in the United States, Government Paperwork Elimination Act of 1998 that required federal agencies to provide the public with the option of submitting, maintaining and disclosing required information electronically instead of on paper was a significant stimulus for e-government. Moreover, the E-government Act of 2002 in the US established broad measures that required using Internet-based information technology to enhance citizen access to government information and services, and for other purposes (Relyea and Hogue, 2003).

In Asia, Wescott, Pizarro, and Schiavo-Campo (2001) point out that governments are only in the initial phases of adopting information and communication technology to improve financial management, streamline the delivery of government services, enhance communication with the citizenry, and serve as a catalyst for empowering citizens to interact with the government. In contrast, in Africa, Heeks (2002) points out that though governments have been using information technology

for more than 40 years, key innovations such as computer networks, intranets and the Internet started to emerge on the continent in the late 1990s. He notes that e-government as we know it today is only starting to slowly diffuse within the continent, because of lack of readiness for e-government, i.e. e-government readiness.

Oyomno (1998) points out that e-government paradigm is still undergoing development to provide an overarching conceptual framework. He observes that the conceptual development of e-government has so far gone through two distinct phases, and is presently witnessing the emergence of a third. In the first phase, the term e-government was used to mean the application of advanced ICT to deliver public services. On the other hand, the second phase emerged, based on the view that electronic service delivery was a new way of doing business in government, and was therefore part of the on-going reforms and transformation of government. Moreover, the second phase locates e-government within the context of the emergent information and knowledge age.

Oyomno (1998) suggests that, initially, e-government was limited to non-transactional information or transactions. Often, only static information, such as instructions about obtaining permits or a brief history of a municipality, was included on a website. Also, government-to-business transactions were the first type of actual online transactions. Commonly, these transactions involved large-scale procurement, and were usually confined to closed networks. However, open-network e-government applications are becoming increasingly common, and are expanding to include citizens, as well as businesses. E-government is increasingly being seen as a panacea to the deficiencies in the traditional form of government that entails citizens physically going to government offices to seek services such as applying for passport, birth certificate, death certificate or filing tax returns, with consequent delays arising from long queues, lost files, absence of relevant officials, failure to give a bribe and more. Through e-government, it is now possible to serve citizens more efficiently and effectively using electronic technologies.

E-Government Maturity Levels

Oyomno (1998) discusses six e-government capability maturity levels namely:

- Business-as-usual;
- On-line information services;
- On-line interactivity;
- On-line transactional services;
- Service integration;
- Organisational transformation.

Oyomno (1998) points out that a government at the 'business-as usual' level goes about its business in more or less the same way it ha always in the past. The on-line information services level entails th establishment and maintenance of an organisational presence in th global cyber space through an appropriate website to which various piece of information on the organisation are posted. The on-line interactivity level expands the capabilities of on-line presence to include forward and backward communications between the government agency and its stakeholders such as customers, suppliers, citizens or other communities of interest. The on-line transactional services level expands the capabilities of the previous level to include conclusion of business deals electronically, such that clients are able to carry out complete transactions on-line. The service integration level creates bridges between the various electronic government applications in the various government organisations, so that they work together as a single, government-wide system. Finally the organisational transformation level provides a total overhaul of traditional government organisational structures, and is replaced with new architectures that take full advantage of the power of ICT.

In contrast, the United Nations Division for Public Economics and Public Administration (UNDP, 2002) articulates five development stages of e-government, namely:

- Emerging,
- Enhanced,
- Interactive,
- Transactional, and
- Seamless.

Countries at the emerging stage have committed themselves to becoming e-government players. Countries at the enhanced stage have online content that is usually dynamic and specialised such as government publications and legislations (UNDP, 2002). The interactive stage includes countries that have web presence, which is characterised by dramatic increase in access to a wide range of government institutions

and services, capacity to search specialised databases, and download forms and applications. At the transactional stage, secure transactions such as obtaining visas, passports, death records, licenses and permits online are provided for. Finally, at the seamless or fully integrated stage, the websites of such countries have capacity to access any services clustered along common needs in a unified environment (UNDP, 2002).

E-Government Institutional Framework in Africa

The implementation of e-governance in Africa is in line with various regional and national declarations. In 1980, for example, the Organisation of African Unity, through the Lagos Plan of Action, recognised the importance of access to information to solve Africa's development problems. Similarly, the United Nations Economic Commission for Africa (UNECA) promulgated the African Information Society Initiative (AISI) with the aim of creating an enabling environment that could facilitate the development of Africa's information society. The AISI envisages that by the year 2010, Africa should have availability of African information resources that reflect the needs of government, business, culture, education, tourism, energy, health, transport and natural resource management (UNECA, 1999).

Similarly, the United Nations General Assembly designated the 1980s as the industrial decade for Africa, and emphasised the need for African states to develop local capabilities as a means of satisfying internal needs. It also envisaged creating indigenous capability for modifying and adapting foreign technologies to peculiar conditions, cultural milieu and economies (Onyango, 1996). Today, the World Bank is working with various African states to mainstream indigenous knowledge capability into their development agenda. These initiatives form the framework, upon which e-governance can be rationalised and implemented in Africa.

More recently, the New Partnership for Africa's Economic Development, (NEPAD) focuses on developing local capability to solve Africa's economic, social, political and infrastructure problems (Government of Canada, 2002; Nepad, 2002).

Potential of E-Government for Africa

Private online content in Africa is expanding rapidly, but reaches few people because of limited physical infrastructure such as

telecommunications. Content produced by service providers other tha government remains largely specialised and skewed towards the educate and those with money. Government online content in Africa, if we developed, would reach most of the citizenry, because governments ten to create large a proportion of local content that may be provided free In addition, information is the most significant of governments' outpu since it is at the heart of every policy decision, response activity, an initiative with the citizens, and business (UNDP, 2002).

E-government in Africa can play an important role in providing a enabling environment to reach as many people as possible and create awareness about issues such as HIV/AIDS, environment, biodiversity development information, democratisation, business opportunities, government policies, access to health information, and access to government services and opportunities. In South Africa, for example, the government has introduced Personal Internet Terminals (PIT) in post offices in the nine provinces of the country where people can search the Internet, download various applications forms for passport, identity card, birth certificate, etc. (Government Communications, 2003). The widespread PIT infrastructure also enables the people to have access to information relating to government announcements, policies, departments, services, etc. The implementation of PITs in South Africa has cut travelling as well as administrative costs incurred by citizens. It has also made the process of obtaining government services much faster and cheaper.

In Kenya, the Teachers Service Commission (TSC) recently established a website to give teachers crucial information on most frequently asked questions. Through the website, commonly used forms would be provided online, from which teachers can fill them from any Internet access point. This will ease travelling to Nairobi, the capital city by teachers from various parts of the country, since all TSC services are centralised. The move has been welcomed by teachers countrywide (Balancing Act, 2002).

Governments across the world provide a rich variety of sources of local information services. Government websites generally articulate government policies, provide information on the country's political system, lists governments departments, provide reports, provide information on tenders, drafts bills, etc. Among governments in Africa that have websites with a variety of content include: South Africa,

Botswana, Kenya, Nigeria, Namibia and Zimbabwe. Some of the government websites, such as that of Zimbabwe, have also a large component of ruling party content. Other websites focus on development information; for example, the Namibian government web site includes the Ministry of Health and Social Services, a gateway providing specialised information services on health (Republic of Namibia, Ministry of Health and Social Services, 2002).

Challenges of E-Government in Africa

There are several challenges relating to e-government in Africa. These revolve around:

- Data systems infrastructure,
- Legal infrastructure,
- Institutional infrastructure,
- Human infrastructure, and
- Technological infrastructure.

Firstly, it must be borne in mind that e-government is largely dependent on reliable data systems infrastructure. These may range from management systems to records and work processes, which ensure that e-government functions well. Without these systems, e-government initiatives are bound to fail, or have little impact on the societies they are meant to serve. It is no secret that in many African countries, data quality, -for example, is very poor, and there are few mechanisms of ensuring the quality of data being collected and processed.

Secondly, e-governments can only operate effectively under appropriate legal frameworks. More often than not, the legal framework under which e-government systems were introduced has not been defined clearly. In many African countries, digital signatures cannot be accepted.

Thirdly, for e-government to succeed, there must be established institutions that are dedicated to the formulation of policies and co-ordination of activities and programmes on e-government. Such institutions are needed to serve as a focus for awareness raising, and to act as a means for facilitation of e-government. In some African countries, such institutions are unavailable, or where they exist, they lack the means to carry out their operations effectively.

Fourthly, in many African countries, human resources with appropriate skills, competencies and attitude are not readily available to initiate, implement and sustain e-Government programmes. Finally, although many African governments have made major strides in adopting ICTs, most African countries are still lagging behind in the computing and telecommunications infrastructure.

Electronic Records

One of the most interesting developments associated with the introduction of ICTs has been the creation of what has come to be known as electronic records. Roper and Millar (1999) define e-records as a digital record that can be manipulated, transmitted or processed by a computer. It can therefore be argued that the term e- records may include any combination of text, graphics, data, audio, pictorial, or any other information representation in digital form that is created, modified, maintained, archived, retrieved, or distributed by a computer system. Unlike paper records where decisions on their management may be delayed, decision on electronic records, their capture, storage and disposition may have to be taken at the time of their creation.

Besides providing essential evidence of organisational activities, transactions and decisions, e-records also support business functions and are critical for the assessment of organisational performance. E-Government generates vast quantities of e-records, which need to be managed and preserved, using accepted records management standards and practices. Without reliable e-records, governments cannot manage state resources, its revenue or civil service. It cannot deliver services such as education and healthcare. Moreover, without accurate and reliable e-records and an effective system to manage them, governments cannot be held accountable for their decisions, and actions and the rights and obligations of citizens and corporate bodies cannot be upheld.

New technologies provide great potential for improving efficiency and the effective provision of services, provided that e-records, as the evidence base upon which governments depends are properly protected and preserved. For initiatives such as e-government and e-commerce to succeed, governments need to ensure that the information generated in electronic form possesses certain crucial characteristics such as:

- Accuracy
- Relevance
- Authoritativeness
- Completeness
- Authenticity
- Security.

The emergence and growing importance of e-records as a means of communicating and preserving corporate information poses new challenges hitherto unknown to administrators and records managers. In many African countries, e-government has been introduced without due consideration as to how e-records generated by e-government are to be preserved. Many archivists and records managers are unaware of the many issues pertaining to the creation, storage, retrieval and dissemination of e-records.

Furthermore, the management of e-records must be supported by clear policies, procedures and guidelines, if they are to retain their evidential values that are needed for accountable and transparent governance. Studies conducted by the International Records Management Trust (2003) have pinpointed various impediments to the management of both paper and e-records. These include:

- Absence of organisational plans for managing e-records;
- Low awareness of the role of records management in supporting organisational efficiency and accountability,
- Lack of stewardship and co-ordination in handling paper-based, as well as e-records;
- Absence of legislation, organisational policies and procedures to guide the management of both paper and e-records;
- Absence of core competencies in records and archives management;
- Lack of appropriate facilities and environmental conditions for the storage and preservation of paper as well as e-records;
- Absence of dedicated budgets for records management;
- Poor security and confidentiality controls for records;
- Lack of records retention and disposal policies;
- Absence of migration strategies for e-records; and
- Absence of vital records and disaster preparedness and recovery plans.

The quality of record keeping systems continues to be a major weakness of many African governments, in spite of the relationship that

exists between records management and public sector management. The effective and systematic creation, distribution, maintenance, use and disposal of records regardless of the format in which they are held are testimonies to a government's ability to reflect the values and ethics that are often associated with good governance, i.e. transparency, accountability, public trust, protection of rights and entitlements, citizen engagement, service, etc. There is urgent need to develop records management programmes that not only address the traditional aspects of managing paper records, but which to a large extent also address the new challenges posed by e-records. Such records management programmes must be supported by well-defined policies and procedures, trained personnel and well-equipped storage facilities.

Automated systems cannot simply be super-imposed on dysfunctional or chaotic paper systems. Given that many African governments have largely operated in a paper-based environment for a very long time, the change process from paper to electronic systems is bound to be more complex than is often realised. One, is the need to fix the paper mess before contemplating to automate. Two, when a decision is reached to automate there may be need to maintain some sort of hybrid system, which allows for parallel or complimentary paper and electronic systems to co-exist for a period of time. Three, is the need to allow for gradual integration of the manual paper system with the computerised system by focusing on specific products that support the business process. Four, is the consolidation of the computerised system by focusing on e-records legislation, policies, systems, procedures, standards and resources.

Whereas the essential characteristics of paper records - content, structure and context are clearly evident, this is not the case with e-records. For paper records, all these elements reside in the same physical medium. In designing an e-records management system, the goal should therefore be to ensure the following essential characteristics:

Comprehensivity

Whatever method or system is used to create an electronic record, the created record should be able to show who, what, where, when, why, with whom, etc, was involved in the record creation. Ideally, the e-records management system should answer the following questions:

- Why was the record created?
- Who created, received and kept the record?
- What functions does the record serve?
- What procedures, methods, and processes were used to create, send and maintain the record?

Authenticity

For e-records to remain authentic and show a true reflection of the activities and transactions that have been carried out, authorisations for access to data or parts of it must be recorded and must be traceable. An audit trail showing what was sent, to whom, who saw it, received it, deleted or amended it should be available. Just like in paper records, this aspect must be ensured in electronic environments.

Fixity

E-records should be tamper-proof. Once a transaction has occurred, no alteration should be made to the record. Any change to this must be recorded and linked to the first. This will ensure accuracy, reliability and authenticity of the e-record.

Strategies for Managing Electronic Records

In order to ensure that electronic records, the by-product of e-government systems remain authentic and reliable, there is need to develop laws, policies and procedures as the basis for their management. Each of these aspects is discussed in greater detail below. This is important, if the corporate memory of e-government is to be captured and preserved.

Laws, Policies and Procedures

The level of commitment to managing e-records can be gauged on the basis of various factors including the existence of records management policies and procedures. However, the mere existence of a law or policy is not enough evidence that the organisation is committed to managing its e-records. Griffin (2003) observes that in many governments, policies and guidance for managing the records of government are often non-existent, and the legislative and regulatory framework is often weak or out-dated. In some countries the responsibility for managing the information on which government and citizens depend is often not

properly assigned or is unclear. It is also important to note that the existence of a records management policy that does not embrace all forms of records and particularly electronic and digital records is inadequate. A recent electronic discussion jointly commissioned by International Records Management Trust (IRMT) and the World Bank involving participants from across the Commonwealth, revealed that while many Commonwealth governments had developed strategies for ICT development and electronic government, very few had come up with laws, policies, systems, standards and procedures for managing e-records. Governments were urged to take appropriate steps to address the deficiency.

In other words, as part of their e-government strategy, governments should strive not only to establish records management legislation, policies and procedures across the public service, but also to integrate these with all business functions as a means of supporting organisational accountability and governance.

Resources and Training

A crucial element in the management of e-records relates to the availability of trained staff, equipment, basic supplies and money. More often than not, these elements are lacking, or are not adequately provided for. With few or non-existent trained and qualified staff in records management and the low status accorded to records work, the principles and standards that should guide records and information work are never included as part of organisation's strategic plans. Availability of trained personnel and resources therefore becomes an aspect that should be evaluated in determining a country's e-records readiness. Another factor impacting negatively on staff resources is the exodus of trained ICT personnel from government service into the private sector, where remunerations are better.

Long Term Storage and Accessibility of E-Records

The collection, processing and storage of e-records would be meaningless if no procedures and mechanisms are in place for ensuring their long term preservation and accessibility by those who would later require access to these records. A special report by Kahn Consulting (2004) argues that retention is useless without accessibility. The report further

states that "capturing, indexing and storing digital content serve little purpose, if it is not readily accessible when required. Too often, organisations implement systems that may improve the business process but hamper the accessibility of significant business content, a fact that courts and regulators may be unwilling to overlook." The New York State Office of Technology (2002) argues that e-records "accessibility includes having the technical means and metadata (data describing how, when, and by whom an e-record was created, and how it is formatted) to access, use, and understand the records." E-records should not only be accessible to government officials, but provision should also be made for such records to be accessible to the public (immediately where freedom of access to information exists) at the expiry of approved closed periods. Unfortunately, this is not happening in many African countries except in South Africa, where a programme is in place to archive e-records. It is therefore impossible to determine the types of data and information that may already have been lost, due to obsolescence of earlier IT technology or failure to preserve e-records. It cannot be over-emphasised that e-records, just like paper records, have to be retained for long periods as evidence of government transactions. If these records are not captured, the consequence is that future generations will have no record of government activities or decisions, resulting in loss of accountability and societal memory.

In assessing the management of e-records in government, various issues need to be critically examined. These relate to the integrity, security, authenticity and accessibility of e-records. An e-record is considered to have integrity, if it can be proved that its contents have not been altered in any way, from its time of creation up to the time of ultimate disposition. Moreover, the trustworthiness of an e-record depends on establishing that it has been stored in a secure environment. In establishing the authenticity of an e-record, mechanisms must be put in place to assess the fact that the e-record is in fact what it purports to be. This demands the ability to determine who created and handled the record at any given moment. In simple terms, in assessing the authenticity of e-records, there ought to be procedures for providing an audit trail from the time of its creation to the time of ultimate disposition. From the foregoing, it is evident that the management of e-records must be a joint effort involving records managers and/or archivists and IT specialists. Unfortunately in many African countries, little consultation is taking place between IT specialists and records professionals.

Conclusion

This chapter has demonstrated that many governments, includi African governments, have embarked on introducing e-governme services, but there are several hindrances to these initiatives. The chap has further revealed that e-government initiatives need to be suppor by well-articulated guidelines and procedures for capturing record failure to which African governments stand to lose large pieces information, which will be needed for posterity. Moreover, e-governme initiatives should not be used as a "high-tech" smoke-screen to cover u backroom inefficiencies, duplication and an intransigent cultur resistance. A warning was also sounded that e-government must b applied strategically and cost-effectively. It was stressed that e-governme initiatives would require data and information planning, re-engineerin processes, changing regulations, merging departments and eliminati others, flattening hierarchies and delegating or devolving authority.

Review Questions

1. What is e-government?
2. What are some of the major challenges of implementing e-government in African countries?
3. Describe the ways through which records arising from e-government may be managed.
4. Discuss the kind of institutional framework available for e-government implementation in Africa.
5. How can e-government implementation enhance good governance?

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Part III: Information Infrastructure and Development

Chapter 8

Institutional Framework for the Information Society in Africa

By Stephen Mutula and Kgomotso H. Moahi

Introduction

The impact of information and communication technologies in bringing about a profound transformation in all aspects of national life in the world over does not need to be over stressed anymore. ICT heralds a fundamental change in the dissemination of knowledge, with regard to among other things, social, economic, business, politics, education, health, leisure and recreation matters, to mention but a few. Though an information society in theory is a society where all people without distinction should have the opportunity and the right of access to and use of information through the application of digital technologies, there are various shortcomings of economic, social, political and institutional nature that have excluded the masses especially in developing countries in general, with sub-Saharan Africa bearing the brunt of it all.

The United Nations, in an effort to redress the problem of inadequate access to information that defines the information society, set in motion a global process of consultation that culminated in the model known as the World Summit on the Information Society (WSIS) that was organised by the International Telecommunications Union (ITU) in two phases. The first phase took place in Geneva, hosted by the Government of Switzerland, from 10 to 12 December 2003, with the objective to develop and foster a clear statement of political will, followed by concrete steps to establish the foundations for an Information Society. The second phase took place in Tunis, hosted by the Government of Tunisia, from 16 to 18 November 2005, with the objective of putting Geneva's "Plan of Action" (the main outcome of the first phase) into motion as well, as to find solutions and reach agreements on a broad range of themes, arising out

of the two phases (The World Bank Group, 2006). The participants in the two Summits were Heads of States and Governments from all over the world, the private sector, civil society and local authorities.

The UN model of the information society, as espoused in the World Society Summit of information (WSIS) Declaration of Principles, is tied to the Millennium Development Goals (MDGs), which in general aim to half global poverty levels by the year 2015. The MDGs framework aims at redressing eight key development areas, namely to: eradicate extreme poverty and hunger, achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDs, malaria and other diseases; ensure environmental sustainability; and develop a global partnership for development by 2015 (United Nations. Department of Public Information, 2005). Although ICT is not a specific goal or target within the MDGs framework, it is a cross-cutting catalyst for achieving all the eight areas identified.

The importance of ICT in the implementation of MDGs cannot be over emphasised. Out of the 48 indicators used to benchmark progress towards the MDGs, the last three read thus: (1) to increase the percentage of the population with access to telephone lines and cellular subscribers; (2) to increase the number of personal computers; and (3) to increase the number of Internet users. The UN General Assembly Resolution 56/ 183 of 21 December 2001 recognises the need to harness the potential of knowledge and technology for promoting the goals of the United Nations (UN) Millennium Declaration. Moreover, the UN Millennium Declaration (8 September 2000) contains a commitment for ensuring that the benefits of new technologies, especially information and communication technologies are available to all (ITU, 2005).

Though there are various documented initiatives taking place in sub-Saharan Africa in the context of WSIS which are aimed at achieving the MDGs, especially in the area of infrastructure, little information exists in the context of institutional frameworks needed to propel the region to the information society status. With the gap in knowledge between developed world and the sub-Saharan Africa showing no convincing prospect of narrowing, it becomes imperative to determine the progress being made in the sub region, with regard to institutional framework for achieving an information society as defined by WSIS. The rest of this chapter covers the concept of information society (its origin and

development); characteristics of an information society; the benefits of achieving an information society status; the institutional frameworks that are in place or being developed to ensure that sub-Saharan Africa reaches the information society status, in order to achieve MDGs.

Origin of the Concept of Information Society

Information has long been perceived as a very important resource, and scientists as far back as 1660 founded the Royal Academy to cope with growth of publication (Kronick, 1962 cited by Crawford, 1983). Similarly, during the 19th century, Billings (1965 cited by Crawford, 1983) talked of geometric progression in the growth of medical literature. Moreover, after the Second World War, there was talk of the information explosion or the exponential growth of publications. Fritz Machlup (1962 cited by Crawford, 1983), an economist, was one of the pioneers to introduce the concept of information society in the book he published in 1962 entitled "The production and distribution of knowledge in the United States".

Fritz Machlup in 1933 begun studying the effect of patents on research before his work culminated in the said book (Crawford, 1983). His book was later translated in other languages, including Russian and Japanese. Similarly, Machlup's initial works were published by Peter Drucker (Drucker, 1968 cited by Crawford, 1983) in his book "Age of discontinuity', where he wrote a section on knowledge society. He noted that by the late 1970s, the knowledge sector would account for half of GNP which came to pass. With Drucker's prophecy coming true, the seed for knowledge/information society which had been sown in variant forms since 1970 germinated, as the concept found its way in library and information science and other literature. In 1970, the theme of the annual meeting of the American society of information science was *the information conscious society*, and one paper is reported by Crawford to have addressed the advent of the information age. Further on, in 1973, Daniel Bell published a book entitled *The Coming of Post Industrial Society* (Bell, 1973 cited by Crawford, 1983). Porat (1977 cited by Crawford, 1983) in 1977 completed a thesis on the information economy by quantifying the work of Machlup. This was followed in 1981 by the founding of *The Information Society* - the title of a sociological journal, which was to deal with critical forum for leading edge analysis of the impacts, policies, system concepts, and methodologies related to information technologies and changes in society and culture.

In all these developments, the transformations brought by the emergence of microcomputer technology in the 1970s-80s, which propelled the use of ICT into the public domain from the mainframe and legacy systems that earlier dominated large corporate organisations cannot be ignored. The revolution in PC technology of 1970s and 1980s and the Internet and the Web revolution of the 1990s and beyond must have given great impetus to the evolution of the concept of the information society, as it is now known today.

Definition of Information Society and the Requisite Infrastructure

Martin (1995) defines information society as a society characterised by rapid growth and use of information, widespread exploitation of varied information sources; a society where people know and appreciate what information they need, where to get it, how to get the information, and in the end, how to use it. Such a society realises the importance of information for all aspects of life, and is fully conversant with how to seek and use the information. An information society caters for all, including children, by providing them with information in many formats, and exposing them to the different technologies used for collecting, manipulating and disseminating the information. An information society is one in which quality of life and economic development depend largely on information and its exploitation; increasing use of computers; commoditisation of information; convergence of computing and telecommunication; e-governance; e-commerce; online education; universal access to phone, Internet, use of technology for community development; and use of information technology in management of public utilities.

Wikipedia-the online encyclopedia defines an information society "as a society in which the creation, distribution and manipulation of information is becoming a significant economic and cultural activity". Closely related with the concept of information society, is knowledge economy, which is the creation of wealth through the economic exploitation of understanding. Information society is seen as successor to industrial society, and is related or used interchangeably with the terms such as post-industrial society, knowledge society, telematic society, and information revolution (Wikimedia Foundation, Inc. 2006).

Central to the attainment of an information society is information technology and information producers. The information society

infrastructure consists of publishers, authors, electronic and print media, online newspapers, films industry, performing and creative arts, indigenous knowledge systems, e-government infrastructure, information service providers (ISPs), fixed line telephony, broadband networks, research institutions, community informatics, telecentres, cybercafes, broadband Internet connectivity, supporting legislation, Freedom of Information (FOI), information services, museums, documentation centres, libraries, postal services, etc.

Furthermore, the infrastructure needed to achieve an information society can be elucidated from the ICT targets of WSIS by 2015, namely: to connect villages with ICTs and establish community access points; connect universities, colleges, secondary schools and primary schools with ICTs; to connect scientific and research centres with ICTs; to connect public libraries, cultural centres, museums, post offices and archives with ICTs; to connect health centres and hospitals with ICTs; to connect all local and central government departments and establish websites and email addresses; to adapt all primary and secondary school curricula to meet the challenges of information society; to ensure that all of the world's population have access to television and radio services; to encourage the development of content and put in place technical conditions, in order to facilitate the presence and use of all world languages on the Internet; to ensure that more than half of the world's inhabitants have access to ICTs within their reach (WSIS, 2006).

The scope of an information society is articulated in the WSIS Declaration of Principles, which in many ways outline information variables that are critical in operating in a networked world. The main objective of the two phases of the World Summit on the Information Society was to formulate a common vision and understanding of the global information society.

IFLA in its submission to the World Summit on Information Society (WSIS) underlined the information readiness issues as pre-conditions for participating in an information society. In particular, it identified universal and free access; effective environment for making use of ICT to access information; learning the skills required for effective searching and retrieval of information; using traditional media and new technologies; improved connectivity; information and records management as a necessary condition for good governance; investment in new technology; providing affordable or free-of-charge access to the

Internet; specific training programmes in the use of ICTs and national policies and laws to enhance content creation.

Importance of Reaching Information Society Status

The impetus towards achieving information society status not only in Africa but also, the world over is driven by the fact that such society is by and large characterised by increased productivity and lower costs. In the United States, for example, during 2001, it was estimated that IT accounted for 25% of GDP growth. Similarly, average salary for IT jobs was per annum $ 46000 compared to $ 28000 per annum for other non-IT jobs. Also, in 1996-97, IT contributed to drop in inflation from 3.1% to 2.0 % (Nelson, 2001). The bottom line for wanting to reach an information society status is the presumption that it would be associated largely with job creation, profits for business and enhanced quality of life. An information society is expected to offer opportunity to students in remote rural areas to enjoy access to resources in major metropolitan areas. Similarly, students can experience hands-on learning by sharing information and participating in projects with their peers, as well as experts, all over the country and the world. Information society would bring about improving healthcare by facilitating communication and collaboration. Through the power of technology, hospitals can pool talent and resources to make patient records and diagnostic information available on-line. Increased access to information would increase entertainment options by increasing citizens' choices for delivery and offering greater diversity of content. Wide access to information can enhance participatory democracy through receiving government information and services and relating to elected officials. Moreover, a country that has reached the information society status is likely to have improved global competitiveness, and use limited resources wisely. Such a country will have leapfrogged technologies and policy decisions to position itself to reap the benefits of digital age.

Readiness of Africa for the Information Society

Africa has a lot of catching up to do, in order to attain the information society status. An assessment of the integration of Africa into the global economy based, on the computations of e-readiness for nine countries

revealed that overall, the mean e-readiness of Africa is poor, in comparison to other economies (Ifinedo, 2005).

The backwardness of Africa in achieving the WSIS Declaration of Principles, in order to reach the information society, is also reflected in the information society index rating, which puts Africa in general at the bottom ranking among counterparts in the world. Information society index provides a measure of free and rapid flow of information across the world. The index was established in 1996 by the International Development Corporation, in collaboration with the World Times Information Society Index. The index was conceived as the first global measurement of information wealth. It measures the information wealth of countries, based on such variables as (Minton, 2003):

- Broadband households;
- Mobile Internet users;
- Software sophistication and wireless telephone subscribers;
- PC penetration and education levels;
- Use and availability of fax machines, radios, landline telephone and newspapers;
- World Wide Web as a primary source of news and information;
- Free and rapid flow of information; and
- Education levels.

Similarly, the Information Utilisation Potential (IUP) is an information society model that represents the relative present and future strengths and weaknesses of information activities of a given organisation. The IUP model has two composite indices-structural and functional. The structural IUP is broken down into three distinct components, namely: background or enabling conditions, information needs and uses, and information services and activities. On the other hand, the functional IUP consists of seven distinct components that form intermediate composite indices corresponding to the major roles of the various constituencies in the information sector (Grigorovici, Schement and Taylor, 2003).

The IUP model attempts to use the information situation or context as a unit of analysis, thus being able to account for more than an information product-based measure. The IUP model is recommended as the most appropriate for providing the theoretical measurement for constructing an information society index (ISI). The scope of the IUP model is expressed by the following equation:

$IUP = (A + B + C + D)$

Where:

A = Information resources and activities;

B = Information needs and uses;

C = Physical, social, administrative environment variables; and

D = Dynamics of (A + B + C).

The relevance of IUP to e-readiness studies is in the provision of the variables that are critical to the formulation of an information model. Such variables would include among others information resources and services, information needs and services, physical, social and administrative variables. Though no specific studies have been reviewed using this model for Africa, the variables it seeks to measure have been found through other studies to place Africa in the bottom ranking among its counterparts around the world (Economist Intelligence Unit and IBM Corporation, 2004).

Institutional Frameworks for Achieving Information Society Status in Africa

Global Institutional Frameworks

The global frameworks for achieving the information society status have been defined at global level by representatives of governments, civil society, NGOs, development agencies, regulatory bodies such as ITU, etc. The global framework for achieving an information society includes among others the Digital Task Force (DOT FORCE) and the World Summit on Information Society (WSIS). The DOT FORCE was created by G8 Heads of States and Governments at the Kyushu-Okinawa Summit, Japan, in July 2000. The Task Force brought together forty-three teams from government, private sector, and non-profit organisations representing developed and developing countries. The focus was on bridging the digital divide. The DOT FORCE identified priority actions that must be taken by individual countries, in order to bridge the digital divide. These priority areas include: fostering policy; regulatory and network readiness; improving connectivity, increasing access and

lowering costs; building human capacity; and encouraging participation in global e-commerce (Digital Opportunity Task Force, 2002).

The DOT FORCE represented goodwill on the part of the G8 countries to do something about bridging the digital divide, and by extension, the poverty gap. The Genoa Plan of Action is the achievement of the DOT FORCE, which basically brought what needed to be done to bridge the digital divide to the attention of the world. However, the plan was not very articulate as to how the goals were to be achieved, apart from stating that a number of initiatives, networks and other collaborations would be formed to tackle implementation. It is unclear whether many of these ever saw the light of day. These include the eDev Resource Network, which would provide expertise to developing countries, as they developed their own e-strategies. The plan emphasised human resources development, but did not indicate where the resources would come from. In short, the Genoa Plan was a list of desirables and some indicative information about implementation which never really took off. However, as stated, DOT FORCE succeeded in bringing awareness about the need to do something about the digital divide. It suggested a number of initiatives such as a French Government project (ADEN) to create a network of Internet community access points in Africa; the CAR project to implement Edu-Telecenters in Malawi, Kenya, Uganda, and Zambia, etc. The major achievement, however, was that DOT FORCE set up an agenda that was picked up by others, for example, the WSIS meetings, that resulted in the SWSIS Plan of Action. Indeed, many of the DOT FORCE partners, such as IDRC, ITU, UN agencies are continuing with the implementation.

On the other hand, the WSIS Declaration of Principles for achieving an information society include: building of information infrastructure through telecommunication and investment in technology; opening gates by achieving universal and equitable access to information technology; meeting needs of the developing world; and making information a common good. The WSIS aims at promoting services and applications for economic, social and cultural development. The WSIS was conducted in two main summits, first in Geneva, and finally in Tunis. The Summit principles place to the fore consumer protection, privacy and security, relevant content, user training, and ethics of the information society. WSIS underlines the roles of government, the private sector and civil society, intellectual property right, freedom of expression and Internet

access tariffs. In the area of education, WSIS sees ICT as tool to leverage education change, opportunity for enhancing teacher-student environment and providing opportunity for access to education by employed workers.

The main output from the first phase or summit were two essential documents, namely: 'Declaration of Principles and Action Plan, upon which the Information Society (IS) will be founded within time frame between 2005 and 2015. Additionally, the aim of the two Summits was to advance internationally agreed development goals in an effort to close the digital divide. In defining the Declaration of Principles and Action Plan, the first phase of WSIS recognised that the information society that was to be built was one which is inclusive, where all persons without distinction of any kind were empowered freely to create, receive, share and utilise information and knowledge in any media, and regardless of frontiers.

To achieve the goals defined in the WSIS Declaration of Principles, various strategies need to be undertaken by all stakeholders, including governments, civil society, media, NGOs, private sector, and individuals. The environment that defines an information society includes the institutional capacities to collect, organise, store and share information and knowledge; stimulate creation, processing, dissemination of information to all people and conservation of local content; enable access by all people to information through the use of ICTs; facilitate speed and ubiquity of information flows through ICTs; enhance information sharing within countries and across the globe; use ICTs to improve productivity and quality of life; create, receive, share and utilise information in any media, regardless of frontiers; develop high quality ICT networks; enhance effective legal and regulatory frameworks for unhindered access by individuals to communication media and information sources, build secure networks to enhance information through trust in using ICTs; provide protection of privacy through confidentiality; human resource development strategies; and develop human capacity to exploit the benefits of ICTs.

Moreover, the WSIS Declaration of Principles defines what each country should do to reach information society status, which include (WSIS, 2003):

- Building public awareness on the capabilities of ICTs;
- Putting in place education and training programmes in ICTs;

- Putting in place continuous training programmes for the benefit of all;
- Facilitating free flow of information and ideas from a diversity of sources;
- Creating conducive conditions for production, processing, and dissemination of local content;
- Eliminating illiteracy and enhancement of ICT literacy;
- Bridging the digital divide;
- Enhancing universal access through deployment of affordable ICTs, including radio and TVs;
- Using open standards to enhance affordable access to ICTs and interoperability;
- Enhancing usage of ICTs in everyday life of the people; and
- Making available appropriate electricity power supply sources.

WSIS has recommended the Digital Solidarity Fund (DSF), which the UN General Assembly has endorsed (General Assembly, GA/10451). This DSF will be a voluntary fund meant to build financial resources to assist in implementation of the WSIS Plan of Action. It calls for measures and benchmarks to be put in place to monitor progress of the plan. The Geneva Plan of Action as the plan is referred was affirmed in the second part of the WSIS held in Tunis, which resulted in the Tunis Agenda for the Information Society which focused on a number of issues:

- Agreement on a voluntary DSF;
- Agreement on Internet governance through the Internet Governance Forum; and
- Agreement on implementation and follow-up through a UN group of the Information Society.

The World Information Technology Forum (WITFOR) is an offshoot of the International Federation of Information Processing body. WITFOR is aimed at reducing the North-South digital divide, through the inception of projects that will, in the end, help to bridge the divide. WITFOR is an international initiative aimed at accelerating development for the world's poorer nations. WITFOR conducts its business through a series of meetings and a final conference where commission chairs in a number of areas are chosen, whose task is to identify projects that can be undertaken, and to seek funding for such projects. The first WITFOR conference was held in Vilnius, and culminated in the Vilnius Declaration which identified the eight areas that WITFOR had to address. The eight

areas or commissions focus on accelerated development in different sectors such as health, education, environment, economy, etc., by using ICT. The vision for each commission was described during WITFOR 2003, held in Lithuania. Each commission is now identifying concrete projects to transform that vision into reality, with tangible benefits for the peoples of developing countries.

The WITFOR 2005 was held in Gaborone in 2005, it was hosted by the Government of Botswana, in collaboration with the International Federation for Information Processing (IFIP). The Gaborone Declaration further reiterated the need for national governments, parliamentarians, local authorities, civil society, the business communities and academia to support initiatives in the eight areas (IFIP World Information Technology Forum, 2005). The Declaration contains the proposed projects and actions for the eight areas, and the hope is that the participating countries and organisations would report back to WITFOR 2007 on progress made, and also suggest other projects and initiatives. WITFOR is linked with the WSIS Plan of Action and the Millennium Development Goals. The achievement of WTFOR has been in actually requesting that tangible project proposals be brought to the conference for discussion, with the hope that those that are not funded will gain the exposure needed to secure the funding. It also lends legitimacy to proposals that are seeking assistance from donors.

Continental Institutional Frameworks

The institutional frameworks that exist at continental level in Africa for achieving the information society status include African Information Society Initiative (AISI) and New Partnership for Africa's Development (NEPAD). The African Strategy (AISI) for the Information Society was entrenched at the May 1995 21st meeting of the Economic Commission for Africa (ECA) Conference of Ministers of Social and Economic Development and Planning, when they adopted a resolution entitled "Building Africa's Information Highway" and created a high-level Working Group of information technology experts to draft an action framework to utilise the information and communications technologies that would accelerate the socio-economic development of Africa and its people. The action framework calls for implementation of national information and communication infrastructure; building institutional frameworks;

human, information and technological resources in all African countries; and pursuit of priority strategies, programmes and projects for the sustainable information society in African countries (Amoako, 1996).

By the year 2010, the AISI envisages to realise a sustainable information society in Africa, where among other things, information and decision support systems are used to support decision-making in all the major sectors of the economy, in line with each country's national development priorities; every man and woman, school child, village, government office and business can access information and knowledge resources through computers and telecommunications; access is available to international, regional and national information highways providing information in the villages; a vibrant business sector with strong leadership, capable of forging the build up of the information society; African information resources are available which reflect the needs of government, business, culture, education, tourism, energy, health, transport and natural resource management; information and knowledge are disseminated and used by business, the public at large and disenfranchised groups such as women and the poor.

Building Africa's information and communication sector will require developing and improving four major components, namely:

- Institutional framework and legal, regulatory and management mechanisms;
- Human resources;
- Information resources (infostructure); and
- Technological resources (infrastructure).

AISI has played a critical role in bringing the African regional perspective to WSIS. This was done through regional consultations and negotiations prior to WSIS. A meeting was held in Bamako which resulted in the Bamako Declaration. This was followed by the second conference in Ghana which prepared an African regional Plan of Action. Thus, many ideas and objectives found in the AISI have found their way to WSIS.

ECA which is responsible for the implementation of AISI has so far assisted 28 African countries to develop ICT national strategies. The implementation strategy of AISI is at three levels. The first is to encourage countries to develop their National ICT Infrastructure (NICI), and it is here that the initiative has made some inroads. NICI has also taken on a

monitoring role that, to date, has identified 32 countries in Africa that have completed their national ICT Policy; 13 other countries are in the process of developing their policies, while in eight countries, the process has not yet begun. The second level is to encourage countries to develop Sectoral ICT infrastructure; with the third level being to encourage countries to set up village ICT infrastructure. It is at the second and third level that success has been illusive – probably because countries have to develop and implement their ICT policies, which would in turn inform the process at village and sectoral level. NICI process is seen as a way of implementing the WSIS Action Plan on the development of e-strategies. The Geneva Plan of Action is clearly linked with the NICI strategy.

On the other hand, the New Partnership for Africa's Development (NEPAD) is an initiative by African leaders to address problems affecting the continent such as access to ICTs, and bridging of the digital divide. The scope of the NEPAD ICT Programme include the desire to frame the implementation of its ICT projects, with a view to encouraging decentralised collaboration within Africa and between Africa, and the rest of the world. NEPAD in partnership with the private sector has embarked on e-school project across the continent through collaboration with respective ministries of education in member countries. Africa's first NEPAD e-school was launched in Uganda, in July 2005. The project in Uganda included equipping the school with computers and accessories, server, Internet, electricity, mobile telephone booster mast, computer desks, DSTV, e-health facility, and trained teachers. It is expected that through the NEPAD e-school initiative, it will be possible to impart modern ICT skills and knowledge to the youth, to enable them tap into the global mainstream of information and knowledge. The e-schools project is a 10-year NEPAD initiative that involves the establishment of an Africa-wide satellite network that will connect the schools to the Internet, as well as to points within each country, from which educational content will be fed to the schools on a continuous basis. It also involves ICT training of teachers and students, content and curriculum development. So far, the countries that have been initially scheduled to benefit from the programme include Algeria, Burkina Faso, Cameroon, the Democratic Republic of Congo, Egypt, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Mali, Mauritius, Mozambique, Nigeria, Rwanda, Senegal, South Africa, and Uganda (Mikenga, 2005).

Also, NEPAD has one of its objectives, the development of local content. This is a noble undertaking by NEPAD, though there is as yet no strategy for communicating with all stakeholders, including local communities. Without involving the people in the programmes, especially those affecting them, through awareness creation and education, NEPAD is bound to remain a boardroom initiative. NEPAD must build consensus among the people of Africa, especially the local communities that should be custodians and implementers of the NEPAD reconstruction programmes. Consensus can be achieved through popular participation, well-packaged content, consultation, and communication process.

The other strategy for Africa endeavour to reach the information society was the establishment of African Regional Bureau. This body was a key outcome of the Africa Regional Conference on the World Summit on the Information Society (WSIS) that was held in Bamako, Mali, in May 2002, and attended by 51 African states, with representatives from government, the private sector, civil society, NGOs, media and international development agencies. The African Regional Bureau was established to work with the WSIS secretariat. The Economic Commission for Africa (ECA) was designated as the interim secretariat for the Bureau. The Conference participants unanimously agreed on a set of principles and recommendations for developing a common African vision for an information society. The conference communiqué emphasised the need to ensure that every citizen has access to information as a basic human right, removal of regulatory, political and financial obstacles to the development of communication facilities. The communiqué also provided ways to address the continent's linguistic specificities, as a result of the introduction of new technologies that ensures access for all. The Conference acknowledged the fact that narrowing the digital divide should go hand in hand with the development of telecommunication infrastructure. Other recommendations from the Conference included the need for mobilising all development partners to provide funds to guarantee public service, universal access and content creation that address the essential needs of the people of Africa; the immediate establishment of a training fund for sensitising Africans on the information society; and the formation of a high level scientific committee to make recommendations on the challenges of the information society from an African perspective (Faye, 2002).

Regional Institutional Frameworks

At regional level, there are a number of information society initiatives that are being pursued through the existing regional trading blocks, such as the Southern African Development Community (SADC), the East African Cooperation (EAC) and Economic Commission of the West African States (ECOWAS).

Southern African Development Community (SADC) Region

This region comprising of 14 member states of Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles (pulled out) South Africa, Swaziland, Tanzania, Zambia and Zimbabwe region has established some institutional frameworks to enhance e-readiness of the member states, in order to propel the region into an information society and enable member states to position themselves to play great roles in the information age. For example, the member countries are signatories to the region's ICT protocol, whose goals are among others to improve and broaden equitable access to ICTs, as a means of creating new opportunities for socio-economic development in Southern Africa; developing an information society in Southern Africa; encouraging growth of software and hardware; improving human resource capacity, increasing investment in information and communication technology infrastructure services, enhancing economic and social development; increasing productivity and competitiveness; reducing costs related to IT; and developing SADC wide ICT infrastructure (SADC, 1999).

Similarly, some SADC member countries have agreed to co-ordinate their science policies and work together to develop the region's science and technology infrastructure. In particular, the countries - which include Botswana, Namibia, Zambia and Zimbabwe, - will harmonise some of the rules governing how scientific research is carried out, especially customs regulations on the movement of researchers and scientific equipment. They have also agreed that although primary and secondary education will remain a national responsibility, higher education should be coordinated at regional level, and that the creation of regional training centres should be made a priority. These decisions were taken when Ministers of Science and Technology in the SADC region met in Mozambique on 1 December 2005 (SciDev.Net, 2005).

East African Community (EAC)

In the East African region, the East African Community (EAC) member states consisting of Kenya, Uganda and Tanzania are working collaboratively to enhance the region's participation in the Information Society through various initiatives. The East African Community Secretariat has developed a vision for the regional e-government framework, whose purpose is to create wealth, raise the living standards of all people of the region and enhance international competitiveness of the region. The key to achieving this vision is envisaged to be increased production, trade and investments in the region, using Information and Communication Technologies (ICTs). The EAC e-government framework covers all major aspects of regional cooperation such as online public services, e-education for public administration and e-business and entrepreneurial support. Currently, the three East Africa Community countries are individually and collectively at different stages of developing national ICT policies.

Through the shared ICT vision for the East African region, the Kenya government, for example, published its e-government strategy in March 2004. The e-government strategy intends to enhance government efficiency, accountability and transparency. The strategy is meant to: help government talk to itself, enhance government's interaction with citizens, and improve government services to the business community (Nyanchama, 2004). On the other hand, in Uganda, the Interagency E-government National Planning Team embarked on strategies to integrate ICT into the revised poverty eradication action plan for 2005/06. In addition, supporting legal framework is being handled by Uganda Law Reform Commission. A roadmap to support e-government is on-going in the Office of the President. Moreover, rural communication development has been established. In addition, 54 portals and ICT training centres and cyber cafes have been set up in 30 districts. On the other hand, in Tanzania, the government is making good progress in its e-governance plans. Tanzania's e-government vision envisages that the government will be a model user of ICT by deploying ICT systems within the public administration to improve efficiency, reduce wastage of resources, enhance planning, and raise the quality of services and access global resources. Moreover, e-government will support the application of ICT to promote good governance, transparency and accountability. The progress so far made in implementing e-government includes

endorsement by Cabinet on 20th April 2004 of the establishment of electronic e-government. Key features of approval according to Sawe (2005) was the establishment of focal point to coalesce and reinforce existing e-government initiatives; and build wide area network to carry voice and data efficiently among all levels of government.

Economic Community of West African States (ECOWAS)

Within the West African region, the Economic Community of West African States (ECOWAS) was founded by treaty in May 1975. ECOWAS was conceived as a means toward economic integration and development intended to lead to the eventual establishment of an economic union in West Africa, enhancing economic stability and enhancing relations between member states (Bureau of African Affairs, 2002). ECOWAS has 15 member States that include: Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. On 2 February 2006, representatives of ECOWAS countries met in Lome, Togo, to review progress made in ICT policy development and implementation in the region in the context of African Information Society Initiative (AISI), NEPAD and the World Summit on the Information Society (WSIS). Moreover, the meeting's objective was to define a harmonised ICT Policy framework for ECOWAS, taking into account the National Information and Communication Infrastructure (NICI) process being implemented in member States.

The ECOWAS framework would address the challenges of building the information society at the ECOWAS level, including harmonising national ICT policies and plans; developing an enabling environment; building a regional infrastructure backbone; developing local content and financing mechanisms and for the Information Society. The ICT Forum was attended by ECOWAS regional integration focal points and NICI experts. The forum made recommendations, including a request to ECA to support the ECOWAS Secretariat in developing its regional ICT strategy and adopt a Draft Declaration on the Information Society to be submitted to ECOWAS Heads of State (Faye, 2006). Similarly, in an effort to harmonise information and communication technology (ICT) market, regulators from ECOWAS agreed to a common regulatory framework for their national ICT markets (Satellite-evolution.com, 2005).

These initiatives, when fully implemented, are expected to help propel the ECOWAS region into the Information Society.

Prospects for Africa in Reaching the Information Society Status

Though Africa in general is rated as the lowest continent as far as efforts to reach the information society status is concerned, a number of positive developments are taking place. For example, there is tremendous investment in mobile phone infrastructure. However, fixed networks and privatisation of some incumbent operators in the telecommunication sector have not been successful. Largely, the mobile phone penetration now exceeds the fixed line telephony in most countries on the continent, and most rural areas that had no prospects of getting a fixed line connection are now pervaded with cell phone networks. Cell phone ownership in Africa is said to be the fastest growing in the world, with more people using cell phones than the traditional fixed lines.

The other prospect for Africa's resolve to reach the information society was the creation of the Digital Solidarity Agenda a key proposition made by Senegal and subsequently included in the main part of the WSIS Plan of Action. This Agenda calls for financing of regional projects that are aimed at meeting the WSIS targets. Similarly, the New Partnership for Africa's Development (NEPAD) also provides a framework for financing regional projects, within which national policies can be made. NEPAD has identified telecommunication development one of the regional and continental infrastructure sectors, as one of its priority projects.

Parliaments in Africa are working closely together to enhance democracy and access to information in pursuit of MDGs and WSIS. For example, a conference on "International Conference Parliaments' Information Management in Africa: Challenges and Opportunities of ICTs to Strengthen Democracy and Parliamentary Governance" took place in Nairobi, Kenya on 10 and 11 February 2005. The conference was held in the context of the Millennium Development Goals (MDG), NEPAD objectives, and the World Summit on the Information Society (WSIS) process. The participants were drawn from the Parliaments of SADC, ECOWAS and EAC regions (United Nations Department of Economic and Social Affairs, Chamber of Deputies Parliament of Italy and Kenya National Assembly, 2005). Among the issues discussed at the

Conference were: access to information; ICTs regulation; enabling frameworks; parliamentary information systems; knowledge-based parliaments; and assistance framework.

The East Africa Optical fibre submarine cable system known as EASSY that started in March 2005 and expected to be completed in 2007 will bolster the region's move towards an information society. The project involves laying an undersea fibre optic cable along the entire stretch of the East African coast which upon completion, will interlink the region to two other undersea cables serving south, west and northern Africa, and form a highway continental loop that connects Africa to the rest of the world. EASSY will stretch from Mtunzini, in South Africa to Port Sudan, in Sudan, a distance of about 9,900Km. The countries involved include Botswana, Djibouti, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, South Africa, Sudan, Tanzania, and Uganda.

Similarly, RASCOM, the Pan African Satellite Communications system provides continental coverage for the exchange of radio and television programmes in a cost-effective manner. RASCOM, with its headquarters in Abidjan, Côte d'Ivoire, is an intergovernmental, commercial satellite organisation with a membership of 45 African countries. It was established to develop a dedicated pan-African geostationary satellite system, with the aim to provide affordable access to broadcast and telecommunications services throughout the entire continent. Among the objectives of RASCOM include: providing a wide range of telecommunications services to all areas in Africa at affordable costs, as a result of the economies of scale generated in the project; establishing direct links between all African countries; and improving inter-urban communications within each African country.

There are also joint infrastructure initiatives that are taking place on the continent, which are likely to influence positively the journey to the information society. For example, in August 1995, the Inter-Governmental Agreement creating the Southern African Power Pool (SAPP) was formed in order to expand electricity trade, reduce energy costs and provide greater supply stability for the region's national utilities. Power corporations in Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zimbabwe and Zambia formed SAPP, with the primary objective to provide reliable and economic electricity supply to the

consumers of each member. On the other hand, COMTEL, the Common Market of Eastern and Southern Africa telecommunication network was conceived and mooted in Kigali, Rwanda, in 2004 by National Telecom Operators (NTOs) and facilitated by COMESA to provide interconnectivity Services for 21 NTOs to connect Africa to Africa to the outside world. The planned network when built would be 18,000 kilometres long. Similarly, COMESA is in the process of mapping out an IT strategy for the region that will initially focus on the development of e-applications and IT capacity building. These two focus areas are expected to provide the first step to enable COMESA region to be part of the information society, in line with the objectives of the WSIS, and also to assist in the achievement of the Millennium Development Goals.

Similarly, there are a number of national initiatives on the continent that are aimed at enhancing access to information to the citizens. Increasingly, most of the African countries are making good progress in the liberalisations of their telecommunication sectors, as well as putting in place e-government infrastructure to enhance access to ICTs. For example, by 2006, Botswana, Djibouti, Ethiopia, Kenya, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Tanzania and Uganda to mention but a few, had made good progress in this regard.

Challenges of Pursuing Information Society Status for Africa

The information society environment is associated with large production of information and easy access to it. This in many ways raises a number of issues of quality of access, intellectual property rights, freedom of access legislation, and free or for sale information. In an information society where there are large pieces of information, it makes little effect if access cannot be enhanced through relevant legislation. Sub-Saharan Africa suffers most from this mistake, where efforts are being made to improve infrastructure, but little is happening in the form of enabling legislations to enhance access. The United States provides a good example with legislative framework that enhances access to information. For example, the US has in place the Digital Millennium Copyright, which makes copy circumvention illegal, the open source and copy left movements, which seek to encourage and disseminate various information products.

Though an information society environment requires easy access to information, most countries in sub-Saharan Africa do not have freedom of information legislation. Kirkwood (2002) notes that freedom of information (FOI) is a necessary pre-condition for an effective and participative democratic society, in which government is both transparent and accountable to its citizens. Moreover, allowing citizens to obtain information is essential for full democratic participation in society, and passing legislation on access to information opens a dialogue between the government and the people. Further, without full information, the citizen cannot criticise policy. Similarly, without a voice and the right to put forward views, the citizen cannot contribute to political and social change. Through freedom of information legislation, an open and accountable administration is promoted. Freedom of information gives the citizen the right to establish what government does and what basis is used for decision-making. So far, within sub-Saharan Africa, only Zimbabwe and South Africa were, by January 2006, having FOI legislations. By and large, lack of an enabling legislation to enhance free flow of information stifles efforts to attain the information society status and achievement of MDGs.

Though some efforts are being made with regard to infrastructure development such as EASSY, COMTEL and SAT3/SAFE, past experience has shown that high costs of access remain a problem. For example, experience with SAT3/SAFE undersea optical cable has shown to date the introduction of new fibre links does not necessarily ensure that cheaper bandwidth becomes available to users, either at the wholesale or retail level, due to monopolies that exist in international bandwidth control and the general lack of a liberalised fixed line telephone environment. The limited bandwidth also presents a problem. For example, of the three sub-Saharan Africa bandwidth markets (East, West and Southern Africa), East Africa has the smallest, and its share of the overall bandwidth market in the region is expected to be only about 12% by 2008. Relative to the other regions, the market has declined since the mid 1990s, and looks set to decline in the foreseeable future.

Conclusion

African countries in general and those in sub-Saharan Africa in particular have over the years tended not to have the same infrastructural facilities and support as Western countries that are prerequisites for moving them

forward into the information society. In most African countries, the existing infrastructure does not provide for efficient, cost-effective and an optimised universal access and service to rural areas, which constitute over 70% of the total population of about 842 million. Moreover, sub-Saharan Africa is associated with poverty, high illiteracy rate, civil strife and chronic under-development (World Bank Group 2002). Overall, the economic climate appears unfavourable for most countries. In addition, perennial climate of instability, inefficient regulatory frameworks and corruption that are often associated with many African countries, exacerbate an already pathetic situation.

Review Questions

1. Discuss the features that characterise an information society.
2. What is the importance of every country in Africa reaching the information society status?
3. What institutional frameworks exist in Africa to help the continent achieve the information society status?
4. What problems must Africa address, in order to reach the information society status?
5. Why in your opinion is reaching the information society status inextricably linked with universal access and social inclusion?

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Chapter 9

Digital Divide in Africa: Its Causes, and Amelioration Strategies

Stephen M. Mutula

Introduction

There is no unanimity about when the digital divide concept was coined. However, its origin has been associated with various individuals in the United States of America during the first part of the 1990s. Former US President, Bill Clinton, is thought to have been the first to use the term digital divide in discussions of the National Information Infrastructure (NII) Advisory Council in 1993. The concept of digital divide was initially associated with the gap that exists between developed and developing countries with regard to access to information and communication technologies. However, this initial perception of digital divide has changed, and one way of looking at the concept is to view it as:

- Inequitable access to ICTs such as PCs, Internet, telephones, cable and other Internet-related technologies (Spectar, 2000) by individuals or groups of people in a country or between countries.
- Much more than providing Internet and computer connections, because access to ICT is embedded in a complex array of actors encompassing physical, digital, human and social relationships (Warschauer, 2002).
- A multidimensional phenomenon encompassing three distinct aspects, namely: the global divide which refers to divergence of Internet access between industrialised and developing societies; the social divide which is concerned with the gap between information rich and information poor in each nation; and finally the democratic

divide which signifies the difference between who do, and do not use the panoply of digital resources to engage, mobilise and participate in public life (Norris, 2001).

The other ways by which the concept of digital divide may be perceived include: the social division between those who are very involved in technology and those who are not; the technology gap that exists not only between countries (inter-country digital divide), but also within countries (Intra-country digital divide); the gap that exists between those groups in developed world that have good access to technology and those in developing world who do not; and the gap in the quality of access to information and communication technologies, because mere access does not guarantee effective access to information.

The digital divide concept is therefore a phenomenon with wider scope beyond technology, and should be seen in the context of the gap that exists between people (at global, regional, national, community or institutional level), with regard to access to and use of various technologies on the account of a plethora of social, economic, linguistic, content, and other factors.

In the social context, the digital divide may be seen through cultural factors that result into disparities in access to and effective use of various digital technologies between countries and within countries. The economic context of digital divide relates to factors such as poverty and monetary constraints that make it more possible for some communities than others to have access to and make effective use of digital technologies. On the other hand, the content form of the divide refers to gaps that exist between communities, on account of inappropriate knowledge contained or flowing through digital technologies that certain communities cannot use, because it is created without their needs being taken into consideration. Linguistically, digital divide arises, when the language of digital technology or the content within the technology is foreign to certain communities, while it is familiar to other communities.

The concept of digital divide is however often misconceived in the sense that it:

- Focuses largely on new technology i.e. Internet, but ignores appropriate technologies, i.e. community, radio, VSAT, solar technologies, adaptive technologies, etc.

- There may be little direct link between digital divide, in terms of ICT and the priorities of people. For example, a national ICT survey in Botswana in 2005 (Maitlamo, 2005) established that Botswana's rural peoples' priorities were water, electricity, health, sanitation and roads. Similarly, in South Africa, the challenges facing the country often cited include: poverty eradication, job creation, safety and security, housing, health and welfare, education, water, electricity and sanitation (Geness, 2004).

Digital divide is an issue that concerns governments, development agencies and non governmental organisations not only in developing countries, but also in the developed world. Digital divide exists across countries, and within countries. The divide threatens to deepen the gaps among peoples in Africa, unless practical steps are taken to ensure equal access to information technologies for all and the benefits that accrue from such access.

Causes of Digital Divide in Africa

Sub-Saharan Africa represents complex linguistic problems by virtue of its Diaspora of varied cultural groups and values. For example, the region has many languages, with virtually none being the language of the Internet and computing. Though poor ICT infrastructure has largely been blamed for inequitable and effective access to the Internet and other digital technologies in Africa, there are several technology-related causes of digital divide on the continent such as high cost of access, inappropriate or weak policy regimes and inefficient provision of telecommunication network. Moreover, most countries in the region suffer largely from poor quality radio reception, and lack of newspapers in local languages.

Economic Factors

The level of economic development is critical in bridging the digital divide, and has been touted as a fairly good predictor of ICT usage in homes and communities. However, in Africa, disparity in economic development between communities within and between countries has been responsible for the inability of communities or individuals to purchase computers, pay for Internet bandwidth, or pay for electricity needed to power the digital technologies. The poor economic status clearly shows that on average each individual in sub-Saharan Africa survives on less

than US$1 daily (Islamic Relief, 2007). Also, though ICT is widely perceived as a new engine of economic development by the World Bank, the people of Africa in general, especially those living in rural areas, do not easily understand how ICTs can provide them with their basic needs such as food, basic health care, shelter, clean water and so on, when they cannot even afford a single meal a day. Any program to reduce the digital divide in Africa should ideally start with poverty alleviation, since poverty is by far the greatest impediment to connections and utilisation of ICT.

Furthermore, the digital divide in sub-Saharan Africa is also exacerbated by financial difficulties, which hamper easy procurement of relevant ICTs. In most universities, for example, declining government subsidies continue to put a lot of strain on the abilities of universities to make meaningful investment in programmes that would enhance access to digital technologies. Some universities which in the past had adequate funding from their governments, such as the University of Botswana and most universities in South Africa have not been spared either. In Botswana, for example, the 2004 government budget made no pronouncement for capital development in the only university in the country. In South Africa, universities have also undergone mergers in an attempt to reduce expenditure and address financial difficulties. Decreased funding to universities and by extension their libraries has in turn contributed to the slow development of digital library and information services. In addition, Internet access is limited, because of the high costs of providing equipment and services.

Local Content Factors

Sub-Saharan Africa faces the problem of inadequate published local content to satisfy the needs of its people. Local content refers to what the community creates, owns or adapts, in terms of knowledge (Ballantyne, 2002). Such content would include traditional medical techniques, community theatre, and cultural artifacts. Though sub-Saharan Africa has rich cultural and indigenous treasures, the traditional knowledge of the people remains largely tacit, and is faced with danger of extinction especially with the onslaught of Western iconography resulting from globalisation (Mutula, 2005). The lack of published local content and the means to access such content implies that even among the sub-Saharan African people, knowledge is not adequately shared, despite

the communal nature of the society. In addition, because of inadequate local content, the sub-Saharan African media, by and large, is dominated by Western iconography such as movies and pop music, which has been expedited by rapid advancements in new technology (Mutula, 2005). The absence of local content in many ways leads to local goods and services finding their way in foreign markets, which repackage and resell them back to the African markets at exorbitant prices. Also content on the web is not by any significant measure relevant to the indigenous people of sub-Saharan Africa. A look at the web, for example, reveals a great amount of children's literature, which largely focuses on American and European readership with little, if any, content for the sub-Saharan African child

Cultural and Linguistic Factors

Most sub-Saharan African countries lack cultural policies to effectively harness and manage traditional ways of life. Consequently, knowledge and know-how disappear, especially to foreign cities without benefit to the local people. In addition, indigenous knowledge has for a long time been exploited by the developed world, particularly in the area of environment and biodiversity. In particular, indigenous resources have attracted the interest of the pharmaceutical industry, because of the belief that collaboration with indigenous people could facilitate the fast tracking of experimentation on therapeutic agents, based on their knowledge of medicinal value of certain plants. Similarly, cases of migrated archives and artefacts are reported to find their way into Western databases, museums, and networks, which the people in sub-Saharan Africa have no easy access to, because of technological constraints.

Sub-Saharan Africa has not yet effectively integrated local languages into ICTs to enable ready access to ICTs by all its people. In schools, colleges and universities, the language of delivery is largely English, and local languages are hardly used. Similarly, the curriculum used in universities and schools has a large component of foreign content which is in English language. Research has shown that people with limited English speaking skills lag behind their English speaking counterparts in access to computers and the Internet (Macias et al. 2002). For example, the continuous use of English as the lingua franca of scholarship and science has often been suspected to contribute to the low pace of

industrialisation in sub-Saharan Africa (Africa Region's Knowledge and Learning Center 1999).

Moreover, gender discrimination is still widely practised in sub-Saharan Africa. For example, in most parts of sub-Saharan Africa, majority of women live in rural areas, where access to job opportunities is limited and enabling infrastructure to facilitate access to modern technologies such as the Internet on the whole is quite poor (Macias et al., 2002).

HIV/AIDS Factors

Sub-Saharan Africa in general has borne the brunt of the negative economic and social effects of HIV/AIDS pandemic. Most of the resources that would have been deployed to ICT infrastructure development, digital literacy campaign, research and development have been diverted to fight the HIV/AIDS pandemic. The Internet as an information carrier, among other roles, is a valuable asset in the campaign against the pandemic. Yet, as the International Telecommunication Union (2002) notes, owing to the substantial diversion of national wealth for treatment and prevention of HIV/AIDS, the disease in turn acts as an Internet-retardant, where fewer funds than otherwise remain available for upgrades of requisite technological infrastructure. Moreover, people in sub-Saharan Africa are faced with more critical challenges such as access to water, food, medical treatment and education, than such 'luxuries' as Internet access.

Telecommunication Constraint Factors

Sub-Saharan Africa faces the problem of inadequate bandwidth to facilitate effective access and use of the Internet resources. Bandwidth problems emanate from inefficiencies in the regional telecommunications network architecture and telecommunications, which affect access to and use of the Internet. For example, INASP has initiated a number of projects aimed at enhancing electronic access to information such as the Program for the Enhancement of Research Information (PERI) and Health InterNetwork Access to Research Initiative (HINARI) in East, Central, South and West Africa (Mwiyeriwa and Ngwira, 2003). However, the quality of the Internet connectivity on account of limited bandwidth has hampered effective access to the networks by researchers in sub-

Saharan Africa. Moreover, although radio remains the important communication tool that can be used effectively to reach the rural masses of sub-Saharan Africa, the radio stations on the subcontinent were inherited from colonial governments, and have not undergone dramatic changes to cater for the needs of the local communities. Furthermore, even radio is still not accessible to most remote parts of sub-Saharan African countries. This problem is exacerbated by the fact that most sub- Saharan African countries do not yet have policies geared to promoting community radios, and also because mass media is largely controlled by the state. Additionally, in countries where radio ownership is reasonably significant, broadcasting in indigenous languages is largely still not the norm, and there is limited local content.

But in most parts of sub-Saharan Africa, wireless telephone far exceeds the fixed lines. Globally, most internet connectivity is largely implemented through fixed line telephony. This situation has arisen, because e-governments lost early opportunities to privatise their public telephone operators (PTOs) by refusing to open up the sector despite growing foreign interest. Whereas telecommunications utilities in developed countries are increasingly upgrading to fiber-based broadband Digital Subscriber Line (DSL), most sub-Saharan African PTOs are reluctant to reinvest current revenues, in order to raise the necessary capital investment for re-cabling, despite hopes for potential future gains from faster service. In addition, various legislative frameworks do not favour complete liberalisation of the telecommunication services, and only some countries at the moment have, for example, liberalised voice over IP.

The telecommunication and other ICT infrastructure are constrained by perpetual civil wars in sub-Saharan Africa. In addition, most countries in sub-Saharan Africa have been ravaged by civil wars in such places as Somalia, Angola, Mozambique, and Democratic Republic of Congo. Such countries, whenever peace returns, strive to piece together infrastructure that is necessary for them to play a meaningful role in the digital age. In general, such countries, in theory, will be expected to use longer time to bridge the digital gap than their counterparts that have enjoyed relative peace over the years.

Brain Drain Factors

Sub-Saharan Africa has also been hit by brain drain of its key professionals looking for greener pastures abroad, as well as students who go to study in countries particularly, Australia, Britain, Canada, New Zealand and the United States, but who never return home after completing their education. Such professionals and students are often those that the continent can ill afford to lose. Brain drain also can occur through migrated archives, incorrect staff deployment (i.e. talented researcher deployed to administration section, etc), disappearance/death of community library of unrecorded/tapped memory/tacit knowledge especially in the case of indigenous knowledge, overdependence on mass media without thinking through the story. Statistics vary, but anecdotal evidence points to about 1/3 of Africa's experts leaving to the West (National Research Foundation, 2002). Consequently, Africa in general and sub-Sahara Africa in particular is getting deprived of its human capital which is needed in its attempt to bridge the digital divide.

Education Budgetary Factors

The digital divide in sub-Saharan Africa is also exacerbated by inadequate budgets for education at primary and secondary level. Though Africa has about 13% of the world's population, it receives a mere 1% of global expenditure on education (Johnson, 2001). Also, forty million children of school-going age are known not to be attending school; less than one third progresses to secondary education; and only 3% receive any form of tertiary education. In comparison, the 15-17 year old child in the developed world is estimated to receive secondary education and more than 50% complete tertiary education (Koen, 2003). Furthermore, a child in sub-Saharan Africa has on average US$ 49 spent on his education, as compared to US$ 4636 on average for the a child in the West in a year (Johnson, 2001). Moreover in Africa, most budgetary needs are met by funding from government to universities and universities are vulnerable to this form of funding. This is because any cuts in funding to the Ministry of Education in general are similarly extended to universities.

Education and Literacy Factors

As far as literacy is concerned, most sub-Saharan African countries are in the bottom ranks, especially with regard to adult literacy. For example,

Botswana's adult literacy in 2001 was estimated at 21.94%, Namibia 17.35%, and South Africa 14.39 % (Dutta et al., 2004). The literacy level in these countries generally mirrors the pattern in other sub-Saharan African countries. In addition, many countries in sub-Saharan Africa lack post-literacy programmes to guard against relapse into illiteracy, and as a result, the functional literacy achievements cannot be sustained. Tertiary education is crucial to provide the management expertise for the deployment and adoption of ICT initiatives; yet, the general gross tertiary enrolment rate is low. For example, in 2001, Botswana had 4.65% enrolment; Mauritius, 11.38%; Namibia, 5.94%; and South Africa, 15.25%, as compared for example, with Canada, 59.99%; and Estonia, 57.55 % (Dutta et al. 2004). Furthermore, sub-Saharan Africa faces the problem of underdeveloped publishing. In addition, the reading culture among the majority of the people in sub-Saharan Africa is poor. The poor publishing capabilities and reading habits in sub-Saharan Africa have also hampered the growth of indigenous information systems.

Institutional Level ICT Policies

Though ICT resources are scarce in a number of sub-Saharan African universities, some of them are nevertheless under-utilised. Such under-utilisation has been reported at the University of Zambia, University of Nairobi, Copper Belt University in Zambia and the University of Botswana. The under-utilisation of available ICTs is attributed partly to inimical policies such as unnecessary restrictions on access to the technologies at the University of Nairobi, and locking of student's labs at the University of Botswana to limit vandalism and theft of computers (Mutula, 2005).

Research and Development Factors

Sub-Saharan Africa generally suffers from a shortage of scientists and engineers for research and development. For example, in 2000, Botswana, South Africa and Namibia had 0.07, 0.99 and 0.46 scientists and engineers in research and development per 1000 inhabitants (Dutta et al., 2004), whereas Estonia, a transition country, and Canada, a developed country, had 2.13 and 2.98 scientists and engineers per 1000 inhabitants respectively. With such a small research and development (R&D) capability, most sub-Saharan African countries are not able to build a

critical mass of ICT-based research, and instead largely rely on imported technical know-how. Secondly, most countries in the sub region suffer from lack of access to current scientific books, journals and periodicals. Thirdly, due to budgetary constraints, libraries in universities often lack the ability to maintain their technical collections to the level of other major universities around the world. The inability of researchers to acquaint themselves with the state-of-the-art within their scientific fields continues to present a serious barrier to innovative research. Further, the difficulty for practitioners in all fields of science and engineering, e.g. public health, agriculture and civil engineering, to access information on new methodologies and processes within their respective fields continues to inhibit improvement of the way they do business.

In addition, though universities play an important role in research and scientific innovation, within sub-Saharan Africa, most university research and development is under-funded, and often, research findings that could contribute to innovative technology solutions to bridge the digital divide are not disseminated widely and used. The resultant low research capacity is also partly due to the fact that information technology is not widely embraced. Recent global rankings of universities in the world have relegated sub-Saharan African universities in the bottom of the league table on account of their poor research output, ICT teaching facilities, etc.

National ICT Policy and Regulatory Factors

Though computer technology has declined in price in developed countries, import taxation policies in sub-Saharan Africa make the computer affordable only to a few people. The delivery of new services on a highly cross-subsidised, uniform price basis reduces or eliminates the prospect of competitive entry, and discourages the incumbent from further investment and service improvement in non-profitable or less profitable areas of the market.

Furthermore, in most sub-Saharan African countries, there are often a lot of disparate ICT programmes and projects that are undertaken in isolation of each other leading to wastage of resources, and inadequate sharing of infrastructure and information. In Botswana, for example, knowledge of the author through working on various governments projects show that there are several fibre optic networks that are owned

separately by Botswana Power Corporation, Botswana Telecommunication Corporation, Botswana Police, Botswana Railways and Botswana Television that are not shared with those who need bandwidth (Mutula, 2005b, Maitlamo, 2005).

Within sub-Saharan Africa, technology deployment has not taken into consideration the continent's poor power infrastructure and inefficient electricity supply. Similarly, software applications are based on Western models and do not take into account local cultural sensitivities. Woherem (1993) observed that much of the technology in Africa, especially sub-Saharan Africa, was transplanted without the provision for re-engineering to suit local conditions.

Political Factors

Political barriers are also responsible for the digital divide in sub-Saharan Africa. For example, the apartheid regime that ruled South Africa for several decades brought about imbalances in the resources that were allocated to the education systems for black, coloured and white people (Johnson, 2001). Consequently, the Blacks and the Coloured people had poor access to school facilities including technologies. The long-term impact of the separate education systems meant that the Blacks and Coloured people obtained poor paying jobs which did not leave them with sufficient disposable income to spend on ICTs such as PCs and telephones, compared to the Whites. There has been great strides made in addressing this imbalance since the democratically elected government assumed power in 1994, however, it will take some time before the education inequalities are realised in South Africa.

Moreover, political expediency and lack of awareness among government officials is also a contributing factor. Some governments have been known to put in place media bills that restrict access to information. Similarly, by and large, most countries in sub-Saharan Africa do not have freedom of information legislations that would guarantee access to information in custody of governments. On the whole, independent media in sub-Saharan Africa has long been perceived by governments in negative ways rather than as instruments for development.

For a long time, most governments in sub-Saharan Africa were single party systems with authoritarian tendencies, until the 1990s when the

wave of democratisation hit the continent. During the pre-multiparty era, sub-Saharan African governments did not provide conducive environment where development of infrastructure could be fairly distributed around the countries. Often, communities that voted against the party that formed the government tended to be marginalised when distributing national resources. Kenya presents a good case in point, where during President Moi's regime, it was common to hear him say 'those areas which did not vote for my party would only be developed when funds became available'. Consequently, any request either for the provision of water, electricity, power, etc. by such political leaders of those regions would be followed by the response: 'yes the government will provide these services when funds become available'. Moreover, in most parts of Africa, governments' priorities do not necessarily fall in sync with those of the people as far as development is concerned. In Botswana, as already pointed out, ICT policy fora during 2004 showed that some priorities of government for the development of ICTs were different from those of the people. For example, most people in rural communities when asked what information technologies they needed most that would enhance access to information responded that rather than ICTs, they wanted information about markets where they could sell their farm produce, information on which markets were offering high price for goods, where to obtain antiretroviral drugs, access to clean water, electricity and good roads.

Benefits from Bridging Digital Divide

Digital dividend refers to innovative ways of bridging the global digital divide and creating social and economic benefits to the majority who are marginalised from access to and use of the technology. ICT has become an enormous engine of development (DigitalDividends, 2001). It is estimated that $2 trillion US dollars were invested in ICT in 1999, and similarly, ICT contributed close to 50 percent of total growth in US productivity in the second half of the 1990s (Bridges, 2001). ICT has the potential for commercial use by local entrepreneurs, which may generate employment and economic growth. A vibrant ICT service sector can provide better-paid skilled employment, for example, by increasing both the demand and ability to pay for better education, health, and other social services. By and large, affordable access to information infrastructure and the effective use of the knowledge gained through

such use are reported to be key factors for economic sustainability and improved social conditions.

In India, integration of ICT with the cultural practices of the people has helped to promote both e-governance and e-commerce. The concept of social inclusion espouses providing a framework that redirects the focus of bridging digital divide from providing access to technology to effective integration of ICT into communities and institutions for social development. To achieve social inclusion in an effort to bridge the digital divide demands paying due attention to physical, digital, human, political, economic, linguistic, cultural, as well as the social factors. When technology is integrated into the lives of a people, it creates multiplier effects, which among other things increase improvements in the level of development. Sub-Saharan Africa should try and emulate best practices that have been successful from such places as India.

Bridging the digital divide has various positive ramifications for the population. For example, enabling every student to gain access to instructional resources, including technology and support services, would promote academic excellence and provide the needed skills to harness digital opportunities. Linn (1999) observed that students who do not have access to computers and the Internet (among other technologies) are likely to get further behind their peers who do have such access. Such deprived students would miss the instant links to information, entertainment, and communication and would also potentially miss out on the 70 per cent of high paying jobs that require moderate or high amounts of computer knowledge.

In addition, computer-related technologies can open the doors of economic independence for individuals with different disabilities, because working with computers requires low mobility or physical strength, and adaptive technologies can make computers accessible to persons with motor and sensorial impairments.

Similarly, bridging the digital divide could be helpful in addressing the HIV/AIDS crisis in sub-Saharan Africa. For example, improved communications associated with national ICTs could provide an opportunity to extend the reach of HIV/AIDS awareness and allow citizens to easily find assistance and information. On the other hand, bridging the digital divide would result in economic growth, increased productivity, lowering of costs, employment generation and reduced inflation.

Measures Needed to Bridge the Digital Divide in Africa

Sub-Saharan Africa's leadership will need to devise multi-pronged approaches to reduce the digital divide phenomenon that pervade the region. As pointed out earlier, the digital divide is embedded in a complex array of factors encompassing physical, digital, human and social imperatives and relationships. Moreover, sub-Saharan Africa has its own unique peculiarities, in terms of its linguistic diversity, history of colonialism, poverty and afflictions from man-made and natural calamities such as droughts, diseases, civil wars, etc. The uniqueness of sub-Saharan Africa demands that its people adopt home grown solutions of resolving problems. *The Economist*, in one of its leader articles entitled 'Emerging Africa', in its issue of June 14, 1997 (The Economist, 1997), urged the continent to forge its own future. This view was also echoed by the Denver Summit of the seven (now turned eight) most industrialised democracies of the world (G7 Summit, 1997).

Multi-pronged approaches to bridge the digital divide would include borrowing best practices from around the world and adapting these to sub-Saharan Africa's peculiarities. Since the early 1970s, there have been several attempts by the people of Africa to craft their own indigenous strategies in resolving problems that affect the continent. One such land mark attempt was the Lagos Plan of Action for the Economic Development of Africa, 1980-2000 (Organisation of African Unity, 1980). Currently, the New Partnership for Africa's Development (NEPAD) is spearheading development agenda for Africa, with emphasis placed on finding solutions for Africa's problems (Chasia, 2002).

The challenges imposed by sub-Saharan Africa's oral traditions and low literacy levels can be addressed through the use of ICTs such as multimedia applications and touch screens. Similarly, voice translation software, digitisation and open source software tools can be applied to design interventions to enable indigenous communities to protect their cultural knowledge and materials. More efforts should aim at giving special consideration to rural and remote areas, under-privileged urban areas, institutions of learning, health, and women's organisations, in development of ICTs.

Every space, such as schools, libraries, and community centres should be used as primary location for accessing and teaching computer skills, for both adults and children. For sub-Saharan Africa to be able to

catch up with developed world in digital parity, proactive policies are needed to enable the region to implement the latest low cost technologies and administrative models that would enable it to leapfrog the industrial age. Leapfrogging means that sub-Saharan Africa can proceed directly to the information age. Moreover, adaptive and appropriate technologies should be promoted to cater for those who have disabilities. Adaptive technology refers to the changes that must be introduced in existing technologies to make them user-friendly and cater for individuals with disabilities. There are a number of programs that can be leveraged to expedite bridging the digital divide phenomenon on the continent. For example, telecentres are becoming important ICT infrastructure in sub-Saharan Africa for providing wider Internet access. Internet kiosks, cyber cafes and other forms of public Internet access are increasingly being set up in several countries (Mayanja, 2002). For example, the cyber café sector is booming in such countries as, Eritrea, Kenya, Malawi, Mali Mozambique and Tanzania, to mention but a few. The infrastructure present good opportunity to bridge the digital divide on the continent.

Tertiary education institutions should be empowered to grow the ICT skills base within the region. It is also vital to develop local content for all media and the creation of awareness about ICTs to enhance understanding of the use and potential of digital technologies. Furthermore, developing and harnessing a culture of lifelong learning that maximise the potential within all citizens and accelerated innovation to develop a knowledge-based system is important in bridging the digital divide in sub-Saharan Africa.

Furthermore, given that a large percentage school going age groups in sub-Saharan Africa are often out of school for various reasons, governments should find ways of promoting free primary education. Free primary education provides an effective way of helping the poor children, especially those orphaned or hard-hit by the HIV pandemic.

Also, sub-Saharan African governments should invest in centres of ICT excellence that can provide scholars with the resources and opportunities to delve into cutting edge research and innovative solutions to address Africa's problems in general and those pertaining to bridging the digital divide in particular. Governments should also find ways of enticing back brilliant scientists and other professionals working in the Diaspora to return to help seek solutions to the problems of sub-Saharan Africa.

The peculiarities of the digital divide in sub-Saharan Africa therefore require several measures that would among others include: encouraging research and education; telecommunication deregulation; adopting various wireless communications solutions that can be applied to reach different areas of countries where it is not feasible to lay cables; funding projects in key sectors of the economy; helping citizens understand and cope with digital revolution; letting the private sector to lead initiatives; and fostering innovation and competition.

Other measures needed to bridge the digital divide in Africa include, but are not limited to:

- Gender sensitive economic and social empowerment;
- Meeting people's basic needs first;
- Facilitate the use of multiple/appropriate technologies to cater for different abilities and needs;
- Documentation of indigenous knowledge and local content;
- Integrating ICTs with the culture of the people;
- Gender/cultural policies that address imbalances in society;
- Protecting the intellectual property rights of indigenous people; and
- Policies that address universal access and universal services.

Initiatives and Programmes aimed at Bridging the Digital Divide in Africa

The interventions to bridge the digital divide in Africa can be catergorised as global, regional and national. At global level, the Digital Opportunity Task Force and World Summit on Information Society principles to which most countries in sub-Saharan Africa subscribe to aim at bridging the digital divide. The Digital Task Force (DOT FORCE) was created by G8 heads of states at the Kyushu-Okinawa Summit in July 2000, and brought together forty-three teams from government, private sector, and non-profit organisations representing developed and developing countries. The focus was on bridging the digital divide (DOT FORCE, 2001). The DOT FORCE identifies priority actions that must be taken by individual countries individually or collectively. These priority areas include: fostering policy, regulatory and network readiness; improving connectivity, increasing access and lowering costs; building human capacity; and encouraging participation in global e-commerce.

Similarly, the basic principles of World Summit on Information Summit (WSIS) require each country to, among other things, build information infrastructure through telecommunications and investment in technology; achieving universal and equitable access to information technology; and making information a common good. The WSIS aims at promoting services and applications for economic, social and cultural development. The Summit brings to the fore such issues as consumer protection, privacy and security; relevant content, user training, and ethics of the information society. WSIS underlines the roles of government, the private sector and civil society, intellectual property rights, freedom of expression and Internet access tariffs. In the area of education, WSIS sees ICTs as tools to leverage opportunity for enhancing teacher-student environment and providing opportunity for access to education by employed workers.

At regional level, the Economic Commission for Africa in 1995 adopted a resolution entitled "Building Africa's Information Highway" and created a high-level Working Group of information technology experts to draft an action framework to utilise the information and communications technologies to accelerate the socio-economic development of Africa and its people. The action framework calls for: implementation of national information and communication infrastructure; building institutional frameworks, as well as human, information and technological resources in all African countries; and pursuit of priority strategies, programmes and projects for the sustainable information society in African countries (Amoako, 1996; UNECA, 1999)). Similarly, the New Partnership for Africa's Development has placed top priority on programmes to modernise telecommunication infrastructure in an attempt to bridge the digital divide between Africa and developed world (World Economic Forum, 2003). So far, one of the major initiatives is the implementation of the East African Submarine fibre optic cable (Eassy) that is planed to cover the eastern part of Africa from Durban in South Africa to Europe. This will complete a ring around Africa connecting to the SAT-3 submarine cable that runs from Cape Town to East Asia. Moreover, there are individual projects under regional trading blocks for telecommunication infrastructure developments such as South African Development Community (SADC), East Africa Cooperation (EAC) and the Economic Community of West African States (ECOWAS). There are also programmes spearheaded by international agencies such as INASP and SchoolNet for infrastructure development in some parts

of Africa. For example, SchoolNet has been collecting redundant computer equipment from the public and private sector, locally and internationally, for distribution to disadvantaged schools in Namibia (INASP, 2004).

The Leland Initiative has spurred Internet connectivity in a number of African countries. The initiative was a five-year, US$ 15 million project designed to extend full Internet connectivity to up to 20 African countries. Some of the African countries that have benefited from this initiative include: Botswana, Namibia, South Africa, Kenya, Tanzania, Zambia and Zimbabwe. The initiative aims to facilitate and encourage Internet use by Africans to achieve sustainable development and create an enabling environment in the project countries to facilitate electronic networking and access to global information infrastructure (USAID, 2001). Similarly, UNINET the South African (University Network), is providing an Internet backbone that supports 500,000 students and staff at the country's universities and technikons, as well as universities in Lesotho, Swaziland and Tanzania. It also provides links to 400 schools within the country that now have connectivity to the Internet (Mphidi, 2004).

Several development agencies are investing in infrastructure development in sub-Saharan Africa. For example, the InfoDev fund of the World Bank has supported the South African Telematics for African Development Consortium that has seen the training of teachers in 261 Africa schools in using Internet (Knight, 1995). Similarly, UNDP is funding the improvement of Internet connectivity in Africa in a project called the Internet Initiative for Africa (IIA). This project involves Angola, Burkina Faso, Cape Verde, Chad, Democratic Republic of Congo, Gambia, Mauritania, Namibia, Nigeria, Sao Tome et Principe, Swaziland, and Togo. ITU, on the other hand, is involved in a number of projects to bridge the digital divide through infrastructure supply and financing, local capacity building, and private-public sector partnerships (Dandjinou and Zambrano, 1997). ITU is developing training centres in some countries in the region and in other developing countries to provide students and telecommunication/IT professionals, with access to affordable and relevant training in mentored e-learning environment. On the other hand, a number of sub-Saharan African countries are benefiting from the Digital Partnership - an initiative of the World Bank, which aims at linking systems and organisations in poor communities by way of disposing millions of computers from the developed world to

developing countries. Other projects underway are the Global Internet Policy Initiative (GIPI), which is addressing the policy aspect of bridging the digital divide in developing countries.

The Regional Satellite Communication Organisation (RASCOM) has put up a satellite to cater for national and international telecommunications services in all African countries. The project is expected to provide telecommunication services in rural areas of Africa on a large scale at very low tariff rates; it would also provide inter-urban links within each country; enhance direct links between African countries; and provide sound and television broadcasting and value-added services such as the Internet.

The African Connection Project developed by African Telecommunication Union aims to create the underlying infrastructure needed to support future Internet activities (Carnegie Corporation of New York, 2001). Similarly, the Common Market for Eastern and Southern Africa (COMESA) commissioned the telecommunication network, COMTEL, to facilitate increased trade relations within the region among member countries. The COMTEL backbone network is configured to include a mix of optical fibre, high capacity terrestrial radio and satellite systems. The network is to carry voice and data of variable bandwidth and TV programmes (COMESA, 2007). Similarly, the East African Community (EAC) is putting in place an optical fibre transmission system linking the capital cities of Kampala, Nairobi and Dar es Salaam.

In most parts of sub-Saharan Africa, a number of telecentres are being established in communities, schools and libraries as access points to the Internet for students and members of society. Such learning environments can be used to bridge digital divide. Similarly, government policies that enhance affordable ICT infrastructure are important to accomplish socio-economic development. Policies and strategies that will promote the rapid development of ICT infrastructure are needed. On the other hand, mobile phones companies in sub-Saharan Africa have generally made good returns on their investment. It is therefore fair that such companies plough back their profits by investing in projects that can enhance access by local communities to ICTs in general and the Internet in particular. But for this to happen, governments should put in place appropriate policies that, for example, tie issuance of licenses to services providers to their ability and willingness to initiate projects that enhance access to ICTs by communities.

Conclusion

Digital divide phenomenon in Africa is caused by various factors of technical, social, political, economic and cultural nature. The diversity of causes demands multi-pronged interventions that empower people economically and recognise their cultural diversity, practices and indigenous capabilities. The policy changes to bridge the digital divide in sub-Saharan Africa should focus on revitalising indigenous information systems as one way of enhancing local content development, meeting people's basic needs for livelihood, creating awareness, enabling research in the use of appropriate technologies and providing an enabling environment that motivates people of the region to pull relevant technologies rather than accept what is being pushed to them. Once people's basic needs for livelihood are satisfied, they can focus their minds on embracing and integrating ICTs in their daily lives. Governments should allow the private sector to lead ICT initiatives, while providing a conducive environment that encourages them to invest in innovative ICT solutions that are affordable and useable by the people. The involvement of the private sector would also raise the required funding to enhance global sustainability of programmes aimed at bridging the digital divide. Finally, attempts should be made to borrow selectively from global best practices of bridging the digital divide that can be contextualised for sub-Saharan Africa's unique environment. Such best practices would for example include the digital inclusion model of the West and the leapfrogging approaches that have been adopted, especially in the emerging economies. ICT development requires an enabling environment of infrastructure and policies before they contribute efficiently to economic growth. Government, development agencies, academia, researchers and others should co-operate to provide a conducive environment for such development to take place.

Review Questions

1. What are the peculiarities of digital divide in sub-Saharan Africa?
2. What interventions are needed to resolve the peculiarities of digital divide in sub-Saharan Africa?
3. How does digital divide negate social inclusion?

4. The World Bank has claimed that the digital divide between developed and developing nations is narrowing. Discuss this claim.
5. Why is it necessary to bridge the digital divide in our midst?

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Chapter 10

Bibliographic and Library Networks in Africa

Priti Jain

Introduction

Network can be defined as "a group of individuals or organisations that are interconnected to form a system to accomplish some specified goal. This linkage must include a communication mechanism, and many networks exist for the express purpose of facilitating certain types of communication among their members" (Martin, 1987). A network may be set up to exchange or share ideas, information, or resources. This can be a telephone network, friends' network, library networks, business network, wireless network etc. In the context of this chapter network refers to computer-based library networks.

A library network is defined as "a cooperative arrangement between several libraries, for example for inter-lending or an electronic network within or between libraries" (Jalloh, 2000). In the library world many institutions have traditionally networked for better information sharing in the form of interlibrary loans and bibliographic information services. In this information age, library networks refer to online computerised library networks, where links are established among several libraries through computer linkages locally, regionally and globally. This chapter will look at all types of library networks including bibliographic networks, library consortia and online databases.

History of Library Networks

In the United States, a loosely structured library network originated with the founding of American Library Association (ALA) and the increasing national activities of the Library of Congress (LC) (Martin, 1978). In 1901, with the initiation of the LC catalogue card production and distribution service, the nation wide network of libraries received its first significant

communication tool (Weber, 1976). During the first half of the century, librarians developed the bibliographic controls, in order to share data among various institutions. In 1950s and 1960s, rules for cataloguing and classification were widely adopted, and most of the librarians began to recognise that they did not need to be self-contained in processing library materials.

The Library of Congress later established a library network of book catalogue, the National Union Catalogue, as a supporting device and a standardised interlibrary loan procedure to exchange the information materials. Increasingly, regional and local library networks flourished to improve customer services. In the late 1950s and early 1960s, librarians began to appreciate the potential of punched card equipment and computers for library automation. By designing a format for machine-readable bibliographic records, the Library of Congress again led in the development of library networks. Within five years, machine readable catalogue (MARC) format eventually got accepted as a common data structure to communicate using computer as a processing tool. In 1969, LC began distributing MARC data. In 1970, the Ohio College Library Centre (OCLC) performed its first offline batch processing for 54 member libraries and in 1971 started online processing (Martin, 1978).

By 1980, OCLC Inc., the oldest and the largest automated library network, had made significant progress in the development of library networks. OCLC provided an essential base for application of online technology and telecommunications to library processing, and for several years most of the networking took place in OCLC or other regional networks linked to OCLC. By 1984-85, OCLC had 6082 member libraries, 6584 dedicated online terminals, 12.1 million records in the bibliographic database, 25.5 million books and other materials catalogued online, 2.2 million online inter library loans (ILLs) transacted, and 1.8 million serials holdings modified (Martin, 1981). This is how bibliographic/library networks have shaped as we know them today.

Libraries and Networking

Throughout the world, libraries and information services began to realise that they can no longer be self-sufficient to fulfil the constantly growing needs of their library customers. This is more so in developing countries, since "libraries in most developing countries suffer from inadequate

funding or stringent budget cuts. This has affected the level of services offered to users, both in terms of quality of collections and the degree of staff support provided" (Jalloh, 2000). So, today all types of libraries are facing the enormous challenge of providing better services to their customers, in spite of constantly dwindling budgets. Only a few libraries can afford to have a wide range of information resources, others are looking for alternatives to provide services cost effectively. In such circumstances, resource sharing or networking between the different libraries is the most suitable and cost-effective solution to cater for ever-changing customer information needs. So, library networking is vital for information sharing, better resource utilisation, complementing one another's expertise and producing more with limited resources.

In Africa, there are bibliographic networks, library consortia, networking initiatives and databases on Africa.

Bibliographic Library Networks in Africa

There are two major bibliographic networks in Africa: Ain Shams in Egypt and SABINET in the Southern African region.

Ain Shams

Ain Shams library network originated from Ain Shams University, which was founded in 1950, and now has nine faculties and several specialised institutes and research centres. The Library of the Faculty of Law has a collection of approximately 40,000 monographs and receives close to 100 current periodicals in Arabic and English. Ain Shams aims to improve the higher education system, and provide value-added services to maximise customer satisfaction by having leading portals locally, nationally and internationally. Ain Shams also offers a list of 135 automated libraries, containing more than 920,000 bibliographic records in Arabic and English. In Egypt, all theses and dissertations are available on the Ain Shams University Network (ASUNET), including theses and dissertations of Egyptians from other international universities. The University Information Network (UIN), with headquarters at Ain Shams University in Cairo, serves as a national clearinghouse for theses and dissertations (Ubogu, 2003).

Recently, Africa has also started to make theses and dissertations available globally. As of yet, only South Africa and Egypt have

computerised bibliographic information networks on bibliographic information on theses and dissertations, for example, Rhodes University has its theses and dissertations online (Fung, 2006).

Southern African Bibliographic Information Network (SABINET)

Sabinet is the biggest bibliographic library network in Africa. Its aim is to provide a comprehensive information service for all South African customers. SABINET has been in the information industry for the past 24 years as a leader in facilitating electronic access to information. Its major products and services include: Legal Information, Electronic Publications, Online Reference, Cataloguing Support and Inter-lending Support (Sabinet, 2007).

Legal Information: Sabinet has a wide range of legal information services. SabinetLaw serves business people, creating awareness about new and forthcoming legislation and implications thereof for business in South Africa. For example, *SA Gazettes* provides immediate access to the full-text of the government and all provincial gazettes. *Contemporary Gazette*, a fortnightly email notification service and website focuses on new legislation and bills for business. *Sabinet Parliamentary Information* is a parliamentary monitoring which offers daily customised alerting via e-mail, and notifies users about parliamentary information, as well as weekly e-mail lists of forthcoming and current legislation and policies. *Law Journal Collection* includes abstracted records and full-text documents of many law journals published in South Africa in a single user-friendly service (Sabinet Online. Legal products and legal information. 2007).

Electronic Publications. This service is the most comprehensive, searchable collection of full-text electronic South African journals in the world, which focuses on making journals published in South Africa available online. Currently, it includes 228 publications, with new publications being added on an on-going basis. Through this networking users can access, locate, display and print full-text documents from their desktops (Sabinet Online SA ePublications - Electronic Publishing, 2007).

Online Reference: Sabinet online reference service offers access to local and international content including full-text documents, articles and

references across a broad spectrum of subject areas. This service offers easy access to Online Legal Information, Online News Information, Online Books & Articles Information, covering national and international information through indexed records from journal articles, research reports, conference proceedings and chapters in books (Sabinet Online Reference, 2007).

Cataloguing Support: This service provides cataloguing support through SabiCat, a fully integrated cataloguing support service which is considered the most comprehensive acquisitions and cataloguing support service in Southern Africa. It is on two main bibliographic databases: SACat (representing most library stock in Southern Africa) and WorldCat (the most comprehensive bibliographic resource in the world) (Sabinet Online Cataloguing SabiCat. 2007).

Inter-lending Support: Through this web-based inter-lending system, libraries can expand their coverage through resource sharing. The system facilitates the entire interlibrary loan process between borrowing and lending institutions. Launched in July 2001, ReQuest makes provision for requesting, supplying, administrative, statistical and financial functions for returnable and non-returnable items. ReQuest is a complete resource sharing system that integrates OPAC data, local policies, and standards-based communication to provide seamless interaction across multiple systems and platforms (Sabinet Online Interlending ReQuest, 2007).

Library Consortia

Traditionally, library cooperation was through interlibrary loan service, which did not seem to be adequate to enhance the provision of library services, especially in this information technology age. Consequently, library consortia emerged to make an impact on a library's core services. A library consortium is defined as a "formal association of libraries, not under the same institutional control, but usually restricted to a geographical area, number of libraries, types of materials, or subject interest, which is established to develop and implement resource sharing among members" (Jalloh, 2000). Library consortia are effective tools of information exchange among various libraries. They are cost-effective

associations of libraries, which reduce information costs, improve resource sharing and develop a networked information environment, using campus networks and the Internet. The main library consortia in Africa consists of: CALICO - Cape Library Consortium, The South African National Library and Information Consortium (SANLiC), GAELIC - Gauteng and Environs Library Consortium, SLIS - Special Libraries & Information Services Group, FRELICO - Free State Library and Information Consortium, esAL - Eastern Seaboard Alliance of Libraries and SEALS - South East Academic Library System, (Sabinet Online Library Consortia, 2007).

Cape Libraries Cooperatives (CALICO)

CALICO was the first formal academic library consortium in South Africa, which was established in 1992. Its main aim was to address the information literacy needs of the region and to promote economic development. In 2004, it adjusted its vision and mission statements and changed its name from Cape Libraries Cooperatives to Cape Library Consortium. CALICO is a network of four academic libraries in the Western Cape, namely: University of Cape Town Libraries; University of Stellenbosch Libraries; University of the Western Cape Libraries and Cape Peninsula University of Technology Libraries. Its main achievements are: implementation of a centrally managed library information system and information portal; introduction of the MetaLib Library Portal service in 2003 increased access to electronic databases for their users by virtue of CALICO's membership of the Coalition of South African Library Consortia's South African Site Licensing Initiative; collaborative agreements among CALICO libraries to facilitate further access to information by the sharing of library resources; use of the Ariel Document Delivery Service and introduction of a SFX Context Sensitive Linking Service to library electronic collections, both bibliographic and full-text (Thomas & Fourie, 2006).

The South African National Library and Information Consortium (SANLiC)

SANLiC was established in 1999, and it provides electronic information through the establishment of (SASLI), the South African Site Licensing Initiative. Its main operational strategic and operational focus is to promote and support national co-operative initiatives, e.g. it contributes

to South African National Catalogue (SACat). It provides access to information by establishing national and international partnerships, agreements for collaborative collection building, information resource sharing and establishment of a national ICT infrastructure for the benefit of library and information services clients. It acts as liaison and lobbying entity between government and other bodies. It establishes networks for optimal information resource sharing for all library and information clients (SANLiC, n.d.).

Gauteng and Environs Library Consortium (GAELIC)

Founded in April 1996, GAELIC is an academic library consortium within Foundation of Tertiary Institutions of the Northern Metropolis (FOTIM). GAELIC's mission is to fully utilise the information resources in the region, in order to promote education, research and lifelong learning. Its vision is to create a virtual library with a common library software package installed at member sites, with local interfaces to form part of a global information community (GAELIC, n.d.). Initiated with six members, GAELIC has grown to 11 institutions across the three provinces of Gauteng, North-West and Limpopo. Its members are: University of Limpopo; North-West University; University of Johannesburg; University of Pretoria; Tshwane University of Technology; University of the Witwatersrand, Johannesburg; Vaal University of Technology; University of Venda; University of South Africa; University of Namibia and University of Botswana. GAELIC provides its members good networking, training and capacity building opportunities. GAELIC's members are automatically members of Coalition of South African Library Consortia (COSALC), and through its South African Site Licensing Initiative, COSALC saves substantial cost for all the GAELIC member libraries, in terms of electronic databases subscription. Across the 10 institutions, there are 40 sites and 67 separate service points with 1267 staff. This is the biggest library consortia in Africa. GAELIC was instrumental in forming the Coalition of South African Library Consortia (COSALC), and made a valuable contribution to the implementation of the new National Union Catalogue at SABINET Online. This is a great achievement for both GAELIC and SABINET (GAELIC, n.d.).

Special Libraries and Information Services Group (SLIS)

This is a professional association for Special Libraries in South Africa, which holds conferences, workshops, etc. It is Linked to Southern African library related- organisations and news. Established in 1947, SLIS is a vibrant network of people, who are involved in the provision of information services within specific subject fields. SLIS is sponsored by LexisNexis Butterworth. SLIS emphasises and promotes the strategic role of information professionals; provides a forum for all special libraries and information services groups; provides abundant networking opportunities to all the special libraries; facilitates the exchange of knowledge and information; and cultivates closer co-operation between groups with similar interests. Currently, it has over 300 personal and institutional members, mainly from special libraries and information centres in the private and public sectors, profit and non-profit making organisations and academic institutions All of its members benefit from SLIS networking through its various activities, such as workshops, conferences, newsletter, Listserver (SLIS, n.d.).

Free State Libraries and Information Consortium (FRELICO)

FRELICO was formed in 1996 by the University of the Free State for the utilisation of electronic networks and to expand access to library and study materials in South Africa's Free State province. It is a library network of three university libraries: University of the Free State (UFS); Central University of Technology (CUT) and Sasol Library (also referred to as Sasol Infonet), the only library in Africa to subscribe to these databases. It is a major research university in the Free State and one of the major research universities in South Africa, serving 15 400 students with a collection of 500,000 plus volumes and 4,000 periodical subscriptions. FRELICO also collaborates with SABINET by hosting the South African national union catalogue, SACat and the National Interlibrary Lending System (FRELICO, 2005).

Eastern Seaboard Association Libraries (esAL)

This library consortium was established in 1997 for KwaZulu-Natal province. Its aim is to create a common cost-effective and cost-efficient library network of four university libraries: University of Zululand; Durban University of Technology; Mangosutho Technikon; and

University of KwaZulu-Natal. Its vision is "To develop fully the information resources of the region for the purpose of promoting and supporting teaching, learning and research in the province". One of this consortium's principles is that academic libraries on the eastern seaboard will share electronic information, no matter how small, provided that they have the necessary communications infrastructure, and provided the relevant license agreements allow for this (Thomas & Fourie, 2006).

South Eastern Academic Libraries' System (SEALS)

SEALS was established in 1989 as a forum for cooperation between Rhodes University, the University of Fort Hare and the University of Port Elizabeth for the collaboration on the purchasing of journals. Later on, Technikon (polytechnic) libraries and the University of Transkei joined the network, and SEALS became a formal academic library consortium in 1998. SEALS' main achievements include: purchase of a common library system; development of a computerised information literacy programme and the establishment of a shared theses and dissertations database. Currently, its members are: Rhodes University, University of Port Elizabeth, University of Fort Hare, University of Transkei, Port Elizabeth Technikon, Border Technikon, Eastern Cape Technikon and Vista University, Port Elizabeth Campus (Marais, 2007).

Networking Initiatives in Africa

There are some networking initiatives in Africa. The most prominent among these initiatives, are: INASP (International Network for the Availability of Scientific Publications and National Inquiry Services Centre South Africa (NISC).

INASP (International Network for the Availability of Scientific Publications)

INASP (International Network for the Availability of Scientific Publications) was established in 1992 by the International Council for Science (ICSU) to improve access to information and knowledge, specifically in developing countries. In October 2004, INASP got registered as a charity, and it got formalised as an interdisciplinary body of the International Council for Science (ICSU) in 2005. INASP works

with partners and networks around the world to encourage the creation and production of information, to promote sustainable and equitable access to information. Through its networks, it assists researchers, scientists, educators, and health and rural development practitioners in transitional and developing countries to access, create and use information and knowledge. INASP's major functions include: networking; accessing information; sharing and supporting local exchange of information and knowledge; strengthening local knowledge creation and dissemination and enhancement of information and communication professionals and local trainers. INASP has initiated two main networking programmes in Africa: Programme for the Enhancement of Research Information (PERI) and African Journals Online (AJOL) (INASP, 2007).

Programme for the Enhancement of Research Information (PERI)

PERI is a networking programme, which supports capacity building in the research sector in developing and transitional countries by strengthening the production, access and dissemination of information and knowledge. It endows researchers with access to international scholarly literature electronically in a wide range of disciplines. It builds national and international library networks to provide interface opportunities to researchers in developing countries. This maximises access and usage of international scholarly literature. Currently, PERI has over 14,500 full text online journals, many of the world's leading citation, bibliographic and reference databases, document delivery from over 20,000 research journals and CD-ROM (or DVD) format can be provided, where they are available. PERI delivers information, using ICT-enabled tools. It supports country collaboration and networking, in order to develop stronger local mechanisms for information sharing. Due to all of these opportunities, PERI is recognised as INASP's most important initiative (PERI, 2007).

African Journals Online (AJOL)

AJOL was initiated in May 1998 as a pilot project, managed by the International Network for the Availability of Scientific Publication (INASP), and in 2005, AJOL moved to National Inquiry Services Centre (NISC). AJOL is a database of journals published in Africa, covering the

full range of academic disciplines. It strengthens library networking by promoting participating journals' visibility and by disseminating research published in African journals. All the materials on AJOL are free to be viewed, searched and browsed; however, the copyright of all contents is retained by the journals or authors. AJOL is not a publisher, it only provides a service to the journals by hosting them online, and actively promoting the website to make them noticeable and establish networks with them (African Journals Online, n.d.).

National Inquiry Services Centre South Africa (NISC)

In May 1995, NISC SA opened in Grahamstown as a result of realisation that there was a need in Africa for indigenous information and a local service. The Eastern Cape is home to many skilled artists and crafts people, and aims to discover these talented people, to promote their products and to make their talents visible to tourists and the general public. NISC SA provides local and global information for Africa, about Africa and by Africans. It is part of a global network, and has its offices in USA, India and South Africa. It publishes over 70 world information databases, available online and on DVD. (NISC SA, n.d.). INASP has recently transferred its AJOL programme to NISC.

Free Online Databases on Africana

In the context of this chapter, a database refers to free online databases in African Studies. Adjah and Adanu (2004) have provided a comprehensive "Guide to Free Online African Studies", some of the databases are as follows:

Africa Resource Com

Africaresource.com is an educational portal that offers academic research materials and products on Africa and African Diaspora. It publishes peer-reviewed journals, bibliographies, scholarly essays, art exhibitions, poetry, profiles, autobiographies, syllabi, multimedia, who's who directory (Africaresource.com: Educational Gateway to Africa, 2007).

African Digital Library

The African Digital Library (ADL) is a collection of electronic books (eBooks) that can be accessed and used free-of-charge by any person living on the African continent, or whoever is connected to the Internet in Africa. ADL aims to facilitate access to library resources without the expense of developing and maintaining a physical infrastructure, by establishing a public digital library for people living and learning on the African continent. Established in November 1999 in collaboration with netLibrary, using netLibrary's existing electronic bookshelf technology, the ADL has a collection of 8714 electronic books, consisting of the African Digital Library collection (3 808 titles) and a publicly accessible collection (4906 titles) (African Digital Library, 2003).

Bibliographic Databases on Africana

These databases provide only abstracts and/or bibliographic citations (The Nordic Africa Institute, 2007). Some of the Africana bibliographic databases are:

- *African Studies Internet Resources*. This is Columbia University's collection of African Studies Internet Resources. This project was initiated in early 1999, and now the site is an official African Studies website for the World Wide Web Virtual Library. It is an on-going compilation of electronic bibliographic resources and research materials on Africa, available on the global Internet, created under the purview of the African Studies Department of Columbia University Libraries. Electronic resources from Africa are organised by region and country. Among the many selected resources on these pages are:
  - On-line catalogs of the world's top libraries with large Africana collections.
  - Bibliographies from Columbia University Libraries and other research institutions around the world.
  - An annotated archive of links to African Studies Electronic Journals and Newspapers.
  - The International Directory of African Studies Scholars (IDASS) = Répertoire international des spécialistes de l'Afrique.

- Electronic news archives that specialise in African affairs.
- Abstracts and full-length reports on Africa from US, African, and international organisations.
- Information on African studies programmes around the world, scholarly organisations, and conferences.
- Electronic African art exhibits, plus other texts, images, and sound files reflecting upon Africa's history and contemporary cultures.
- Maps, flags, and geographical data.
- Links to other Africa-related gophers and web servers. (African Studies Internet Resources, 2007).

- *Africabib. Org:* Initiated in 1974, this work aims to index all of the issues of an entire periodical/journal that contained information on Africa or was a major source of Africana, and makes those citations as a comprehensive source accessible to all. This English language database indexes over 50,000 articles from over 415 English language and multi-lingual journals and periodicals that specialize in African Studies or consistently cover the African continent. In 1999, the database began adding electronic journals to its list, and Africabib indexes ten electronic journals (Africabib. Org, 2005).

- *African Women's Bibliographic Database:* This database is the product of a three-volume work published in 1989 by Greenwood Press that indexed materials on African Women published during the International Women's Decade, 1975-1985. This database indexes six types of materials: books and government documents; articles appearing in edited books; periodical and journal articles; Masters theses and Ph.D. dissertations, as well as a few B.A. theses and honours papers; conference papers and videocassettes. This English language database contains over 22,000 citations from 1986 to current. The database indexes anything the compiler can find published in English about African women (Adjah and Adanu, 2004).

- *Periodical Literature Bibliographic Database:* This work was originally begun in September 1974, aiming to index all the issues of each periodical/journal titles and place them all in one source. This English language database indexes over 33,000 articles from over 280 English language and multi-lingual journals and periodicals that specialise in African Studies or consistently cover the African continent. The titles indexed in this database represent Africana materials published from over 22 nations within North America, Europe Arica and Asia (Africabib. Org, 2005).

- *African Studies Centre:* The African Studies Centre in Leiden is the only academic research institute in the Netherlands devoted entirely to the study of Africa. It welcomes African scholars through its visiting fellowship programme, and has a monthly seminar programme and an extensive library that is open to the general public (African Studies Centre, 2007). African Studies Abstracts are issued online four times a year on the journal's website, where it can be consulted free of charge. They provide an overview of articles from periodicals and edited works on Africa in the field of social sciences and humanities available in the library of the African Studies Centre in Leiden (Adjah and Adanu, 2004).

- *An A-Z of African Studies on the Internet:* It encompasses Internet sites, discussion lists and any other e-resources of relevance to Africa or African studies. It is widely linked to by scholars. Internet addresses change frequently (An A-Z of African Studies on the Internet, 2007).

Infrastructure for Enhancing Library/Bibliographic Networking in Africa

Mobile Communication Networks

In Africa, the mobile telephone networks and market are among the fastest-growing in the world. Mobile networks have removed communication barriers, and Africa's mobile networks are compatible with a majority of the countries in the world. However, developments are still hampered by regulatory environments. Mobile licences frequently

require that operators rely on a fixed network operator for interconnection, and relatively few countries allow their mobile operators to operate their own international gateways (Bharat Book Bureau, 2006). Thus, Africa has a great potential for mobile communications networks development, as well as their development implications. The Global System for Mobile Communications (GSM) is in evolution for enhanced performance, capacity, and features to meet user demands at the lowest cost.

Mobile phones can be used as effective and economical communication tools in the provision of information services, such as interlibrary loan services, book reservation, book renewal, and reference queries. For instance, the Royal Library of Denmark is using powerful Nokia IP400 and IP500 Series network appliances to provide secure and reliable connectivity and data security (Royal Library of Denmark, 2003). In a comparative study of student cell phone use at the University of Botswana, it was found that the cell phone was a revolutionary communication tool for students, and that Library and Information Studies [LIS] students used the cell phone for academic purposes more than students in the other departments. Students considered cell phones better means of communications than Internet-based mail systems, because through cell phones, they could communicate at anytime from any place (Mutula, Komanyane and Grand, 2005). So, mobile communication networks can be used to enhance library networking in Africa.

Initiatives for Enhancing Library Networking in Africa

There are various initiatives going on to enhance library networking in Africa. They include:

SAT-3/WASC/SAFE (South Africa Telkom 3)

The joint participation of thirty-six African countries brought this cable system into place. This is an undersea cable system, which offers a faster and more efficient communication and trading channel between Africa and international markets. Due to this technology and commercial breakthrough, the continent does not need to rely solely on foreign nations anymore to route their international traffic. This is a device to bridge the digital divide in Africa and the developed world. This has

equipped Africa with a fast, efficient and affordable communication infrastructure for the sustainable development of the continent (SAT-3/WASC/SAFE, 2004).

Currently, six submarine cables provide international fibre connectivity to Africa. The SAFE/WASC/SAT-3 project is split into two segments: SAT-3/WASC runs from South Africa to Portugal, with landing points in Angola, Gabon, Cameroon, Nigeria, Benin, Ghana, Ivory Coast, Senegal, Canary Islands, and Spain, and SAFE runs from South Africa to Malaysia and India, via Mauritius and Reunion. The other cables provide international links for Algeria, Djibouti, Egypt, Morocco, Senegal, Tunisia, Cape Verde and the Canary Islands. Now it is possible to transit traffic between Africa, Latin America and Asia, without needing to go through Europe or North America.

Eastern African Submarine Cable System (EASSy)

Due to inadequate ICT infrastructure to support high speed Internet connectivity and the increasing amount of payment in routing international traffic in Sub-Saharan Africa, there was an urgent need for more efficient international data carrier systems to support Africa's economic and social development. Africa is paying a high price for not having a direct link to the international fibre optic system. Without affordable infrastructure there will be no real information society in Africa. Carrying traffic over satellite is more expensive than submarine cables, so if eastern and southern Africa switches to the submarine cable, it will lower costs of connectivity. That is why the East African Submarine Cable System EASSy is planned to be built to link eastern and parts of southern Africa to the international fibre optic system; this will reduce the costs of connectivity, especially of the consortium members, and reduce the payment to foreign carriers for routing their traffic. All the stakeholders believe that EASSy will deliver better value to users in Eastern and Southern Africa, if built and run along the Open Access model. EASSy will provide the last link to completely encircle Africa with a high capacity fibre optic telecommunications network. Once completed and operated in mid-2007, 17 Southern and Eastern African countries are expected to benefit from improved communication services and lowered communication costs. They are Botswana, Djibouti, Eritrea, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Rwanda, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe (CIPESA ICT Policy Briefing Series, 2006).

COMTEL Communications Ltd. (COMTEL)

This is another initiative for enhancing library networks in Africa. COMTEL is a broadband infrastructure project spearheaded by the Common Market for Eastern and Southern Africa (COMESA) to improve the communication system in the region. It will connect 21 Eastern and Southern African countries to Europe and Asia (Malakata, 2006).

Thus, "to bridge this gap, Nepad has launched several infrastructure initiatives. The sub- marine cable systems (SAT-3/WASC) connecting South Africa and the West African countries to the Far East and Europe have been completed. The Eastern Africa Sub- marine cable system (EASSy), which will close the fibre-optic loop around the continent, and the Comtel initiative, which will connect all countries of the common market for East and Southern Africa, are all part of the initiative. The SAT-3/WASC, along with EASSy and a North African submarine cable system, will complete a ring of submarine cables around Africa to facilitate the connection of African countries to each other, and to the rest of the world, the concept document states" (Swanepoel, 2007).

Challenges of utilising Library Networks in Africa

In spite of all these initiatives and availability of library networks, not all the libraries in Africa are able to utilise these facilities, due to the following limitations:

- Under-utilisation of existing technology;
- Digital illiteracy;
- Lack of skilled and trained manpower;
- Inadequate ICT facilities;
- Lack of National IT policy;
- Poor communication infrastructure;
- Ignorance of ICT and networks benefits;
- Expensive ICT equipment and resistance to change (Jain, 2002; Mutula, 2003); and
- Costs of bandwidth are disproportionately high, and it is difficult to significantly expand international network connectivity (INASP).

Conclusion

Regardless of all these infrastructural boundaries, libraries have to strive continuously to provide excellent information services to their customers, in order to equip them with better education, research, information and lifelong learning. They have to find mechanisms to overcome these barriers, and in these rapidly changing and financially constrained library environments, the utilisation of library networks is the best solution.

Review Questions

1. What is a library network? Discuss the importance of library network in the African context.

2. What are the major uses of library networks?

3. Discuss the challenges of library networking in Africa.

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Chapter 11

Framework For Digital Preservation in Africa

Saul F. C. Zulu and Trywell Kalusopa

Introduction

The process of encoding and recording information has evolved over a thousand years. The way in which generations expressed their ideas, skills, emotions, etc, has led to the production of information materials since time immemorial. Every generation desires to leave a mark of documented issues, concerns, ideas, discourse and events, and the only way to do this was by leaving a legacy in the form of documented matter. One of the earliest forms of recording human experiences on earth has been through rock paintings found in most parts of the world (National Research Council, 1986).

The media of recording information, has however, evolved over time. In the past, stone, wood, metal, clay and paper served as information storage media. The written heritage of humankind, found in libraries, museums, temples, monasteries, and private collections, consists of different types of cultural materials incised or written with ink on palm-leaf, bark, wooden tablets and traditional paper. These information media, however, posed different challenges at efforts to preserve them in the face of harsh elements of nature (Morrow, 1983).

The challenges of preserving paper-based information materials increased with the discovery of the Fourdrinier machine in 1806, which was designed to meet the high demand for paper. The demand for paper caused alkaline or 'traditional' paper, which was long-fibred, stable and durable, to be supplanted by modern mass production methods, based on materials other than rags. These papermaking materials have an inbuilt decay factor, due to the nature of the raw material adopted – wood, and extensive use of chemicals. The use of machines, which mechanically ground wood into pulp, also greatly reduced the wood

fibres. This caused paper to be vulnerable to deterioration and decay, because the chemicals induced deterioration and shortened its capacity to bond together. The result is weak paper, which posed preservation problems (Harvey, 1994).

However, owing to developments in science and technology over the past two centuries, we are now in the midst of transition from essentially output of information in paper format to output in a variety of media. We are now increasingly in the multi-media era, where information is output as picture, sound, text or a combination of these and increasingly being stored in electronic media (Zulu, 2005). Information resources in electronic era, ranging from simple text based files such as word processed files to highly sophisticated web-based resources such as databases, websites, e-mails, are preserved in a wide range of storage media such as disks, flash drives, CD ROMs and others.

Scope and Meaning of Digital Preservation

The term 'preservation' is an umbrella word or concept under which most librarians and archivists cluster all the policies and options for the managing, including conservation treatments of different formats of information materials. Digital material preservation therefore is a way of preserving information materials, which refers to digital surrogates created as a result of converting analog materials to digital form (digitisation), as well as those that are 'born digital' for which there has never been, and is never intended to be an analog equivalent, and digital records. The term 'digital preservation' refers or embraces two major categories, based on the process by which the digital materials came into existence or were created (Digital Preservation Coalition (DPC), 2002 a).

"Born digital" refers to materials which were not intended to have an analog equivalent, either as the originating source as a result of conversion to analog form, while 'made digital' refers to creating digital files by scanning or otherwise converting analog materials, and the resulting digital copy is classed as a digital material (DPC, 2002 b).

The terms "digital preservation and digital archiving" are often thought to be synonymous, and therefore used interchangeably. However, there is a fundamental difference between them. As defined by DPC (2002 c), digital preservation refers to a series of adopted

management activities necessary to ensure a continued access to digital materials for as long as necessary, while digital archiving is referred to as the process of creating backup as an ongoing maintenance, activity as opposed to strategies for long-term digital preservation.

Challenges of Digital Material Preservation

Challenges of preserving or archiving digital information are not new, and have been explored at many fora over the last five decades. Several scholars and institutions, respectively, such as Garret and Walter (1996), Lin, Ramiah and Wal (2003), Caplan (2004), Wamukoya and Mutula (2005) and the National Library of Australia (2003), have cited the following challenges to the preservation of digital materials:

- technological obsolescence;
- continuous migration;
- lack of legislation, policy and strategy;
- lack of awareness;
- lack of collaboration and partnership;
- deterioration of the digital media; and
- disaster planning and recovery.

Each of these challenges faced in preserving digital materials are briefly discussed below:

Technological Obsolescence

Markets are full of a variety of digital formats that continuously change from time to time with some formats getting obsolete (Caplan, 2004). Format obsolescence is complemented by rapid hardware and software obsolescence, which is a significant threat to digital preservation, as it causes the loss of the means of access (Wamukoya and Mutula, 2005). This comes as a result of the continuous upgrade of operating systems, programming languages, applications and storage media (Lin, Ramiah and Wal, 2003). Such loss of access makes preservation of digital materials meaningless since the main purpose of preserving digital materials is to maintain accessibility (National Library of Australia, 2003).

Continuous Migration

Another challenge of digital preservation, which arises from the challenge of rapid technological obsolescence, is the need for continuous migration. Migration is a means of overcoming technological obsolescence by transferring digital resources from one hardware/software generation to the next. The purpose of migration is to preserve the intellectual content of digital objects and to retain the ability for clients to retrieve, display, and otherwise use them in the face of constantly changing technology. (National Library of Australia, 2003).

Lack of Legislation, Policy and Strategy

According to the National Library of Australia (2003), lack of supportive legislation is a major challenge of preservation of digital material. Besides, since legislators are usually neither aware nor conversant with the requirements of digital preservation, they make legislations that either ignore or inadequately cover digital preservation issues (Wamukoya and Mutula, 2005). Further, Internet links bring additional challenge in terms of copyright legislation in that the copyright of software required to access digital files, and the right to copy for preservation has not been adequately articulated in most national legislations. For instance, the current practice is that due to copyright requirements, a subscriber to an Internet-based information service requires to continuously renew the access licence, even for materials long paid for, in order to continue accessing the same information. An additional challenge is that digital evolution has been too rapid and costly for governments and institutions to develop timely and informed preservation strategies (National Library of Australia, 2003).

Lack of Awareness about Digital Material Preservation

The UNESCO draft charter on the preservation of digital heritage stresses the need for urgent awareness raising and advocacy in favour of preservation of digital materials. It proposes for the alerting of policy makers and sensitising the public to both the potential of the digital media and the practicalities of digital preservation (National Library of Australia, 2003). The University of Edinburgh, for example, in following this principle, raised University-wide awareness about digital preservation, as part of its digital preservation project (Semple, 2004).

Lack of Collaboration and Partnership

Another major challenge of digital preservation is lack of collaboration and partnership among stakeholders, as well as "lack of clearly assigned responsibilities and resources for the long term-preservation" of digital materials (Wamukoya and Mutula, 2005). Such absence of collaboration and partnership exists among governments, creators, publishers, relevant industries and heritage institutions. The situation is also exacerbated by the lack of awareness by legislators and IT experts regarding digital preservation. There is also need for partnerships between archivists, information technology personnel, systems analysts, records managers, and other information management staff to come up with holistic strategies on how to deal with digital preservation issues (Lin, Ramiah and Wal, 2003).

Deterioration of the Digital Media

One of the challenges of digital preservation is the deterioration of the digital media. This is becoming a cause for the disappearance or inaccessibility of digital information (Lin, Ramiah and Wal 2003), as the media usually deteriorate within a few years or decades at most. Another challenge to digital preservation is the possibility of digital media getting lost in the event of disasters such as fire, flood, equipment failure, or virus attack.

Disaster Planning and Recovery

The other challenge relates to lack of disaster planning and mitigation strategies for digital materials at institutional, as well as national levels. The effect of the absence of disaster planning and mitigatory measures results in unnecessary and sometimes, permanent loss of valuable information resources.

Digital Preservation Requirements

According to Hedstrom (2005), there are two perspectives for examining digital preservation requirements: from the perspective of users of digital materials and from the view of libraries, archives, and other custodians who assume responsibility for the maintenance, preservation and distribution of digital materials.

The most basic requirements from a users' point of view include: the ability to establish the authenticity and integrity of a source (the provenance or origin of the document must be known), document structures (sequencing and logical flow of the presentation of the information), metadata (document descriptive identification) that explains the maintenance and use history of the document, time and date stamps, and a series of references.

According to Michelson and Rothenberg (1992), digital preservation requirements may be defined differently by archives, libraries, and other types of repositories. However, all these institutions need storage systems capable of handling digital information in a wide variety of formats, including text, data, graphics, video, and sound. Ideally, storage media should have a long life expectancy, a high degree of disaster resistance, sufficient durability to withstand regular use, and very large storage capacities. They further observe that conversion from analog to digital formats and migration to new generations of technology should be rapid, accurate, and inexpensive enough to permit very large-scale conversions of heterogeneous materials.

Strategies for Digital Materials Preservation

Russell (1999) has identified some of the strategies or methods that could be adopted to help preserve digital materials. These strategies are briefly presented below:

Reliance on Hard Copy Media

This strategy also known as "change media" involves printing out digital materials and preserving the hard copy.

Technology Preservation

This involves preserving the technology that was used to create the digital material, including hardware and software. This strategy ensures access to the digital material.

Technology Emulation

This involves using the existing technology that is able to mimic the old technology, thereby creating the original technical environment for the preserved item to be read or viewed.

Migration

Whereas technological preservation and technology emulation focus on the environment of the object and preserving the resource through re-creating or preserving the necessary operating environment, a different strategy for digital preservation is what has been called "migration". Migration is a means of overcoming technological obsolescence by transferring digital resources from one hardware/ software generation to the next.

Encapsulation

The other preservation strategy is encapsulation, which involves the grouping together of resources and whatever is necessary to maintain access to it. This can include metadata, software viewers, and discrete files forming the digital resource (DPC, 2002 b). Encapsulation is further described by Haag (2002), who says that in contrast to the migration approach, the encapsulation approach retains the record in its original form, but encapsulates it with a set of instructions on how the original should be interpreted. Encapsulation is considered a key element of emulation.

Digital Preservation Efforts in Africa

There have been several universal initiatives to deal with digital material preservation. Among the major international organisations that are concerned with digital preservation are the International Federation of Libraries Associations and Institutions (IFLA) and UNESCO.

In 2003, UNESCO's General Conference adopted a Draft Charter on the Preservation of the Digital Heritage. The Charter is a declaration of principles to assist Member States in preparing national policies to preserve and provide access to digital heritage. The Charter describes the digital heritage as those unique resources of human knowledge and expression in digital form, and recognises both the risk to this material through technological obsolescence and the urgency required to ensure its preservation (UNESCO, 2003 b).

IFLA's Core Programme for Preservation and Conservation focuses "efforts on issues of preservation and initiates worldwide cooperation for the preservation of library materials." IFLA, in collaboration with the

International Council on Archives (ICA), has produced guidelines for digitisation programmes for collections and holdings in the public domain (IFLA, 2005). The IFLA guidelines identify and discuss the key issues involved in the conceptualisation, planning and implementation of a digitisation project, with recommendations for "best practice" to be followed at each stage of the process (UNESCO, 2003 a).

Different countries, such as the United States of America, United Kingdom, Australia, New Zealand, have made efforts to come up with strategies on how to combat or deal with digital preservation.

In Africa, there have been some digital preservation initiatives as well. A study commissioned by IFLA in its project "Networking Cultural Heritage" reported the following findings on the state of digital preservation in Africa (Tsebe, 2005):

- That the need for preservation of digital collections in the long-term had been mentioned at workshops and in recent articles by African authors;
- The realisation of the establishment of de-centralised repositories of digital libraries through collaborative programmes still had a long way to go;
- Few libraries had attained ICT levels required for adequate connectivity;
- libraries were at different stages of digital development, with very different needs; and
- There was a need for country-level bodies, which understand the requirements of libraries and that could drive forward digital development.

In South Africa, the National Archives and Records Service of South Africa is faced with major preservation challenges. These challenges include budgetary constraints in the face of the need for improved access; limited human resource skills; new developments in ICT; and invasion by ambitious IT vendors and product developers who prescribe systems which have no long term preservation and accessibility value (Tsebe, 2005).

The centre piece of digital preservation efforts in South Africa is the Digital Imaging Project of South Africa (DISA), which was established in 1997. The objectives of DISA are aimed at investigating and

implementing digital technologies to enable scholars and researchers from around the world to access South African material of high socio-political interest that would otherwise be difficult to locate and use. In addition, DISA aims to providing South African archivists and librarians with knowledge of, and expertise in, digital imaging. To date, DISA has hosted various workshops in Southern Africa on digital imaging, managing digital libraries, and metadata.

Other efforts in South Africa are demonstrated by Sabinet Online, which has been digitising more than 180 South African journals, which were originally published in hard copy. This service (SA ePublications) was launched in June 2002 with 40 online journals. Sabinet has also made huge investments in the digitisation of South African government publications (Tsebe, 2005).

In Botswana, the production or creation of records in electronic form has been on the increase following different strategies and efforts put up by the government to use ICTs in most government offices, in order to achieve high productivity and efficiency in the public sector. There has been progressive investment in ICT in Botswana since the 1990s, which has resulted in the establishment of a basic ICT infrastructure. Government has also put in place an ICT policy, which is designed to guide the ICT environment. It is also putting in place necessary attendant pieces of legislation to backup the implementation of the ICT policy. Like in any other country, the increasing production of electronic records in Botswana in government departments and offices has undoubtedly raised issues of challenges of preservation of digital materials.

Challenges of Digital Preservation in Africa

A 2005 study commissioned by UNESCO on digital heritage preservation in three countries, Botswana, South Africa and Ethiopia, revealed the following gaps regarding the status of digital preservation in Africa (Tembo, Zulu, Kalusopa, 2006):

- Lack of a national policy framework on digital material preservation;
- Relevant legislation on ICTs, especially on digital material preservation, is yet to be drawn and enacted;
- Lack of clearly defined national heritage institution(s) responsible for digital material preservation;

- Absence of coordinated national initiatives and programmes on digitisation;
- Gaps in the necessary human resource requirements, in terms of knowledge skills and competencies to drive digital material preservation in heritage institutions;
- Lack of standards in digital material preservation, in terms of hardware, software, storage media and metadata;
- Haphazard approach to digital material preservation in most heritage institutions;
- Absence of local institutions that could serve as models for "best practices" (or centres of excellence) in digital material preservation;
- The management of indigenous knowledge systems, in terms of their digitisation, remains to be addressed; and
- Disaster planning and recovery in most heritage organisations remains to be addressed

Framework for Digital Preservation in Africa

A conducive framework for sustainable digital preservation in Africa should be anchored on the following:

- National policies;
- Legislation;
- National coordination;
- Human resource capacity building;
- Standardisation;
- Research and development; and
- Disaster planning and recovery.

These issues are briefly discussed below:

1. National policies on digital material preservation should be formulated. As observed by the Electronic Resource Preservation and Access Network (ERPANET) 2003, a policy forms the pillar of programme for digital preservation. This is because it gives general direction for the whole organisation. Further, the lack of policy results in lack of co-ordination in digital activities at institutional and national

levels. Among the objectives of the national digital material preservation policy will be to:

- identify institution(s) that will be responsible for driving digitisation;
- initiatives at national, regional, as well as international levels;
- stipulate the preservation and accessibility of digital materials;
- ensure the authenticity of preserved digital materials; and
- stipulate national digitisation standards in terms of hardware, software, processes and procedures to ensure compatibility and easy migration of digital materials.

2. National policies on digital material preservation should be backed by relevant legislation. Legislation is important because it provides the legal framework, and stipulates the specific responsibility on the management and preservation of digital materials.

3. National heritage institutions should come up with co-ordinated digital material preservation initiatives or programmes. Among objectives of such initiatives would be to:
   - raise national awareness and advocacy on digital material preservation. This should be done at various levels: strategic, technical as well as end-user levels;
   - promote research on digital material preservation;
   - spearhead training in digital material preservation;
   - create national databases on digitisation;
   - document indigenous knowledge systems and oral history; and
   - provide technical assistance to institutions on the selection and retention of digital materials.

4. National Heritage institutions in Africa and other stakeholders should address the human resource gaps in digital material preservation by recruiting, developing (through various short-term and long term training strategies) and putting measures in place for the retention of personnel.

5. Standards on hardware, software, storage media and metadata should be implemented at institutional level. National heritage institutions such as national archives should be consulted, when such standards are being implemented. in addition, national heritage institutions at regional levels (such as Economic Community for West African State (ECOWAS), Southern Africa Development Community (SADC), United Nation Economic Commission for Africa (UNECA) should strive to articulate common standards on digital material preservation, based on international norms, such as the Open Archival Information System. This will enhance the exchange and sharing of heritage material within the region.

6. Digital material preservation programmes should be preceded by detailed studies on needs and re-organisation of analog systems for identification, selection and classification of materials for digitisation. Further, organisations should include in their digital material preservation plans and all heritage materials that are produced and received, including grey literature.

7. African countries should develop centres of excellence on digital preservation. Among the functions of such centres would be:
   - Development of standards in hardware, software, as well as metadata.
   - Research in digital material preservation.
   - Adaptation and testing of digital technologies.

8. National Museum institutions should take a lead in the documentation of indigenous knowledge, including heritage sites and their digitisation. In addition, legislative and policy issues on copyrights and intellectual property rights on indigenous knowledge should be addressed.

9. National heritage institutions should put in place strategies for disaster planning, mitigation and recovery of digital materials in their holdings.

Review Questions

1. Explain the scope digital preservation.
2. What are the challenges of digital preservation?
3. What are the common strategies for digital materials preservation?
4. Review efforts on digital preservation in Africa.
5. What are the key challenges of digital preservation in Africa?
6. Review the key elements of a framework to guide sustainable digital preservation in Africa.

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Part IV: Knowledge Systems

Chapter 12

Knowledge Management

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Nature of Knowledge

Knowledge is a derivative of information. Similarly, knowledge management can be perceived as a derivative, and an enhancement of information management. The basic component of knowledge is data, which may be figures, numbers, facts, events, transaction, opinions, etc, that have been recorded. Often, data are regarded as input or raw material from which information is produced (O'Brien, 1997). Sound decisions cannot be made from data, because they are not organised in meaningful ways. Similarly, information is defined data that has been organised to enhance meaningful interpretation. On the other hand, Leonard and Sensiper (1998) refer to knowledge as information that is relevant, actionable, and based at least partially on experience. Knowledge is more personal, as it is acquired largely through experience.

Knowledge can be viewed from three perspectives, namely: simplistic view, subjective view and objective view.

(a) The Simplistic View

The simplistic view of knowledge is usually used when introducing the concepts of information management. This view shows the knowledge hierarchy from the simplest form, data to wisdom. Data would constitute the basic form followed by information, then knowledge and lastly wisdom. Synthesised and manipulated data give information. According to Durant (1957), information is turned into knowledge when an individual processes and internalises it. Knowledge is made explicit and becomes information while information is internalised and becomes knowledge. Similarly, wisdom refers to totality of perspective – seeing an object, event, or idea in all its pertinent relationships.

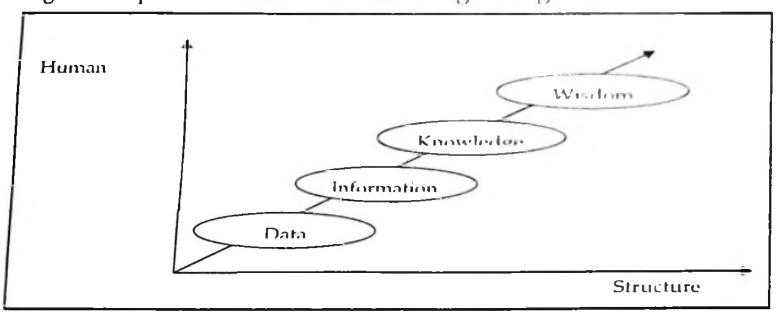
(b) Subjective View

Knowledge is also viewed from a subjective stance. The subjective view presents knowledge from two possible perspectives: as a state of mind and as a practice. The subjective view explains knowledge in terms of social construction. Those in favour of this view see knowledge as an accomplishment which affects and is influenced by social practices (Boland and Tenkasi, 1995). According to this view, since knowledge is embedded in practices, it does not have a specific location outside social practices, human interactions and experiences. Since this knowledge is held by a group, it does not belong to an individual, neither is it possessed by an agent. For example in the African culture, the process of asking for a girl's hand in marriage varies from one community to the other. The parents of the groom to be and the bride to be know the cultural procedures to be followed. This knowledge is passed down generations through participation, observation and discussions. No individual member of the community can claim possessions of such knowledge. The knowledge belongs to the community, and it is an important part of their identity.

(c) Objective View

In contrast to the subjective view, the objective view advances that knowledge can be discovered, improved, stored, transferred and can exist in a variety of locations (Bender et al, 1995).

Figure 1 depicts the evolution of knowledge along a continuum.



***Source:** Evolution of Knowledge (Source: Nicholas and Rowlands, 2000)*

Relationship Between Information Management and Knowledge Management

Data, information, knowledge and wisdom can be perceived as artefacts, while processes involved in their transformation constitute the management aspect of these artefacts. The management of these artefacts is needed to improve organisation's performance of the organisation. Consequently, data and information management would refer to the management of an organisation's data and information resources, in order to improve the performance of the organisation. Information management involves a number of different tasks, including creation and maintenance of meta information, searching for documents and other data objects, viewing and retrieving information. The Information Management Consultants (2003) defines information management as "an interdisciplinary field that draws on and combines skills and resources from librarianship and information science, information technology, records management, archives and general management. Its focus is information as a resource, independently of the physical form in which it occurs. Books and periodicals, data stored on local or remote computers, microforms, audio-visual media and the information in people's heads." According to this definition, information management includes one or more of the following activities:

- Subject indexing;
- Classification and coding;
- Construction and use of thesauri and controlled vocabularies;
- Cataloguing and indexing by names, places, and events;
- Database design and data structures;
- Physical storage of books and records, in paper and electronic form;
- Storage of photographic and digitised images;
- Information audits: reviews of an organisation's information resources; and
- Documentation of museum objects, both for management purposes and as a resource for scholarship.

Information management involves a number of components that facilitate generation and use of information. The components forming up the information management are explained below (Information Management Consultants, 2003):

(a) *Audience Profile/segment* - Provides administration of the system, including setting up of system users and definition of the user profiles. The profiles then influence the segmentation of how the information is presented and becomes visible.

(b) *Authoring/Input* - Authoring is the creation and uploading of information into the system.

(c) *Extract/Translation/Production* - The extraction of information involves removing data from a centralised database, (in our case) and re-creating that information onto a different medium, e.g. we may decide to extract information from the system and re-publish it to a CD-ROM.

(d) *Publishing/Distribution* - Involves presenting the information to various user groups.

(e) *Access* - Is the physical access function of calling up an application and having information available.

Knowledge management on the other hand, has its origin in business and various definitions of the concept tend to reflect this orientation. Though knowledge management has largely gained more impetus as a result of the revolution in information and communication technologies, Knowledge Management (KM) ideas have been available to managers for millennia. However, these ideas only started getting integrated into organisational planning and processes a few years back. For example, Alexander the Great, Caesar, Napoleon and Henry Ford are referred to as pioneers of knowledge practice. Knowledge as strategic resource gradually started being appreciated by both individuals and organisations in the mid 1980s. However, knowledge management as a new concept was first introduced in a keynote address at a European Union management conference (The European Conference on Knowledge Management, 2007). White (2004) perceives knowledge management as a process of creating, storing, sharing and re-using organisational knowledge (know-how) to enable an organisation to achieve its goals and objectives. Chase (1998) points out that contrary to widely held view by librarians, knowledge management is not managing or organising books or journals, searching the Internet for clients or arranging the circulation material, but it is about enhancing the use of organisational knowledge through sound practices and organisational learning.

Types of Knowledge

There are two main types of knowledge: tacit and explicit. Other forms of knowledge are made of the two basic forms.

(a) Explicit Knowledge

This type of knowledge can be expressed in the form of numbers, words, drawings, etc. It is also known as documented knowledge. It is easily communicated, shared and transferred in its codified forms. It is disseminated via documents, electronic forms and manuals. Documented knowledge renders itself to indexing, cataloguing, provision of access points and hence it can be searched and retrieved in electronic and manual environments. Explicit knowledge can also be viewed as codified tacit knowledge. Examples include knowledge shared during meetings, brainstorming sessions, workshops, conferences. This knowledge is then recorded in the form of minutes of the meeting and conference proceedings. The documents from such events largely represents the insights, experiences shared codified and disseminated in an easily transferable form. They are basically implicit (tacit) knowledge that has been converted to explicit knowledge (Hildreth and Kimble, 2002).

(b) *Tacit Knowledge*

According to Stenmark (2002), the notion of tacit knowledge was introduced by Michael Polanyi, a philosopher, in his principal work entitled "Personal Knowledge: Towards a Post Critical Philosophy" (Polanyi, 1958). Choo (2000) defines tacit knowledge in organisations as personal knowledge used by members to perform their works and to make sense of their worlds. It is learned through extended periods of experiencing and doing a task, during which the individual develops a feel for, and a capacity to make intuitive judgments about the successful execution of the activity. Tacit knowledge resides in people's minds, and involves some intangible factors such as one's belief and values. It is difficult to codify or extract from the heads of individuals and write down. It is knowledge gained through personal experience in a given context. It can also be seen as individual insights and expertise. Tacit knowledge can be shared, transferred, learned through imitations, observations, directions and instructions.

What is Knowledge Management?

The concept of knowledge management is defined from the point of view of how people use it. Recently, the meaning of the term knowledge management has been the subjects of debates. There are many definitions of KM in the literature. Groff and Jones (2003) define knowledge management as the tools, techniques, and strategies to retain, analyse, organise, improve and share business expertise.

As Munn (2001) has pointed out, a close examination of these numerous definitions point to the "idea that an organisation seeks to identify, capture, disseminate and exploit the knowledge it possesses for the benefit of both its employees and clients". Knowledge Management is a broad, multi-functional area, covering many aspects, underpinning the day-to-day activities of an organisation. It can be used to improve the performance of the organisation, secure and sustain a competitive advantage or viability.

Knowledge management entails:

- Capturing the knowledge that the employees and customers need at a central repository;
- Identification of the categories of knowledge needed to support the overall business strategy;
- Process of collecting, classifying, and disseminating information throughout the organisation;
- Assessment of the current knowledge-base of the organisation, identifying and filling knowledge gaps;
- Employment of information technology to help organise and store information; and
- Provision of access tools.

The reasons why organisations invest in knowledge management are varied. One of the reasons has to do with the fact that staff change employers and careers, and leave with the organisational knowledge. The organisation loses the experience and expertise accumulated by employees. This knowledge can be used to give the organisation competitive edge. Moreover, organisations go through phases of development and growth. Sometimes because of the environment they operate in, they are forced to make decisions, which may result in downsizing. As a result, some of the organisational knowledge is lost, as the staff leaves the organisation.

Phases of Knowledge Management

Bhatt (2001) identifies five phases of knowledge management:

(a) Knowledge creation

This is the first phase, and refers to the ability of an organisation to develop novel and useful ideas and solutions. Moreover, this phase represents an emergent process involving motivation, inspiration and experimentation.

(b) Knowledge validation

This phase is concerned with the extent to which a firm can reflect on knowledge and evaluate its effectiveness for the existing organisational environment.

(c) Knowledge presentation

This third phase refers to the way knowledge is displayed to the organisational members, whether in print, disks, or optical media.

(d) Knowledge distribution

This refers to the distribution and sharing of knowledge throughout the organisation, and requires the interactions between organisational technologies, techniques and people.

(e) Knowledge application

This phase is concerned with the art of locating the right knowledge in the right form in any organisation. Moreover, knowledge application means making knowledge more active and relevant for the organisation, in terms of creating values.

Generations and Levels of Knowledge Management

There are various generations and levels of knowledge management as described below:

(a) Generations of Knowledge Management

The first generation KM systems focused on knowledge capture. That is the capturing of information and experiences and makes them available to the organisation. This generation relied on the capabilities of

information technologies such as large storage and retrieval. This generation led to organisations investing a lot in IT systems. The second generation is organisation and people focused. Organisations are seen to be capable of learning. Therefore this generation pays attention to the way knowledge is created and shared within an organisation. It recognises that learning and doing are important to the organisation success (McElroy and Firestone, J.M. (2002).

(b) Levels of Knowledge Management

Sveiby (2001) identified three levels of knowledge management, namely: Track level, organisation level and individual level. Track level of knowledge consists of two aspects the IT-Track knowledge management (management of information) and People-Track knowledge management (management of people). At the IT-Track KM level, researchers and practitioners in this field tend to have their education in computer and/or information science. They are involved in construction of information management systems, artificial intelligence, reengineering, group ware, etc. To them knowledge is equated to objects that can be identified and handled in information systems. The IT-Track Management level is still but growing very fast, because the influence of IT. Similarly, at the People-Track aspect of KM, researchers and practitioners in this field tend to have their education in philosophy, psychology, sociology or business/management. They are primarily involved in assessing, changing and improving human individual skills and/or behaviour. In addition, the people track is more about how to maximise the ability of human resources, and encourage them to create new knowledge, share it and be innovative. To them, knowledge is equated to processes, a complex set of dynamic skills, know-how etc, that is constantly changing. Both researchers and practitioners are traditionally involved in learning and in managing these competencies individually. Unlike IT-Track aspect of KM, this track is very old, and is not growing so fast.

The Individual level of KM- the focus is on research and practice on the individual. Similarly, at the organisational level, the focus in research and practice is on the organisation. The organisations' role here is to provide a conducive environment that will nurture the sharing of knowledge and allow the staff to try new things, which results in new products, new markets or acquiring a competitive advantage. The different levels of KM are depicted in the 2x2 grid in table 1.

Table 1: Levels of Knowledge Management

Track Level	Organisation Level	Individual Level
IT Track (Knowledge= Object)Specialist'	"Re-Engineers"	"AI-Specialists"'E-
People track (Knowledge = Process)	"Organisational Theorists"	"Psychologists"

(Source: Sveiby, 2001)

Table 1 basically shows that the researchers and practitioners in the "Knowledge = Object" column tend to rely on concepts from Information Theory in their understanding of Knowledge. Similarly, the researchers and practitioners in the column "Knowledge = Process" tend to take their concepts from philosophy, psychology or sociology. Because of their different origins, the two tracks use different languages in their dialogues and thus tend to confuse each other when they meet (Sveiby, 2001). The e-specialists (electronic specialists) and the AI-specialists (artificial intelligence specialists), can best be understood in the context of two perspectives of knowledge management - the technology and people centred perspectives. The proponents of *technology-centred perspective* are e-specialists who are largely IT and business process re-engineer enthusiasts with backgrounds in information and computer science, data communications, database and data analysis. They believe that knowledge equals objects that can be encoded, stored, transmitted and processed by IT. They also see IT solutions as the answer to knowledge management problems (Silver and Shakshuki, 2002).

Proponents of people centred perspective are organisational theorists with backgrounds in psychology, human development cognition, organisational behaviour, group dynamics and sociology. Proponents of this perspective believe that knowledge equals process and that the most valued knowledge defies encoding and machine storage and analysis. The development of human intellect, people organisation and management skills are paramount (eg. fostering life-long learning, knowledge creation and an atmosphere of information sharing and trust). The objective of KM is to leverage the transfer of knowledge within the organisation and with its external customers and partners. Consequently,

the people centred perspective views IT solutions as only a small part of an approach to knowledge management within organisations. For this reason organisational theorists have a tendency to shy away from IT based knowledge management solutions, often to their own detriment (Silver and Shakshuki, 2002)

Knowledge Management Processes

The management of knowledge is a continuous process. One form of knowledge is transformed into the other. Knowledge keeps on changing and this necessitates creation of new knowledge. Knowledge management processes as depicted in Table 2 include:

- Combination.
- Externalisation.
- Internalisation.
- Socialisation.

Knowledge management processes, support the conversion of tacit to explicit knowledge and vice versa. Combination is the reconfiguration of explicit knowledge through sorting, adding, combining and categorising processes and spreads it throughout an organisation (Nonaka, 1991). Internalisation is the conversion of explicit knowledge to tacit knowledge. This is when codified knowledge is assimilated and becomes part of one's knowledge base such as in learning. Externalisation is the conversion of tacit knowledge into documented forms such as text, pictures, and audio-visuals. On the other hand, socialisation is the sharing of tacit knowledge across individuals at an individual level and in a group. Examples may include, working on a joint project, and sharing experiences or sharing ideas during informal meetings. Socialisation facilitates trust among members of the organisation which might bring about innovative projects within and beyond the organisational setting (Brint Institute, 1994).

Table 2: Modes of Knowledge Conversion

Tacit Knowledge	Explicit Knowledge
Socialisation	Internalisation
Externalisation	Combination

(Source: Nonaka, 1991 and Brint Institute, 1994)

Mechanisms for Creating, Sharing and Transferring Information and Knowledge

Some of the mechanisms used to create, share and transfer knowledge in organisations include, brainstorming, storytelling, informal discussions, and communities of practice.

(a) Brainstorming

Brainstorming is a method used to generate ideas and refine them, using the composite talent and experience of a group. It is also used as a problem-solving and learning technique involving open discussion. The discussion is facilitated by a moderator and no idea is rejected, no matter how irrelevant it may seem, until it has been evaluated. The participants discuss in an informal and related environment. This forum serves as a fertile soil for creativity, sharing of ideas and building trust among the group. It helps the group to identify and address the problem collectively and come up with a solution that they own. Brainstorming opens a window for lateral thinking (Logical Media Srl, 2006).

(b) Story Telling

Story telling is an ancient art used for conveying messages, promoting values and good morals. Story telling is increasingly becoming an important tool in KM, because people are receptive to stories they are capturing when such stories are surprising and humorous. As documented by Groff and Jones, organisations have realised the potential impact of story telling, and thus use this mechanism to promote change, to promote the capturing of tacit knowledge, transferring knowledge and changing behaviours (Prusak, 2001).

(c) Communities of Practice (CoP)

The term, Communities of Practice, was coined by Lave and Wegner in 1991(cited in Ardichvilli, 2006) who defined it as "an activity system about which participants share understandings concerning what they are doing and what that means in their lives and for their community. Communities of practice, also referred to, as communities of specialists, communities of experts, are self-organised groups of people, who meet informally to build each other's capabilities and exchange knowledge in their area of expertise. The primary objective of CoP is to share knowledge and promote learning in an area of interest (Smith and Mckeen, 2003).

Dickinson (2002) also sees them as a fundamental part of learning and knowledge exchange. Membership is voluntary, therefore, the members are kept connected because of their interest in the subject matter. Meetings can be face-to-face or may employ electronic means of communication. Communities of practice benefit organisations in several ways. They are able to solve problems very quickly. This is made possible by the fact that members have networked, and the membership stretches outside the organisation boundaries. As a result, there is a pool of expertise to tap from for help. They help in driving the organisational strategy.

The culture of knowledge sharing, which exists in communities of practice, helps in sharpening the organisational strategy and making it achievable. In addition, because these groups are ideal forums for sharing information, they also spread best practices and skills across and among organisations. Even though communities of practice are not part of a formal organisational structure, management can show their support by encouraging professional staff to participate and by seeking for advice from them. The inexperienced members of the CoP learn from the experts in the area through social interactions. Virtual CoP does not exist in the corporate environments only, but in any community where people have a common purpose which is essentially the drive to meet (face-to-face or online) learn and share new knowledge. Although the benefits of CoP are well known, some authors have pointed to some factors which may negatively affect one's full participation in the learning and sharing processes within CoPs. Such factors include the unwillingness to ask questions and share insights for fear of revealing one's ignorance, disagreeing with respected experienced members, cultural differences and preferred mode of communication (Wegner and Snyder, 2002; Ardichvilli et al., 2006).

Technologies for Creating, Sharing, and Transferring of Knowledge

There are several technologies that are available for facilitating the creation, transference, and sharing of knowledge. These technologies include but are not limited to:

(a) E-mail

Electronic mail is by far the most commonly used collaborative tool for communication. It offers, for example, students the ability to reach

outside the classroom walls. In addition, it is useful for collaborative and project-based learning activities. E-mail as a means of communications exists several variant forms. For example, listservs are one-to-many mailing lists, topic-oriented discussion groups, where messages are sent to all subscribers. Some listservs are usually moderated, where a person manages, edits, and organises the message before the group receives it, whereas other listservs are not, which means any message may be posted, regardless of the relevance. The quality of the discussion in listservs is determined by the experience and personalities of the participants, and, the moderator's ability to steer the discussion. Examples of specific listservs may include discussions between teachers in curriculum writing; students moderating homework where they collect survey and research information, plan and execute collaborative projects (GigaOmniMedia, 2007).

Other forms of e-mail communication may involve newsgroups that offer site-based one-to-many, or small group, and public interaction. Private newsgroups, accessible only to certain students, also exist. Some newsgroups allow the storage (archiving) of older discussions or threads, viewable at anytime, whereas Internet mailing list messages are sent directly to an individual's mailbox and may be deleted.

(b) Mailing Lists

A mailing list is an electronic discussion forum that anyone can subscribe to. When someone sends an e-mail message to the mailing list, a copy of that message is broadcast to everyone who is subscribed to that mailing list. Mailing lists provide a simple and effective communication mechanism. With potentially thousands of subscribers, there is a common set of etiquette guidelines that you should observe. There are generally two types of lists, (Apache Software Foundation, 1999).

- The "User" lists, where you can send questions and comments about configuration, setup, usage and other "user" types of questions.
- The "Developer" lists, where you can send questions and comments about the actual software source code and general "development" types of questions.

Some questions are appropriate for posting on both the "user" and the "developer" lists.

(c) Newsgroups and Discussion Fora

Newsgroups are user-supported area on the web to exchange information. Newsgroups are also places on the Internet, where people can contribute to a discussion by leaving a message of interest. Newsgroups exist on thousands of topics, and are useful for building online communities and bringing people together with similar interests. There are newsgroups on practically any subject. Some newsgroups are moderated, though most are not. Moderated newsgroups are "owned" by someone who reviews the postings, and can answer questions, delete inappropriate messages, etc. Anyone can post messages to a newsgroup. Newsgroups do not require any kind of membership or joining fees (Taylor, 1996).

Likewise, discussion forums are less similar to newsgroups where people can exchange messages of common interest. A sense of virtual community often develops around fora that have regular users.

(d) Knowledge Web Logs

Web log is a term that was coined by John Barger in 1997. Web log is usually shortened for blog. This is a type of website where entries are made, such as in a journal or diary, displayed in a reverse chronological order. The most recent additions are featured most prominently. A blog entry consists of title, headline of the post, URL, post date and time. The activity of updating a blog is blogging, and someone who keeps a web blog is a blogger. Blogs and klogs allow individuals and groups to keep diary-like postings that can be read, and commented on by other members of the organisation. If not properly managed they can be unmanageable and unorganised. They are a source of innovation as they carry thoughts, insights and share expertise. The *wiki* allow other people other than the author to edit the content of the postings. An example of a well-known wiki, is *www.wikipedia.com* an online encyclopedia (Barger, 1998).

Intranet blogging is a great way for new employees to pick the level of efficiency expected by the organisation. This will save time, instead of having other employees suspend what they are doing to train a new employee. Corporate blogging may be used to stimulate discussion across the organisational levels. K-blogs are organisational learning tools, and also sources of new knowledge. One of the important aspects of blogs is

their ability to provide feedback to the blogger through the comments system built into blogs. Blogging is an effective way for organisations to build relationships among employees and communities of practice (Ward, 2006).

(e) Knowledge Systems

There are various examples of KM systems. For instance, Imagineware from Venture beginnings Inc. – *www.imagineware.com*- is a system that connects people, knowledge and ideas to create innovation. This is achieved through capabilities in the system such as idea management, interaction and collaboration, and intelligent search agents. Imagineware captures ideas, best practices and intellectual capital. On the other hand, the Idea management toolkit gives the users the ability to evaluate ideas and also receive feedback from others. The interaction and collaboration capabilities allow users to post and share best practices; interact on topics of mutual interest; and form virtual innovation teams. Imagineware's KM capabilities include intelligent search agents, the ability to customise knowledge bases and quick access to specific information.

Similarly, Universal Knowledge Processor (UKP) - *www.knowledgeprocessors.com* - is a KM system designed for browsing and retrieval of data in the form of text, image and video. The contents are arranged on the basis of a hierarchical organisation of topics. The system responds to queries by displaying related topics, and automatically discards irrelevant topics. The other KM system is REASON for lessons learned – www.rootcause.com. This system facilitates knowledge sharing throughout the organisation at all levels. The users can set up a search profile and when a lesson is added to the database and matches their search profile, it is automatically broadcasted to the users. Knowledge mining facility enables the organisation to see emerging patterns within the problems encountered. The organisation can take proactive and preventive steps. REASON allows for document searching, and displays an abstract of the report to facilitate screening.

Challenges of Implementing Knowledge Management Systems in Organisations

The challenges of designing and implementing knowledge management systems include (Storey and Quintas, 2001):

- Developing and sustaining an organisational culture that supports and promotes knowledge creation and the ability to innovate;
- The problem of gaining access to the form of knowledge which knowledge workers have and use;
- Winning trust, motivation and commitment;
- Managing workers who are often not conventional employees such as contract workers and consultants;
- Reliance of organisation on knowledge workers who may leave the organisation without the organisation having captured their knowledge capital; and
- Web-based systems and other technology infrastructure used in knowledge management are vulnerable as they can be easily replicated and pirated making them less valuable for strategic purposes (Storey and Quintas, 2001).

Other challenges include but are not limited to:

- Integrating and managing the knowledge and information needed to perform effectively;
- Learning to manage one's-self and formal and informal exchanges and interactions with others;
- Understanding individuals' dispositions including; goals, capabilities, knowledge, strengths and weaknesses;
- Appreciating social, technical and business environments;
- Maintaining continuity and identity over time - sometimes with minimal infrastructure;
- Managing knowledge and information residing in peoples heads without roadmaps, or a filtering function;
- Handling knowledge in different formats such, web sites, personnel files, accounts, order books, customer histories, procurement records;
- Protection of intellectual property, patent processing, and confidentiality protection;
- Dealing with intangible products and auditing intellectual capital that involves establishing its existence, its ownership and its value;
- Costs of research and development to prepare staff in knowledge; and
- Transfer of innovations from one staff to the other (Leonard, 1999).

Knowledge Management Activities, Tools and Challenges

The world over, including Africa, organisations undertake various knowledge management activities either advertently or inadvertently, using variety of tools. They include among others: knowledge creation, knowledge taxonomy or classification, knowledge packaging, knowledge audit, knowledge mapping, research, indexing, publications, communications, software development, knowledge retrieval, etc. Some of these activities are described below:

(a) Knowledge Creation

The process of knowledge creation generates products and services such as software, online databases, publications, websites, minutes of meetings, policy briefs, standards and practices, directories of expertise, intranet, extranets and portals, knowledge centres, domain know-how, etc.

(b) Knowledge Taxonomy

Knowledge taxonomy also known as knowledge organisation refers to the classification of knowledge assets for the purpose of making them easier to find and understand. Knowledge taxonomy can also be perceived as high level information search devices that are constructed to provide the means of knowledge management and discovery, navigation and access to intellectual capital (Herd, 2001). The notion of knowledge taxonomy is not new. Since the written word, man has made attempts to organise intellectual assets to make them accessible. Increasingly now than before, knowledge taxonomies are being applied in customised search engines, and as integral part of web portals to enhance resource discovery. Moreover, knowledge taxonomies are also important in:

- Facilitating the sharing of common language of classifying knowledge;
- Facilitating search and knowledge retrieval especially controlled vocabularies in search engines, web content managers and online databases;
- Improving internal communication as standards are understood in a similar way by all,
- Enhancing intelligence gathering;

- Thesaurus use especially by publishers whom it helps to improve retrieval of their publications on the web;
- Organising web portals to enhance management and retrieval of information;
- Networked environments for effective access to information; and
- Making knowledge manageable, accessible and retrievable.

Despite the importance of knowledge taxonomies, they present problems to organisations with regard to:

- Their integration into organisational technology and information policies;
- Cost of building them (taxonomies);
- Their technical documentation; and
- Knowledge management and its access within the divisions of agencies.

(c) Knowledge Packaging

Knowledge packaging refers to the process of putting knowledge in the format necessary for transmission and usage. Similarly, it can be taken to mean methods, tools and techniques for formalising experience and know-how, and making it available in the form of products and services (Ardimato et al., 2006). Knowledge packaging involves creating products or services, converting them into useable formats, as well as commercialising them. Such packaging process starts with intelligence, which is largely uncodified (implicit) knowledge. This is followed by its codification (making it explicit) which may including developing processes, creating documents, making drawings, databases, websites, publications, etc. Once the process of codification is over, the resultant products or services are diffused. Both explicit and implicit knowledge can be packaged.

There are various formats or products in which knowledge can be packaged. Srinivas (2007) identifies them to include among others: abstracts, alerts, announcements, policy briefs, bibliographies, indexes, catalogues, best practices, brochures, books, bulletins, charts, databases, diaries, blogs, commentaries, annotations, journals, metadata (i.e. hyperlinks), models, pamphlets, posters, slides, standards and practices,

directories of expertise, intranets and portals, knowledge centres, domain know-how, extranets, expert systems and customer profiles. The purpose of packaging knowledge is to facilitate its communication, enhance its understandability, commercialisation and use.

Selecting appropriate information packaging format depends on a number of factors that include but are not limited to:

- Problem or issue being addressed;
- The decision-making process;
- The information user/stakeholder-type as well as number of users;
- The level/scale at which the activities are taking place;
- The intended effect of providing the information; and
- The medium through which information is delivered.

(d) Knowledge Audit

Knowledge audit is a systematic examination and evaluation of the explicit and tacit resources of an organisation (Hylton, 2003). Knowledge audit is a bit of a misnomer because since traditional audit is to check performance against a standard, as in financial auditing. This process involves a comprehensive investigation of the entire knowledge within the organisation. It is diagnostic in nature. Knowledge audit gives a clear indication of how well organisational knowledge is being exploited in business activities and in alignment with the goals and mission of the organisation. It answers questions such as what knowledge exists and where it is, where and how is it created and who owns such knowledge, knowledge assets the organisation has and where they are.

A knowledge audit should be undertaken before an organisation embarks on knowledge management activities. K-Audit is people-centered because all employees in an organisation carry useful or important knowledge, skills and experiences about the organisation they work for. The benefits of knowledge audit include: identification of knowledge gaps; what knowledge is needed to support overall goals; individual and team activities; provision of a map of communication flow; and revelation of good practice; barriers and blockages.

An audit enables one to determine a strategy for developing KM initiatives and projects based on:

- An assessment and prioritisation of the requirements of the intended users;
- The expectations and objectives of stakeholders;
- A clearly defined statement of the value and potential benefits for investing in KM;
- An assessment of the resources and services currently provided and available elsewhere; and
- The identification of gaps between resources/service available and requirements

Some of the activities to consider when undertaking a knowledge assessment of an organisation include but are not limited to.

- Documenting the organisational units, their functions and how each individual unit supports other organisational entities;
- Identifying the existing reporting structures as they play an important in the sharing of knowledge in the organisation;
- Documenting the existing technological infrastructure and software such as communication infrastructure, local area network, wide area network, intranet, e-mail, website, productivity software, databases, servers, content/document management system, etc;
- Documenting mechanisms in place which facilitate knowledge creating, capturing and sharing;
- Documenting knowledge problems as seen by top, middle and line managers. These problems may help in formulating projects; and
- Assessing the security in place and regulatory measures in place to protect the organisational assets, documents and personnel.

(e) Knowledge Mapping

A knowledge map is a virtual representation of an organisation's knowledge. It can be seen as a navigation aid to codified information and tacit knowledge, showing the importance and the relationships between knowledge stores. Knowledge mapping encourages the re-use and prevent re-invention of information. A knowledge map helps in identifying knowledge sources, expertise and ways of creating bridges to increase knowledge sharing. As a result, it reduces the burden on the experts and supervisors by helping staff to find information on their own (Kang, Park and Kim, 2003).

Knowledge mapping helps in understanding the flow, and what blocks or enables the flow. To map where real knowledge resides and its value it is necessary to understand how it is built, maintained and used. Knowledge maps make corporate assets visible to all the members of the organisation through access to the organisational intranet. This makes the retrieval of reference information easy, because the location of needed expertise is known.

Knowledge Organisation and Communication Tools

There are several tools available that can be deployed to enhance knowledge organisation, both in print and on the web. For example, OCLC libraries are using Cooperative Online Resource Cataloguing (CORC) software to catalogue websites, which become part of WorldCat Database. Likewise, the Cooperative Digital Reference Service is a 24 x 7 worldwide information service of the Library of Congress in partnership with over 100 libraries. This system is used for answering digital reference questions (Gnoli, n.d.).

The Library of Congress Network Development and Standards Office have made attempts to create mappings of traditional retrieval systems. For example, Dublin Core's 15 elements have been mapped to MARC and vice versa. This mapping makes it easy to share metadata across many types of records. Similarly, MARC has been mapped to XML, in order to translate it into latest web mark up language. Customised search engines using taxonomies are the foundation for enterprise information portals used in businesses today (Library of Congress, 1998).

Increasingly, traditional cataloguing tools are being made web compliant to enhance use of common interface and standards when cataloguing. Examples of tools that have been made web compliant include:

- Medical Subject Headings (MeSH),
- Web Dewey,
- LC Classification web software.

Challenges of Knowledge Management in Africa

Knowledge management is largely predicated upon the use of ICTs. However, Africa suffers from severe effects of digital divide. The digital divide as defined elsewhere in this book is the inequitable access to ICTs

such as PCs, Internet, and telephones by individuals or groups of people in a country or between countries. An experience worth sharing was the author's involvement in consultative forum aimed at promulgating a National ICT Policy for Botswana, which revealed that people in the far flung areas of the country away from urban centres prioritised on quality radio reception, electricity and newspapers in local languages rather than access to information technologies.

Africa has a rich reservoir of knowledge reflected in the forms traditional medical technology, community theatre, cultural practices, art, goods and services, songs, dance, theatre and cultural artifacts. However, the management of Africa's knowledge resource remains poor. For example, the means to adequately access locally generated knowledge is lacking, and knowledge is not adequately shared despite the communal nature of the populations. Because of the lack of access to adequate local knowledge, African multimedia is for example is overshadowed by Western forms of knowledge (Soltane, 2002).

Radio is an important ICT tool that could be used effectively to manage and disseminate local knowledge especially among the rural masses of Africa. However, most African radio stations were inherited from colonial governments and have not undergone dramatic changes to cater for the needs of the local communities. By and large, radio is still not accessible to most remote parts of some African countries. In most African countries large component of radio content tends to be dominated by foreign programmes. This problem is exacerbated by the fact that most African countries do not yet have policies geared at promoting community radios and by and large mass media is controlled by the state. Additionally, in countries where radio ownership is reasonably significant, broadcasting in indigenous languages is largely still not the norm and there is limited local content (Jensen, 1999).

Management of African knowledge is negatively affected by the use of English as the lingua franca of scholarship and science. For example in schools, colleges and universities, the language of delivery is largely English and local languages are hardly used. Similarly, the curriculum used in universities and schools has a large component of foreign content which is in English language (Sahelian Languages 1999). Similarly, within the African continent, technology is evolving without its integration in the local cultural practices. For example, ICTs have not been engineered for the continent's poor infrastructure such as inadequate and inefficient

electricity supply. Similarly, applications programmes are based on western models, types of problems and types of solutions and these do not always fit in with problems, cultural realities and sensibilities of Africa. Woherem (1993) observed that much of the technology in Africa was transplanted without provision for reengineering to suit local conditions.

The inefficient management of Africa's knowledge is also reflected in its poor manufacturing and publishing industries. This makes countries in the continent to rely on imports to satisfy the ICTs needs. Likewise, Africa faces the problem of undeveloped book infrastructure exacerbated by the fact that though the Internet has increasingly become a source of information, it is not widely available in schools, libraries or homes (Sopova, 2003). Moreover, Africa suffers from severe brain drain of high-calibre skills in search of a decent life overseas, especially in Australia, Britain, Canada, New Zealand and the United States. This loss of specialist skills creates shortfalls of critical expertise that could be relied upon to develop knowledge systems for the continent. The problem of illiteracy hampers effective management of knowledge.

The African states have also largely ignored putting in place sound policies that could enhance the generation and use of knowledge that is generated locally. Sopova (2003) points out that in a number of African countries, no cultural policies have been formulated and specific cultural characteristics are not sufficiently taken into account when developing national strategies. Consequently, traditional ways of life, knowledge and know-how is disappearing with the onslaught of foreign cultural models. Africa's local content, especially the indigenous knowledge has for a long time been exploited by the developed world more so in the area of environment and biodiversity at the expense of local people. Often such content found its way in Western databases, museums, networks, etc, which most people in Africa have no easy access to because of technological constraints.

Now than ever before, locally generated knowledge in Africa is increasingly being managed through e-government. The design and implementation of e-government is predicated upon efficient knowledge management systems that acquire, create, disseminate, integrate, maintain and exploit knowledge in an organisation for the benefit of employees and clients. Wimmer (2002) points out that e-government, through informatisation, supports current human–executed information

processes such as decision making, communication and decision implementation. Moreover, e-government provides an environment where knowledge is created, shared, learnt, enhanced, organised and utilised for the benefit of the organisation and its customers. Governance work involves information and knowledge products especially with respect to policies, management, regulation and monitoring of society, market and the environment. The advent of e-government has made the management of knowledge an important preoccupation in the public sector for the purpose of achieving transparency and accountability in the management of national resources. E-governments generally generate content of immediate local relevance and preserve national history or heritage and traditional knowledge.

The ability to read among the population is a basic prerequisite for any social progress and in its absence the society experiences limited self-determination, limited communication and limited community participation whether in politics, civil or development activities. Education is also an indispensable asset in any effort to attain ideals of peace, freedom and social justice (Delors, 1996). However, in Africa education and research remain poor in comparison to western standards. There is need for access to information resources to support all levels of learning activities in schools, universities or research centres. Even basic learning skills such as literacy, oral expression, numeracy, and problem solving require information resources to be actualized (UNESCO, 1995). In Africa, universities have a bigger role to play as engines of development because they are often among the few institutions with the resources, skills, logistics, organisation and network to undertake quality training. They are also the only singularly endowed institutions with the capacity to conduct advanced research to support the community and also assess issues of national interest such as health and education. However, most African universities lack resources such as reading materials, efficient internet access, well equipped laboratories, etc.

For most countries of Africa, library and information services are presently inefficient and largely ill-managed to service the information needs of the people. By and large, libraries have remained peripheral in the educational, scientific, social and political life of the people (Rosenberg, 1994; 1997). This is exacerbated by the fact that the economic situation in Africa is such that many libraries have not had the resources to purchase any books for the past two decades (UNESCO, 1995). This has

had very negative and damaging effect on training and research capacities and has also seriously limited the possibilities for good policy analysis and planning. A study, by Rosenberg (1997) observed that since mid 1980s, the relative value of local university libraries in Africa has declined to a near total collapse. This decline is characterised by low number of monographs per student, poor journal subscription and limited access to electronic information. This situation has led to the marginalisation of libraries from the teaching, learning and research process in the university.

Other challenges that affect effective knowledge management in Africa include: intellectual challenge to manage tacit knowledge; cultural challenge to develop an environment of sharing and creating knowledge; managing central knowledge repositories for the parent organisation; lack of well-equipped education environment for technological know-how to work effectively, inadequate networks to collaborate effectively between librarians and IT experts; lack of mechanism for knowledge editing, refining and re-packaging in ways to make it accessible cost effectively and timeously; problems of digitising library resources for easy access; problems of managing of knowledge as an asset; problems of updating available knowledge regularly, etc.

Africa has potentially lost ground in the area of managing its knowledge resources by paying attention to skills development in the area of knowledge creation, organisation and mechanisms of retrieval. Increasingly, various infrastructure in the forms of Internet connectivity, e-government and digital libraries are increasingly being implemented. These can be harnessed for knowledge management. Governments must continuously be lobbied to put in place enabling cultural policies that address knowledge management issues and avail adequate resources for the same. In the absence of effective management of its knowledge resources, Africa is unlikely to bridge the digital divide in order to catch up with the developed world.

Conclusion

Increasingly, organisations and individuals are all faced with the need to constantly re-invent themselves to adapt to their environments. The growing interest of knowledge management in both private and public sector organisations is motivated by the increased competition between organisations (private vs. private, government vs. private, etc), and the development and use of ICT, for enhanced profitability and productivity,

efficiency and timeliness in service delivery. Ever than before, those participating in knowledge industries or performing knowledge-related work are required to leverage the accumulated knowledge and wisdom of their organisations, in order to enhance competitive advantage. Without harnessing organisational data, information and intellectual capital in the information age, organisations will find it difficult to take advantage of these vital resources to compete and survive in the global environment. Africa than any other continent in the world faces major challenges that must be addressed by government, academia, civil society, business and industry and other stakeholders, in order to bring order and sanity in the management of information and knowledge resources.

Review Questions

1. Define a knowledge map and state its importance in knowledge sharing.
2. Explain the meaning of knowledge audit and state the benefits of undertaking a knowledge audit.
3. Describe how you would go about knowledge audit for an organisation of your choice.
4. What is the role of best practices and how can best practices, make positive contributions in the attainment of organisational goals?

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Chapter 13

Indigenous Knowledge Systems in Africa

Priti Jain

Introduction

Indigenous knowledge has long been misinterpreted or frowned upon in Africa. It is only recently that it has begun to gain attention. Highlighting the importance of indigenous knowledge, this chapter defines indigenous knowledge (IK) and indigenous knowledge system (IKS), explores the types of IK, benefits of IK, current initiatives of development agencies to enhance the creation, documentation and dissemination of IK. The chapter also discusses intellectual property issues related to IK, concludes with a review of major challenges of IKS.

Definitions of IK and IKS

IK has been defined in various ways: cultural knowledge, environmental knowledge, community knowledge, local knowledge, traditional knowledge, farmer's or pastoralist's knowledge, folk knowledge, traditional wisdom, traditional science, people's knowledge and also as a sub-set of traditional knowledge. According to UNESCO, MOST and - Nuffic -CIRAN (2001-2002), IK is "the local knowledge that is unique to a given culture or society. It is the basis for local-level decision-making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities in rural communities". According to (Flavier et al., 1995), indigenous knowledge is (...) the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems. Grenier (1998) defines IK as "the unique, traditional, local knowledge existing within and developed around specific conditions of women and men indigenous to a particular

geographic area". According to the World Bank Indigenous Knowledge Program (n.d.), IK refers to "the large body of knowledge and skills that has been developed outside the formal educational system. IK is embedded in culture and is unique to a given location or society". IK is an important part of the lives of the poor. It is the basis for decision-making of communities in food security, human and animal health, education and natural resource management".

IK is knowledge, which is culture specific, dynamic, constantly evolving and instigating from age-old beliefs, traditions, experiences and observations, indigenous to a specific area, non-formal, orally transmitted and usually not documented, adaptive, and basis of survival in decision making for many people. Some of the examples of IK are: horn (short horn & long horn), *imbati* (stinging nettle- wild vegetables used by members of the Ezigeni community), *lututelo,shisiliba*, drum, fire/smoke, whistling for communication and information; wailing for medicine; *mukombero* for fermenting and preserving porridge (in Western Kenya), *Isukuti* (bullfight in Africa in the Western part of Kenya. This comes with Luhya Chants), *omusala* (a tree and also medicine) *umremebe, Shilili or Litungu* for entertainment, narratives around bonfire in the evening for education (from the Luhyia community of Kenya).

Indigenous knowledge systems (IKS) are "the complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular geographic area" (National Research Foundation, n.d.). IKS are also defined as "specific systems of knowledge and practice, developed and accumulated over generations within a particular cultural group and region, and as such are unique to that group and region" (USNC/UHPS, 2001). From the above definitions the main attributes of IKS are; (i) indigenous knowledge, (ii) technology, (iii) a particular cultural group practising and developing IK, and (iv) generations long experience. In the simplest form, IKS can be defined as knowledge systems, that are composed of informal knowledge and technologies and which are practised, accumulated and evolved over generations within a specific region to epitomise the locality with that specific knowledge. IKS are the representation of the relations between indigenous peoples and their surroundings.

The sources of indigenous knowledge systems are; indigenous people, technology, community environment, community gate keepers,

databases, websites and people who manage and codify IK. IKS are the maps of how indigenous people manipulate the indigenous knowledge which have built up, grown, experienced and practised for generations. IKS are especially important for the poor, as they are dependent on them for their day to day needs in terms of food security, health, education, and natural resource management. Some of the examples of IKS are: traditional indigenous knowledge systems for environmental management; *Kgotla*, health systems and ecological systems.

Thus, IK refers to the content part of indigenous knowledge and IKS mean the whole infrastructure required to collect, generate, archive, maintain and disseminate indigenous knowledge including human, technology, information, financial and physical resources.

IKS and Global Interest

Due to the highly acknowledged fact that knowledge is indispensable for social, economical, and technological development, the importance of IK in sustainable development is being recognised. Since each community around the world has some sort of indigenous knowledge, IK has won global attention. Although the Western knowledge system still dominates the world, today even the scientists and professionals are acknowledging that the concept of sustainable development can never be fully appreciated without integrating IK in the development process. The main reasons of IKS attracting global interest are:

- anthropologists abiding interest in people's knowledge systems
- complimentary relationship between IK and biodiversity
- participatory role of IK in decision making for sustainable development
- growing recognition of the importance of IK in peoples' daily lives
- growing awareness of the need to empower the poor in community with locally available knowledge
- Increasing realisation of the IKS' commercial value of IK
- IK often provides cost-effective solutions to the problems faced by local and rural communities.

Anthropologists abiding interest: Anthropologists are showing their continuing interest in people's knowledge systems, which in turn draws the attention of development policymakers and practitioners. Indigenous

knowledge has increased in importance along with the growing focus on popular participation and planning-from-below. Anthropology has a wealth of experience and much to offer the indigenous knowledge movement (ASA Conference, 2000).

Complimentary relationship between IK and biodiversity: Increasingly, global commitment towards the conservation of biodiversity is being expressed in various forums. The Convention on Biological Diversity in 1992 recognised indigenous knowledge and biodiversity as complementary to each other and essential to human development. The convention raised concerns over the crisis in the conservation of biodiversity and the uncertain status of the indigenous knowledge. Several prominent scientists were quoted noting the accelerating rates of loss of floral and faunal species and negative impacts of this loss of germplasm on humankind. The convention emphasised the preservation of traditional indigenous knowledge for the importance of the preservation of biodiversity and its sustainable use (Warren, 1992).

December 1993 was proclaimed "the year of the World's Indigenous People" to strengthen international cooperation for solving the problems of indigenous people (United Nations General Assembly, 1993a). At its forty-eighth session, in 1993, United Nations General Assembly had proclaimed the period 1995-2004 as the "International Decade of the World's Indigenous People" under resolution 48/163 (United Nations General Assembly, 1993b). In 2004, an international conference entitled "indigenous knowledge and bioprospecting" areas was held at Macquarie University, Sydney Australia marking the end of the International Decade, which focused on three key Indigenous Knowledge and Bioprospecting: i. respond to indigenous needs, ii. value indigenous knowledge, and, iii. enhance bio-cultural diversity (Indigenous Knowledge and Bioprospecting, 2004). Indigenous people have close relationship with natural resources for their subsistence and spiritual needs, hence, they play a central role in the earth's natural resources and biodiversity.

Participatory role of IK: Today, international and national development agencies have recognised the value of participatory approaches to decision-making for sustainable development. Indigenous knowledge provides the basis for grassroots decision-making, since problems are identified and solved at the indigenous community level (Warren (1992).

Empowering the poor: Increasingly, the need to empower the poor in communities is being recognised. The rural poor are indigenous peoples, who represent one-third of the 900 million extremely poor rural people in the world. Established in 1977, the International Fund for Agricultural Development (IFAD) is fully dedicated to eradicate rural poverty in developing countries (IFAD, 2003). Many indigenous peoples do not have the legal right to live on the lands they depend on for survival or to use the resources they have managed for a long time. Increasingly, these valuable resources are exploited by outsiders, with few benefits to the indigenous people. This way they are displaced from their traditional lands. IFAD is working towards it and tackles poverty as an advocate for rural poor people. The poor need to take advantage of development opportunities. The Management of Social Transformations Programme (MOST) database of best practices on indigenous knowledge also working on poverty alleviation and improved quality of life of poor people by providing creative, successful and sustainable solutions to social problems.

Commercial value of IK: Because of its wide range of commercial and scientific uses, IK is now being progressively more highly esteemed by the global community. According to the recommendation of the UNESCO-ICSU World Conference on Science held in Budapest, Hungary in June-July 1999, IK deserves a respect along scientific knowledge. In 2004, the Centre for Indigenous Knowledge and Biodiversity organised an international conference on indigenous knowledge and bioprospecting in Macquarie University, Sydney Australia and noted that approximately 25% of the world's pharmaceutical products are based on the knowledge of the indigenous communities (Macquarie University, 2005)

IK provides cost-effective solution: Due to growing recognition of the importance of IK to make peoples' living, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), Food and Agriculture Organisation (FAO) and International Fund for Agricultural Development (IFAD) are interested in indigenous knowledge. They began to appreciate its practical relevance as means to earn living among the majority of indigenous communities, who have generated and managed their natural resources to survive through generations. Today a growing number of African governments and international development agencies are recognising that indigenous

knowledge and systems provide the foundation for cost-effective and sustainable approaches to development.

Food and Agriculture Organisation (FAO) has developed a "Strategic Extension Campaign" (SEC) methodology, which has been introduced in Africa, the Near East Asia and Latin America. This programme has a system approach starting with a farmer's Knowledge, Attitude and Practice (KAP) survey. It encourages all the beneficiaries, for example small farmers to participate in strategic planning, systematic management and field implementation of agricultural extension and training programmes. SEC's extension strategies are based on the identification of a participatory problem due to inappropriate practice of a recommended agricultural technology. The SEC technology transfer and application is needs-based, demand-driven, and has a problem-solving approach. SEC employs a cost-effective multi-media approach, whereby cost-effective combination of mass, personal and group communication channels and the materials are used, which reduces the extension cost and effort and increases its effectiveness (Adhikarya, 1996). Management of Social Transformations Programme (MOST) has established a database of best practices with indigenous knowledge, which contains several best practices and examples of successful projects that demonstrate how indigenous knowledge is used to develop cost-effective and sustainable survival strategies (MOST Clearing House Best Practices, 1994-2003).

According to the Institute of Science in Society (ISIS), "The price to Africans for a month's supply of pills made from the Sutherlandia bush is £2.50, and the powder form of the dried leaves, which is thought to be more effective because of its bitter taste, costs less than 60p for two month's supply" (ISIS, 2004). By working with IK people, many cost-effective solutions can be found for many problems. All the traditional medicines are affordable by the majority of people in comparison to highly paid medical practitioners.

Benefits of IK

Thus, IK has several benefits, the major benefits can be summarised as below:

- Using IK in research gives such research legitimacy and credibility from researchers and builds local capacity and empowerment;

- Indigenous people can provide valuable input in the local environment for the efficient use and management of local resources;
- IK is readily available at little or no cost;
- Through IK, African cultures are getting known better to the global society;
- In the endeavour to manage IK some of the lost African traditions and information are being discovered;
- IK is vital for ecologically sensitive socio-economic activities;
- IK can contribute to sustainable local and national development;
- IK contributes to economic development; this is evidenced by the explosion of herbal products onto the global market.

Types of IK

Knowledge can be interpreted in many ways depending on the context in which it is used. A common definition of knowledge, is the awareness and understanding of facts, truths or information gained in the form of experience or learning. "There are two kinds of knowledge. One is explicit knowledge, which can be expressed in words and numbers and shared in the form of data, scientific formulae, product specifications, manuals, universal principles, and so forth. Tacit, on the other hand is something not easily visible and expressible"(Edvinsson and Malone, 1997). In short, knowledge can be categorised into two: tacit and explicit.

Tacit knowledge originated from Michael Polanyi's book *The Tacit Dimension*, he believed that "we can know more than we can tell" and defined knowledge as "non-verbalisable, intuitive, and unarticulated" (Polanyi, 1966). So, tacit knowledge refers to the knowledge, which is hard to put into words, expressed through action based skills and not rules based. *Explicit knowledge* on the other hand, can be "expressed in formal and systematic language and can be shared in the form of data, scientific formulae, specifications, manuals, and so forth" (Nonaka and Takeuchi, 1995). So, explicit knowledge refers to knowledge, which is formally and systematically expressible, easily communicable, and can be rule-based or object-based.

IK is predominantly tacit knowledge, which is passed from generation to generation, usually exchanged through personal

communication (story telling is the most common way of transmitting IK), cultural rituals and demonstration. It is described as tacit knowledge, as it is stored in peoples' memories and activities and it is expressed in the form of stones, and other cultural songs, folklore, proverbs, dances myths, cultural values, beliefs, rituals, community laws, local language and taxonomy, agricultural practices, equipment, materials, plant species, and animal breeds, which is shared and communicated orally (Charyulu, n.d.). IK becomes explicit only, when it is translated or documented in any format.

Major Areas of Application of IKS

Major areas of application of IK by indigenous communities are: agriculture, ecosystems, medicine, conflict resolution, and traditional attire.

Agriculture

IK facilitates agriculture, horticulture and forestry. Indigenous knowledge can determine favourable times and how to prepare, plant and harvest gardens and farms, ways to propagate plants, seed storage and processing, and crop planting. They can also suggest techniques of pest management and plant protection. For example, the fact that burnt cow dung and *Mbonovono* seeds can be used for preserving legumes, and that manure can be used as fertiliser with long residue content.

Ecosystem

Indigenous people have knowledge of the ecosystems where they live and know how to use natural resources sustain ably. They use their IK for natural health, sustainable agriculture, and sustainable resource management (Gough, n.d). In some African regions, knowledge of the local ecosystem is used as means for survival. The ecosystem of many indigenous African societies reflect in the following traditional management practices including individual and community wisdom and skills (Lalonde, n.d.).

1. Indigenous soil taxonomies
2. Indigenous knowledge of potential uses of local plants and forest products, and animal behaviour, and acquired hunting skills.

3. Local knowledge of important tree species for agroforestry, firewood, integrated pest management, the control of soil erosion and soil fertility, and fodder management.
4. Indigenous agronomic practices such as terracing, contour bunding, fallowing, organic fertiliser application, crop-rotation and multi-cropping.
5. Indigenous soil and water conservation and anti-desertification practices.

Medicine

According to the World Health Organisation (WHO, 2002-2005), traditional medicine (TM) serves the health needs of almost 80% of people in developing countries, as other medical facilities are expensive and beyond affordability for the common person. To maintain natural health, IK provides traditional medicines and medical practices. Among the most popular African Traditional medical practices are: hydrotherapy, heat therapy, spinal manipulation, quarantine, bone-setting and surgery. Others include: *muarubaini* (the name of a tree found in East Africa and in many parts of Africa known to cure about *arubaini* (40) different ailments); *Umusikhu* for malaria treatment; aloe vera for applying on bites; *libokho* for massaging swollen limbs; *Lugoshe* as first aid to stop bleeding; *Shitutil lusiola* (is a type of wood/tree commonly found in Western Kenya. It is a hard wood that is used as fire wood, timber, etc), *indalandalaa/ musutsu/shikhuma* for ear/nose/mouth; *Libokowi* and *Dodo* (types of vegetable are commonly found in Western Kenya); *Lusutsa, Tsisaka and Indelema* as rich sources of calcium are commonly found among the Luhyia of Western Kenya; *Shikhome* (tail) for marriage faithfulness medicine.

In South Africa, the San community has identified that *Hoodia Cactus* helps them to keep away hunger and thirst when going on long hunting trips, that Hoodia sap can be used to treat eye infections, that the brew of boiled Hoodia pieces can be used to treat severe stomach pain, and that extracts from the Hoodia plant can be used to reduce caloric intake. In 2003, there was a benefit-sharing agreement between the Council for Scientific and Industrial Research (CSIR) and the South African San Council that will benefit the custodians of traditional knowledge relating to the Hoodia plant. Consequently, the San community shares a total of

14% benefit from two different funds; the CSIR pays the San 8% of all the payments it receives from its licensees and UK-based Phytopharm plc pays 6% of all royalties that the CSIR receives once the drug is commercially available. So, Hoodia Cactus is generating money for the country (CSIR, 2003).

Also, in South Africa, a sangoma or an inyanga refers to a person who practises traditional (herbal) medicine or has supernatural healing powers among Southern African communities. The herbal medicine that Sangomas produce is referred to as muthi. Sangomas are believed to perform healing, embedded in the beliefs of diverse cultures in Southern Africa, that ancestors in the after life guide and protect the living (Isilow, 2007). They perform a holistic and symbolic form of healing, embedded in the beliefs of their culture that ancestors guide and protect the living.

Sangomas play various roles in the community: divination, healing, directing rituals, finding lost cattle, protecting warriors, counteracting witches, and narrating the history, cosmology and myths of their tradition. They are believed to be connected to ancestral spirits and hence, directly linked with the universe and open to all channels of communication. As healers they use a variety of roots, bark, herbs, flowers, and a wide range of plant and animal products in making medicine known as muti. The Sangomas have always been a crucial part of tribal life. They are highly respected, especially if illness is thought to be caused by witchcraft, pollution, or by the ancestors themselves. Sangomas perform their rituals in a sacred healing hut or *Ndumba*. They are guided by the ancestors in three ways: possession by an ancestor or channelling; throwing bones; and interpreting dreams (Wikipedia, the free encyclopaedia, 2006).

Conflict Resolution

Traditional conflict resolution mechanisms in Africa are generally closely bound with socio-political and economic realities of the lifestyles of the communities. These mechanisms are rooted in the culture and history of the African people, and are in one way or another unique to each community. The customary courts rely on goodwill of the society to adhere to its ruling (Edossa et al., 2005). For instance, indigenous system of conflict resolution in Oromia, Ethiopia known as "Gadaa system" is well-cited among indigenous knowledge systems. In the drylands of Ethiopia, where intra- and inter-ethnic conflicts are common over the

use of natural resources, *Gadaa* system of conflict resolution is well respected by the Oromo society in the country. If this indigenous knowledge can be harnessed, it can be used to achieve sustainable peace among communities and hence, development.

In Nigeria the use of the kolanut (*Cola accuminata*) and the fresh palm frond (called locally omu) was key instruments of peace negotiation and conflict resolution in Igbo society. Once one community gives these to another, the receiving community is under an obligation to accept them and also return a similar gift. In a war situation, the kolanuts are shared among the elders while the palm frond will be conspicuously displayed at the boundary of the warring communities. The elderly men of Ntighauzor Amairi (NA) presented the traditional gift of kolanuts and one fresh palm frond to Abala, and Abala promptly sent their own gift to NA. On the same day, the two palm fronds were put on display and all arms were laid down and their communal conflicts resolved (Chimaraoke, 2002).

Traditional Attire

Traditional attire plays an important role in the identification of a particular culture, tribe and country and sustains indigenous culture. In Nigerian presidential politics, khaki signified military rule, while *agbada* denotes civilian rule. In the quest of an uncompromising nationalist identity Luanda people rejected the style of their immediate colonisers, the Portuguese. Instead, they combined Western and African dress practices as a hallmark of their chosen cosmopolitan identity, one that was removed both from the traditions of their parents and the imperialism of their colonisers (Kimani, 2004).

Global Initiatives on IK

The Centre for International Research and Advisory Networks (CIRAN) was a focal point of the global network of indigenous knowledge centres until 2004. It was responsible for maintaining the web, produced the Indigenous Knowledge and Development Monitor (IKDM) to serve everyone around the world thrice a year and provided an overview of various IK activities and its use for sustainable development. In co-operation with UNESCO's Management of Social Transformations (MOST) Programme, CIRAN also established a database in 1999 of "best

practices on indigenous knowledge", containing examples and cases illustrating the good use of IK in developing cost-effective and sustainable strategies for poverty alleviation and income generation (MOST Clearing House Best Practices, 1994-2003).

Local and Indigenous Knowledge Systems in a Global Society (LINKS) was launched in 2002 to bring together all the programme sectors of UNESCO. It is a collaborative effort on local and indigenous knowledge. LINKS' main goals are granting local communities power over cultural and social change, renewing traditional knowledge transmission within local communities by reinforcing relationships between older and younger generations, and ascertaining the laws that govern IK access and control (Kabudi, n.d.).

International Institute for Sustainable Development (IISD) instigated a project entitled, "Indigenous Knowledge and Innovation (Global) and Generating Incentives for Natural Resource Management". This project aimed to integrate natural resources in sustainable development, to generate monetary and non-monetary incentives and to create a knowledge network among innovators, scholars, policy makers and other interested parties who may add value to local innovations. The lead organisation in the project is the Society for Research and Initiatives for Sustainable Technologies & Institutions (SRISTI) (IISD, 2006).

In 2005, indigenous communities from 44 countries gathered at the Community Commons, held at Fordham University in New York City, and made a proclamation, "We are calling upon the United Nations, its member states, multilateral organisations and other stakeholders to adopt the principle of the implementation of all MDGs and to empower local and indigenous communities to take control of their own development processes to ensure sustainability". This was followed by five recommendations to fulfil this vow (Community Declaration, 2005).

Many global initiatives on IK have been initiated, some of which are:

- World Bank is supporting over two dozen projects on IK.
- Ethiopia Women's Development Initiatives Project (WDIP) is an income generated project to support Self Employed Women's Association (SEWA) in India (SEWA, n.d.).
- Ethiopia Information Communications Technology for Development (ICTAD) plans to have IK-related activities in the

health and agricultural sectors and to assist the government of Ethiopia to develop standards for computer based scripts for some major Ethiopian languages, thereby facilitating the dissemination and sharing of local knowledge (Adam, 1999).

- The Guinea Multi-Country AIDS Program (MAP). This project seeks to organise and train traditional healers on HIV/AIDS practices. The IK programme sponsored a consultant to help integrate IK into the MAP (The World Bank Group, 2007).
- The Malawi Social Action Fund (MASAF) is to empower indigenous communities and support education and communication by building on traditional means of communication (Chibwana and Mohan, 2001).
- Northern Uganda Social Action Fund (NUSAF) aims to utilise the skills and knowledge of communities, elders or traditional leaders to prevent or manage conflict, to reconcile during post-conflicts and heal disrupted societies and plans to produce a resource kit to guide development workers on how to integrate IK into NUSAF (NUSAF, 2002).
- Agricultural Research and Training Project (ARTP) of the World Bank in Ethiopia focuses on farmer's needs and priorities. It aims to: expand the network of research centres to cover the poorest marginal agro-ecological zones; improve agricultural research and its response to the needs and priorities of smallholder farmers by establishing and strengthening research-extension-farmer linkages and support establishment of an agricultural research fund (IFAD, 2007).
- Multi-Sectoral AIDS Project in Burundi, encourages access to and use of appropriate IK practices that have been shown to work in the fight against HIV/AIDS. This will expand the capacity of extended families and local communities to cope with HIV/AIDS and thus support people infected with HIV/AIDS (Gilmore, 2004).
- The Conservation and Sustainable Use of Medicinal Plants Project in Ethiopia, was initiated to support the conservation, management and sustainable utilisation of medicinal plants for human and livestock healthcare. Ethno-medical surveys would explore the utilisation of medicinal plants and traditional healthcare practices for the prevention of HIV/AIDS and the mitigation of the adverse

impact of the disease (Ethiopia - Conservation and Sustainable Use of Medicinal Plants Project, 2001).

African Initiatives on IK

A number of African initiatives are in place on IK, some of which are as below:

- The North West University in South Africa established IKS learning, research and community programmes in 2001 at both undergraduate and postgraduate levels in the Faculty of Human and Social Sciences. The rationale of these programmes is to develop students' abilities to work both critically and cooperatively in the promotion of IK and to sensitise them to the realities of IKS. The teaching curriculum and research activities are based on a multi-disciplinary, historical and comparative approach. One other main objective of the programmes is to instil competencies among graduates and postgraduates to establish IK networks within and outside South Africa (Indigenous Learning Company, 2007). Furthermore, the South African National Research Foundation (NRF) is sponsoring 253 IKS projects at a cost of R30 million (NRF, n.d.).
- The National Research Foundation (NRF) of South Africa publishes an IKS Newsletter to: develop theoretical and methodological paradigms to understand IKS, shed light on the role of IK in nation-building,, and develop research capacity in IK in South Africa (NRF, n.d.).
- The Indigenous Peoples of Africa Coordinating Committee (IPACC), is a network of indigenous peoples' organisations in Africa, which is also promoting recognition for indigenous peoples in Africa; strengthening leadership and organisational capacity of indigenous civil society in Africa; promoting tolerance and understanding of the cultural, spiritual and language diversity of Africa; and supporting sustainable economic development based on indigenous knowledge (IPACC,2007).
- Botswana is working on a project to explore how indigenous knowledge and Western scientific ideas can be used to control the AIDS epidemic in the country (Nakaar, 2005).

- The African Ministerial Council on Science and Technology (AMCOST) was established in November 2003. It is a free network to promote collaboration in science and technology in Africa. It also helps to consolidate science and technology programmes of the African Union (AU) Commission and the New Partnership for Africa's Development (NEPAD). (AMCOST, 2006). Its overall objective is to strengthen Africa's capacity to harness and apply, as well as protect indigenous knowledge and technologies. The other objectives are:

  i. build or enhance public understanding of the nature and contributions of indigenous knowledge and technologies;

  ii. promote linkages between formal research and development institutions and holders of indigenous knowledge and technologies;

  iii. increase intra-African sharing and application of indigenous

  iv. knowledge and technologies to solve specific problems; and improve the continent's capacity to protect indigenous knowledge and technologies from piracy and related misappropriation.

  v. AMCOST is currently pursuing two major projects: development of an African databank on indigenous knowledge and technologies and promoting the integration of indigenous knowledge and practices in education curriculum. A lot of projects and initiatives are in place to utilise IKS to their optimum potential in order to achieve sustainability of Africa (AMCOST, 2006).

Management of Indigenous Knowledge

Oral tradition is the most important information gathering and sharing method in IK. This way transmitted information inherited from past generations may be shared in both structured and unstructured contexts. Oral tradition is categorised into five kinds: formulae embedded in slogans, ceremonial or spiritually derived language, poetry, leadership lists of reigning monarchs, narratives or tales and commentaries.

Preservation

Preservation of IK is critical for maintaining the identification of the specific culture, for economic development, for preserving artistic and cultural works, and for achieving political goals of self identification and self-reliance of indigenous communities, and for helping them to appreciate their history. IK can be preserved by:

- Recording IK into audios, videos and other modern ICT media formats;
- Making the communities aware of the value of IK through story telling, dances, plays etc.
- Assisting communities in documenting their local practices;
- Making IK available to the whole community;
- By protecting intellectual property rights so that IK is not misused and provides benefits to its originators.

According to (Gough, n.d.), perhaps, the best way to preserve indigenous knowledge would be the integration of indigenous knowledge into formal education. This would reactivate inter-generational learning, this way local people would participate in curriculum development and would enable schools to act as agencies for transferring the culture of the society from one generation to the next.

Protection

IK provides useful ideas, guiding principles, procedures and practices for social, economic and environmental development. Indigenous people have a historical relationship with their lands, natural resources and environment and they represent a significant number of the world population, hence they can make a tremendous contribution to African sustainable development. "The main problem with IK protection is that IK are characterised by the fact that they are not binding" (Sahai, 2002). For this reason it is crucial to safeguard IK. In some cases IK has been used without contacting the source of origin, for example, the use of traditional medicines as basis of pharmaceutical medicine and herbal remedies. Because of growing recognition of the commercial and scientific value of IK, it is vital to protect IK from its misuse and to keep it alive. For that international actions are required.

Documentation

Documentation of IK is crucial. Through documentation one can explore whether solutions for a given problem can apply to a different country or time. Documentation makes it easy to share, and is one way to preserve IK. Established in the year 2000, the Center for Indigenous Knowledge Systems (CEFIKS), Inc. is dedicated to the research, monitoring, documentation, and coordination of indigenous knowledge systems in Ghana. The primary focus of CEFIKS is to:

- record, preserve and disseminate information about indigenous knowledge systems.
- serve as a clearinghouse of indigenous knowledge systems from various communities within and without Ghana.
- support and advocate the use of indigenous knowledge systems in the socio-economic development process in Ghana and the region of West Africa (CEFIKS, n.d.).

The MOST Clearing House has started documenting "Best Practices on Indigenous Knowledge". Best Practices, in the MOST Database, are model projects or policies, that are aimed at improving the quality of life of individuals or groups who are suffering from poverty or social exclusion. The goal of this database is to present and promote creative, successful and sustainable solutions to social problems arising from poverty and social exclusion in order to build a bridge between empirical solutions, research and policy. Established in 2000, based in Accra, Ghana, the Centre for Indigenous Knowledge Systems (CEFIKS) is exclusively dedicated to research, monitoring, documentation, and coordination of indigenous knowledge systems in Ghana (HSD, 2006).

The Tanzania Development Gateway maintains the indigenous knowledge database for Tanzania. The purpose of this database is to enhance sharing and dissemination of IK information, experiences and practices in Tanzania (Tanzania Development Gateway, 2007).

There are various databases at different institutions on IKS:

- CSIR: Database on Indigenous Technologies
- MRC: Work with traditional healers; TRAMED
- SANBI: Database on medicinal plants
- ARC: Database on various indigenous plants
- NRF: Database on research in IKS

- Tertiary Institutions: Recordings and other databases have been made by many South African universities (University of KwaZulu-Natal; University of Johannesburg; Databases on Provincial Audits at North West University – Mafikeng Campus, University etc.).

Restoration

It is vital to restore indigenous knowledge. To fulfil this purpose, Indigenous Peoples' Restoration Network (IPRN) and African Resource Centre for Indigenous Knowledge (ARCIK) are solely dedicated to this activity. Indigenous Peoples' Restoration Network (IPRN), the primary goals of the IPRN are:

- to develop and use the tools of ecological restoration to enhance the survival of indigenous peoples and their cultures, and
- to incorporate the TEK of indigenous tribes and native communities into newly emerging models of sustainable agro-ecosystem management (IPRN, 2000) .

African Resource Centre for Indigenous Knowledge (ARCIK) is dedicated to multidisciplinary research and documentation activities in Africa's indigenous knowledge (IK) systems and it has been institutionalised and passed through many generations up to the present (Ojoo, n.d.).

The Centre for International Research and Advisory Networks (CIRAN) is producing *Indigenous Knowledge and Development Monitor* with the cooperation of the indigenous knowledge resource centres. It publishes thrice a year and exchanges information on IK and sustainable development.

Dissemination of IK

Unless IK is properly documented, analysed and disseminated, it could be lost forever. Dissemination of IK assists people networking and builds up their knowledge networking. Various projects are in place to disseminate IK. Electronically published, *IK Notes* is a publication that periodically documents IK development issues. *IK Notes* is published by the World Bank Indigenous Knowledge for Development Program and is aimed to facilitate potential authors to write an article for the *IK Notes* series. Also available in print format, *IK notes* is published in three

languages and reaches over 40,000 readers. Each *IK Note* edition explores IK sensitive issues and describes locally driven solutions to the problem (World Bank, 2006).

Indigenous Knowledge for Development Results (IKDR) is another web site, which is devoted to raising awareness of the role that community-based practices play to mainstream indigenous/traditional knowledge into development activities. To disseminate IK information, this site has developed a database on indigenous/traditional knowledge and practices with nearly 300 entries in addition to copies of *IK Notes* (Indigenous knowledge Program, 2006).

In 2005 the World Information Technology Forum (WITFOR) brought together more than 700 delegates to Botswana including ICT ministers, senior policy-makers, academics, NGOs, ICT experts and the private ICT sectors. This three-day conference set-up three projects, one of which was "Internet based digital archive for indigenous knowledge" (Introna, 2006).

African Resource Center for Indigenous Knowledge (ARCIK) focuses on the multi-disciplinary research and documentation in Africa's IKS. It is specifically involved with the search, storage, retrieval, and dissemination of information on IK systems affecting social, economic, political, cultural and technological life of African societies. It also encourages its staff to undertake IK research, provides bibliographic support to researchers and organises conferences, seminars, workshops on IKS in Africa (Ojoo, n.d.).

The Conserve Africa Foundation is an environmental NGO, which aims to promote and implement sustainable development practices, policies and strategies in Africa through information dissemination, capacity building, education, applied research, community environmental and natural resource development, advocacy and campaigning that focus on the environment and natural resources management using innovative, participatory and gender sensitive approaches (The Conserve Africa Foundation, 2007).

Challenges and Issues of IKS

IK and IKS can be resources for establishing the African identity and for the sustainable development of the continent. Unfortunately, however, African IK and IKS are gradually displayed by the influence of other

cultures. This is happening mainly because of the obsession with modernity and globalisation. The distinct culture of indigenous peoples and their identity, their economic activities, religious beliefs, and traditional ways of managing natural resources are often regarded as backward and superstitious. Due to the development of society and the rapid evolution of ICT, IKS seem to be dying. In spite of growing interest in IK, it continues to be derogated in many ways. The current situation challenges us to consider the following problems and issues:

- Distortion of IK with Western technologies, i.e. mismatch between local people knowledge content and Western developed models
- Capturing, recording and storing IK without the participation of those who produce and manage it everyday
- Determining the conceptual framework for Africa's IKS
- Use of IK for national development
- Western styled education system
- Intellectual property rights of indigenous people
- Lack of implementation of policies and procedures.

A lot of debate is going on the issue of providing legal protection to the intellectual property of indigenous people. Intellectual property of indigenous people is being abused in many ways, such as unlicensed and unauthorised commercialisation of IK; using, reproducing and copying images, photos and video film of indigenous people without their permission and acknowledgment; misusing indigenous symbols without permission; sharing and disclosing indigenous and cultural knowledge with others; publishing research works without any acknowledgement for the knowledge holders; getting research assistance from the indigenous people without any proper explanation of how the research findings will be used and who will have the copyright.

Most of these debates tried to adapt the existing Intellectual Property Rights (IPRs) like patents, trade secrets, copyright, etc, but they do not seem to be working with IK. For example, in Tanzania, intellectual property rights are protected by the Copyright and Neighbouring Rights Act of 1999, the Patents Act of 1987 and the Trademarks and Services Act of 1986. The Patents Act of 1987 is further supplemented by the Patents Regulations, 1994. The Copyright and Neighbouring Rights Act of 1999 protects folklore against illicit commercial by other people.

The National Science and Technology Policy of Tanzania was proclaimed by the Government in April 1996. The National Beekeeping Policy was issued in March 1998, but it has no provisions recognising the potential of indigenous knowledge in beekeeping management and the use of honey and its products. This omission needs to be remedied.

The Southern African Development Community (SADC) countries are planning to develop a *sui generis* system. This is a system, which is used for plant varieties' protection.

There are three determinants for an effective sui generis system: i. Effective enforcement; effective action against any act of infringement, ii. Adoption of UPOV (the International Union for the Protection of New Varieties of Plants) as a sui generis system: both the WTO and UPOV secretariats have considered UPOV framework as an effective sui generis system, iii. Protection available as indicator of effectiveness; the availability of protection for new plant varieties (Dhar, 2002). UPOV is a convention that has been amended thrice (in 1972, 1978 and in 1991) since it came into force in 1968 and now it has 50 members including the USA with 14 developing countries. Sui generis provides several options that World Trade Organisation (WTO) can exercise: it examines the evolution of the legal regime to protect plant breeders' interest; distinguishes between commercial breeding efforts and the efforts made by farmers in developing new varieties; discusses several alternative frameworks for Plant Variety Protection (PVP) that have been either proposed or adopted and it identifies the possible contribution of official development assistance. Many countries have initiated alternative sui generis systems including India and Namibia. NGOs have also initiated developing sui generis for protecting plant varieties. In developing countries the sui generis legislation should take into account the interests of both the famers and the plant breeders in the formal sector (Dhar, 2002).

The adoption by the World Trade Organisation (WTO) of the Trade Related Intellectual Property Rights (TRIPS) agreement has however raised issues of conflicts between TRIPS and the patentability or protection through a sui generis system of plant varieties. International efforts are under way in an attempt to harmonise the two instruments and achieve the most beneficial compromise for all interested parties.

To protect the farmer's rights, other international initiatives include the renegotiation of the Food and Agriculture Organisation (FAO's) International Undertaking on Plant Genetic Resources. The Organisation

of African Unity (OAU) has developed an "African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources". This model recommends for the development of a national information system to compile and document information on local knowledge and innovation practices of the communities and guidelines for collectors of resources (Sahai, 2002).

The government of Botswana recently suspended issuing of new research permits in National Parks and Game Reserves in order to monitor such researchers and derive appropriate benefits. Botswana, Namibia and South Africa are also engaged in talks to protect the Devil's claw plant from a German company, which wants to have patents rights over it.

Limitations of IK

Before going into how to overcome the challenges, it would be appropriate to appreciate the limitations sometimes associated with IK:

- It is contemporarily evidenced that indigenous people have also made some mistakes through over-grazing, over-hunting, or over-cultivation of the land, so it is not always true to believe that IK is good, right or sustainable.
- IK can also be windswept by wider economic and social forces. The continuous growth of national and international markets and the imposition or adoption of educational and religious systems all call for a homogenisation of the world's cultures, which influences and displaces indigenous beliefs, values, customs and know-how, with the result that indigenous knowledge base gradually becomes incomplete.
- Sometimes well-adapted and effective practices in a particular environment reflected in existing IK become inappropriate under changed environmental conditions.
- Sometimes local people's knowledge is wrong and harmful. For instance, practices based on mistaken beliefs, faulty experimentation, or inaccurate information can be dangerous and become a barrier to the development of indigenous people (Langill,1999).

Overcoming the Challenges of IK

Considering the above limitations and challenges, it could be suggested:

- There should always be some flexibility to adjust and adapt IK as the time and environment demand.
- Western technology should not be allowed to be used to distort the local indigenous knowledge. All imported models should be adapted to the local environment, available facilities and resources, culture, finance, telecommunication infrastructure and local people's needs.
- Indigenous knowledge is community based, it should be captured, recorded and stored with the proper interaction, and participation of those who produce and manage it.
- Determining the conceptual framework of Africa's IKS is the biggest challenge, and the African Governments should consider this issue as one of their priorities.
- IK should be treated as national commodity for sustainable national development, as well as a cultural heritage to be preserved.
- IK should be introduced into the educational curricula throughout Africa, as is being done in Uganda.
- The intellectual property rights of indigenous people should be protected to ensure that indigenous people remain the custodians of IK.
- There is a need to review existing policies and come up with policy strategies and action plans for the protection and development of IK.
- African Universities can influence social, economic and cultural developments using IK-based approaches. Reaching the people through IK-based models means helping to develop indigenous knowledge and consequently developing the nation socially, economically and culturally.
- Africa should actively participate in global IK network initiatives.

Conclusion

It is apparent from the foregoing discussion in the chapter that various activities and initiatives are taking place in order to manage and promote IKS. Despite all the recognition, contributions and promotions, IKS are not satisfactorily promoted and protected in most African countries. The provision of intellectual rights to indigenous knowledge holders is weak in most countries. There are weak links between the formal research and development institutions and local communities that hold and use the knowledge. This has denied Africa the opportunity to better understand and use its indigenous knowledge base for development.

Nevertheless, important questions with respect to IK are: Whose knowledge? For whom? Who will benefit? Unless these questions are answered, the current concern for IK will be just specified by the outsiders, for the outsiders (Charyulu, n.d). If IK is not properly documented, analysed and disseminated, it may be lost forever, within one generation. IK is well cited in the context of African renaissance, "the new dawn of the African Renaissance will only be a reality when we use knowledge fully, including African indigenous and local knowledge, in partnership with modern scientific knowledge" (Masoga, 2004). Hence, IK should be considered instrumental for the sustainability of African identity.

A lot needs to be done in this area. More researches have to be undertaken. IK needs to be documented and preserved properly to facilitate retrieval and dissemination. As IKS vary from one country to another, its practices and resources need to be integrated and harmonised with local needs and ideas. The original creators of this knowledge (local peoples) should be the final authority over the knowledge that is recorded and exchanged within all such systems. As Madley (1993) reminds us "...the fact that such knowledge has often been overlooked by development planners presents developing countries with a powerful asset..."

Review Questions

1. What is the contribution of IK to development?
2. Discuss global and African initiatives on IK.
3. What are the major challenges of IK in Africa?

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Part V: Policy and Management Issues

Chapter 14

Intellectual Property Rights in the Digital Age

Saul F.C. Zulu

Introduction

Modern intellectual property rights (IPR) have to a great extent been propelled by the growth of formal education in Europe from the 13th century onwards and the rise of higher education and the subsequent growth of science and technology from the 15th Century onwards. The growth of formal education in Europe from the 1200s onwards led to the creation of a literate and numerate class of writers and readers. Ultimately, this development gave rise to a class of people who lived by writing and publishing. The publishing industry owes its origins to the growth of a literate and numerate class in Europe, because the need for information materials for the literate/numerate class led to the invention of the movable type. The invention of the first movable type is credited to Johannes Gutenberg, a German inventor and industrialist, who invented it in the mid 15th Century. The invention of the movable type mechanised printing processes led to information explosion (i.e. mass production of information) and diffusion of ideas across local, national and international boundaries. The growing publishing industry pushed for legislation that would protect its interests. The pressure from the publishers and printers culminated into the passage, in England, of *The Statute of Queen Anne of 1709*, which was the first copyright law in the world (Lehman, 2003, Sherman and Bentley, 1999). This copyright law was later copied by other countries.

The second driver for IPR was the rise of higher education, science and technology in Europe from around the 1400s onwards. The introduction of formal education changed Europe in the sense that the educated class of people that emerged from the school system were critical thinkers who no longer meekly accepted the knowledge that

was handed down to them. The new class of critical thinkers led to the introduction of higher education. With the introduction of higher education, the concept of education changed from teaching established facts and truths to questioning of the "facts" and "truths." Higher education was characterised by acquiring and confirming knowledge through research and discovering of new facts and truths. Higher education was driven by:

- The study of science, which became the major tool of enquiry and discovery. Science is a systematic study of phenomena (whether physical or social). The scientific approach to studying entails conducting experiments, based on a verifiable methodology.
- The method of delivery in education changed from the teacher being the centre of learning to a participative approach where the learner became an active participant in the learning process.
- Experimentation became the method for confirming the old truths and seeking of new knowledge.
- Use of laboratories, workshops and libraries became important tools of learning in universities.

After a period of time, a large body of scientifically acquired knowledge began to accumulate. The application of this knowledge to solve human problems in turn brought technology, which resulted in inventions and innovations. When these inventions and innovations were applied to the productive sectors of Europe, they led to the First Industrial Revolution in the 1600s/1700s (which saw the mechanisation of agriculture and increased productivity in agriculture). Later on, improvements in technology led, in the 1700s/1800s, to the Second Industrial Revolution (setting up of factories where raw materials from agriculture and mining were processed into finished goods for home consumption and export).

The technical inventions and innovations needed to be protected, in order to encourage more inventions and innovations, because they benefited society at large by providing the technologies that improved human life and brought development. The earliest patents for inventions were granted in the City State of Venice (Italy) in the 15th Century (Lehman, 2003). As technology spread and grew in importance, this system of patenting soon spread to other parts of Europe, and later to the rest of the world. Today, we have special institutions at the national

level (e.g. trademarks and patents offices), regional level (e.g. the African Regional Intellectual Property Organisation (ARIPO) and international level (e.g. the World Intellectual Property Organisation (WIPO) and the World Trade Organisation (WTO)) that administer IPR.

Information is one of the most valued intellectual properties in society. This is so because all human activities are centered on information processing. It is because of the value that society places on information that all the stages of the information chain are closely monitored by various stakeholders. There are three main factors that have shaped the management of intellectual property. These include: governments, people, and technology. In the last 500 years or so, the management of intellectual property and the rights that go with them have largely been influenced by governments and people. But with the advent of information and communications technologies (ICTs), the structure of the management of intellectual property has drastically changed. This chapter examines how ICTs have impacted the management of information-based intellectual properties and the rights of their creators.

What is Intellectual Property?

Intellectual property (IP) refers to creations of the mind. These include: inventions, literary and artistic works and symbols, names, images, and designs used in commerce (WIPO, 2007; Phillips and Firth, 1998; Hefter and Litowitz, 2003). There are two broad types of IP: Industrial property, and Copyright and Related Rights. The two types of IP are briefly explained:

Industrial Property

The term "industrial property" refers to a collection of intellectual properties covering a wide range of creations of the mind, including patents, trademarks, industrial designs, geographic indications, and trade secrets. These types of industrial property are briefly explained below (WIPO, 2007, Phillips and Firth, 1998, Baker and Mckenzie London and Hart, 1998).

Patents

Patents are exclusive rights granted to inventors for their inventions. An invention can be a product or a process or a new way of doing something

or something that offers a new technical solution to a problem. A patent provides protection for the invention to the owner of the patent against commercial exploitation of the invention through its use, manufacture, distribution or sale without the consent of the owner. Patents provide incentives to individuals and organisation to invent more through:

- Recognition of inventors and the material rewards they get from their creations;
- Encouraging innovation (i.e. technological improvements to existing technology) which leads to improved quality of life for people in general; and
- A patent registration protects the patent owner against unfair or unauthorised use of their creations.

To receive protection, inventors must register their inventions with their national registration office (a government agency). A patent has a life span of 20 years.

Trademarks

A trademark is a distinctive sign which identifies certain goods or services provided or given by a specific person or company (e.g. Coca-Cola trade mark, Game Stores trademark, Sun Hotels, Levi's Jeans, Botswana Meat Commission beef, etc.). A trademark could be a three dimensional object (e.g. the shape of the Coca-Cola bottle, Toyota symbol, Mercedes Benz symbol, etc.), drawing, sound recording (jingles), and colour (as in national flags, company logos, national emblems). Trademarks are important for the following reasons:

- Trademarks help consumers to identify a product or service of its nature and quality. This is indicated by its unique trademark.
- A trademark registration provides protection to the owner of the mark by ensuring exclusive rights to it to identify goods or services.
- A trademark registration helps fight against counterfeit or imitation goods which are marketed under other people's trademarks.

A trademark has no time limit, in the sense that once it has been registered, it remains in force for as long as the trademark owner wants. Trademarks have to be registered with the relevant Trademark office of the country where it will be used.

Industrial Designs

An industrial design is the ornamental or aesthetics (or shape) of an article, e.g. Coca-Cola bottles being of a particular shape. They include: textiles, electrical appliances, architectural structures, medical instruments, shape of a pen, shapes of kitchenware, etc. It is the way a product looks to the eye that helps to market it. Industrial designs make products to look attractive and appealing. They add value to a product and increase their marketability. Industrial designs have to be registered to ensure exclusive use and application by the owner of the design.

Geographic Indications

A Geographic indication is a sign used on goods that have a specific geographic origin, and possess qualities or a reputation that is due to the place of origin (source of the product). Some products will have the "made in [and name of country]" sign (e.g. Made in South Africa, Cuban cigars; Botswana Beef; French, Italian, South African wines, etc.). Under international law, countries have a right to prevent other countries or regions from using the names of their countries or regions for the purposes of selling of goods or services.

Trade Secrets

Trade secrets are internal confidential information of an organisation, which if it is revealed to its competitors, would put the organisation at a disadvantage. Trade secrets could be formulas, practices, designs, instruments, etc. For instance, the formula of the Coca-Cola soft drink is a trade secret of the Coca-Cola Corporation. If this formula was to be revealed to the competitors of the Coca-Cola Corporation, it would lose its competitive advantage in the soft drinks market.

Oelsner (2003) provides a glossary of intellectual property terms.

Copyright and Related Rights

Copyrights are rights given to creators for their literary and artistic works. There are two types of copyrights: literary works and artistic works. Literary works include: novels, poems, plays, reference works (non-fiction), newspapers, computer programs, films, musical compositions and choreography. Artistic works include: paintings, drawings, sculpture,

architecture, maps, and technical drawings. The duration of copyright is 50 years after the death of the author. In the case of joint publications, the duration of such works is 50 years after the death of the last surviving author (WIPO, 2007, Sherman and Bentley, 1999).

Rights related to copyright, also known as neighbouring rights to copyright, are rights given to performers, producers and broadcasting organisations in relation to their performances, broadcasts, etc. of copyrighted works. For example, if a novel is adapted to make a motion picture, all the people who will be involved in the making of the motion picture (such actors/actresses, script writers, directors, producers, choreographers, etc.) will have neighbouring or related rights to the motion picture, which is based on the original copyrighted work. For a further elaboration of other categories of copyright and related rights, see (Kiggundu, 2007 and Government of Botswana, 2003).

Intellectual Property Rights Laws

Intellectual Property Rights (IPR) are exclusive rights granted to the creators of intellectual works. This can be industrial property or copyright and related rights. Baker and Mackenzie (1998) have defined IPR as "private rights, and in common with other legal rights, they enable the owner to obtain capital or income." According to Baker and Mackenzie, the IPR owner can use their rights by:

(a) Applying the protected materials himself/herself. For instance, an inventor can use their invention to set up a factory and start producing goods for sale himself or herself;

(b) Licensing his/her intellectual property rights in the protected material to others either exclusively or non-exclusively, or

(c) Assigning his/her rights to others (i.e. permanently selling their rights to others).

IPRs are a claim to ownership of an IP by the person or persons responsible for creating it. These claims on IP are realised by registering the IP with the relevant government agency at the national level or through an international agency such as WIPO or ARIPO. Once an inventor has registered a patent for an invention, he/she is given a registration certificate that grants him/her exclusive rights over the use or application of that invention. IPRs are important to society for the

following reasons (Groves, 1997; Hefter and Litowitz, 2003; Lehman, 2003; Mould-Iddrisu, 2003):

- They provide incentives to individuals by offering recognition for their creativity and material reward for their marketable inventions. These incentives encourage innovation, which benefits society as a whole.
- They encourage the publication or use of inventions, designs and other IP by providing legal protection to enable the owner to control the publication or use of their work.
- They provide creators the benefit of economic rewards, while the public receives the benefit of literature, music, and other creative works that might not otherwise be created or disseminated.
- They prevent conflicts among individuals and among nations over ownership of intellectual property.
- They can lead to national wealth creation, in the sense that invention and other creations of the mind can lead to the establishment of various industries, which will create employment. The industries would be a source of tax revenues for government. And surplus products can be exported to other countries to earn the much needed foreign exchange. In fact, the rich nations of today are those that have transformed their intellectual properties into various kinds of industries.

IPR Laws

Intellectual property as a commodity has both national, as well as global dimensions. IPRs are enforced through national and international statutes (laws). These laws are known as IPR laws. To this end, the legal and administrative framework of information with regards to IPR covers both the national and international levels (Kiggundu, 2007).

IPR Laws at the National Level

Every country has IPR laws that are designed to enforce IPR at the national level. These laws define the boundaries of usage/application of intellectual properties. They define the offences and penalties for contravening IPR. National IPR laws are normally in accord with

international statutes on IPR. This is done to facilitate the implementation of international laws at the national level. National IPR laws cover a wide range of IP. For instance, some of the IPR laws on the statutes of Botswana cover the following areas (Government of Botswana, 1989):

- Copyright and Neighbouring Rights Act, Cap 68 (1-2) of the laws of Botswana which provides for the protection of copyrights and the related rights to copyright;
- Cinematography Act, Cap 60 (2) of the laws of Botswana, that provides for the regulation of the making and dissemination of motion pictures;
- Printed Publications Act, Cap 20 (1) of the laws of Botswana, that provides for the registration and regulation of printers and publishers;
- The Registration of Business Names Act, Cap 42 (5) of the laws of Botswana, that provides for the registration of business names;
- The National Museum and Art Gallery Act, Cap 59 (1) of the laws of Botswana, that provides for the protection museum artefacts, art galleries, and other national heritage sites;
- The National Library Services Act, Cap 58 (2) of the laws of Botswana, that provides for the establishment and provision of national library service;
- The National Archives Act, Cap 59 (4) of the laws of Botswana, that provides for the establishment and provision and administration of a national archives and records service;
- Telecommunications Act, Cap 72 (3) of the laws of Botswana, that provides for the regulation of the telecommunications industry;
- The Public Procurement and Asset Disposal Act, Cap 42 (8) of the laws of Botswana, that provides for the procurement and disposal of all government property, including information resources;
- The Broadcasting Act Cap 72 (4) of the laws of Botswana, that regulates broadcasting activities. The broadcasting law covers both radio and television broadcasting; and
- The Industrial Property Act, Cap 68 (3) of the laws of Botswana, that provides for the registration and administration of patents and trademarks in Botswana.

IPR Laws at the International Level

A number of agreements, conventions or treaties have been signed by nations of the world, in a bid to harmonise the protection of IPR across national boundaries. One of the recent international treaties that cover both industrial property and copyright is the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). This Agreement is jointly administered by the WTO and the WIPO.

The TRIPS Agreement was concluded at the end of 1994, as part of the Uruguay Round multilateral trade agreement. This Treaty provides for the establishment of standards for protection of a full range of IPR and the enforcement of those standards, both internally and at the border, through legal and administrative actions. The intellectual property rights covered by the TRIPS Agreement are: copyrights, patents, trademarks, industrial designs, trade secrets (undisclosed information), integrated circuits (semiconductors), and geographical indications.

Other treaties cover specialised areas in the fields of industrial property and copyright and related rights. For detailed information on these international treaties, refer to the WIPO website at *www.wipo.int*. Vora (2003) provides a comprehensive listing and descriptions of international treaties on IPR.

Administration of IPR Laws at National Level

There are a number of stakeholders that participate in the administration of IPR laws at the national level. They include the following: national governments; creators and producers of intellectual property; representatives of foreign governments; representatives of multinational corporations and international agencies; and information dissemination institutions.

National Governments

National governments set the legal and administrative framework for the administration of IPR. This is done through various government institutions, such as parliament/national assembly which makes the relevant IPR laws; law enforcement agencies, such as the police to ensure compliance by everyone with the IPR laws through effecting investigations, arrests and preparing the prosecution of offenders. The

judiciary is another arm of government that participates in the administration of IPR. The role of the judiciary is to ensure that all cases brought before the courts of law regarding infringements of IPR are done in accordance with the provisions of the law. Other government institutions through which the IPRs are administered are customs and excises that regulate inflows and outflows of traded IP at ports of entry and exit; and special intellectual property institutions, such as Registrar of Companies, Registrar of Patents and Trademarks and various licensing bodies that governments have set up to manage certain aspects of IP.

Creators and Producers of Intellectual Properties

Producers of intellectual property, including inventors, authors, performers, publishers, printers, and manufacturers can initiate legal action against infringement of their intellectual property rights.

Representatives of Foreign Governments

Members of the diplomatic corps representing foreign governments at embassies and high commissions ensure that IPs from their respective countries are protected. If they detect incidences of infringements of IPR on IP originating from their countries of origin, they can take action against such infringement through diplomatic channels.

Representatives of Multinational and International Agencies

Representatives of multinational corporations (such as Coca-Cola Corp) and international organisations such as the United Nations Educational, Cultural and Scientific Organisation (UNESCO) protect the interests of their parent organisations. They can initiate legal action on behalf of their parent organisation at the local (national) level.

Information Disseminating Institutions

Information dissemination institutions, including libraries, archives, museums, and broadcasters administer IP at the institutional level, with respect to access and use of IP, such as copyrighted works. Sometimes, they have to sign agreements with suppliers of information materials to ensure that the copyrights of materials they hold in their collections shall not be violated.

Administration of IPR Laws at the International Level

A number of international agreements/conventions/treaties, designed to enforce IPR laws at the international level, have been negotiated by nations of the world. These agreements are attempts at ensuring that countries that are signatories to these treaties or conventions adhere to the enforcement of IPR laws within their national boundaries by incorporating them into their national legal and penal systems. Due to the problems that countries were facing in coordinating the administration of IPR at the international level, international agencies (or organisations) have had to be established. These agencies have been mandated to coordinate and administer various issues related to the implementation of IPR at the international level. Two of the major agencies that are now responsible for the administration of IPR are the WIPO and WTO.

At the regional level, there are a number of international agencies that have been established to administer IPR pertaining to particular regions of the world. For instance, there are regional IPR institutions for Africa (ARIPO), based in Zimbabwe; for Europe, there is the European Patent Office (EPO); and for Asia, it is the Eurasian Patent Office (EAPO). For the purposes of this work, we shall briefly explain the functions of the WIPO, WTO and ARIPO.

The World Intellectual Property Organisation (WIPO)

The WIPO was established in 1970, although its origins date back to 1833, making it the oldest international IPR organisation in the world (Lehman, 2003). It is one of the specialised agencies of the United Nations system. The WIPO was established with a mandate to administer intellectual property matters recognised by member states of the United Nations. It has a secretariat based in Geneva, Switzerland. It has a world wide workforce of 650 employees, who undertake its various mandates and activities. The WIPO has a membership of 170 member states. It is currently administering 21 treaties, two of which it administers jointly with the World Trade Organisation. The activities of the WIPO revolve around its goals, which include the following (WIPO, 2007) to:

- Harmonise national intellectual property legislation;
- Provide services for international applications for industrial property;

- Exchange intellectual property information;
- Provide legal and technical assistance to developing and other countries;
- Facilitate the resolution of private intellectual property disputes; and
- Marshal (or harness) information technology as a tool for storing, accessing and using valuable intellectual property information.

For detailed information on the WIPO, the reader is referred to the organisation's website at www.wipo.int or www.wipo.net.

The World Trade Organisation (WTO)

The WTO is one of the newest international agencies. It was established on 1st January 1995, as a result of the Uruguay Round Negotiations which took place between 1986 and 1994. Its roots can be traced to 1948, when the General Agreement on Tariffs and Trade (GATT) was signed by trading nations of the world. While the GATT had mainly dealt with trade in goods, the WTO and its agreements now cover trade in services and in traded inventions, creations of the mind and designs (Intellectual Property) and goods. The WTO has a global membership of 146 states. Its Headquarters are located in Geneva. The WTO is the only global international organisation dealing with the rules of trade among nations. The major function of the WTO is to administer the WTO agreements which have been negotiated and signed by the world's trading nations and ratified in their national parliaments (WTO, 2007). Other information on the activities of the WTO can be accessed at its website at www.wto.org.

The African Regional Intellectual Property Organisation (ARIPO)

The African Regional Intellectual Property Organisation, sometimes called the African Regional Industrial Property Organisation (ARIPO), was established on 9th December 1976, under the Lusaka Agreement, which came into force on 15th February 1978. Its Headquarters (Secretariat) are in Harare, Zimbabwe (*www.aripo.wipo.net*). The main objective of ARIPO is to pool together the resources of its members in industrial property matters, in order to avoid duplication of financial, human and other resources. For additional information on the activities of ARIPO, *visit* the organisation's website at www.aripo.wipo.net

Challenges of Managing IPR Laws in the ICT Era

The onset of information and communications technologies (ICTs) on the information arena has fundamentally impacted on the management of intellectual property rights. The impact of ICTs on the intellectual property management regime is best demonstrated by looking at how the management of the various stages of the information chain has changed before and after the ICT era.

Management of IPR before the ICT Era

In this chapter, the term 'Information Chain' will be used to refer to the various stages through which information products pass from the time they are created up to their final disposition. The information product chain has four distinct stages through which information passes. These are:

- Origination/production
- Distribution/dissemination
- Application/access/usage
- Disposition

These stages are briefly discussed below.

Stage 1: The Origination and Production of IP Materials

The information product chain begins with the conception or origination of ideas. This is where someone comes up with an idea to create something. There are a number of actors that are involved in this phase of the information product chain. They include:

- Authors/writers
- Artists
- Researchers
- Inventors

When ideas or inventions have been made, they have to be produced into something tangible. The tangible products of ideas could be goods, services, processes or information items. The production is done by:

- Manufacturers of various goods. They turn inventions into marketable goods or products such as information media, such as DVDs, CD-ROM's, audio cassettes, video cassettes, films, etc.
- Publishers of information. These are the people who sponsor/finance books and other information materials. They provide the necessary financial resources that are used to turn ideas into tangible products.
- Printers of various information materials. Like manufacturers, printers are the ones that provide printing facilities that are used to output various types of information materials, such as newspapers, books, periodicals, etc.

Stage 2: Distribution/Dissemination of IP Materials

Once information materials have been produced, they have to be distributed or disseminated to the end users. This is done by a number of distribution channels, including booksellers, online database vendors, libraries, museums, archival institutions, broadcasting/narrowcasting institutions, newspaper organisations, the Internet, and others.

Stage 3: Access to and Usage/Application of IP Materials

In Stage 3, the end-user of the goods, possess an item of information, and has access to the intellectual property. To have access to information items, the end-user has to meet the conditions set by producers or disseminators and distributors. Various types of end-users are involved in this phase of information chain. Information seekers may wish to access information for different reasons, including educational purposes, research purposes, recreational purpose, or to aid the execution of a work-related need.

Stage 4: Disposition

Once information or goods are no longer needed, they have to be disposed of. Disposition of information refers to the removal of information resources from the holdings of an organisation (such as government/private sector), or an information disseminating institution

(such as a library, archive, museum, broadcaster, etc). The need to dispose off information resources may arise, due to a number of factors, such as:

- When the information medium is damaged, such that it can no longer be used (e.g. when a CD is scratched, tapes are warped, books/ periodical are torn, computers storage media are corrupted, etc).
- Obsolescence of the information (i.e. when information is no longer needed in the organisation because it has become out-of-date, and needs to be weeded out to make room for more current information materials).
- When the law requires that certain information materials should be removed from the holdings of an organisation for social, moral, religious, political or security reasons. For instance, a new censorship law may require that certain items of information that were previously acquired be removed from the holdings of an organisation.

Before the ascendancy of ICTs on the information arena, the regulation of information products, which were produced in hardcopy, was easier, because all the stages of the information chain were visible to everyone. But ICTs have made the existing legal and administrative regulatory framework for the information chain weak, and have posed challenges for protection and management of information-based IPR.

Management of IPR in the ICT Era

Information and communications technologies (ICTs) is a collective term, used to refer to the various technologies that are used in the creation, acquisition, storage, dissemination, retrieval, manipulation and transmission of information (Zulu, 1994). In its broader context, ICTs include: computers – which are essentially used for processing and storage of information; telecommunications –which are used for the transmission of information; and publishing technologies –these technologies are used for documenting, presenting and disseminating of knowledge and information. These three ICT technologies are converging and creating newer forms of ICTs that have facilitated the communication of information in the world.

While ICTs have facilitated the communication of information, they have created problems in the management of IPR. This is so, because ICTs affect all the stages of the information chain - from creation of information products through their final disposal. The net effect of this

on the management of IPR is that the current legal and administrative regulatory framework that was essentially designed for the management of hardcopy-based information products can no longer be used to effectively manage IPR. The impacts of ICTs on the management of the information chain are briefly reviewed below:

Origination and Production of IP Materials

Before the introduction of ICTs, the origination and production of information materials was done by many different actors, such as creators and producers of information materials. The whole process can now be done by one person at a computer workstation. It has now become difficult to control electronic and Internet-based creations because governments have no means of controlling what people do on computers. The previous strict checks and balances that used to exist among the various stakeholders involved in the creation and production of information materials are no longer there. One person can now originate an idea, word-process the ideas into a document and publish the document electronically on his/her own. Further, digitally-output information products are weightless, and are not measured in physical quantities but in cyber quantities (such as kilobytes), as opposed to volumes of books, etc., measured in kilograms or cubic metres.

Distribution/Dissemination of IP Materials

The distribution and dissemination of information products to the end user can now be done by one person (i.e. the creator). This can be achieved by mounting the work on a website on the Internet. Distribution is done electronically, and it can be done very fast, and can reach many remote locations at the same time. Legal, administrative and physical national and international barriers that are used to control and regulate the transfer of hardcopy information products can no longer be used on materials that are distributed electronically.

Access to and Application of IP Materials

ICTs afford multiple and remote access to the same document by different people located in different places. This facility for remote and multiple access to information has brought about problems of controlling access to copyrighted information materials. In addition, it is easy for people to

access documents that have controlled access, because electronic passwords that are used to control access are easy to break. Due to poor legal and regulatory framework for ICTs, the rate of piracy of software and other ICT-based products is very high. For 2006 alone, it was estimated that over 90% of the software used in Africa was pirated. The value of pirated software alone for sub-Saharan Africa was estimated at over $12.4bn (OmaribaCIPAC, 2006).

Manipulation of IP Materials

ICTs have made it easy to manipulate/reformat documents. An electronic document can be easily changed without any trace. Although documents produced in Portable Document File (PDF) format are supposed to be protected against alteration, they can be easily changed into other formats such as MSWord, which then makes it easy to alter or change the original document. The ease with which ICT-generated documents may be manipulated brings problems of how to secure or determine the authenticity (genuineness) of such documents. It is equally difficult to prove the originality (source) of Internet-based documents. These issues make it difficult to use computer-generated documents as evidence in a court of law, unless their origin and authenticity can be proved.

Disposition of IP Materials

It is very easy to dispose of documents in electronic formats. All it takes is to strike the "delete" key, and all the information will be deleted. Because of this, information may be deleted without following legal and administrative provisions for the destruction of certain types of information.

Challenges of IPR Management in Africa

In addition to the challenges posed by ICTs discussed above, African and other Third World countries face other problems that have magnified the difficulties of managing IPR in the digital era. Some of the significant challenges are briefly presented below:

Absence of Effective Cyber Laws and Policies

In Africa, and indeed much of the Third World, the legal and policy frameworks that are supposed to deal with ICT-related issues are not yet

in place in most countries. The existing laws were designed to control physical paper-based information resources. They do not cover information in electronic media. In countries where cyber laws exist, these laws in most cases are weak and they lag behind developments in technology. The legal and policy framework is compounded by the fact that the majority of law makers in most countries are not ICT-literate, and it becomes difficult for them to appreciate the impacts of ICTs on IPR and formulate appropriate policies and legislations to back them up. Most countries in Africa are just coming up with ICT policies to guide developments in this sector.

Under-utilisation of ICTs to Enhance Management of IPR

Whereas e-government has been entrenched in North America, Europe and in some countries of South East Asia, much of Africa is still grappling on how to employ ICTs to enhance operations of government. In most cases, the registration of intellectual properties such as patents and trade marks and business names, is still done manually. Manual operations often result in loss of documents due to poor document filing and storage systems, and result in delays in retrieving of information. It therefore becomes very difficult to effectively manage IPR in such an environment.

Underdeveloped ICT Infrastructure

The requisite ICT infrastructure does not exist in most African countries. Almost all ICTs (hardware, software, as well as telecommunications equipment) are sourced from outside the African continent. telecommunications infrastructure is either non-existent in most parts of the countries, or they are, at best, poorly developed, characterised by low bandwidth, low teledensity, expensive and generally inaccessible.

Inadequate Resources to Sustain an ICT Environment

Besides facing a critical shortage of financial resources that are required to support a viable ICT infrastructure, most African countries lack technical expertise to manage and sustain an effective ICT environment (infrastructures and facilities). The lack of expertise exists at all levels of the IPR legal, administrative and regulatory framework. For instance, most African countries do not have legal experts in the areas of ICT - these would be required in leveraging effective cyber legislation. ICT

experts such as software, hardware and telecommunications engineers are also in short supply; ICT expertise is also in short supply among law enforcement agencies, such as the police and border regulatory agencies, such as customs. These agencies are not supported by sophisticated ICT systems to enable them to effectively scrutinise IP materials that are imported or exported in the digital form (Zulu, 1994).

Conclusion

The onset of ICTs on the information arena has fundamentally impacted on the management of IPR. The policy, legal, administrative and regulatory framework that was designed for the management of IPR in the pre-ICT era has been rendered inadequate in the digital era. The challenges posed by ICTs require the reformulation of the IPR management regimes in tune with the changed technological environment.

Review Questions

1. Describe the different types of intellectual property.
2. Explain why intellectual property rights are important to society.
3. How do governments of the world manage intellectual property rights both at the national and international levels?
4. Explain how the stages of information chain have been affected by ICTs.
5. What problems do ICTs pose in the management of IPR in Africa?

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Chapter 15

Evolving Mechanisms for the Protection of Copyright in the Digital Environment

Kgomotso H. Moahi

Introduction

This chapter discusses the issues surrounding the enforcement and protection of intellectual property rights in the digital environment. The protection of intellectual property is seen by many as a way of motivating creativity and innovation; it is seen as a way of ensuring that knowledge and ideas for products and services are encouraged to grow. In essence, this is done by protecting moral rights, as well as economic rights, which are accorded to the owners of intellectual property. Moral rights refer to the right of owners to be acknowledged for their expressions or products; economic rights refer to the rights of owners to benefit from the fruits of their creation and expression. There are however different types of intellectual property rights that include copyright, patents, industrial rights, trade secrets, etc. The focus of this chapter is copyright in the digital environment.

Copyright

Copyright basically refers to the rights of owners to protect their expressions such as: "works of a literary, dramatic, musical, artistic, or cinematographic nature (Clarke, 1999). Owners are granted the rights to do the following: make copies, perform their works, translate their works, and display it publicly (Story et al. 2006). Copyright protects the expression of ideas and not the ideas themselves. Copyright infringement occurs, when a substantial part of a book or work is reproduced without the owner's permission, or is used for economic gain. Ideally, an individual's use of others' work must either acknowledge the fact and/or also seek the owner's permission. There are, however, a number of

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exceptions where copying of work is accepted, and these include fair use or fair dealing and the first sale doctrine. Fair use allows content users to access, make copies and use copyrighted materials without seeking permission – as long as the use is for educational, research and non-profit making purposes. First sale provides for the right of a content user who has purchased a product such as a book, to lend it out, to sell at second hand rates, etc.

Copyright has a long history that can be traced to 18th century English law. Prior to the invention of the Gutenberg printing press, there was little concern with copyright, as reproduction of works could only be carried out by hand, a laborious exercise. With the invention of the press, reproduction became possible since copying could be done using machines (Hollaar, n.d.). *The Statute of Anne of 1710* was the first copyright law enacted in England, as access to printing machines became possible, and people began copying documents. Not long afterwards in 1790, the first copyright law was enacted in the US. Eventually, copyright was extended into the international arena, with the signing of the *Berne Convention for the Protection of Literary and Artistic Works* in 1886. States which had ratified the convention were expected to enact national laws that would protect the works of authors. The World Intellectual Property Organisation (WIPO) was an offshoot of the office, established to carry out the administrative work of the Berne Convention. In 1974, WIPO became a special agency of the United Nations. Two treaties of WIPO are seen to have been critical in extending copyright to digital materials: these are the *WIPO Copyright Treaty* and the *Convention for the Protection of Producers of Phonograms*. According to Szczepanska (n.d.), both treaties granted protection of works in the digital environment. Also significant is the *Trade Related Aspects of Intellectual Property Agreements (TRIPS)* signed under the auspices of the World Trade Organisation (WTO). TRIPS basically tied intellectual property rights with trade partnership, and it was expected that to become a member of WTO, states had to also sign TRIPS. Although TRIPS did not protect digital works, it did extend protection to computer software and databases.

However, copyright as first conceptualised provided protection to the producers or owners of works written on a fixed, tangible format. It provided protection of individual's expression whether as books, music and artistic works of different nature. It is important to note that in the publishing world, copyright may not necessarily be owned by the originator, creator or author. Usually, it lies with publishers or what are

referred to as content owners. It is these publishers or content owners who make money from copyrighted works, and therefore have a special interest to ensure that protection of copyright is enforced at any cost.

The Nature of Digital Information

The digitised world of today is characterised by the availability of the Internet and the development of more sophisticated digital technology. The Internet was at its inception hailed as a liberating and democratising entity, where anybody could express themselves and not be bound by physical boundaries in their expression. Hence, the view that one can find anything and everything, good or bad on the Internet. The effect of the digitised world is that information is no longer physically bound, but traverses through cyberspace, and where it originates is not of any concern to those who use it. Information on the Internet can also be easily copied and distributed to all at the blink of an eye. It is these factors that have affected the economy of information, its creation, distribution and use.

The information age, as we know it, is characterised by information largely available in digital form. Indeed Clarke (1999) has stated that "the most cost effective form in which data can be prepared and disseminated is in digital formats". The development in computing, networks and data communications has resulted in a lot of information being available in electronic or digital formats; more and more organisations, businesses and governments are dealing with information in this form and find it easier to deliver services through the digital medium. Since information is now available in digital form, and is mostly available on the Internet, copying, manipulating, and distribution of information have become much easier than they were before. The very act of reading resources from the Internet entails downloading – which is essentially copying files to your own computer, so that you can read them. Digital information can be copied easily to make perfect copies; such information is also amenable to manipulation, which could be difficult to detect, but which could have devastating results. Digital information that is available via networks can be easily accessed by undesirable elements that may use the information to discredit or negatively impact on individuals for whatever reason.

Digitisation of information has made it easy for copyrighted works to be copied without any effect on the copy; it has also "blurred the lines

between copying and reading, sale and reuse, performing and viewing a work (Hill, et al. 1998) quoted by Correa (2000). The very empowering factors of digital technology, i.e. easy publication, etc, has a negative effect: it has made the rendition of copies an easy, effortless endeavour. These factors have engaged those tasked with ensuring that the moral and economic rights of owners of intellectual property are protected.

Publishing in the Digitised Environment

In the past, publishing materials were a physical matter, as books, newspapers, journals, etc, were published in a tangible form. Although reproducing such materials was done even then, it involved a lot of time and effort to photocopy or to record music on tapes, etc. Hence, although there was and has always been copyright infringement, it was not as easy to do, as it is in the digital environment. According to Clarke (1999), the electronic or digital environment has enabled the following:

- Convenient and inexpensive creation of new data objects in digital form;
- Conversion of existing materials into digital objects (digitisation);
- Near costless replicas of data objects at immeasurably low marginal costs;
- Inexpensive and widespread access to data objects from a variety of devices (mobile phones, web-enabled TV, etc);and
- Convenient manipulation of data objects.

The Internet or the web has made publishing an easy matter; it has facilitated distribution, as once information is published on the Internet, it becomes instantly available to millions of people all over the world (Moahi, 2004). Digital technologies such as CDs, DVDs, ipods, etc, have also made publishing easy and affordable for publishers; hence, the explosion of materials and music on those formats.

For individuals and scholars, who want exposure for their work, this is indeed a very welcome development. However, for publishers who have a profit or commercial stake in their publications, it has posed a significant problem. The publishers worry about their returns, where materials are easily accessible on the Internet. This has led to licensing materials and controlling access through the use of passwords and encryption and Internet protocol (IP) recognition.

However, this has created a problem for both publishers/owners and the users of information. On the one hand, for publishers/owners, the easy distribution and availability of materials on the Internet means that the economic returns (i.e. from sales) of the works would be severely curtailed, because once the material is available digitally, illegal copying and distribution becomes easy. On the other hand, for users, the concern is that the content owners would want to take measures to curtail access to information as is being done now through licensing agreements, and the use of digital rights management systems. This is the dilemma currently facing copyright in the digital era. Issues around easy reproduction of digital materials have also become a challenge for publishers and users alike. For example, movie and music distributors have felt that copying of these to other mediums, for example, from a CD to a computer or iPod, is violating their intellectual property right. On the other hand, users feel they have the right once they have purchased their original copy to make as many copies and in as many formats as they wish.

Copyright and the Digital Environment

The digital environment has changed the way content is accessed and used, especially on the Internet. Information can be communicated quickly to millions of individuals all over the world. Low cost, high quality copies of digital documents and objects can be made; such copies can be altered and manipulated in ways that may not be immediately obvious. Most crucial of all is that the relationship between owners and users has changed dramatically. According to Story, et al. (2006), the ease of copying and distribution of digital materials through piracy has increased. Users do not see the need to have to pay for information and products that can be freely available. Second, many users rightly feel that the doctrine of first sale has been upset. This arises from moves by content owners in the entertainment industry to make it illegal for users who have legitimately bought products to make copies, for example of their CDs on their computers to use at home, work or in the car. Second, most users in the eyes of the content owners are viewed as pirates and thieves as they go about sharing music, information, entertainment, and other materials found on the Internet. There is now a dichotomy between users who favour a culture of sharing, and owners who favour a culture of monopolisation and privatisation of information (Story et al. 2006).

Copyright owners and their agents have therefore taken to lobbying for stricter and more stringent means of controlling access to information and other copyrighted materials

Measures taken to Protect Copyright in the Digital Era

Copyright owners have pointed out that the relative ease that technology gives to users to make copies, cut and paste, etc, has the effect of jeopardising the owners' economic interests and gains. Over the years, copyright owners have implemented technical and legal means of protecting their works from what they termed "unauthorised use". As far back as the early years of computing and networks, various digital rights management (DRM) systems were in place. Software and databases were protected, using technological methods, such as encryption, requiring passwords and limits on the number of times software could be copied and databases could be used. Even as DRM systems existed in the early days with reference to software, it was not until the World Intellectual Property Organisation (WIPO) Internet Treaties were put in place that intellectual property measures were articulated to embrace the changes brought about by the digital era. These are the *WIPO Copyright Treaty* and the *WIPO Performance and Phonograms Treaty*, which were created in 1996, and came into force in 2000. These treaties, according to Yu (2006), required states to make legal provision to protect against the circumvention of DRMs. Since then, protection measures for digital copyrighted works have increased in sophistication, and legal measures (especially in the US) have been instituted.

Digital Rights Management (DRM)

Protection of digital work has been facilitated by the use of digital right management technologies. DRM is defined as "a collective name for technologies that prevent you from using a copyrighted digital work beyond the degree to which the copyright owner wishes to allow you to use it" (Litman, 2001) quoted by Bailey (2006). DRM ensures that works such as documents, objects, computers software, databases, etc., can be subjected to access control measures, such as passwords to unscramble encrypted works, and licensing agreements. This means that digital materials can only be accessed through facilities such as logging in and providing passwords or through the recognition of the Internet Protocol (IP) address of the computer the user will be utilising to gain access or through the use of access cards.

The use of such technologies enables the copyright owners to use technology that grants certain rights to the users and prevent certain uses of the copyrighted work. DRM allows monitoring and control of how such materials are used, in effect, putting copyright owners in control of their works, even as they charge users for it. There are two key technologies that make up a DRM system: digital markings and encryption. According to Bailey (2006), digital markings may be "simple labels that attach rights information to content; or watermarks that typically hide information that can be used to identify a work". Encryption involves scrambling content, so that those who have no authorisation in the form of a code or password cannot decipher the content.

Although DRM technology has always existed, users have found ways of circumventing them. There are and have always been a large variety of devices and software used to gain access to encrypted content. In today's environment, hackers will always find a way of gaining access to encrypted works or develop software for doing so.

Licensing of Content

Another measure used to control access and use of copyrighted materials is the signing of licensing agreements between owners and users of knowledge. To protect their economic earnings, publishers and copyright owners have turned to the use of contract law, by enforcing the signing of license agreements as a prelude to gaining permission to use copyrighted works. For example, in order for a university library to access a database, they may have to sign a user license agreement that stipulates rights and obligations to the user. Copyright owners/content providers end up dictating terms of use to the content users. They dictate who may use such information, who may have access to it, how long they can use it, whether it can be translated or repackaged, etc. Licensing, therefore affects fair use, first sale and public lending rights (especially for libraries and information centres).

Digital Millennium Copyright Act (DMCA)

The US Congress, in response to the lobbying of owners, their agents and publishers, passed the Digital Millennium Copy Right Act (DMCA) in 1998. According to Lee (2006), US Congress, by passing the DMCA, gave content owners "explicit statutory protection". The DMCA makes

it a crime to crack or circumvent (override) DRM technologies, manufacture or sell technology that helps to circumvent DRM. Indeed, according to Reese (2003), DMCA provides legal support for DRM, and gives copyright owners the right to control access to their works. However, DMCA legislation has provisions meant to safeguard fair use. These, according to Lepage (2003), include exceptions for the following:

- Encryption research – research into the effectiveness of encryption or into the ways and means of protecting content;
- Reverse engineering for identifying how technology works in order to create technology that is compatible;
- Security testing;
- Access to databases containing personal information; and
- Authorising libraries, archives and education institutions, to access works for purposes of evaluating them for possible purchase.

However, in spite of the above exclusions, copyright owners have used the DMCA to impinge on various aspects of fair use.

Impact of DRM Systems and DMCA

The use of DMCA to give a legal backing to DRM has had an impact on some copyright exceptions, as well as undermining the very *raison d'être* of intellectual property protection – the encouragement of creativity and innovation. It threatens academic freedom, access to public domain works, preservation of works by libraries, the creation of new derivative works, and the conduct of historical research. Basically, it has an impact on the individual user, libraries, and content and technology industries.

Fair Use or Fair Dealing

Fair use or fair dealing is one of the provisions in many copyright laws. In this provision, copying and distribution is allowed for the purpose of research and study, as well as reproducing materials to enable disabled individuals to access it, e.g. translating it into Braille. All these can be done without first seeking the permission of the copyright holder. Fair use consists of a set of guidelines that outline what constitutes allowable use of copyrighted material (Moahi, 2004).

Prior to the digital era, users of information and owners had struck a balance through fair use, where it was understood that educators and

researchers can use portions of works without seeking permission for educational and research purposes, including also conversion of works into formats that are user friendly for different groups of people, such as those living with disabilities, in particular, visually challenged individuals. However, this balance was upset by the ability of users to create copies of works easily through the use of digital technology. In the digital or electronic environments, many such works are available in electronic form, and are easily copied and distributed around the world as compared to the tangible works of old. Today, it is possible to have e-books, which can be copied and distributed around the world, at the blink of an eye. Obviously, these developments would have effect on the rights of owners and producers of information and related products. In response to this, copyright owners have intensified efforts to control their economic benefits by enforcing DRMs, licensing agreements and ensuring that legal provisions are in place to support the DRMs in the form of the DMCA. The effect of DMCA is that copyright owners "are exerting increasing control over playback devices, cable media offerings and even Internet streaming" (Lee, 2006), not forgetting databases, e-journals and e-books. This control is exerted in a number of ways: First, the use of DRM means that content users are limited in how they access and use a copyrighted work. According to Bailey (2006), DRM technologies provide three types of content rights:

- Render rights where authorised users may view, play and print protected content;
- Transport rights where authorised users may copy, move and loan content; and
- Derivative rights, where authorised users may extract pieces of content, edit it, and include in other works.

Depending on the type of rights that one is afforded through the license agreement, the DRM technology is structured such that the rights are embedded and therefore the user will be restricted accordingly. Notably, the types of rights accorded depend on the price paid, which is differentiated accordingly.

Licensing agreements give the copyright owner power to control how the content is used and tend to override the copyright law which may exist in a particular country or domicile. Licensing means that copyright owners even after selling their content for use can still dictate

terms of how such information may be used, accessed, for how long, etc. This particularly affects information providers, such as libraries that are increasingly buying journals and other products in digital form. Not only are these products very expensive, but also the libraries are expected to sign license agreements that dictate who can use the products, and usually will restrict the repackaging of such information to cater for minority groups, such as the visually impaired users. It also affects individuals as Lessig (2004), has shown through a very good example that follows below.

Copyright laws basically protect against copying. However, to use electronic or digital materials, one has to download, or copy content to one's computer. Lessig notes that prior to the Internet, individuals could read copyrighted materials that they had purchased as many times as they wanted to. That act of reading over and over was not a copyright infringement, because to read the book, the individual did not have to make a copy. To use an electronic book or document, one has to first download the copy – effectively making a copy. To prevent this happening, licensing agreements and DRM technology would allow the individual permission to read the book a number of times, beyond which the individual would be infringing copyright. Further, the technology is such that the DRM would not allow the individual to read the book beyond a number of times. In the digital environment, therefore, the content user is controlled.

In essence, copyright owners can and do use these licensing agreements to override the local rules of copyright, which have included in them the exceptional clauses, such as fair use, first sale doctrine, and public lending rights of libraries. This situation is not made any easier by the fact that copyright owners are merging, and thus becoming bigger and bigger, and therefore wielding more power over content users. Further, the merging of copyright owners and providers, such as the merging of Google and YouTube, has the effect of pushing up the cost of digital information.

First Sale Doctrine

The first sale doctrine allows individuals who own copies of copyrighted works (e.g. books, CDs, etc) to sell, lend, rent, or make copies for their own use. The exclusion is of particular interest to public libraries, owners of second hand books, music or video rental shops (Reese, 2003). Indeed,

the first sale doctrine, according to Reese, "has been essential to the balance in copyright law between authors' rights and public access to works (Reese, 2003). Digitisation of such works, coupled with the use of technology or licenses to control access means that this balance is upset. Digital works that are sold to users are usually encrypted or protected in such a way that the use of the work is controlled and the individual is restricted in the use. For example, the library's public lending right is challenged, because restrictions are imposed as to whom the library can allow access. The purchase of an electronic book or e-book does not mean one can use the book or dispose of it as one may wish, or may have done with a physical book. DRM and licensing agreements dictate how the book may be used and how many times it may be read, or even excerpts of it printed. Lee (2006), goes on to point out that technology generally tends to offer some empowerment for individuals: for example, the VCR allowed users to be able to tape TV shows for later viewing; MP3 players allowed users to put their music in their pockets or bags (i.e. put all their music on one little gadget for portability). However, content owners and providers have sought to use legal provisions within DMCA to try and block what these technologies can do for users by arguing that by recording shows and music, they are violating copyright law.

Competition to Motivate Innovation and Creativity

Copyright as envisaged was an attempt at giving creators of copyrighted work an incentive to create more by safeguarding the economic returns from their creation. However, DRM and DMCA have made it increasingly difficult for competition to thrive, and for new and exciting products to be created. Lee (2006) has the following to say about the DMCA: "The DMCA is anti-competitive. It gives copyright holders and the technology companies that distribute their content the legal power to create closed technology platforms and exclude competitors from interoperating with them" (Lee, 2006). Essentially, while copyright was focused on providing incentives for creativity, DMCA is increasingly being used to stifle competition, and thus has an effect on the diversity and amount of creativity and innovation. Lee goes on to note that the DRM technologies that are used to protect copyrighted works are "clumsy and ineffective; they inconvenience legitimate users but do nothing to stop pirates" (Lee, 2006). Although attempting to fight piracy, DRM and DMCA mainly serve to control the interest of a few copyright holders,

who want to make as much a profit from their creativity and are afraid that other "upstarts" will wrestle the market from them. Copyright owners in the technology and entertainment field are particularly interested in stopping others from making products that are compatible to theirs. Yu (2006) states that: "DMCA has been misused to deter competition and interoperability of tangible products that only incidentally incorporated copyrigtable software code" (Yu, 2006). Examples provided by both Lee (2006) and Yu (2006) show that DMCA may be used to effectively stifle competition. Lee points out that technology industry has challenged the concept of reverse engineering (trying to understand how a technology works, in order to create own products that are compatible with the technology) as being copyright infringement.

Preservation and Conservation of Works

Another crucial issue pertains to the preservation and conservation of digital information. In the past, libraries and other information centres have been in the business of ensuring that works are preserved for posterity. In the digital era, this is not possible, because the licences stipulate that the content users have the right to use the information, but do not own it. Not owning it means that they may not archive the content, and when they cease to pay the licensing fees, access and use of the materials also ceases. This is another problem area, where the rights of users are infringed through DRM systems and licensing agreements.

Measures of Protecting IP and the African Perspective

According to Nicholson (2005), developing countries, especially African countries, are net importers of copyrighted information or intellectual property. Many of these countries are made to sign international intellectual property laws as a condition for trade agreements and membership into the World Trade Organisation. This means that these countries are mandated to adhere to the laws and rules imposed by developed countries on intellectual property rights. This includes the DRM systems and the DMCA of the US (which is the biggest net exporter of intellectual property and stands to gain the most from it). It is further pointed out that the anticircumvention laws as found in the DMCA, are likely to find their way into developing countries that have signed trade agreements with the US, and thus affect developing countries, such as those in Africa in a number of ways.

Since most information, educational and otherwise, comes from developed countries, and in particular, the US, the use of DRM means that even if a country has its own copyright laws to reflect national development priorities, the use of technology to block and control access may undermine and overrule these priorities (Doctorow et al. n.d.). For example, where a country allows exemptions in the way copyrighted materials are used, DRM may override the exemption through technological means that govern and determine how materials are to be used.

Many African countries have in various fora expressed concern that IP protection measures may have the adverse effect of stifling development, because they may deny access to ideas and technologies that are crucial for their development process. They rely to a great extent on knowledge and information from developed countries, most of which is copyright protected. For example, in order to innovate, there may be need to utilise some information that may be copyrighted and therefore not accessible. DRM is yet another stumbling block that these countries may face. Many African countries are also poor, and cannot afford software and other educational material for their students and pupils. Where such materials are protected through DRM, which specifies how many people may use them and from what location, etc, it becomes difficult, and, mean that the provision of education is affected. Doctorow, et al. (n.d.) points out that although digital technology, such as e-books has made it easy for disabled persons to enjoy the same materials as able bodied people, DRM may make it difficult. An example is given of Adobe's e-books, which come with capacity to be read aloud by computer, but which the authors of the books are allowed to switch the capacity off.

The provision of education may be affected, where a country's copyright laws provide exemption for educational works. Where works are digital, as is increasingly the case, DRM may impinge on the use of materials for educational purposes by dictating how many times and by how many people that may use it. Where materials may be bought and licensed by one entity, such as a Ministry of Education or a national university, it may not be possible to distribute the material, unless a licence is granted to do this – at a cost. Many African countries cannot afford the extra cost associated with the purchase of such licences.

The African continent in general suffers from the digital or information divide. Basically this means that there is an imbalance of

access to information or even the tools of information such as ICTs between the developed world and the developing world. It is contended that the digital divide may be exacerbated as information, knowledge and ideas are locked in using DRM, unless the entities wishing to use it can pay. Many African countries have weak economies and low exchange rates that will affect their ability to pay, and thus protection of content in the digital era may stifle African development.

One of the rights protected through the use of DRM is prevention from making derivative works. Derivative works may be required to adapt materials for people who may be illiterate or who may have a disability. DRM technology is able to prevent derivative works technologically, and thus it may be necessary, but not possible that those wishing to make derivative works pay for doing so, if at all they would be given permission.

According to Doctorow et al. (n.d.), developing nations rely on used and second hand information materials such as used books, computers and other instructional materials. However, DRM can prevent the re-sale, lending and donation of information goods, thus undermining the development process.

Conclusion

This chapter has considered issues affecting copyright in the digital era. It has shown that copyright in the digital era is not easily implemented, and this has resulted in various measures such as digital rights management systems (DRM) and the Digital Millennium Copyright Act (DMCA) of the USA. These measures are shown to have a detrimental effect on some of the exclusions that were available in the copyright laws or guidelines in the analogue environment or era of physical manifestations of expressions. These exclusions covered or protected fair use, first sale and public lending rights. In addition, the measures have been shown to pose potential threats to competition and innovation, threats to individual privacy, to academic freedom and to preservation and archiving of digital materials for future generations. The chapter has also highlighted some of the problems posed by these copyright protection measures on developing countries, especially African countries, which overall, produce a tiny fraction of the intellectual property in the world, and therefore depend greatly on copyrighted information from abroad – especially the US.

Review Questions

1. Identify the characteristics of digital information resources that make infringement of copyright easy and sometimes difficult to detect.
2. Describe the different measures taken to protect copyright in the digital environment.
3. What in your view would be the impact of these measures in the various uses of information and other copyrighted materials?
4. How do these measures to protect copyright in the digital era impact on African countries and their bid to enhance their development?

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Chapter 16

Freedom of Information and Privacy in Digital Era

Nathan Mnjama and Peter Sebina

Introduction

Information occupies centre stage in all disciplines. This may partly be due to the fact that almost everything which individuals do or which society engages in, generates or is driven by information. The increasing significance of information has given rise to legislation to promote and control it, such as Freedom of Information (FOI) and Privacy legislations, among other laws. FOI legislation provides a legal right of access to all official records held by government subject to certain exemptions, which the law clarifies. The essence of Privacy legislation is to establish a right of access to information held by government on individuals. Both legislations aim to create an access regime, which ensures that citizens can gain direct access to official information, while at the same time making certain that privacy of individuals is maintained. (Whitman, et al., 2001). It has however been observed that the adoption of Information Communications Technology (ICT) has resulted in new opportunities, through which citizens can gain access to information, but at the same time opened new ways for the intrusion into the citizens lives. Bennett (1997) noted that the adoption of privacy laws was meant to counter the intrusiveness of the state and ICTs into the personal affairs of individuals. Privacy laws are therefore designed to protect individual privacy and in so doing empower individuals to influence control over the communication, disclosure and access to information about them. Clearly as Cahir (2002) had observed, any law which is adopted to regulate access information can impact on its creation, content and on the modalities for accessing, communicating and disclosing it.

This chapter discusses the effects of ICT on access to information in FOI and Privacy regulatory environments. It argues that the continuing

advances in ICT have led to greater and improved access to public information, and at the same time have intruded into personal privacy.

The chapter shows that there are areas of conflict that have been created by FOI and privacy legislations. Whereas FOI promotes access to information, privacy laws limits and controls access to personal information. Compounding these conflicts is the complex nature of society and developments in ICT, which makes privacy difficult. In view of the difficulties in attaining complete privacy, Cahir (2002) suggested that:

> A person's desire to keep private his personal information is at odds with the way in which modern society functions; to prevent a loss of privacy a person would have to opt out of modern life altogether. A legal measure that (is) aimed at establishing an absolute and inalienable right to privacy would require a restructuring of society itself.

With the continued sophistication of ICT with their varied ways of capturing and disseminating information, privacy laws can at best regulate infringements rather than sustain definite privacy.

Developments in ICT have also created restrictions for FOI legislation, as some individual employees who are empowered to use ICTs to create and maintain records as they transact official business may personalize the records. At times, the records are unknown to exist, because they have not been logged into organisational files or databases to form part of the corporate memory. At other times, the records are known to exist, but retrieving and making them available for access in support of other business needs not related to those of the creator or for FOI legislation is difficult. Therefore, advances in ICT impact not only on FOI or Privacy legislation, but also on the management of public sector records.

The importance of access to information has been enshrined in various international and regional treaties, which bestow on their signatories the responsibilities of enforcing and regulating adherence to them. Since access to information is a wide undertaking, its enforcement and regulation by signatory countries is by virtue of constitutional guarantees, FOI and through privacy legislation, among other laws. Realizing the importance of access to information to humanity the United Nations (UN) was the first international body to commit its members to protecting and facilitating access as a human right. Initially, the UN considered access to information as facilitator of free expression. Later,

through evaluations by the Office of the Special Rapporteur on Freedom of Opinion and Expression, it becomes clear that access to information is also an independent right on its own accord. The European Union followed with similar access to information treaties, and much later the African Union adopted access to information provisions into instruments which member countries committed themselves to.

The section that follows provides a historical overview of access to information from the perspectives of FOI and Privacy legislations. The next section attempts to define and differentiate FOI legislation from Privacy law. Other sections focus on the impact of ICT on both FOI and Privacy laws, ICT, FOI and Privacy laws, from an African perspective, and the argument irrespective of the level of ICT development, both FOI and Privacy laws benefit from good records management regimes. The chapter concludes by stressing that access to information legislations is an important development, but countries which seek to adopt the laws, including those who have already done so, should not consider good records management practices as an option, but an integral element.

Access to information: Historical Background

Access to information is normally ascribed to FOI legislation, as seen in the titling of *Access to Information Act (1983)* of Canada, *Promotion of Access to Information Act (2000)* of South Africa, the *Law Concerning Access to Information Held by Administrative Organs (2001)* and many others. If this is taken to be the norm, we may fail to understand that access to information is a broad process, which caters for access to official information, as well as protecting personal privacy through regulating access to information in which individuals are the subject. It should be known that most, if not all, FOI laws have exemptions which seek to promote personal privacy, (Banisar, 2006). In as much as FOI laws do have clauses seeking to protect personal privacy, countries still adopt Privacy laws. Others like Zimbabwe have adopted a law which promotes access to official information and protects access to personal information in one instrument (see the *Access to Information and Privacy Act* (2002).

Essentially, access to information is centered on two competing rights: freedom to access official information and the protection of access to personal information captured in official information. This chapter will break away from the norm of taking access to information to be a facilitator for free access to official information. It considers access to

information to be a broader concept, which caters for both free access to official information and protection of personal privacy. It views FOI legislation as facilitating free access to official information, and Privacy laws as protecting and regulating access to official information which have individuals as subjects. As a result of this explanation, tracing the history of access to information will be considered under FOI and Privacy laws.

FOI Laws

The history of FOI laws dates back to 1766, when the first law was enacted in Sweden as the *Freedom of the Press Act*. Many more countries have followed with the adoption of similar laws. However, the precedent to many more countries adopting FOI laws appears to be one set by the UN. As early as 1946, the UN through *Resolution 59 (1)* proclaimed that "freedom of information is a fundamental human right and... the touchstone for all freedoms to which the United Nations is consecrated." Although this resolution appears to pin only the UN to FOI, it nonetheless suggests that member nations were also expected to uphold access to information as a fundamental human right. Two years later, through Article 19 of the Universal Declaration of Human Rights (UDHR), the UN made it known that: "Everyone shall have the right to hold opinions without interference. Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice." By way of this declaration, the UN envisioned each human being to be in possession of a right that enabled them express themselves freely. Invariably, this right greatly depends on the ability of people to *seek, receive and impart information*, indicating the necessity of access to unrestricted information. The UDHR was seen more as a statement of principles and aspirations, which did not compel member states to legislate for freer access to information or expression. It was seen more as a move to encourage countries to guarantee freedom of expression.

Realizing the little legal grounding of the UDHR, the United Nations in 1966 ratified the International Covenant on Civil and Peoples Rights (ICCPR), and Article 19 of this treaty reiterated the exact words of Article 19 of the UDHR, and importantly, bound signatories through Articles 2 and 3 to create legal environments to protect and enforce freedom of

expression and establish remedial measures for deliberating on its infringement.

Indicatively, the above treaties protected freedom of expression, which also included freedom to form and hold opinions. Conversely, protecting freedom of expression warranted protection of access to information, since without the latter, freedom of expression would not be complete. This was made clear by the several reports of the Office of the Special Rapporteur on Freedom of Opinion and Expression. In some of these, the Special Rapporteur argues that access to information should not only be taken to be a facilitator of free expression, but, is in itself a free standing right, (United Nations, Commission on Human Rights, 1995).

Privacy Laws

Introna (1997) observes that while academic debates on personal privacy emerged in the 1960s, the history of privacy can be linked to the 1890 journal article of Brandeis and Warren in the *Harvard Law Review*. Just like FOI laws, laws protecting personal privacy have their emergence linked to the UNDHR and ICCPR. While enforcing recognition of freedom of expression and committing member states to protecting it against abuse, the UDHR and the ICCPR went further to protect privacy of citizens. Articles 12 (UDHR) and 17 (ICCPR) state "No one shall be subjected to arbitrary or unlawful interference with his privacy, family, home or correspondence, nor to unlawful attacks on his honour and reputation...Everyone has the right to the protection of the law against such interference or attacks." In 1990, the UN issued guidelines on the collection and processing of personal information.

The purpose of this protection was acknowledgement that access to information is critical to citizens, but the access has to take into consideration that individuals also have information which is personal to them and access to which had to be regulated. Commenting on the importance of protecting privacy of personal information, the United Nations High Commissioner for Human Rights (1988) stated that:

> The gathering and holding of personal information on computers, data banks and other devices, whether by public authorities or private individuals or bodies, must be regulated by law. Effective measures have to be taken by States to ensure that information

> concerning a person's private life does not reach the hands of persons who are not authorized by law to receive, process and use it, and is never used for purposes incompatible with the Covenant. In order to have the most effective protection of his private life, every individual should have the right to ascertain in an intelligible form, whether, and if so, what personal data is stored in automatic data files, and for what purposes. Every individual should also be able to ascertain which public authorities or private individuals or bodies control or may control their files. If such files contain incorrect personal data or have been collected or processed contrary to the provisions of the law, every individual should have the right to request rectification or elimination.

The ICCPR also through Articles 2 and 3 made certain that privacy to personal information would be protected and guaranteed. By having both Articles 17 and 19 into the ICCPR, the UN was creating a more balanced access to information framework which had regard to information dealing with the person of individuals.

The European Union (EU) adopted the European Convention on Human Rights (ECHR) in 1950 and Article 10 of this treaty says: "Everyone has the right to freedom of expression. This right shall include the freedom to hold opinions and to receive and impart information and ideas without interference by public authority and regardless of frontiers." The EU in adopting this article signalled its commitment to embracing the UDHR and the ICCPR, and was thus expecting member states to further obligate themselves to access to information at national levels. Just like the UDHR and the ICCPR, the EU went on to safeguard access to personal information through Article 8 of the ECHR. To enhance acceptance of access to information, the EU in 1981 released the *Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data*. Further, through the Council of Europe Committee of Ministers, the EU in 1982 released the *Declaration on freedom of expression and information*, and in 1995 the *European Commission on Data Protection* was established. In 1999, the Council of Europe issued guidelines on the collection and processing of personal information on the Internet.

In as much as access to information is promoted and facilitated through the passing of FOI and Privacy laws, in Africa these two processes are mostly through guarantees in independence constitutions of the various countries. By 2007, only Angola (2002), South Africa (2000),

Uganda (2005) and Zimbabwe (2002) had enacted FOI laws. It appears that no African country has passed a privacy law as at 2007. Apart from constitutional guarantees, these countries also regulate access to information through repressive official secrets laws or some forms of national security laws.

Access to Information: definitional issues

FOI Legislation

The importance of FOI legislation to the society cannot be overstated. Birkinshaw (1996:1) argues that FOI legislation "has the ability to generate more controversy and heated debate than any other aspect of contemporary government and administration." Why should this be so? Is it because, when enacted, FOI legislation enables the citizens access to information which in normal situations they would have had to wait for several years before being granted access to it or is it simply because governments the world over believe in secrecy? Bolton (1996) observes that the "fundamental purpose of FOI is to make public bodies more accountable by providing the public with records on request." Banisar (2002) argues that the collapse of authoritarianism and the emergence of new democracies have given rise to new constitutions that include specific clauses guaranteeing citizens rights of access to government held information. He singles out the Word Bank, the International Monetary Fund and some donor agencies as being champions in advocating the enactment of FOI legislation as way of increasing government transparency and combating corruption.

There are also other reasons justifying citizen's interest in gaining access to government held records. These reasons were perhaps best summed by Marsh (1987) when he wrote saying: "There are somewhat different reasons why it may be said that the citizens of a democracy ought to be informed about the operations of the executive government". That is because it is feared that any government, if it is allowed to work in secrecy, will abuse the power entrusted to it. The second reason is simply that openness of the government process is essential to good governments.

FOI refers to a "right which the individual exercises directly, without an intermediary. People seeking information do not have to persuade an

elected representative to ask questions for them, search for a lawyer willing to waive his fees or hope the situation involves peculiar characteristics that the press deem newsworthy. It is a free-standing right, which the ordinary citizen uses in his or her name." (Frankel, 2001). Some FOI laws declare that the access they wish to facilitate is to records, others to information. Generally, as Banisar (2006) observed, FOI legislation sets about a right of access to recorded information. As the practice in New Zealand shows, access to information should not just be set aside for recorded information or to records, but to oral information which is known to a government agency. But it can therefore be said that freedom of information is about which records can be disclosed and which records can be withheld from public inspection, thus making governments more open, transparent, and their actions subject to public scrutiny.

Screene (2004) noted that FOI legislation obliges government agencies to know:

(i) What is the information they hold?

(ii) Where is it held?

(iii) Who holds the information?

(iv) How accessible is the information?

(v) How can it be accessed?

(vi) Is the information reliable in relation to the transactions that gave rise to it?

Freedom of information also provides for means of appealing against decisions, where access to the records has been denied. Under FOI legislation, a citizen who requests for information should be given the opportunity to inspect the document without any hindrance, unless the document has been exempted from FOI legislation. Citizens are also entitled to obtain a copy of the documents subject to paying the required photocopying charges. In case of audio visual materials, the citizens have the right to be provided with the opportunity of viewing a film, a videotape or hearing a sound recording, or receiving a transcript of a sound recording or short hand notes. Under FOI legislation, institutions are required to provide feed back within a specified period to all requests for information within a limited time, indicating its willingness to comply or reject the application. Experiences gained in many countries indicate

that many institutions are unable to meet time limits for requested information, due to too many requests and inadequate staffing.

Where FOI legislation has been enacted, it gives the citizens the right to request information held by government departments, local councils, semi-government agencies and statutory authorities, public hospitals and community health centres, irrespective of how long these records have been held. FOI legislation further makes provision for the right to access documents about one's personal affairs, regardless of the age of the documents and allows the citizen the right to request that incorrect or misleading information held by an agency on them be corrected or removed. In most cases, the Act does not apply to privately owned businesses. It is also worth noting that FOI legislation allows an agency to refuse access to certain documents or information. However, in most cases, it is only information that is likely to cause substantial harm to individuals and the public interest that may be withheld. The documents that are usually withheld are often called 'exempt' documents. Where a file contains some information that qualifies to be exempted from public disclosure, the entire file is not necessarily exempted. Instead FOI legislation makes provision for any portions that can conveniently be segregated to be availed to the requester after the deletion of the portions that are exempt. This action is often referred to as redaction.

Requests for access to information under FOI can be made by the requester themselves, or their authorised nominee (for example, a solicitor), but in the case of a nominee, written authorisation from the requester must be furnished, in order to make the request. Moreover, the applications must be made in writing, clearly describing the requested documents, and must include the required application fees. The fees are basically used to cover searching time, copying the requested information, and in some cases for time spent in reviewing requested information to establish if it can be disclosed or not. Some institutions charge separate charges for information requested for personal use and commercial use. Where the information requested relates directly to the requester, some form of identification will be needed to certify that the records relate to the requester.

Through FOI legislation as Rodrigues (2006) has argued, governments attempt to:

(i) Acknowledge that official information belongs to the public, since it is they who have financed its collection and maintenance through paying of taxes among other revenue generation methods;

(ii) Set out the content and parameters of the right to access official information;

(iii) Create duty-holders who are responsible for the provision of official information;

(iv) Create beneficiaries who are legally empowered to seek and harness official information;

(v) Stipulate government bodies from which members of the public can gain access to information and the ones exempted;

(vi) Explain how, when and at what cost information can be accessed;

(vii) Make clear the duties of government bodies covered by the legislation;

(viii) Set out prescriptions governing how government bodies may legitimately refuse to provide the public with access to official information;

(ix) Lay down procedures regulating how access to information will be provided without waiting for requests for its access to be made; and

(x) Explain how conflicting access issues will be resolved.

Privacy

Although the enactment of FOI legislation has provided a major step towards increased access to information held by governments, nonetheless this has also led to the invasion of citizen's rights to privacy. The advent of ICTs has brought with it radical changes in the manner in which vast quantities of information are collected, processed and stored. While this advancement has been of great benefit to the society, it has also resulted in great opportunities for invasion of personal privacy. While it was possible to secure and control access to traditional paper-based record keeping system, the same cannot be said of modern day databases. It is for this reason that various governments have passed privacy or data protection laws regulating access to personal information held by government agencies. Where privacy laws are in place, they enable citizens to access information held by governments about themselves. Privacy laws demand that information concerning individuals be accurate, complete, relevant and timely, and makes provision for the persons involved to challenge the accuracy of such information.

Moreover, privacy legislation requires, that information be obtained directly from the individuals concerned, and that information collected for one purpose cannot be used for other purposes without the consent of the individuals involved. Privacy laws further forbid the disclosure of personal information to third parties, without the consent of the persons mentioned in the records, unless their activities are of a criminal nature.

Privacy itself is a difficult term to define. Article 12 of the Universal Declaration on Human Rights provides that "No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to protection of the law against such interference or attacks." The International Council on Archives (1998) defines it simply as "the right to be secure from unauthorized disclosure of information contained in records/archives relating to personal or private matters." Different authors interpret the term private differently. To some, privacy is the ability to control information about individuals, their personal affairs and the circulation of information relating to them. Parker (2001) opines that privacy is the ability of the individual to lead his life without anyone:

(i) Interfering with his family and home life;

(ii) Interfering with his physical or metal integrity or his moral and intellectual freedom;

(iii) Attacking his honour and reputation;

(iv) Placing him in false light;

(v) Disclosing irrelevant and embarrassing facts about him;

(vi) Using his name, identity or likeness;

(vii) Spying or prying on, watching and besetting him;

(viii) Misusing his private communication, written or oral; and

(ix) Disclosing information given or received by him in circumstances of professional confidence.

As can be seen from the above definition, privacy covers several areas. In this chapter, the focus is on the use and misuse of information. In order to ensure the privacy of data subjects, many governments have established what Clayton (2001) and Bennett (2001) refer to as privacy or data protection principles. According to these authors, the principles demand that:

(i) Personal data should be processed fairly and lawfully. In other words, any government agency which holds personal information must be accountable for it;

(ii) Personal data should be obtained only for one or more specified and lawful purpose, and not be processed in any manner incompatible with that purpose or those purposes;

(iii) Personal data should be adequate, relevant and not excessive in relation to the purpose or purposes for which they are processed;

(iv) Personal data should be accurate, and where necessary kept up to date;

(v) Personal data processed for any purpose or purposes should not be kept longer than is necessary for that purpose or those purposes;

(vi) Appropriate technical and organisational measures shall be taken against unauthorised or unlawful processing of personal data and against accidental loss or destruction of, or damage to, personal data; and

(vii) Personal data shall not be transferred to another country, unless that country ensures adequate level of protection for the rights and freedoms of data subjects in relation to the processing of personal data.

Despite the increased demand for access to information, citizens are also increasingly demanding for protection from unnecessary disclosure of information about them. In this respect, there is need to maintain the right balance between the need of access to information and the need for privacy for citizens. In order to maintain some balance on the two issues, many governments have passed privacy laws, which regulate the types of personal information that is gathered, retained and disclosed.

A historiography on access to information earlier shows that privacy, as protected by international and regional treaties, is diverse. People demand privacy in their households, correspondence, conduct and behaviour among many other things. They demand that their privacy should not be interfered with either by the state or other individuals and institutions. Privacy from the perspective of access to information is substantially for personal information also known as information privacy. Clarke (1999) opines that personal privacy refers to the "claims of

individuals that data about themselves should generally not be available to other individuals and organisations, and that, where data is possessed by another party, the individual must be able to exercise a substantial degree of control over that data and its use." Privacy legislation is founded on the belief that boundaries exist between an individual and others; a group and an individual; an individual and state, and so on, (Bennet and Raab, 2003).

Bennett and Raab (2003) suggest that privacy legislation is developed on 10 principles which require organisations to:

(i) Be accountable for all personal information which they create, receive, manage and use;

(ii) Ensure that the personal information they collect, use and maintain is accurate, complete, up-to-date and adequate for the purpose that necessitated its collection;

(iii) Be able to identify the purposes for which they collect personal information;

(iv) Collect personal information limited only to that purpose;

(v) Not collect and use personal information for other purposes other than the one identified. If there is need to do so, the individual concerned has to give consent;

(vi) Collect all personal information with the knowledge and consent of the individual concerned;

(vii) Retain personal information only for the time period commensurate with the purpose for its collection;

(viii) Be transparent about the policies guiding collection, use and maintenance of personal information;

(ix) Have adequate security measures to protect personal information from undue access; and

(x) Allow individuals whose information they hold the potential to access it, have it corrected if it is found to be inaccurate, not complete, or obsolete.

Privacy legislation just like FOI is not absolute. Privacy legislation has to be balanced with many other competing rights, one of which is FOI. However, withholding and restricting certain personal information can be contested, especially where there are feelings that the information

is likely to benefit the larger citizenry. For instance, information on the acquisition of property and other economic benefits by politicians can be considered as personal information, but at the same time, it can be taken to be information which citizens can use to dispel the belief that politicians are after enriching themselves than pushing through public good. Even if privacy legislation is guided by the above factors, personal information continues to be collected without the consent or knowledge of the individual, and at times, individuals do not even know the organisations which hold or are likely to hold their personal information.

FOI and privacy are related, because they both provide access to information. However, they are at the opposing ends of the spectrum. FOI is intended to open access to information through creating a defined access framework, with clear procedures to facilitate or deny access, and privacy legislation regulates access and use of personal information. From a democratic standpoint, citizens need unhindered access to information. Citizens have to formulate consent, participate in governance, and they need access to information, in order to do these well. But democracy also realises that in as much as access to information has to be freer, citizens have personal lives which have to be respected, which means that access to personal information aspects of public information has to be regulated.

The Impact of ICT on FOI and Privacy Laws

The development and growth in ICT has had considerable impact on access to information. ICT through email, Google, Yahoo and Blackberry technology has led to wider access and dissemination of both official and personal information. The advent of ICT has revolutionised access to information, in that it is not limited by space and time. Information access is now possible outside office hours, and can be transmitted the world over in a matter of seconds. The ICT revolution, despite having led to wider and much freer access and dissemination of information has created vast opportunities for collecting and sharing information, in which individuals are subjects without their knowledge or consent.

ICT as FOI Legislation Promoter

One of the tenets of FOI legislation is for government agencies to inform citizens of the records series of the information held, which is accessible

upon receipt of a request. The other mandates them to disclose official information without waiting for access requests to be made. The harnessing of ICT can make these processes much easier to perform. For instance, through ICT, government agencies can create an online FOI manual (also known as publication schemes) which lists the various records series of the information they hold and to provide advice on how requests for access can be made. The manuals can also be used to publish and disclose records and information without waiting for access requests to be made. The online manuals will be easy to update as and when necessary. In addition, the use of ICT can enable citizens to select whether they would want access, following a request made, to be in the form of a virtual record or one sent through snail mail.

Other benefits of ICT towards FOI legislation is in the form of the Co-ordination of Access to Information Request System (CAIRS), developed by the government of Canada. This system lists all the information which has been requested under the Canadian FOI law. It also lists the summaries of the records released, and further provides online copies of them. Through this system, individuals desiring making access to information requests can cross-check whether the information they seek to access has ever been requested before; if it has not been released, it allows individuals to ascertain the cause, and if it has been released, save them the trouble of making a request, but gain access to the online copy. This and many more uses of ICT can promote effective usage of FOI laws.

ICT as a Privacy Intruder

Privacy has been under increasing intrusion, as a result of developments in ICT. The development of technology to tap telephone lines, to put under surveillance individuals without their knowledge, or to exchange personal information again without individuals knowing, has invaded personal privacy. Clarke (1999) is of the opinion that the introduction of ICTs have resulted in "technology-driven privacy invasion...Data is increasingly collected and personalised. Storage technology ensures that it remains available. Database technologies make it discoverable. And telecommunications enables its rapid reticulation." It can therefore be said that growth in ICT promote invasion of personal privacy.

Organisations in their dealings with citizens collect, use, maintain and share personal information with others. Some of the information is

kept in registered personal files, which are meant to capture complete information about an individual. Others are collected and sent to a central processing organisation like a credit bureau. For instance, an individual who enters into a hire purchase agreement or obtains a loan from a commercial bank has his or her personal information captured by the institution with whom he or she enters into an agreement. This institution will then have the personal details, repayment history of the individual. This information is then sent to a credit bureau, even without the consent or knowledge of an individual. The purpose of sending the information to this bureau is to enable other commercial enterprises with which the concerned individual seeks credit related services, have access to it and judge the credit worthiness or ranking of the individual. At times, this information is not complete i.e. the individual has completed paying for the credit related service, and the information has not been sent to the bureau. Thus, other institutions which access this information may deny the individual similar services without stating the reason for doing so. ICT has been used to collect and share personal information, with others often in disregard of the 10 rules itemised earlier. Other organisations like the secret services can obtain personal information from banks (bank statements on accounts) or hotels bookings, or tap telephone lines and use surveillance cameras to collect information on an individual.

Thus, ICT has the capacity to erode privacy. However, passage of privacy legislation is in itself not a deterrent against privacy invasion. Many countries have adopted the laws, and yet, there are continued outcries from personal privacies that are invaded. The legislations are means towards protecting the privacy and not an end in themselves. As the discussion on the EU above shows, privacy legislation should be supported by specific guidelines for it to achieve set goals.

Developments in ICT have also positive aspects. ICT can be used to protect and enhance privacy. The development of Privacy Enhancing Technologies (PECTs) have attempted to regulate collection and use of personal information. It is common that when individuals access certain web pages which require provision of personal information, a window will appear guaranteeing protection of privacy. At times, the window will warn that safety of the personal information is not guaranteed, revealing the likely risk of submitting the information through the Internet. Where privacy legislation has been adopted, the web pages make reference to the particular section of the law to guarantee that the personal information they collect will be used for the stated purpose,

and may ask the individual to indicate if they would wish the information to be shared.

ICT therefore has both negative and positive aspects. Since ICT is continually developing, it is near impossible to state that technology will always protect privacy. As more PECTs are developed, others technologies are appear to decode the information which they seek to protect. Thus, once privacy laws are passed, guidelines are needed to help organisation protect the personal information they hold.

FOI, Privacy Laws and ICT: the African Perspective

The creation and usage of ICT in Africa is on the increase. African countries are continually investing heavily in ICT equipment and networking technologies. Many African government processes have been automated, and most of the countries which have done this have developed policies and other guidelines, which are meant to promote access to information and protect personal privacy. As mentioned earlier, only Angola, South Africa, Uganda and Zimbabwe have passed FOI laws. Many African countries are, as at 2007, at different levels of adopting some form of FOI legislation. None have, as mentioned, enacted privacy laws, but rely on constitutional guarantees and national security laws for the protection of personal privacy. The continued growth in the usage of ICT in Africa means that access to information in general will be affected.

Clearly, the protection of access to information rights in constitutions in Africa was predicated on three things. First, constitutions are supreme laws of countries, and underpinning access to information in them was a guarantee that the rights would be held in high esteem. Secondly, constitutions are not amendable like normal laws but they have set and established procedures which governments have to abide by. The difficulty which underlies constitutional amendments was aimed at preventing governments from amending with ease access to information and thwarting its intentions. Lastly, courts have been given the mandate to enforce the constitution hence, if access to personal information is infringed or access to information which is not personal is denied, individuals have the right to approach the courts and seek redress.

African countries which have so far adopted FOI legislation did this, in order to make the constitutional guarantees on access to information to be effective. The recent initiatives to introduce FOI laws seem to

emerge from the African Unions (AU) through the *Charter on Human and Peoples Rights* of 1981. The Charter through Article 9 (1) expresses that: "Every individual shall have the right to receive information..." Another instrument of the AU *Resolution on the Adoption of the Declaration of Principles on Freedom of Expression in Africa* of 2002 stated that: "Public bodies hold information not for themselves, but as custodians of the public good, and every one has a right to access this information subject only to clearly defined rules established by law." The same instrument when to further declare in Part IV (2) that:

- Everyone has the right to access information held by public bodies;
- Everyone has the right to access information held by private bodies, which is necessary for the exercise or protection of any right;
- Any refusal to disclose information shall be subject to an appeal to an independent body and/or the courts;
- Public bodies shall be required, even in the absence of a request, to actively publish important information of significant public interest;
- No one shall be subject to any sanction for releasing in good faith information on wrongdoing, or that would disclose a serious threat to health, safety or the environment, save where the imposition of sanctions serves a legitimate interest, and is necessary in a democratic society; and
- Secrecy laws shall be amended as necessary to comply with freedom of information principles.

These instruments of the AU mandate signatories to adopt some law which will promote and facilitate access to official information in Africa.

Both the *Charter on Human and Peoples Rights* and the *Resolution on the Adoption of the Declaration of Principles on Freedom of Expression in Africa* also encourage member states to protect access to personal information held by public organisations. For instance, the *Resolution on the Adoption of the Declaration of Principles on Freedom of Expression in Africa* observes that: "Every one has the right to access and to update or otherwise correct their personal information, whether it is by public or by private bodies."

Essentially, both these AU instruments suggest that member countries should like their counterparts in Europe and other parts of the world adopt both FOI and Privacy laws. The AU seems to understand that constitutional guarantees are in needs of specific laws, which will implement and regulate access to official information, as well as to personal information.

Challenges on the Implementation of FOI and Privacy Laws in Africa

Despite the efforts being made by many national governments to adopt FOI and Privacy laws, there are still major challenges that need to be overcome before Africans can fully enjoy their rights of access to information. The greatest challenge in accessing information in Africa is the presence of Official Secrets Act, many of which have been inherited from colonial governments. These Official Secret Acts prohibit the release of official information, unless under special circumstances. Under these Acts, civil servants decline to accept any requests for information, fearing penalties they are likely to incur for violating these Acts. For example, the Botswana National Security Act (1986) forbids the disclosure or access of any information. The Act states that:

> 3. Any person who, for any purpose prejudicial to the safety or interests of Botswana:
>
> (b) obtains, collects, records, publishes or communicates in whatever manner to any other person any secret official codes, password, sketch, plan, model, note, document, article or information that is calculated to be or might be or is intended to be directly or indirectly useful to a foreign power or disaffected person;
>
> (c) ...shall be guilty of an offence and liable on conviction to a term of imprisonment not exceeding 30 years.
>
> 4. (1) Any person who, having in his possession or control any secret official codes, password, sketch, plan, model, note, document, article or information that relates to or is used in a prohibited place or anything in such a place, or that has been made or obtained in contravention of this act, or that has been entrusted in confidence to him by any person holding office under the government, or owing to his position as a person who holds or has held office under the government, or as a person who is or was a party to a contract with

the government or a contract the performance of which in whole or in part is carried out in a prohibited place, or as a person who is or has been employed by or under a person who holds or has held such an office or is or was a party to such a contract –

(a) Uses the information in his possession for the benefit of any foreign power or in any other manner or for any purpose prejudicial to the safety or interests of Botswana; or...shall be guilty of an offence and liable on conviction to imprisonment for a term not exceeding 30 years.

5. (1) Any person who communicates any classified matter to any person other than a person to whom he is authorized to communicate it or to whom it is in the interests of Botswana or is his duty to communicate it, shall be guilty of an offence and liable on conviction to imprisonment for a term not exceeding 25 years.

(2) In a prosecution for contravention of subsection (1), it shall be no defence for the accused person to prove that when he communicated the matter, he did not know and could not reasonably have known that it was a classified matter. Republic of Botswana (1986)

The magnitude posed by Official Secrets Acts was perhaps best summed up by the Media Institute of Southern Africa (2000), when it stated: that "a culture of secrecy has become entrenched in government throughout the sub-region and members of the public, including the media, are routinely denied access to official information which, in a democracy, they should be entitled to receive." In East Africa, the situation was noted by International Federation of Journalists (2000), when they reported saying, "Reports from the region have shown that free access to information held by public authorities is not respected in law or practice. While some countries grant the right to access to information in the constitution, there is no country in the region with an enabling legal framework for the full realization of the citizen's right of access to official information. On the contrary, in all countries of the region, laws limiting freedom of expression, such as laws on sedition, official secret acts or criminal defamation, remain on the statute book."

Many African countries are yet to reap the tremendous benefits that ICT brings with it, especially in the areas of increased access to information. This is a result of some of the challenges posed by ineffective

and inefficient records keeping systems as identified above, and partly due to the fact that many African countries are yet to enact freedom of information legislation and the disparity in ICTs distribution. The state of FOI in Africa was perhaps best summed up by Hameso (1992), when he wrote saying: "difficult to come by is access to information that affects their ability to survive and to that which enables them to take decisions for action."

This does not suggest that African societies do not need FOI. Information is just as valuable to them as it is to any modern day society, whether rural or urban. In order to address barriers hindering access to information, the International Federation of Journalists in its 2000 meeting in Nairobi recommended that:

1. There should be a constitutional guarantee for freedom of information without exceptions;
2. Governments must repeal laws that limit freedom of information, and to put into place a legal framework that guarantees freedom of information;
3. That everyone has the right to obtain information from public authorities. This right shall apply, regardless of the form in which information is held;
4. That in all laws and decisions concerning the right to obtain information, the public interest in having the information shall be the first consideration;
5. That exceptions to the right to obtain information may only apply to clearly and narrowly defined categories of information;
6. Those public authorities should establish a central register to enable citizens to locate documents, so that information is easily obtainable;
7. Those public authorities should create and preserve records on their activities;
8. That if a request for information is denied, sufficient reasons should be given immediately in writing. There should be a right of appeal, within a short and defined time scale, against a refusal to disclose information to can independent authority. Upon successful appeal, the information should be given, if not, a penalty should be imposed;

9. That no official and no journalist may be prosecuted, reprimanded, or should suffer any loss of status for giving information to the public or to media, when such information is in the public interest;
10. That information directly available must be given immediately and not later than 24 hours; and
11. That once information has been made public, any justification for trying to stop further publication and dissemination will be overridden by the public's right to know.

That no fee should be charged for providing information other than the minimal costs for copying that information. An independent authority should determine minimum costs charged for copying documents.

Good Records Management Fundamental to Effective Access to Information Regimes

FOI and Privacy laws are not in the strictest sense record laws. They do not mandate organisations to create and manage records. In as much as the laws do not mandate for the creation and management of records, some like the UK FOI law of 2000 through section 46 bring about the importance of effective records management to practicable access to information regimes. In this section of the UK FOI law, the Lord Chancellor is given the responsibility to issue and revise from time to time a records management code of practice "providing guidance to relevant authorities as to the practice which it would, in his opinion, be desirable for them to follow in connection with the keeping, management, and destruction of their records.' (United Kingdom, Freedom of Information Act, 2000). Another indication of the importance of records management towards creating an effective access to information environment is exemplified by the Northern Territory in Australia which has enacted an information law which enforces FOI, privacy and the management of archives and records all in a single piece of legislation. The law of the Northern Territory seems to suggest that good records management is the foundation on which FOI, privacy and archives are built. Good records management enables for the creation and management of records some of which citizens may seek to gain access to through FOI or Privacy laws or gain access to as archival records.

Access to information laws in many other countries do not have clauses on records management. Access to information in these is premised on the belief that records exist, and the information and evidence they hold will be made accessible as and when needed. However, as reports from some Information Commissioners indicate, the perception that effective records management exists to facilitate access to information is fallacious. For instance the Canadian Information Commissioner noted in his 1999-2000 annual report:

> The whole scheme of the Access to Information Act depends on records being created, properly indexed and filed, readily retrievable, appropriately archived and carefully assessed before destruction to ensure that valuable information is not lost. If records about particular subjects are not created, or if they cannot be readily located and produced, the right of access is meaningless. The right of access is not all that is at risk. So, too, is our ability as a nation to preserve, celebrate and learn from our history. So, too, is our governments' ability to deliver good governance to the citizenry.

Good record keeping and record management practices are a prerequisite to the success of any FOI legislation. Bolton (1996) notes that "without a substantial and comprehensive records management programme in place, the FOI legislation would not be worth the paper it was written on. Records could neither be identified as existing nor would they be obtainable from their storage." The enactment and implementation of FOI legislation places considerable demand on records management personnel. This is a fact that is often not easily appreciated by higher authorities. In several countries, including the UK, FOI legislation has been introduced without due consideration on the impact it would have on records management. No wonder, in the U.K, it was later realised that a phased approach was the only workable solution to successful implementation of FOI in the government departments. In justifying the phased approach to implementing FOI legislation in the U.K, The Lord Chancellor observed that "it has to be remembered that a much greater level of preparation is required. We took two years with the Human Rights Act before the Freedom of Information Act. The act covers about 70,000 organisations...The information commissioner has to double her staff and she has to approve about 70,000 publication schemes. That will take time." (The United Kingdom Parliament, 2001). Consequently, full implementation of the FOI Act in the U.K had to be delayed until 2005.

The importance of records in achieving the objectives of FOI was further stressed in a Code of Practice on the Management of Records Under Section 46 of the Freedom of Information Act 2000 of the UK, where it was observed that "any freedom of information legislation is only as good as the quality of the records to which it provides access. Such rights are of little use, if reliable records are not created in the first place, if they cannot be found when needed or if arrangements for their eventual archiving, or destruction are inadequate". (United Kingdom. Department for Constitutional Affairs, 2004).

However, for records to meet the objectives of FOI legislation, they must be accurate, complete, timely, and appropriate for retention, relevant, adequate, credible, engaging, readily accessible, and likely to be needed in the future. To be reliable, records must in turn be accurate; that is, they must accurately reflect the transactions that they document. Records are reliable, when it is possible to rely on the evidence that they contain as being accurate. There are cases, where human error or deliberate falsehoods can affect the reliability of records, but this must be guarded against. Dietel (2000) suggests that for records to be considered accurate and reliable, they should not contain errors in transcription, collection or aggregation. He goes further to suggest that "the information in this sense is either right or wrong. Yet, accuracy is also affected by how finely or grossly it is measured; that is how much of the information stays at a high or abstract level, or gets into the fine details of the subject matter involved? Perceptions about accuracy are important, for if the person who receives the information does not trust the source, then the source has questionable accuracy. Reliability and credibility in this case matter a great deal.

The accuracy and authenticity of records can be used as evidence. But records can only be considered to be authentic, when they have been under proper custody and care, and when it can be proved beyond any reasonable doubt that they have not been altered or tampered with by unauthorised persons. Moreover, for records to be useful, they must contain complete information; that is the information should not have "holes" or areas that are left to guess work or speculation. A complete record should contain the context in which the transaction was conducted, the business process of which the transaction documented by the record, the participants in the transaction, the exact time of the transaction or communication and its chronological relationship with others.

Impact of FOI and Privacy Legislation on Records Management

Snell (1993), who has conducted some preliminary studies in Tasmania, Australia, is of the opinion that the passing of FOI legislation in Australia is "a mixed bag, and certainly, changes in records management practices appear to have lessened the potential of any significant impact." He went further to say that:

> A study of the literature about the effects of FOI provides strong support for the benefits which flow to records management. This literature can be separated into three major groupings. The first either briefly refers to other reports which mention the records management benefits of FOI or assume a benefit without any supportive evidence. The second grouping, and the far smaller category, presents some tangible evidence for the positive linkages between FOI and improved records management. The third grouping and most informative consists of the reports of government agencies about their perceptions of the benefits of FOI. Rarely in any of the groupings, are possible negative consequences of FOI on records management canvassed.

Using five different case studies for his study, Snell sought to answer five basic questions:

(i) What was the department's system of records management prior to FOI?

(ii) Has it changed with the advent of FOI?

(iii) What other factors have contributed to changes in records management, e.g. new managerial policies, updates, staff departmental changes?

(iv) Has FOI assisted or hindered other changes to records management, e.g. by necessitating a new system of information retrieval?

In response to the above questions, Snell came to the conclusion that some departments had noticed considerable improvements in the management of records, while others had not noticed any changes at all. Snell did acknowledge that the passing of FOI legislation is likely to exert pressure in some of the following areas: fear of disclosure of normal demands of good record keeping, the need to justify decisions, the impact of a range of administrative mechanisms such as the ombudsman, Auditor-General, Ministerial or Parliamentary requests.

Snell, making reference to the 1987 Nash Report on records management and FOI legislation in the Victorian Department of Premier and Cabinet, Australia, argued that FOI can at times be seen as an intrusion to the governance process. Where this occurs:

(i) Information will not be captured as records;

(ii) Information or records will not be indexed making their identification and retrieval for purposes of meeting FOI demands difficult;

(iii) Public servants disregarding good records management to the extent of removing correspondence and other information from official registered files to create their own personal files;

(iv) Public servants failing to keep track of the movements of files leading to some going missing;

(v) Low morale of records management personnel due to the indifference directed to good records management practices.

Although it cannot be categorically stated that FOI is likely to improve record keeping practices such as filing, storage, retrieval and destruction of government records, nonetheless, the passing of FOI is likely to lead to improvements and efficiency of these systems. The provisions contained in the legislation if properly implemented should lead to improvements in record keeping requirements. In the first instance, as the law requires that each government agency publish lists, indexes, manuals, etc. of its information holdings, one would expect that records storage conditions should improve. Moreover, as a requirement under FOI legislation, each agency is expected to appoint an officer who will be responsible for dealing with all requests for information. The appointment of such officers will obviously lead to the establishment and strengthening of linkages between national archival institutions and records creating institutions to ensure smooth transfer of records. Furthermore, as agencies will be required to retrieve records while they are still current, it is hoped that current records will be better managed and transferred to national archives in better conditions. Finally, as decisions to deny an individual access to documents held in offices are likely to be challenged before the courts, record keeping officers will be required to exercise greater care in administering exemption clauses.

The likely impact that FOI is likely to exert on archival institutions relates to the increased demand for access to records that would normally

be restricted from public inspection. Experience gained in the West indicates that on the passing of an FOI legislation, there has been an initial upsurge increase in the number of records requested, but this initial increase tends to decrease with the passing of years.

There is also the possibility that in some countries, the passing of FOI legislation may have negative effects on records management. For example, one can not rule out the possibility that some departments might destroy records or even fail to document their decision for fear that their actions might be challenged in courts of law under FOI legislation.

Conclusion

Access to information is an important process which countries around the world aim to regularise through the passage of FOI and Privacy laws. The passage of the two laws is meant to create an equitable and variable access to information framework. The advent and growing usage and reliance on ICT has lead to improved information dissemination resulting in effective use of FOI legislation but also to infringements to personal privacy.

This chapter has shown that good records management is crucial to effective access to information regime. It is the records which can be relied upon to provide information through FOI legislation and to protect and promote personal privacy.

Review Questions

1 What is freedom of information?

2 In what ways has the adoption of information communication technologies facilitated or hindered access to information?

3 What would you consider to be the factors hindering access to information in the African region?

4 What role do privacy laws play in promoting or protecting citizen's rights of access to information?

5 What is the role of good records management to both the FOI and Privacy processes?

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Chapter 17

Information Security Management Challenges and Prospects in Africa

Trywell Kalusopa

Introduction

Recent technological, social, economic and political changes have resulted in a need to ensure that there is enhanced security in the collection, processing and transmission of information. The issue of information security is however discussed from different and shifting professional paradigms. Some authors have dealt with the topic from a purely technological stand point; some have taken socio-economic considerations into account, while others have embraced an integrated approach in addressing the issue. Stanley (1997) posits that information security is indeed a complex and challenging subject, and emphasises that "information security is the challenging topic at the best of times. It is a complex, wide ranging subject that has to deal with a computer and network environment which is developing very rapidly. In a business context, information security has to support key business processes and those involved with information security need a good grasp of how businesses operate."

This chapter attempts to examine the concept of information security, and outlines some basic issues for reflection by information managers in Africa. The purpose of the chapter is to explore the concept of information security, paying particular attention to the following: information security management, information security risk analysis, information security standards, legislation, regulations and policies. The chapter also discusses the general challenges of information security in Africa, and puts forward some recommendations on the creation of sound information security culture in an African context.

What is Information Security?

Conventional definitions of information security such as that of the Australian Defence Signals Directorate (DSD), say that information security is "the combination of communication security, computer security and radiation security, which refers to emissions from devices such as monitors and printers, also known as "TEMPEST" (DSD, 2006). As such a definition indicates, it is often agreed that most information security standards such as, GMITS (1996-2000), AS/NZS 3931 (1998), BS 7799 (1999), TPEP (1999), AS/NZS 4444 (1999/2000), thus focus on the technical aspects of information systems and yet, many threats to information are beyond such technical realm. In this chapter, information security, as ably put by Clarke (2001), is considered from a broader perspective to include organisational and individual behaviour pertaining to both manual and computerised information systems, including computing and communication support facilities.

Information security deals with several different "trust" aspects of information. It is not confined to computer systems, neither is it confined to information in an electronic or machine-readable form. It applies to all aspects of safeguarding or protecting information or data, in whatever form, e.g. paper documents; electronic data; software or systems and networks on which information is stored, processed or communicated; intellectual information (knowledge) acquired by individuals; and physical items from which information regarding design, components or use could be derived. In other words, it covers not only information, but also infrastructure that facilitate its use.

Information security can thus be used in two ways:

- *a condition in which harm does not arise, despite the occurrence of threatening events; and*
- *a set of safeguards designed to achieve that condition (Clarke, 2001).*

The security of information cannot always be perfect. The level of information security sought in any particular situation should be commensurate with the value of the information and the loss, financial or otherwise, that might accrue, damage or improper use of information through disclosure, degradation, denial, etc. The widely accepted elements of information security are: *availability*, *integrity*, and *confidentiality* and more recently, *accountability* has been added. The issue of accountability underscores the fact that the responsibility or

liability of information custodians, information providers, users and other parties concerned with the security of information should be made explicit within the context of the overall organisation's objectives.

The Organisation for Economic Cooperation and Development's (OECD) 1992 *Guidelines for the Security of Information Systems* cited in Orlowski (1996) defines the first three elements (availability, integrity, and confidentiality) as follows:

- *Availability*: It means the characteristic of data, information and information systems being accessible and useable on a timely basis in the required manner;
- *Confidentiality*: It means the characteristic of data, information and information systems being disclosed only to authorised persons, entities and processes at authorised times and in the authorised manner; and
- *Integrity*: It means the characteristic of data, information and information systems being accurate and complete and the preservation of accuracy and completeness.

The objective of security of information therefore is the protection of the interest of those relying on information in whatever form from harm resulting from failures of availability, confidentiality, and integrity. Gattiker (2004) also confirms that information security "uses a system of policies and/or procedures for identifying, controlling, and protecting from unauthorized disclosure, information whose protection is required." Information security can thus be simply expressed as the right information to the right people at the right time.

Further, several authors (Wylder, 2004; Australia. Department of Commerce Guidelines, 2003; Clarke 2001; Ettinger, 1993; Smith, 1989) agree that for an information system to be secure, it must have a number of properties:

- *Service integrity*: It implies the availability, reliability, completeness and promptness of information are assured;
- *Data integrity*: It means records (both electronic and manual) should be authentic, reliable, complete, unaltered and useable, and the processes that operate on them are reliable, compliant with regulatory requirements, comprehensive, systematic, and prevent unauthorised access, destruction, alteration or removal;

- *Data secrecy*: It implies that information should be available only to those people authorised to receive it. At times, this property is often ambiguously referred to in the technical literature as 'confidentiality', and even worse still as 'privacy';
- *Authentication*: It refers to situation whereby assertions are checked in an information system. Some forms of assertions that are subjected to authentication may include: *data* authentication (whereby captured data's authenticity, accuracy, timeliness, completeness and other quality aspects are checked); identity authentication (whereby an entity's claim as to its *identity* is checked, which can apply to the identity of *a person, an organisational entity, software agent, device*); and *attribute* authentication (which implies an entity's claim to have a particular attribute is checked, typically by inspecting a 'credential'); and
- *non-repudiation*: It refers to that property of an information system whereby an entity is unable to convincingly deny an action it had taken.

Information Security Management

There are several fundamental components in an information security management framework/strategy. To ensure effective management, a framework or structure is required. The following are the components of a comprehensive information security strategy as identified by Clarke (2001):

- *Infrastructure Security*: This component is that which provides protections for both technical components (hardware, software, networks) and organisational processes (structure, procedures and processes);
- *Threat Management*: This is the analysis, detection, investigation, and adaptation of the occurrences that can cause harm to features of the information system that can be affected;
- *Vulnerability Management*: This relates to the analysis, prevention, insurance and recovery planning, which relates to the occurrences that can cause harm to features of the information system that can be affected; and

- *Application-Specific Security*: It is the component that addresses safeguards, which are particular to the context of the information system.

In organisational environments, the scope of information security management can thus be seen as a process or cycle, and will entail the following:

- Identification and valuation of assets that need to be protected;
- Detection of the peculiar vulnerabilities and weaknesses of the information system;
- Recognition of all the threats against the information system;
- Assessment of the likelihood or risk of a particular threat or weakness arising and the consequences thereof;
- Development and implementation of a cost-effective information security policy to reduce risks against the information system and allowing the system to operate at acceptable levels;
- Putting in place disaster recovery plans to mitigate disaster; and
- Monitoring, reviewing periodically the effectiveness of the information system.

The remainder of this chapter is devoted to a review of the principles and issues pertaining to these aspects of information security management.

Identification and Valuation of Information Assets

As earlier observed, information security extends beyond the technical safeguards in an organisation. The value of an information asset is normally taken as the total loss to the organisation, if such an asset is suddenly not available or destroyed. It is therefore important to take a holistic approach in the identification and valuation of such information assets. It is useful to consider the following assets during the identification and valuation process in an organisation:

- Software and hardware, including the communication equipment and devices.
- Manual processes and procedures associated with the information system.

- Human resources or personnel associated with information system at varying levels of usage, operation and responsibility, including all staff engaged in information handling.
- Environment of the information system such as buildings, utilities, communication links, and their physical location and housing.

Threats to Information Systems

Most authors (Clarke, 2001; Smith, 1989; Orlowski (1996) classify threatening events into the following kinds:

- *Natural threats*, commonly referred to as "acts of God or Nature" such as fire, flood, lightning strike, tidal wave, earthquake, volcanic eruption;
- *Accidental threats:*
  - by humans, who are directly involved, e.g. dropping something, tripping over a power-cord, failing to perform a manual procedure correctly, mis-coding information, mis-keying, failing to perform a back-up;
  - by other humans, such as transmission failure due to a back-hoe cutting a power cable, the insolvency, bankruptcy, or withdrawal of support by a key supplier;
  - by machines and machine-designers, such as disk head-crash, electricity failure, software bug, air-conditioning failure; and
- *Intentional threats:*
  - by humans, who are directly involved, e.g. sabotage, intentional recording of incorrect data, unjustified amendment or deletion of data, theft of backups, extortion, vandalism;
  - by other humans, e.g. graffiti, vandalism, release of malicious software, riots, terrorism, warfare.

Threatening events may give rise to harm. The broad categories of harm can include:

- injury to persons;
- damage to property;
- loss of data, alteration of data, access to or disclosure of data, and replication of data;

- loss of value of an asset; and
- loss of non-reputation and confidence.

Information Risk Management

By definition, risk is a measure of the "likelihood of threats being manifested, the vulnerabilities being exploited and the effect on the system of successful attempts to damage it and its data." (Smith, 1989). Risk management is the "decision making process that combines information about risks with economical, ethical, legal and political considerations." (Gattiker, 2004). The broad aim of risk management is to produce and implement a plan or programme of countermeasures in the best interest of the organisation. Risk management is an approach that ensures that information security issues are addressed in a particular manner, which follows a set of rules and regulations that all stakeholders adhere to or are aware of in an organisation.

Wood (1982) affirms the fact that risk management "provides an approach to handling the problems of how to deal with such threats." In his view, there are "three stages or facets in the process. First, the risks must be identified; then, their impact must be assessed or analysed, and thirdly, the risks must be handled in some way." In other words, information professionals need to embark on information security initiatives in a methodical manner to ensure that their objectives are met.

Assessment of Threats

It is important for organisation to take stock of the potential threats of the "the information and processes involved, their sensitivity from the perspectives of the various stakeholders, and their attractiveness to other parties. This needs to be followed by analysis of the nature, source and situation of threats." (Clarke, 2001).

Sources of the threats to information may include the following:

- A person who has authorisation to access the data, but for a purpose different from that for which they use it;
- An intruder, who has no authorisation to access the data, including:
  - an interceptor of data during a transmission; and
  - a 'cracker' who gains access to data within storage; and
- An unauthorised recipient of data from an intruder.

The situations of the threats include the following categorisations:

- manual processes, content and data storage;
- physical premises housing facilities connected with the information system; and
- the organisation's computing and communications infrastructure, including data storage, software and electronic transmission over local area and wide area networks; and
- supporting infrastructure, including electrical supplies, air-conditioning, and fire protection systems (Clarke, 2001).

Assessment of Vulnerability

It does not always follow that when a threat exists, then harm will arise. For example, it is not sufficient for a threat about floods to exist. There has to be some form of susceptibility within the system, such that the floods can actually cause harm. Vulnerability of an asset is a measure of it susceptibility to damage. Thus, storage of inflammable gases would increase vulnerability of computer resources being burnt; the linkage of a system through a network increases the vulnerability to virus or hacking or poor work motivation among staff can increase less vigilance of processes and procedures in information handling. Vulnerability assessment is therefore important in identifying all such receptiveness to the identified threats, and the nature of the harm that could happen. Organisations must thus analyze their vulnerabilities, in order to put in place safeguards to counter such threats.

Assessment of Risks

Risks have varying degrees of likelihood; have varying impacts if they do happen; and it costs varying amounts of time and money in order to establish safeguards against the threatening events or against the harm arising from a threatening event.

In most organisations, the risk of each particular harmful outcome is not all that high. The costs of risk mitigation, on the other hand, may be very high. Clarke (2001) sums the kinds of costs involved to include:

- the time of managers, for planning and control;
- the time of operational staff and computer time, for regular backups;

- the loss of service to [illegible]
- additional media for [illegible]
- the time of operational staff, for [illegible]
- duplicated hardware and [illegible]
- contracted support from [illegible]

The concept of 'absolute security' [illegible] it is of the nature of security that risks have to be managed. It is therefore necessary to weigh up the threats, the risks, the harm arising, and the cost of safeguards. A balance must be found between predictable costs and uncertain benefits, in order to select a set of measures appropriate to the need (Clarke, 2001). The aim of risk assessment is therefore to determine the extent to which expenditure on safeguards is warranted, in order to provide an appropriate level of protection against the identified threats.

Risk Management Strategy

Risk management is broader than risk assessment or analysis and is concerned with the management of risks arising out of an assessment. Depending on the threat, there are several approaches that can be used to deal with the threat. These can be classified as (Clarke, 2001):

- Proactive Approaches: These include avoidance risk-prone technology, deterrence through signs and warnings, prevention through education, etc.
- Reactive Approaches: These include detection, recovery, and insurance.
- Non-reactive Approaches: These could include tolerance (is it worth worrying about).

Clarke (2001) also identified the following as key to devising a risk management strategy:

- Selection of a mix of measures that reflects the outcomes of the preceding threat and risk assessments. The measures need to comprise:
  - technical safeguards which are of a preventative nature, support the detection of the occurrence of threatening events, enable the investigation of threatening events, and monitor the environment for signs of possible future threatening events.

- policies and procedures which are organisational features, in the form of structural arrangements, responsibility assignment, and process descriptions;

- Formulation of a information security plan, whereby the safeguards and the policies and procedures will be put into place;

- Devising and implementing controls, to detect security incidents and investigate and address them, and to monitor whether that all elements of the information security plan are in place and functioning; and

- Embedment of audit processes, in order to periodically evaluate the safeguards, the policies and procedures, the actual practices that are occurring, and the implementation of the planned controls.

Information security is thus an attempt to ensure that vital information is accessed and routed to the right persons, so that possible threats can be avoided or be put under control. In an attempt to ensure that the security of vital information is enhanced, security managers need "to be as flexible as attackers. They need to take a broader view of security and focus on information risk management." (Murray, 2006). The concern in information management is the need for those who are involved to be at the forefront of every technological development, as well as latest security issues that hackers are thinking of, if the battles that seek to ensure that information is secure are to be won.

Information Security Plans and Disaster Recovery

It is often argued that there is no such a thing as total security. Although organisations will always direct their efforts towards preventing harm to their information facilities, there is need to recognise that they cannot eliminate all risks. This means organisations must be able recover from unforeseen risks or disasters. It is a well known fact that disasters can have devastating impact on organisations, and this calls for disaster planning to mitigate the impact of unforeseen risks. The preparation and testing of disaster planning and discovery will normally receive less attention, but is one such critical part of information security. The consequences of the lack of disaster planning can therefore not be overstated.

A disaster recovery plan must be current, comprehensive, achievable and properly regularly tested. The following steps are useful in the development of such a plan (Smith, 1989):

- Development of a disaster recovery policy, which entails critical analysis of information facilities and consequences of loss. The policy should be part of the whole information security policy within an organisation.
- Appointment of a disaster recovery manager, which involves apportioning of responsibilities to some members of staff, who shall oversee the active enforcement of safety and security measures.
- Designing the disaster recovery plan which, implies drawing up a detailed plan that indicates the emergency responses, immediate and longer back-up, replacement of information facilities, and creation of standby facilities.

In general, the process of implementing the information security plan must be subjected to strong project management. Policies need to be expressed and communicated. Manual procedures need to be variously modified and created, in order to comply with the strategy and policy. Safeguards need to be constructed, tested and cut over (Clarke, 2001). Such implementation also entails a change in organisational culture through creating awareness, education and training.

Information Security Standards

Security standards are defined as "a specific set of rules, procedures, or conventions that are agreed upon between parties, in order to operate more uniformly and effectively." (Tudor, 2001). These standards "ensure that individuals operate consistently to minimise risk and to make the administration of systems and networks more efficient." (Tudor, 2001). Standards are therefore critical to achieving uniformity and efficiency, so that information managers and their associated subordinates operate within the same set of standards. Standards are also meant to ensure that new members or employees quickly fit into the environment.

The need of information security in organisations is being addressed by emerging standards and recommended best practices. Currently, there are on going efforts towards standardisation of practices and processes, in order to ensure a high level of security, with respect to all

forms of information especially, e-records. Harry (2004) asserts that the establishment of a national and [international] e-security framework with the use of a recognised standard like the British Standard (BS) 7799 or ISO 17799 is one way towards conquering the security challenges of managing e-records. The ISO 17799 is a recognised industry standard with comprehensive set of controls, comprising best practices covering people, processes and technology. The standard framework should apply to both public and private sector. ISO17799, contrary to other security standards or proposed practices for IT systems, does not only cover IT security, but also attempts to identify vulnerabilities and suggests controls for the security of information, irrespective of the form, method of handling and level of this information within an organisation. ISO17799 forms an invaluable tool in identifying possible areas of vulnerabilities throughout any corporate structure. It does so by providing guidance for the establishment of security requirements, the assessment of security risks, and the selection of controls for identified vulnerabilities. Thus, if applied consistently, it is a standard that can go a long way in ensuring security to e-records.

Information security standards have been aptly summarised by Oliva (2004) with the recommendation for the formation of a "certifying body which will have the role of assessing the infrastructure of firms, based on evolving security and assurance standards. It could also serve as a clearing house for best practices in information security and assurance, and assisting firms in implementing security strategies in stepped progression". If information professionals, especially those involved with security, can buy this view, then, there can be a possibility of having professionals in different organisations operating within the same standards.

Information Security Legislation

Advances in information communication technologies (ICTs) continue to facilitate rapid growth in business interconnections, and most governments are now concerned about the protection of information, when it is processed or transmitted. This has led to governments now taking legislative action to ensure this protection. Legislation has also been inspired by cyber crime, which has assumed international dimensions, with calls for a harmonised legal framework to guarantee trans-border information security.

Legislation is necessary to facilitate cooperation between organisations and governments, and to ensure that operations in information systems meet the requirements of the law, so that different users feel free to use such systems. Andersen (2004) argues that, "certain security measures will only be trusted, if users have confidence that they are using systems which have been okayed by public entities." Legislation plays a critical role in ensuring that the intended audience is always ready to use a system with complete confidence that what they are given is approved by government. This will also be a way of ensuring that the organisation achieves a greater information security and competitive advantage.

Information Security Policies

Most organisations now agree that for coherence and orderliness, there is need for information security policies. Gattiker (2004) defines information policy as "a set of rules, defined and set in force by the management of an organisation." Gattiker (2004) further explains that management sets forth the overall security policy for employees and other members of the organisation. It also defines the handling procedures for information and how this information is to be protected. This includes intellectual property rights, as well as access rights to such information and the organisation's IT resources. This policy aims to reduce the risk of, and minimise the effect (or cost) of security breaches or disasters. It establishes the ground rules, under which the organisation should operate its information systems.

It can consequently be argued that such a policy need not be reactive, and must be agreed upon and involve all key players in the organisation. The policy must be formal and therefore well documented. The following are important requirements of information security policies (Smith, 1989):

- It must be written in clear and comprehensible manner explaining the aims, principles of achieving the standards of information security set.
- It should be drawn by those charged with the responsibility, and who are key, and have the depth of the knowledge of the information system use, operation and security.

- It must fit with the organisational culture, and must take into account the organisations' ideas rather than just imposing stringent security measures with little idea of the type of risk (high or low) associated with the system.
- It must be flexible and be able to be updated and reviewed to meet the changing needs of the organisation
- It must be realistic and attainable, and whose objectives must be appropriate with nature and aims of the organisation
- It must be backed up by adequate resources, and must remain cost effective.
- It must provide for adequate training of all staff, since most of them would be involved in information handling in the organisation.
- It must stipulate contingency plans of how to deal with unforeseen situations, in order to recover normal services at the quickest possible time.

It may also be useful to divide the information security policy document into the following key components:

- Overview of the information system: It is describing the system, nature of data stored and processed, description of administrative measures, contracts and agreements, planned future development of information systems.
- Risks to the system: It is description of the results of the risk analysis defining the possible risks, strategies intended to counter these risks, as well as contingency plans and disaster recovery strategies.
- Specific counter-measures: The policy document should describe specific counter measures focusing on physical, document, personnel, hardware and software security.

Information Security Evaluation/Audit

It is important to note that, at best, no information security management strategy is complete without a mechanism, whereby it is reviewed and evaluated periodically, adaptation detected, and appropriate actions taken. Information security audit will thus ensure the orderly diagnosis of the whole information security programme. To be effective, audit must be comprehensive, rather than being limited to specific aspects of security;

and it must follow through the entire organisation and its activities rather than being restricted to examinations of technical safeguards. However, this is largely dependent on real commitment to the security strategy by executives, managers and staff in an organisation.

Challenges of Information Security Management in the Africa

The application of information communication technologies (ICTS) in Africa in the management of information in private and public organisations, although beneficial, has brought about several challenges. Though most African countries have tried to put in place ICT policies, in order to accelerate e-government, a closer look at most of these polices indicate the lack of recognition of information security as a fundamental element in the management of ICTs and information. The issue of information security is thus often treated after thought in most ICT development programmes driven by such policies.

Most of the challenges of creating an information security culture in Africa arise from the following inadequacies of information management processes, particularly in the public sector agencies. Some of these are discussed below:

Policy Framework and Legislation

The legal, regulatory and institutional arrangements to oversee, support or implement information security programmes are weak or almost absent. Most national information communication policies do not clearly stipulate the co-ordination and management of information security issues. These are left to individual organisations with no well defined or little internal linkages among organisations within the public sector or between the public and private sectors. A study carried out by Mutiti (2001) to assess the technological infrastructure and needs in East and Southern Africa region revealed that limited progress has been made in the area of managing electronic records created in the public institutions. Mutiti (2001) asserts that most countries in Africa have no specific legal and administrative frameworks, within which to operate an e-records management programme nor do their staff have the skills to do so.

In Botswana, for example, an ICT legal framework has been produced as a companion to the National ICT policy – Maitlamo. This framework provides a review of current legislation in Botswana, and identifies appropriate policy actions that need to be taken to establish a trusted and secure e-commerce environment. The framework also sets

targets for the connectivity laws, policies, programmes, including media neutral legislation to deal with electronic documents (e-commerce legislation). Amendments to specific legislation such as the Criminal Procedure and Evidence Act, the Authentication of Documents Act, and the Foreign Documents Evidence Act are still under consideration.

However, Botswana is still grappling with enactment of the Freedom of Information legislation that would provide a broader platform for participation in the information age by its citizens. In addition, the development of policy and appropriate legislation to deal with e-signatures, industry codes of conduct to deal with the protection of personal privacy, particularly in the context of cross-border data flow, and health care and financial information are still far from being agreed on.

Standards

The use of standards across most government departments and businesses that could provide confidence in information systems and promotion of information security is lacking in most African countries. Further, regional initiatives in information management such as in the Souther African Development Community (SADC), for example, do not explicitly articulate information security issues. A recent UNESCO-funded study by Tembo, Zulu and Kalusopa (2006) confirmed the lack of standards in dealing with digital materials such as hardware, software, and storage media in the SADC region. This lack of standards exists within and across government ministries in the SADC. The study further revealed the lack of co-ordination within and across most ministries in the region with regard to information security.

Disaster Preparedness/Response

Most organisations in Africa are said not be adequately prepared for disaster and that there are no clear policies on how to mitigate and manage such disasters. For example, a UNESCO-funded study by Tembo, Zulu and Kalusopa (2006) on digital materials preservation in South Africa, Botswana and Ethiopia reported serious weaknesses in the disaster preparedness of most government departments for essential digital heritage materials. Another earlier study by Ngulube (2003) demonstrated that disaster preparedness and security of records and archives did not form a significant part of the preservation activities of

archival institutions in South Africa. Ngulube (2003) also confirms that in the year 2000, it was discovered that 65% of government ministries in Zimbabwe did not have any disaster plans for their records.

Ensuring Authenticity of Information

One security challenge of managing e-records is ensuring the authenticity of information. Information security in a digital world must ensure the integrity of the information, as well as its access and authenticity. With an electronic document, it is difficult to assure authenticity, integrity and reliability. It can be disassembled, rearranged and reassembled without anyone knowing the difference. The ease with which electronic records can be created, altered, accessed, duplicated and shared jeopardises their value as records. The challenge has been to adopt a number of online authentication methods which include passwords, personal identification numbers (PINS), biometrics, encryption, public key cryptography and so on. In most Africa countries, these technologies pose heavy strains on most budgets, and are not be considered seriously. An example of a good practice in achieving authenticity is the South African Home Affairs Identification System (HANIS). Identity fraud has of late emerged as information security challenges of managing e-records, especially in government departments in Africa. Identity fraud extends beyond the purposes of theft and forgery to acquiring false citizenship, residence status and work permits. For example, illegal immigrants have become a common feature in South Africa, and there are a lot of people acquiring false identity, citizenship and permits. South Africa has introduced the Home Affairs National Identification System (HANIS) to store and match all of South Africa's identity details for example photographs and fingerprints. While HANIS may prevent fraud that results from stolen or forged papers, the challenge is that identity theft has become even much easier and more profitable, as more systems become electronic in Africa.

Information Infrastructure

The existence of a digital divide arising out of, among other issues, the lack of telecommunication infrastructure and manifested, in terms of frequent connectivity failures, low bandwidth, and unavailability of dedicated data service networks compounds the problem of information security in Africa. According to the report on SADC e-Readiness Review

and Strategy (2002), the SADC region is one of the most diverse regions in the world, with some countries well developed, and while others have been referred to as "world's poorest countries". The report categorises these in two distinct groups. The first group includes Seychelles, Mauritius, Tanzania and South Africa, and is cited to have some developed ICT infrastructure than the rest, to an extent that they are participating in the e-world. However, this group does have serious challenges such as shortage of skilled individuals, poor economic conditions, expensive subscription fees and relatively low PC penetration to the larger poor and disadvantaged groups of people. The second group includes Namibia, Botswana, Swaziland, Lesotho, DRC, Zimbabwe, Angola, Malawi, Zambia and Mozambique. Of these, Namibia and Botswana show significant growth and potential to participate in the e-world. In general, the report highlights serious challenges that most African countries face, such as: poor infrastructure that varies from bad to worse, poorly skilled societies, low education levels, high cost of Internet access, and a very large percentage of the population living in rural areas that has no access to information communication technologies.

Human Resources/Expertise

Africa also suffers from a dearth of specialists in information security. This has been compounded by brain drain, thus leaving the continent at the mercy of experts from outside that have their own corporate vested interests. In addition, most of the ICT education programmes are highly dependent, in terms of curriculum and orientation from outside; hence, most professionals lack the orientation to entrench a home-grown driven information security culture. In a survey conducted by Wato (2005) on e-records readiness in the ESARBICA region, lack of skilled manpower fared high, as the leading challenge accounting for 24% among eight other challenges. This was also observed by Wamukoya and Mutula (2005) in an earlier study on the capacity building requirements for e-readiness in Eastern and Southern Africa. In Kenya, for example, there was lack of adequate resources to provide training that would equip information management staff with the skill to manage information in an electronic environment. As earlier observed, the SADC report (2002) also confirms this lack of skilled manpower as a challenge to e-readiness.

Education/Sensitisation for Information Security

Most African countries do not have clear and well co-ordinated sensitisation or education programmes on the creation and implementation of information security controls in the private and public sectors. Education and sensitisation is at most limited to the technical use of security safeguards rather than detailed role personnel in information security in organisations.

Way Forward

In order to foster an appropriate information security management culture among businesses, government agencies, including public-private co-operations, African countries should consider:

- Raising the awareness about information security issues in the private and public domains;
- Strengthening education and training for information security management;
- Creating reliable information security audit trails within information systems to discourage information security breach attempts and enable the investigation of actual breaches;
- Encouraging the creation and implementation of public and corporate information security policies;
- Initiating and implementing legislative and regulatory mechanisms that emphasise the prevention and combating of cyber-crime;
- Establishment of globally acclaimed technical standards; and
- Establishing means of independent certification of security of information technology.

Conclusion

Information security management is essential, demanding, and intricate. It involves organisational, as well as technical safeguards. Thus, modern information security strategies and measures go beyond "using naive military ideas" that inculcate "absolute security". Rather, most organisations now tend to use the 'risk-management' approach. Such an approach to information security entails a consistent methodology to ascertain the nature and level of threats and risks; the required security

measures to put in place, as well the development of common standards and policies which are backed by national legislation.

Information security and its management has also gone through a radical paradigm shift, whereby the hitherto narrower focus on technical forms of security management has been replaced by approaches that encompass all security measures: physical, organisational, human, and electronic, in order to achieve the security objectives of confidentiality, integrity, accessibility, accountability, authentication and audit.

African countries need to address information security management issues in their efforts to promote the use of ICTs for development. But in order to be successful, there is the need for collaborative initiatives between public, private sectors and the civil society in promoting a culture of security of information systems as a basis for sound e-government and management of information for development.

Review Questions

1. Why is Information security important in any organisation? Discuss the different dimensions of information security.

2. List three threats to information security in an organisation. Describe measures that can enhance information security.

3. Explain the following:
   (a) Risk assessment in organisations
   (b) The basis of disaster planning and recovery in an organisation.
   (c) Information security standards in organisations

4. Why is it necessary to have information security policies?

5. Why should an organisation carry out an information security audit?

6. What challenges do African countries face in developing an information security culture? What are some of the strategies that African countries should pursue to create an information security culture?

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Chapter 18

Information Retrieval Systems, Strategies and Challenges for African Information Searchers

Athulang Mutshewa

Introduction

This chapter discusses issues and concepts underlying information search and retrieval processes. Those who manage or provide reference information services using various online information retrieval systems (IRS) need to understand the search processes in such systems, in order to provide high quality service.

The factors that influence online searching process are many and varied. While there may be several ways of categorising these factors, the most common in the literature is to look at them in terms of the characteristics of the user/seeker, the search system and the context in which the information retrieval system is used. The information task or problem that the individual is dealing with is also an important factor. The chapter begins with a discussion of the information retrieval systems, followed by an exploration of the concept of information retrieval. A discussion of search concepts and strategies then follows. Before linking the discussion to the African context, the chapter provides an account of who the users of IRS are, and the problems that they encounter when using such systems.

Information Retrieval System

The importance of information retrieval systems (IRS) can never be over emphasised, given the volume of information that we are currently exposed to and the increasingly declining amount of free time available to those who are in most need of information. An IRS facilitates extraction of relevant documents or information from a large collection of

documents in response to a user query. Within the current context of information explosion, IRS ought to be flexible tools, capable of providing the user with information on various subject areas, as well as allowing the user to perform a wide range of information activities. For instance, the IRS should allow the searcher to refine his /her search without losing the search history. The searcher should be able to refine the search using the feedback from the system. Furthermore, the IRS should be user-friendly. The searcher should also be well positioned to interrogate the system in an appropriate manner to retrieve the information that is needed. Given this scenario, it is inevitable that both the searcher and the developer of IRS have a good conceptual understanding of the IR process.

Although information retrieval systems have become an important aspect of human endeavours in their attempts to address their information problems, the term has not been used consistently in the IR literature. Unfortunately as Hert (1997) notes, there has been a definitional confusion surrounding the term information retrieval, thus complicating any attempt to define the term IRS. Therefore, it is important to precede a discussion of IRS with a clarification of how these concepts are used in the discussion. Information retrieval is concerned with finding documents that are relevant to a user's information need (Dunlop and Reid, 1998). It involves searching a collection of documents to identify those that relate to an information problem at hand. The information retrieval process requires that there be a user who has an information need, and is attempting to satisfy the need by getting only those documents that are relevant to that particular need. An IRS therefore is the device that helps the user to filter through a pool of information sources, so that only those documents that are relevant to his or her information need are retrieved. Harter (1986) defines an IRS as "a device interposed between a potential user of information and the collection of information itself". Hert (1997) says it a system designed to facilitate the information retrieval process.

An analysis of the definitions given above shows that information retrieval systems are many and varied. For instance, a library card catalogue fits the definition; an online public access catalogue also would be classified as IRS. Others would include an indexing and abstracting journal, CD-ROM database, and commercial database such as Dialog, Academic premier, etc.

Chowdhury (2004) classifies IRS into two broad categories: in-house and online. In- house refers to those that are developed in-house, that is, in a library or information centre with the objective of serving mainly the users within the organisation. An example of an in-house IRS is the library catalogue. It should be noted, however, that, with the advent of new technologies such as the Internet, today's library catalogues have become more sophisticated, and allow users to search for materials held in a given library collection, as well serving as gateways to other libraries' collections.

Online IRS includes those that are designed to provide access to remote databases to a variety of users. They are mostly available on commercial basis. Another group of IRS, which are also mainly available on a commercial basis, relate to those that make use of the optical storage technology, and appear on CD-ROM (compact disc read–only memory). Although Chowdhury's categorisation seems to be "neat", it is more towards the computer-based IRS, but it is important to note that IRS have been available even before the use of computer technology in the management of information. However, such an omission is understandable, given that the use of computer technology has changed the information management processes to an extent that IR is to some extent taken as a computer activity. This chapter, informed by the current trend, focuses on information retrieval from the current perspective, as a technology based activity, hence the use of the term IRS will limit itself to those which are computer-based. Accordingly, the computer-based information retrieval systems are shaped by the technological developments, and are increasingly becoming complex and offering users higher capabilities to search for information they require.

Information retrieval researchers have, however, long maintained that information seekers characteristics, the context and the system characteristics are critical determinants of the performance of the system in the market place (Zhang and Fine, 1996; Marchionini, 1995 and Hert, 1997). It is imperative that those who endeavour to facilitate the retrieval of documents by users should have a good understanding of such factors. For instance, users who understand the information retrieval system, including the structure of the database, the file structure and the indexing system used, stand to use it appropriately, formulating queries that will enable them to retrieve the most relevant documents, and should be able to move quickly through the information seeking process, especially at the level of interaction with the system (Marchionini, 1995). Moreover,

such users could also be able to customise the system to be in line with the way they seek and use information. As Kuhlthau (2005) notes, *We need to take a 'just for me' approach to system design that is based on the user's perspective of information seeking and use.* More importantly, maximum benefits from IRS require a tripartite relationship between the researcher in user studies, information technology pundits and information retrieval researchers (Kuhlthau, 2005). Together, the three communities of researchers can lead to the development of information retrieval systems that meet the information needs of users.

Understanding Information Retrieval

Information retrieval involves the retrieval of information from a collection or database in response to an information problem. Imagine a student who has an assignment that requires him or her to acquire a certain piece of information. How does he/she get that piece of information with the least trouble? If there are only a few information sources (say ten or less books) available and the information is contained in one or two of them, it will be easy in that the student could easily page through the books to locate the one that has the piece of information required. However, if the number of information sources from which to search for the required information is huge (say ten thousand books), then it becomes unpractical to go through all the sources to locate the required piece of information; hence, the user is faced with an information retrieval problem. The latter case reflects what information seekers almost always face due to the multitudes of information sources that are available in any given subject area.

Researchers and practitioners of information retrieval are grappling with information problems such as the one described above to find ways which information seekers could be helped to be able to find the information they require from the multitude of sources available with the least "pain" possible. The goal of IR research is to find the best ways of helping information seekers to find information relevant to their information problem by developing information retrieval systems that are "user friendly". Understanding the information behaviours of the communities of users of information retrieval systems is necessary for both developing and searching IRS.

Search Concepts and Strategies

Users approach and interact with an information retrieval system because they want to get documents that can satisfy their information need. However, if we just focus on the act of interrogating the system without considering the whole process involved, we may only partially comprehend the behaviour exhibited by users of systems. The whole process that leads to the final state of actual keying in a query into the system is important.

The route to getting a solution to an information problem varies in many ways, such as time, mental effort and skill required, and the satisfactory level with the result obtained. When faced with a problem of any kind, people will always look for the shortest possible route to get to the solution. For instance, a newcomer in a job could easily find out about the working hours and where to get the keys for the office in the morning from his or her supervisor. However, if he or she wants to find information about the likelihood of the company not doing well in the market in the next two years, it may not be that easy. This type of information problem may require waiting for a while for the appropriate information to be sought, analysed and packaged properly.

The process of retrieving information (IR process) is by nature interactive, and involves an interaction between the user and the IRS (Xie, 2003). The process can be divided into several steps. It should be noted that these steps may not be followed in the order given below, and the number of steps may vary from one user to the other depending on the level of aggregation chosen. In some cases, some steps may be repeated several times depending on the complexity of the information problem. What is important is that the process continues until the results obtained are satisfactory.

Recognising and Accepting an Information Problem

People need information when they want to know something, learn or solve problems. These needs for information constitute what is called an information problem. An information need could either be internally or externally motivated. Internally motivated information arises from within the individual and could be a result of one's curiosity to know. External motivated information needs are those that arise as a result of the demand to respond to an external stimulus such as a question asked.

Whether internal or external motivated, the information problem manifests as a gap (Dervin, 1977) or an anomaly (Belkin, 1980) in the individual's knowledge structure. The person recognises that there is a deficiency in his or her knowledge or mental model.

It is important to note that before an information search process could be initiated, those who need information should recognise and accept that they have an information problem (Marchionini 1995). Consequently, a person may want to do something about the information problem, thus, engaging in a search for information that could address the information problem. Alternatively, the person may suppress the need and choose not to do anything about the problem because he or she realises that it is not worth the effort. If the former is selected, then the following steps become important.

Understanding the Information Problem

Once the individual has seen that he/she has an information problem; the next step is to define the problem. This sub-process aids in understanding the problem. The problem ought to be defined from the perspective of the individual who needs the information (Chowdhury and Chowdhury 2001). The outcome should be a clear search statement.

Understanding the information problem is considered as the most vital part of the IR process. At this stage, the irrelevant and unnecessary aspects are filtered out, and the correct terms and synonyms that define the information problem are identified. If the search is going to be done by an intermediary, then he or she may have to go back to the enquirer to check for the correctness of the definition of the information problem.

Deciding on and Selecting the IRS

Once the information problem is understood, it is possible to select the IRS and database(s) to perform the search. Forrester and Rowlands (2000) point out that several factors may influence the selection of the database, including subject coverage, indexing, up-to-datedness, date range, journal range, language, field and limiting fields and cost. With regard to the host, the important factors are cost, time and command language. The other things that need to be considered when selecting the search system are the structure of the database, costs of communication and whether the system allows searching across more than one database.

The experience of the searcher in using a search system is also an important factor. A searcher may prefer to use a system that has proved to be useful before when searching a similar subject.

Formulating a Query

At this stage of the IR process, the information problem is converted into one or more concepts that are going to be used to search the database(s). For instance, the user may want to find information about e-governance in developing countries' public sector. Three concepts: *e-governance, developing country* and *public sector* could be derived from this query. Each of the three concepts could in turn be expressed into several others that can be used in the search. For instance, *e-governance* could be expressed in terms of *Internet, Information and Communication Technology*. The terms could still be narrowed further depending on how the searcher understands the information problem. When formulating the query, the searcher should take into consideration the indexing language used in the databases. For instance, some databases use natural language, in which case expressing the search terms into very narrow terms may not be necessary. If a controlled vocabulary is used, the searcher needs to find out the terms permitted so that the subject of interest could be expressed in the appropriate terms. In order to simplify the search process, the searcher may categorise the search terms into narrow terms, related or synonyms and broad terms.

Once the appropriate terms are known, a search strategy is formulated. A key issue in the formulation of the search strategy is that the searcher decides on the appropriate combination of multiple search terms. Using specific narrow terms will help the searcher to get specific documents. The broader terms could be introduced when the searcher modifies the search. It should be noted that this step may not be a one off thing because the searcher may time and again require changing the combination of terms if the search fails to retrieve relevant documents. When formulating the search strategy, several retrieval techniques could be used to combine concepts. It is important that information searchers have a good understanding of these various techniques that databases use to combine terms to improve information retrieval. The next section introduces the reader to the functions that are mostly used for setting up search queries. Even though these search functions may differ slightly (especially the notation used) across search engines or databases, the principle employed is the same.

Functions for Formulating Search Queries

The way a query is represented when searching database(s) determines the relevance of the results that are going to be obtained. The rules that are followed when setting a search query are generally a function of the search engine that the database uses. Readers are advised to always check the search tips provided in the help of the system when they are not sure of notation to use when formulating the queries. Alternately, the system user manual can be consulted for clarification.

Boolean Operators

Boolean operators are the most commonly used functions to combine terms when searching electronic databases, and three of them, AND, OR and NOT are the standard Boolean operators. When used to combine terms in a search, the operator AND tends to narrow the search. For instance, if a database contains documents indexed under the term "*anorexia*" and also documents indexed under the term "*culture*", a search statement "**Anorexia AND culture**" will retrieve documents indexed under both terms *anorexia* and *culture*. This means the search is narrowed since documents which are indexed under only one of the terms will not be retrieved. This means the AND operator allows you to retrieve citations or documents discussing all the concepts that are combined by the operator, hence limiting or narrowing the search. The more concepts are combined by the AND operator, the fewer the documents will be retrieved.

The OR operator allows you to expand or broaden a search. For instance, a search statement **"heart problems OR cardiac problems"** will retrieve items using either (or both) terms, that is, *heart* or *cardiac*. The effect of the OR operator is that it expands the search, resulting in retrieval of documents in which either of or both the terms appear. It is important to note that when more search terms are combined with an OR operator, more documents would be retrieved. The Boolean operator NOT, when used in a search statement, allows the search to exclude unwanted concepts. For instance, a search statement **"gender NOT sex"** allows the author to exclude documents that are indexed under the term *sex*. However, one needs to be careful when using the NOT operator as it could lead to the exclusion of relevant documents. For instance, in the example given above, it means documents where *gender* and *sex* have been used interchangeable may be left out.

Search engines also allow for mixing of Boolean operators in a search statement. This is also referred to as nesting. Normally, curly brackets () are used to separate concepts when more than one Boolean operator is used in a single search statement. In general, search engines apply the AND operator first. This means when a combination of AND and OR operators are put together in a single query statement, words combined by an OR operator should be enclosed in brackets, so that they are searched together.

Sometimes, users may be interested in retrieving documents with a certain phrase. When search words are entered in direct succession, some search engines would assume that they are to be searched as a phrase. Other search engines would automatically insert a Boolean AND or even OR between such search words. To exclude such ambiguity, quotation marks are put around words that are supposed to be searched as a phrase. However, it should be noted that not all search engines accept quotation marks, hence any intended Boolean operators between words in a query need to be specified (Lucas and Cutspec, 2005). Furthermore, for most search engines, the order in which the search statement is executed by the system is such that the searches within the curly brackets are done first, and then the statement executed from left to right. Once more, searchers are advised to always check the help menu when they are using the database for the first time to be sure of how their query is going to be executed.

Below are typical examples of nested queries:

Weight loss AND Modelling OR Anorexia

The search statement above will retrieve documents containing both the concepts *Weight loss and Modelling* or any documents with the concept *Anorexia*. In the case of the above search statement, because there are no brackets, the search will be executed from left to right.

The use of brackets may change the outcome of the search. For instance, if the search statement is changed as follows:

Weight Loss AND (Modelling OR Anorexia)

The execution of the above statement would retrieve documents that have the concepts *modelling and weight loss*, or the two concepts *anorexia*

and *weight loss,* or documents that are containing the three concepts: *weight loss, modelling* and *anorexia.*

Other Search Functions

There are several other functions that are used in formulating search queries. Table 1 provides a summary of the functions and the role they play. It should be noted that the search functions given could be used with the Boolean operators in search statements.

Search function	Description	Example
Adjacency	Allows for multiple words to be searched together as one phrase and usually requires that words appear in the order that they were entered.	*Gabor one City Council.* If the "adjacency" function is used to search the above statement, only documents with the above words in the order given will be retrieved.
Proximity	Uses words such as "near" to specify words that are close to each other, in any order. The word "within" is also sometimes used to specify terms which occur within a "number" # of words of each other in the record.	*Botswana near University.* The statement will allow for the retrieval if documents that have the words 'Botswana' and 'University' near each other. Note that you can also specify the number of words that are allowed between the terms.

Search function	Description	Example
Truncation	Truncation is used to search for variations of a word by entering its root, followed by the truncation symbol. For instance, words may be right-hand truncated using an asterisk symbol. It is also possible to specify the number of characters to truncate for by the number of asterisks. Open truncation could also be done, whereby the number characters truncated for is not specified.	*Govern** could retrieve documents with the terms governance, government, govern, governmental etc.
Field	Allows the searcher to specify fields to search. Many search engines use field abbreviation. Examples of fields available in many database are author, title, subject, etc.	The search statement *(Author: Harter)* will search for the name *Harter* in the author field.
Wildcards	These are symbols that are used to substitute for characters in words. Wildcards are important when dealing with words that have different spellings.	If you want to search for the word 'Organisation' and want to retrieve both the spellings organisation and organisation, the *s* and *z* could be substituted by the wildcards marks and both spellings will be catered for, e.g. *organi?ation.*

Note that symbols used in the search statements may vary from one search engine to the other and the searcher needs to check using the help of the system before inputting the search queries.

Executing the Query

This stage of the IR process is based on the formulated query and may involve keying in the search terms into the IRS (Marchionini, 1995). The searcher communicates with the IRS, and calls for relevant information sources. IRS allows searchers to perform different types of searches, which include known item search, fact search and subject search (Large, Tedd and Hartely, 1999). A known item search requires the searcher to have enough bibliographic details of the item to be able to pinpoint it. A fact search is normally performed to confirm a specific fact, and it focuses on choosing suitable sources that contain the required information. Subject search is more sophisticated than the previous two, as it attempts to locate information sources that deal with a particular subject. This search is regarded as more open-ended because the searcher begins with little or no idea about the information sources that are to be retrieved. For a searcher to be successful in implementing or executing a query, it is important that he or she has knowledge and understanding of the nature, content and structure of the database. This includes knowledge of the indexed or searchable fields, as well as the search facilities that are available in the IRS.

The last step in the IR process relates to the examining the results of a search for relevance. If the user is not satisfied with the results, he or she may go back to reformulate the query so that another search could be performed. This may be repeated several times until the searcher is satisfied with the results.

Modern information retrieval systems allow the searcher to specify the display format of the results. There may be various options available, and the searcher needs to be aware of them. Examples of the formats that may be selected depending on the databases searched are full records or brief displays from which the relevant items could be selected to display full records. Databases also give users options such as printing full records or just brief citations. The searcher may also have the option of either saving the results to a local disk or sending them by email.

Relevance

Relevance is a very important concept in the IR literature. The concept has both theoretical and practical dimensions (Harter 1986). However, despite its centrality in the IR literature, there is still no universal definition of the term. Relevance as a concept attempts to describe and explain the relation between documents and the information problem from the user's perspective. According to Lancaster and Gale (2003), relevance should indicate "a relationship between a document and a request statement in the eyes of a particular judge" and it is essential to measuring the IR output (Meadow, 1992). Therefore, an appropriate measure of relevance should seek the judgement of the document recipient on the search output.

The fact that relevance depends on the judgement of the user makes it subjective, as the value that the user places on the information at the time of receiving it is critical (Pao, 1989). Relevance also changes with time, and thus making it time-bound, and influenced by the sequence in which the user receives a given pile of documents as well the attributes of the user. Consequently, it would be flawed to base relevance decisions on a single individual (Lancaster and Gale, 2003), nor even just one criterion to evaluate the performance of an IRS.

Relevance Judgements

There are various ways in which relevance decisions could be made. For instance, relevance measures could focus on the relatedness of the retrieved document to the query. It can also be looked at in terms of the value or utility of the document to the user.

In terms of subject relatedness, relevance measures the closeness of the retrieved document to the queries based of the subject mater of the document or other attributes of the document. This measure is often applied by someone other than the user of the information. For instance, a reference librarian helping a patron of the library will be able to judge the relevance of the documents by relating the subject matter to the query. Other attributes such as authors, publication type could also be considered. For instance, the relevance of the document could be judged on the basis of the author who is known to write in the subject area of the query. Relevance measured in terms relatedness can be subjective, as the searcher's judgements could be influenced by other factors such as the knowledge of the subject, and interpretation of the query. The

experience of the person making the judgement in relation to dealing with queries such as the one posed may also affect the judgement on the relevance of the document retrieved.

Another measure of relevance relates to the value and utility of the document. The value of the document to the user can be interpreted in several ways. For instance, drawing from marketing concepts in business literature, value can be defined in terms of what the item can be exchanged for. This means value is determined by the demand of the item to address an information problem. For instance, seminal works that are cited most in a subject area have high market value.

Secondly, value can be assigned to a document in terms of the expectation that it would be helpful in providing a solution to the information problem being addressed. This value is not necessarily driven by the market forces, but it is the users' anticipation or expectation of the benefit that could be derived from that particular document.

Value can also be influenced by personal attributes. This is an intrinsic form of value, and is likely to vary from one person to another because the judgement is based on the attributes perceived by the individual. Intrinsic value can be judged in terms of the, uniqueness, timeliness and accuracy of the document.

A third measure of relevance is utility. It is a way of judging the document's relevance by looking at its usefulness to the user to solve his or her information problem. The important issue is what the user achieves as a result of the document. A document could be highly relevant in terms of subject matter, but if it does not add something new to finding the solution to the information problem then it is of less relevance in terms of utility. For instance, if a user retrieves a document that in terms of subject matter covers relevant materials but the user has seen the document before, then the document has no value to the user because there is nothing new that is going to be gained from the document to add to finding a solution to the information problem.

Recall and Precision

According to Harter (1986), recall and precision measure the extent to which the retrieval fails to be perfect. Recall focuses on maximising the number of items retrieved. It can be computed by dividing the number of relevant documents retrieved in a search with the total number of

relevant documents held in the system or file. The formula given below illustrates how recall can be calculated:

R = (Y/X)

Where:

R represents the recall

Y represents the number of relevant documents retrieved from the database.

X represents the total number of relevant documents in the database.

It is important to note that recall measures the degree to which all the information that is sought in a database is received. A perfect recall would result, when Y equals X. This means that all the relevant documents that could be found in a database pertaining to a query have been retrieved, and a maximum value for recall of one (1) would be obtained.

Precision assesses the purity of the output (Pao, 1989), and is computed by dividing the number of relevant documents retrieved, with the total number of documents retrieved from the system or file. The formula for calculating precision is as follows:

P = (Y/Z)

Where:

P represents the precisions

Y represents the number of relevant documents retrieved from the database.

Z represents the total number of documents retrieved from the database.

The measure of precision emphasises the accuracy of the retrieval by measuring the degree to which only relevant documents that could be found from the databases are retrieved, leaving out those that are not relevant.

An important point to note is that there is an inverse relationship between recall and precision. When the number of documents retrieved

is large, the number of documents which are not relevant increases, leading to a high recall ratio, but a low precision ratio. Table 2 below illustrates the relationship between recall and precision:

Table 2: Relationship between recall and precision

	Number of retrieved documents	Number of documents not retrieved	Total
Number of relevant documents	w [relevant document retrieved (hits)]	y [relevant documents missed out]	(w+y) [all relevant documents in the database]
Number of documents not relevant	x [retrieved documents but not relevant (noise)	z [rejects]	(x+z) [all documents that are not relevant]
Total	(w+x) [the total number of documents retrieved]	(y+z)[all the documents not retrieved]	(w+x+y+z) [total number of documents in the database]

Table 2 above shows the relationships in the number of documents in a typical information exercise. From the table, using the formulae for recall and precision defined above: recall = w / (w+y) and precision = w / (w+x). As stated above, the two quantities, recall and precision, are inversely related. When recall increases, the precision decreases.

The recall and precision measures have implication for the IR process, and the searcher needs to decide whether he or she wants to maximise recall or precision. Maximising precisions may lead to some relevant documents left out, and the searcher may miss out on relevant information. If the searcher maximises recall, then a lot of irrelevant documents would be retrieved, and the process may be costly, in terms of both time and money if the searcher is going to pay for the resources in kind. High recall will be important when the information problem is not very clear and the author is attempting to get a broad-based knowledge on what is available. However, as the information problem becomes clear and the searcher starts looking for specific items, then he

or she can aim for high precision to receive only a few documents that are highly relevant.

Exhaustivity and Specificity

The representation of documents in a given IRS affects the extent to which users can retrieve relevant information. Two conceptual measures commonly used to assess relevance from the information representation perspective are exhaustivity and specificity. Exhaustivity assesses the extent to which various topics in a particular information item are covered by the assigned indexing terms. As noted by Chu (2003) "exhaustivity is decided by the indexing policy adopted in the practice" and reflects the extent to which the content of a document is revealed by the indexing of that document. For example, for an information source on "Tertiary, secondary and primary education" a fully exhaustive indexing will include the terms *tertiary education; secondary education* and *primary education* as indexing terms. Any indexing which leaves out any one of the above terms will not be exhaustive.

Specificity measures the indexing quality (Chu 2003). It shows the level of detail at which a given concept is represented in the IRS. Specificity assesses the extent to which the subject index headings used in the IRS matches the content of the document. For example , for the information source "Tertiary, secondary and primary education", using the indexing terms *tertiary education; secondary education* and *primary education* will be fully specific indexing, while using the term *education* as the indexing term will not be specific indexing.

Users of Information Retrieval Systems

Various factors determine people's behaviour to adopting and using of technology. Such factors are increasingly becoming cornerstones for designing and implementing technologies that are accepted by users. Likewise, it is important to identify the users and characterise them according to the reasons they may want to adopt and use an IRS.

Meadow (1992) categorises users of information retrieval systems into three: a) information specialists or reference librarians; b) professional persons or end-users with both information needs and considerable subject matter knowledge, such as physicians, lawyers, chemists or teachers; and c) others, essentially novice, deferring from the second group in that they lack subject-matter expertise.

Information specialist or search specialist such as librarian refers to a person devoted to providing an information service. He/she helps people to find information which is commensurate with their information needs. The information specialist serves as vital link to the IRS. In organisations, information specialists are called by different titles, such as librarians, information managers, information resource centre managers. Information brokers are also referred to as information specialists because they provide an information service as a business. According to Meadow (1992), for information specialists to perform their work successfully, they are expected to have a good knowledge of:

- The types of information available in a discipline or specialised areas that they serve;
- The ways of using information systems relevant to the subject or institution; This includes basic information technology skills such as installing software in a computer system and using the relevant software to access and search both local and remote databases;
- Basic terminology in the area of speciality, including the use of search tools such as thesaurus and subject heading lists;
- Conducting basic studies that would enable them to determine the information needs of the client; and
- Conducting reference interviews.

Harter (1986) notes that the skill required to perform the job of an information specialist effectively and efficiently is highly sophisticated. It does not only develop from aptitude and interest, but also require an understanding of the concepts and principles underlying the design of IRS. The skill is improved through practice and frequent use of IRS. However, because they serve other people, the difficulty that is usually encountered relates to the accuracy with which the information problem is usually communicated to, and understood by the information specialist. It is imperative that the information specialist understands the information problem in the same way as the client, if he or she is to provide a satisfactory solution. Several problems could hinder the appropriate communication of the problem to the information specialist. Firstly, the client may fail to articulate the problem in clear enough terms for the information specialist. This could either be that the subject is still also vague to him or her, and that is the reason for looking for information. Secondly, the client may be clear about what he or she wants, but fails to

communicate it properly, because he or she makes a lot of assumptions about what the information specialist knows about the subject. Another reason that could lead to failure to communicate the information problem may result, when the complexity of the concepts in the information problem overwhelms the information specialist. Notwithstanding the problems that information specialist could encounter, they are still expected to assist the users in the best ways possible.

The second category of users of information retrieval systems are the professional users, also referred to as end-users. The advent of current technologies such as the Internet, which allows professionals to access databases from their workstations, has made this category of users very complex. This includes a community of experts from various disciplines. These are people who could directly use online services by themselves without the aid of an intermediary. For instance, many researchers do not have go to the librarian for them to effectively search for information from several databases in their area of discipline. They can do that in their offices. Members in this category have expertise in their subject areas and tend to have a good understanding of the subject matter than the information specialist. Such knowledge allows them to define their areas of research in more specific ways, and thus improving the relevance of the information they obtain from each search (Barsky and Bar-Ilan, 2005). As Harter (1986) observes, service providers such as DIALOG are expanding their services to appeal to the end users, thus, making their services to appeal to the growing number of personal computer owners.

Professional users need to be trained to acquire appropriate information retrieval skills. Consequently, blending subject knowledge with IR skills is important because it makes them more effective than many intermediaries (Meadow, 1992). For instances, their subject knowledge enables them to make better judgements when it comes to evaluating the information, and matching it with the information problem that needs to be solved.

A third category of users is the novice users. These are people who are very often not familiar with the various types of sources, databases or search methods. While these people can make use of information specialist to find information, they can also be trained to use IRS more effectively by themselves as well. There is need for well defined development programmes that could help such people to become

competent users of the IRS. However, there are always problems when novice users are being assisted. First is their inability to express or describe their information tasks. Secondly, they may not be even aware of their information needs. Even after the information has been located, they may fail to use the information productively.

When considering users of IRS, whether we are referring to an information specialist, a professional user or a novice, the kinds of search and the success will to some extent be influenced by the systems that are being used, and the context within which the search process is conducted. With regard to the system, the important factors are the database structure, the interface and the overall organisation of information the IRS. A good IRS should be flexible and should allow users to use various search techniques and tactics to search for information. Furthermore, the system should be "user friendly". The task that the searcher is handling is also a critical factor. This would be influenced by the domain knowledge and the search skills of the user. Domain knowledge influences the searcher's ability to get relevant information.

General Search Problems Encountered by Users

Today's information seekers/users operate in an environment of rapidly growing and changing electronic systems and services. Such an environment often quickly renders obsolete existing and acquired knowledge and skills on such systems and services. Accordingly, users encounter different problems when they have to search for information in the dynamic information environment of today's digital searching. It is imperative to assist users to overcome these problems, and such efforts have led to number of information literacy programmes, specialised user training programs, including texts and manuals designed to help users find relevant information in specific environments. The aims of these various initiatives are to develop the ability and confidence of the users to search and use information appropriately.

It should be noted that whenever users have failed to get the information they require, they are quick to fault the information retrieval system. Some examples of the responses that information professionals usually get are that the information is not available in the database or the system can't give the right information. In a number of cases, the user will look very frustrated and give up on the task. This is understandable

because information retrieval systems are not perfect, they could be faulty in one way or the other. However, observations reveal some fundamental problems which recur in several cases, when dealing with users engaged in information searching activities.

The first problem relates to the lack of or inadequately developed search strategy plan. Several authors have alluded to this problem. For instance, Kuhlthau (2003) when referring to students contends that they are quick to rush to enter search terms into the search boxes without giving much thought to what they do, that is, planning how they would perform the search. This results in the use of general terms without much consideration of other terms that might be used to enhance the search. There is very little time given to reading and interpreting the information problem. A second problem is the inability to evaluate resource and select the relevant ones. This problem may be regarded as emanating from the lack of understanding the information problem, hence it becomes difficult to make a judgement on which resource would be most appropriate to address the problem at hand.

Databases from which information is searched are many and varied, and for one to be able to search properly, there is need to understand the structure of the database, the interface and the search techniques and tactics that could be used when interrogating the database. Some searches fail not because the information is not available, but because the user is unfamiliar with the information retrieval system, hence he or she can only exploit it to a very minimal level. Another problem relates to the overdependence on one information retrieval system. For instance, in the case of students, if they have used an IRS and found it useful in one information problem, they tend to want to use it again, regardless of the information problem they are facing. An important factor would be for user to appreciate that information problems are different, and need different IRS to address them. An IRS that was highly successful in addressing one problem situation may be completely useless when the problem is different, and the user should be willing to accept that and move on to try other IRS.

Another problem relates to inadequate searching skills, and trivialising the search process. Information searching is a specialised skill area in its own right, and individuals need to take a conscious effort to develop that skill. However, what is happening in practice is different, information searching is normally not treated as a critical aspect of the

steps towards the completion of an information task. Furthermore, despite an attempt by information services departments such as libraries to run information searching training programmes, users do not make any follow-ups to try their skills. Information search process is usually done on a trial and error basis, and it is usually experimental in nature. Even after failing to achieve results in one instance, there is no follow up to find out the reasons for failure and finding ways of improving one's search skills.

While the problems mentioned and described above are considered important and should be the focus of any information literacy training and induction programmes for systems users, they are by no means exhaustive. They are however, fundamental to the discussion of this chapter. An appreciation of these factors could help information seekers to look at information retrieval and search process in a way that could lead them to get results much more easily. Another interesting thing about the above factors is that they compare favourably with the major areas of evaluation of online search process identified by Harter (1986). However, one draw back in the information retrieval research is that studies are in most cases experimental, and they fall short in the analysis of frustrations of the users in operational systems. It is important to point out, however, that literature on the problems that information seekers encounter when they try to retrieve relevant information is scanty, even though it is an important area that should inform any discussion of the information IR process.

Large, Tedd and Hartley (1999), drawing from IR literatures, point out that some of the problems encountered by searchers are failure to identity and use all the appropriate terms to perform a complete search. Searchers sometimes fail to identify synonyms. In some cases, users lack experience and knowledge of the subject area, and these are essential to performing successful searches. Provision of appropriate training programmes for users can enhance success in the retrieval of information. Information professionals need to continually give appropriate skills to their customers, and help them to succeed in their information tasks. However, the exposition by Chowdhury and Chowdhury (2001) shows that giving the skill to the users, especially in a changing technological environment, is not an easy task. In addition to learning the basic skills for using technology, the users have to learn the structure of the databases, the organisation of the information and other retrieval facilities.

Furthermore, the user has to learn new skills each time he or she uses a new service. Most importantly, the user needs to be aware of their deficiencies and be ready to seek the right assistance.

Information Retrieval Systems in the African Context

From the foregoing discussion, it can be seen that information and communication technology (ICT) is a substantial component of the information retrieval systems. Consequently, the factors that affect the use, development and deployment of information and communication technologies would provide context for understanding the use of IRS. Several texts and research works have tended to discuss the use of IRS in a general way albeit the different technological environments in which they are used. In this section, factors which are peculiar to Africa and could affect users and potential users of IRS are highlighted. The section concludes with a synopsis of online IRS available on the African continent.

The use and adoption of ICTs in the communities of Africa is not that rosy. It is characterised by several problems, some of which could be internal within countries, while others are external. Among the internal problems are the physical infrastructure and the human resources requirements for the deployment of ICTs. In Africa, the state of development and the rate at which these resources grow is low. For instance, the telecommunication network is insufficient and is characterised by several problems. First and foremost, its presence cannot be guaranteed. Where it is available, the reliability is almost always a problem. There are many and long downtimes. The equipment required to keep the systems running may be difficult to obtain because in most cases it is sourced from outside. The sluggish economies of African countries, which present problems of getting foreign currencies, create barriers to obtaining such equipment. On the other hand, if the equipment is available, maintenance and repair of the infrastructure is problematic. Power cuts, which are frequent, may also lead to the destruction of the equipment. In fact, in some cases, even getting access to power is a big problem.

Computer and other equipment required to keep the information systems up and running may not be available altogether, or not enough to cater for the needs of those who require them to search for information. Another problem that is faced by those who introduce information systems in Africa is the missing or short supply of specialised knowledge

and skill required to develop, use and maintain computer-based information systems in general. Such skill is fundamental when information retrieval systems are to be made available and used.

An implicit assumption in the definition of an IRS is that the relevant information content is available and embedded in some document, hence, the IRS helps the user to locate that particular information or content. While such an assumption may be true to most of the developed world, it would be unrealistic to generalise it to the African environments. Some of the fundamental problems that many African countries face are the lack of appropriate documentation of content. For instance, the issue of indigenous knowledge which has kept many societies in African countries together for centuries is slowly disappearing, as there has not been a proper documentation. Furthermore, there is a vast amount of grey literature kept by governments in hard copies, and such information is not accessible to many electronic databases, including the Internet. In terms of scientific research, most of studies have been conducted in the developed countries; hence, the applicability of many theories, especially in the social science arena, is yet to be tested in the developing country contexts. Consequently, the relevance of the content contained in most international databases to the African context is questionable.

Online IRS Availability in African Countries

Notwithstanding the problems highlighted in the section above, online IRS or ICTs in general are still relevant in the African context, and there have been several initiatives to make them available to users. Consequently, learning about IRS is not a futile exercise. It is important that information users are aware of the shortfalls, and devise strategies for maximising opportunities available. Some examples of African initiatives are given below.

It should be noted that the number of libraries that are developing Online Public Access Catalogues (OPACs) in Africa is increasing, and several of them are accessible via the World Wide Web. For instance, the University of Botswana library system allows users to link with other institutional libraries both regionally and international and thus, making its OPACs more widely accessible. Another example depicting an African initiative is the Database for African Theses and Dissertation (DATAD) found at http://www.aau.org/datad/database. The database is an initiative by the Association of African Universities (AAU), and is meant to enhance

the capacity of African universities to collect, manage, and access their theses collections. The DATAD database contains citations and abstracts for theses and dissertations completed in African universities. Users need to register and then log in before they can be able to access brief citations in the DATAD database. Searching the entire database requires subscription or connecting via a subscribing institution. The CODESRIA Documentation and Information Centre (CODICE available at http://www.codesria.org/Documentation.htm) is another example of an African initiative to provide African users with social science information resources. The database provides "documentary support and information to CODESRIA research programmes, African researchers, African universities, research and training institutes, as well as to African governments and their agencies".

The advent of the Internet makes it possible for many organisations to access information from all over the world much more easily and quickly and at a lower cost. Many African organisations are connecting to the Internet to access these resources. Regarding the IRS, the technology continues to improve. Searching continues to be user-friendly. Users can with very little effort retrieve information that is most relevant to their tasks. This means, non-experts in the IR field can learn and use the IRS more effectively and efficiently. Examples of such systems could be expert systems and information retrieval systems that make use of natural language searching technology. For instance, with natural language searching, users do not have to learn complex search languages when they want to retrieve information, as they can use their everyday language to retrieve information. Furthermore, even the creation of records in such databases does not require complex indexing skills, and this facilitates more content to be easily availed in searchable databases. Consequently for those who have access to electronic resources, searching continues to be more user-friendly, and more relevant content also continues to be available. This has the effect of improving the ability for users to retrieve information much more easily without having to learn complex terminologies that restricted searching in the earlier databases. Thus, making searching for information from electronic databases no longer privy to experts only. These developments in technology offer a direct benefit to communities of users in Africa, considering that there is limited knowledge and skill to use the technology is limited. However, despite the developments in technologies, for one to retrieve relevant information, it is important that one learns certain procedures that would maximise success in the users search efforts.

Conclusion and Recommendations

Given the complexities that go with IR, this chapter makes a modest contribution to the literature by bringing together and highlighting some salient factors that may contribute to success when using online information retrieval systems. The discussion has focused on various factors related to online searching. The IR process is complex and multifaceted. Whether one is a user or designer of IRS, it is critical to understand these processes to ensure maximum benefit to be derived from using the IRS. It is hoped that users will appreciate the complexities surrounding the use of IRS and the need to take a systematic approach to using the available tools and seeking the relevant assistance that could enhance one's searching skills. For information providers and specialists, teaching users how best to use IRS is not an option, but a fundamental area that needs to be developed. Information professionals should have important programmes designed specifically for users of each of the IRS available to users. With regard to the African environment, online information retrieval systems have the potential to improve the information environment of users.

Revision Questions

1. What is an information retrieval system?
2. What is in an information problem?
3. Define the tern relevance as used in the evaluation of the performance of an information retrieval system.
4. What are Boolean operators?
5. Describe the steps in the search process.
6. Discuss how the following three concepts; recall, precision and relevance are interrelated.
7. Under what circumstances is high recall desirable in information retrieval?
8. Name the three categories of IRS users?

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Information management and knowledge management are considered very important in the development agenda of most nations in their efforts to achieve information society status, bridge the digital divide and attain the Millennium Development Goals by the year 2015.

Given the importance of information management and knowledge management to nations and organisations, it is desirable for professionals and students of information science, library, archives, records management, information technology, publishing and related professions to have adequate understanding of the characteristics and uses of information and knowledge in the digital era. Also, progress towards achieving the eight Millennium Development Goals would be enhanced if the concepts and principles of information management and knowledge management are well understood and practised by all stakeholders in Africa's development.

This book aims to provide a comprehensive single text on the concepts and principles of information management and knowledge management and the associated technologies, the challenges the technologies pose for African countries, the policies and programmes that African information profesionals and policy makers can implement to exploit the technologies to promote the development of their countries or organisations.

The book covers the Internet and the World Wide Web, digital resources, technologies and applications, information infra[illegible] and development, knowledge systems, p[illegible] nd management issue[illegible]

This book is ad[illegible]dents and profession[illegible] and information science, archives, [illegible] management, the in[illegible] technology and publishing profess[illegible], at all levels. The b[illegible] oduct of the efforts of lecturers of the D[illegible] of Library and Inform[illegible]dies, University of Botswana, who are distin[illegible]ned information profes[illegible] Africa.

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