Information and Communication Technologies in Africa: A Review and Selective Annotated Bibliography 1990-2000

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Foreword

Much has been discussed and written about information and communication technologies (ICTs) being a possible panacea for the difficulty that all sectors of society have in accessing all kinds of information. Indeed, there have been many studies and initiatives concerned with ensuring that African countries are prepared to meet the challenges of the information age, and much seems to revolve around access to ICTs and ICT policy development in general. However, what evidence is there for the potential of ICTs to assist in Africa's development? Are ICTs actually changing the 'shape' of Africa? It was with these questions in mind, that Dr Catherine Nyaki Adeya was invited to prepare this review and bibliography.

In undertaking the work, Dr Adeya has made a personal selection of literature that she has found to be representative of the developments in ICTs in Africa over the past decade. The review and annotations of the literature selected have been undertaken to give particular attention to the type of research carried out and methodologies used, with the object of identifying areas for future research. The full text of much of the literature cited is available on the Internet, so this review and bibliography will guide researchers who need more detail about work done in specific countries or in relation to specific applications of ICTs.

The book is divided into two sections: the review and the annotated bibliography. The review begins by introducing ICTs and the information economy in the African context. The literature selected for the bibliography is then reviewed thematically under a number of headings: Overview of ICTs in Africa; Information Infrastructure; Information Economy; Information Management; Socio-cultural and Political Issues; Education and Training; and Gender. Dr Adeya then draws some conclusions from this review and provides some thoughts on the future.

The review reveals that, despite many constraints, the use of ICTs is growing in Africa and there have been successful developments in infrastructure, information management, networking and gender-related issues. However, the literature has also revealed considerable variation between different African countries in their adoption and use of these technologies. The literature reviewed relates primarily to anglophone Africa and generally excludes telecommunications issues, as these are already well documented in other publications. In essence it is hoped that this publication will act as a window of opportunity for more nationally and locally focused empirical research and will make a contribution to understanding the research opportunities and challenges that still face most African countries. Carol Priestley Director, INASP Oxford April 2001.
Acknowledgements

This is a 'issues' book for those wondering about research-worthy areas on ICTs in sub-Saharan Africa. I would like to recognize the contributions of Shadrack Katuu for helping in the searches and tirelessly encouraging me on. This is for you and students like yourself who believed this was a worthwhile venture. To the many students (B. Murimi, J. Muthama, M. Ndung'u, Pauline, etc.) who kept sending e-mails for topics or justification of their topics . . . your answer lies herein.

My heartfelt thanks to Carol Priestley and Diana Rosenberg for your guidance and support in bringing this work to fruition. Dr Janet Hussein and Roger Stringer provided valuable editorial assistance by re-structuring the text to meet a format different from that in which it had originally been prepared. However, the selection of items for review and comments expressed about them remain mine.

To my friends, thanks for your undying support. And always to my family, my greatest and sometimes 'silent' supporters, and particularly in memory of my father, Ambrose Adeya Adongo. Catherine Nyaki Adeya April 2001

This publication was made possible by a grant from the Carnegie Corporation of New York. The statements made and the views expressed are solely the responsibly of the author.
About the compiler

Catherine Nyaki Adeya, a Kenyan national, is an information scientist with knowledge and skills in information development issues which include social, political and economic impacts of the new Information and Communication Technologies, particularly in Africa but in the developing world in general; this is where her research interests lie. She has a Ph.D. in Information and Development. Other interests include: project evaluation; project development, implementation and dissemination; developing, sensitizing and monitoring training courses for capacity-building in this field, especially for sub-Saharan African countries. She has proficiency and experience in communicating with a culturally and socio-economically diverse population.

Acronyms

Section I: Information and Communication Technologies in Africa: A Review of Selected Literature, 1990–2000

1 Introduction

In this period of rapid technological developments and an ongoing information revolution, one of the key by-products is incessant change. Two of the main characteristics defining this historical period are the twin concepts of globalization and the information economy. This transformation - which embodies social, economic, political, technical and cultural processes - is affecting nearly all economies and creating tremendous challenges and opportunities in its wake. African countries will not be (and have not been) spared, although there is still concern that the gap from the rest of the world is widening. Within this context, many studies and initiatives are concerned with ensuring that African countries are prepared to meet the challenges of the information age, and their main thrust seems to revolve around access to information and communication technologies (ICTs) and ICT policy development in general.

By definition, ICTs include electronic networks - embodying complex hardware and software - linked by a vast array of technical protocols\(^1\). ICTs are embedded in networks and services that affect the local and global accumulation and flows of public and private knowledge. According to the United Nations Economic Commission for Africa, ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities; quite an expansive definition [see 48]. It is not uncommon to find definitions of ICTs that are synonymous with those of information technology (IT). For example, Foster defines IT as 'the group of technologies that is revolutionizing the handling of information' and embody a convergence of interest between electronics, computing and communication [see 45]. Duncombe and Heeks simplify the definition by describing ICTs as an 'electronic means of capturing, processing, storing and disseminating information' [see 46]. Therefore, in this review, the terms IT and ICTs will be used nearly synonymously and in a somewhat broad sense. The terms designate the information processing interaction between providers and users of information and also the development and application of information-processing systems that may not be regarded as part of the development of telecommunications/telematics \textit{per se}. It is important to emphasize that these technologies only provide new mechanisms for handling an already existing resource: information. Therefore, to understand ICTs, one must first understand information practices and needs.

It has been observed that many researchers in Africa have to confront the acute lack of basic data and factual information relevant to policy-making, a situation that is not unique to the ICT policy environment. This predicament is not uniformly bleak, because researchers have some knowledge of attempted (and successful) baseline studies and applications in ICT-related issues. Furthermore, a key factor in the African situation has been the major effort on the part of funding agencies to improve infrastructure and connectivity in the region, as well as providing training in the use of ICTs. Many of those who are engaged in this are, in the main, well aware of the social and cultural issues that arise in such an undertaking.

Such awareness and sensitivity, important as they are to a proper understanding of economic and social realities, cannot in themselves compensate for the fundamental lack of information. There is a lack of analysis of, and detailed knowledge about, the economic structures within which the application of new technologies is presently being attempted and from which the market demands for these technologies must come if there is to be a sustained process of adoption. Here, there is a fundamental gap in our collective knowledge of the African reality, even though there have recently been attempts to address this, such as the UNECA-led National Information and Communication Infrastructure (NICI) processes [see 49]. Many researchers have decried the lack of reliable data - or the absence of any data at all. One of the results of a national policy framework should be the collection by national governments of data in a consistent form, and their availability for planning purposes and for monitoring the performance of the ICT policy process.

It is important, however, to recognize that there are, in many African countries, already initiatives in which outside agencies, governments, and the public and private sectors are involved in the application of ICTs. Innovation is happening because the agencies engaged in it do not wait on policy - least of all on policy research. It is most important, however, that policy researchers and practitioners are informed about experiences in the application of ICTs. In the end, the experiences will be a fundamental source of understanding about the application of ICTs in various fields, and of their social and economic outcomes.

The phenomenal rate at which these applications continue to grow has generally meant that attempts to collate empirical evidence have inevitably been out of step with the realities on the ground. Therefore, policy-makers in Africa are confronted by a conundrum. Their dilemma in developing strategies to bring the information revolution to Africa by creating truly national, integrated information infrastructures lies in simultaneously accelerating the use of high-tech and low-tech information services. They are required to nurture the development of highly sophisticated, world-class channels, capable of carrying the digitized content that now races through the world's financial systems, educational institutions and business networks; at the same time, they must carefully address the information needs of the vast majority of their populations with low per capita incomes, who are mostly rural based. It is worth noting that, in 1995, the per capita income level of 36 per cent of Africa's population was below that achieved before 1960; that of another 6 per cent was below the level achieved by 1970, 41 per cent below the level achieved by 1980, and 11 per cent below the level achieved by 1990.

Nevertheless, in African countries, there is considerable interest in exploiting ICTs in all sectors. In the economic sphere, interest in ICTs is partly inspired by a belief that they are increasingly essential for the efficient use of resources in general. For example, in the short term, low-wage countries may be able to compete in international markets without having to make much use of the newer technologies, but, in the longer term, income growth is likely to be constrained along the path of low productivity growth. Also, since the new technologies are often concerned with quite new areas of activity - software production or data-entry services, for example - a failure to develop the capability to make use of them could preclude other important opportunities.

Yet, with all the 'noise' surrounding the potential of ICTs to speed Africa's development, is there evidence for it? Are ICTs actually changing the 'shape' of Africa? Do the findings from past studies support the policy advice being given to African governments? This review is intended to help answer these questions, though I do not claim it to be complete. It is by no means intended to be an exhaustive analysis of literature on ICTs, but rather an attempt to synthesize some work (drawn mainly from sub-Saharan Africa between 1990 and 2000) that has been done in this area.

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2 E. J. Wilson, 'The Information Revolution Comes to Africa.' CSIS Africa Notes, 185, June 1996.
and to give an overview of studies that have been conducted. It may be considered a limitation that the review does not include the many publications on telecommunications issues over this period. However, there is justification for not including many such studies in this review, as they are already well documented in books and in publications by the International Telecommunications Union (ITU). This review also generally excludes post-graduate theses (especially doctoral theses), as these are often difficult to access for review.

I chose to begin the review from 1990 because a number of dynamic ICT developments/initiatives in Africa were started and/or matured in the 1990s. Some significant initiatives, such as the Capacity Building for Electronic Communication in Africa (CABECA) project, were initiated in the mid-1990s. Some gender-related studies were also initiated in the mid-1990s; for example, in 1995 the first operational activities associating gender and ICTs appeared in Kenya, Senegal and South Africa. Many publications prior to 1990 were 'futuristic', advocating the importance or potential of ICTs for Africa. During the year 2000, there have been many initiatives to build or improve the information infrastructure and to 'connect' Africa. Recent news indicates that Somalia's first Internet Service Provider (ISP) has been set up in Mogadishu, the capital. There are also a number of discussions and initiatives towards e-commerce developments in Africa - for example, in Kenya, Senegal, Ghana and Nigeria. The most advanced developments are in South Africa, while other countries such as Egypt are also fairly advanced in this field.

This review was partly inspired by queries from a number of people, mostly in African institutions, who are not sure what research-worthy issues exist in ICT-related areas. It should also be a useful resource for many in Africa who are not able to access these publications easily. The lack of educational resources in many African countries is a constantly cited barrier to development. Many academic libraries have cancelled their subscriptions to international journals owing to budgetary constraints. There seems to be an assumption that because there is so much information 'out there' it can easily be obtained or accessed. However, access to the information in some kind of synthesized form is close to impossible. Many African postgraduate students stressed that part of the problem was due to under-stocked libraries, a lack of up-to-date periodicals, and poor or no Internet access. They need to know that their research topics are in 'new' uncharted directions and are not merely repeating previously covered work.

Direct evidence from the literature reviewed shows that the survey is the most dominant technique used to gather data for the study of information development. Qualitative methodologies are used more than quantitative ones are. This may be justifiable as qualitative methodology generally aims to derive meaning from issues that are not easily quantifiable. However, a number of the studies reviewed were more descriptive than analytical. The problems of ICTs throughout Africa are mostly common and predictable. Some studies simply list these problems, adding no value with further discussion or analysis. Overall, there was an absence of clear analysis that could identify whether specific problems were unique to the country or region in question or could examine how these problems might effectively be addressed.

In essence, this review acts as a window of opportunity for nationally and locally focused ICT research. One limitation is the strong focus on anglophone Africa. This does not mean that there were no initiatives in/from francophone and lusophone Africa, but the language barrier prevented my including them in this review. Despite these limitations, it is hoped that the review will make a contribution to an understanding of the research opportunities and challenges that still face most African countries in their development and use of ICTs.

4 See <http://www.somalinternet.com>
A note on methodology

For this study, a number of sources on the Internet were searched, including indexes such as the BUBL Journals in Library and Information Science <http://bubl.ac.uk/journals/lis>, Current Cites <http://sunsite.berkeley.edu/CurrentCites>, Library and Information Science Abstracts (through dialog.com) <http://library.dialog.com/bluesheets/html/bl0061.html>, Library Literature (through dialog.com) <http://library.dialog.com/bluesheets/html/bl0438.html>, and Proquest Database <http://www.bellhowell.infolearning.com/proquest>. I was aware that IDRC and UN Economic Commission for Africa were doing a lot in this area and some sources were located on their Web sites <http://www.idrc.ca> and <http://www.uneca.org>, respectively.

Searches conducted on the Internet included general search engines, such as Altavista <http://www.altavista.com>, as well as searches on Africa-specific Web sites, such as Orientation Africa <http://af.orientation.com>, Woyaa <http://www.woyaa.com>, the Africa Studies Center <http://www.sas.upenn.edu/African_Studies>, and Mike Jensen's Web site on ICT Projects in Africa <http://www3.wn.apc.org/africa/projects.htm>. Various combinations of keywords were used when searching, the major ones being: Information and Communication Technologies; Africa; ICT; Information Technologies; Communication Technologies; Information Science; Library; Third World Countries; Developing Countries; as well as the names of specific African countries.

The relevant publications identified were studied and subdivided into thematic areas for review as follows:

- Overview of ICTs in Africa
- Information Infrastructure General Networks Computerization
- The Information Economy
- Information Management General and policy issues Libraries Electronic publishing, CD-ROMs and databases Information consultancy and brokerage
- Socio-cultural and Political Issues Socio-cultural issues Political issues
- Education and Training
- Gender

It should be noted that some of the papers were difficult to categorize or dealt with more than one theme. These themes have been used to provide a framework for the following discussion of ICTs in Africa. A thematic index to the items reviewed appears below.
2 Thematic review of the literature

2.1 Overview of ICTs in Africa

2.1.1 A review of literature published between 1990 and 2000 has revealed that the use of ICTs is growing in Africa, despite many constraints. There is a considerable variation between different African countries' adoption and use of these technologies, ranging from the fairly advanced status of South Africa to the relatively undeveloped status of Somalia, which is reported to have only recently introduced its first Internet Service Provider (ISP).

2.1.2 The constraints to ICT development in Africa have been well documented by researchers [see, for example, 17, 104, 131, 150]. These constraints include lack of infrastructure, absence of ICT policy or its implementation, few trained or skilled ICT personnel, poor knowledge of ICT at all levels from suppliers to users, as well as financial constraints. These problems are discussed in more detail in later sections of this review.

2.1.3 Despite these constraints, there have been successful applications of ICTs in different sectors in many African countries, including banking, air travel, software development, and the provision of health care. Further appropriate development in ICTs in Africa could improve communication, access to information, research, distance learning, teacher education, etc.

2.1.4 The developed world (the North) dominates the production and distribution of information; however, the flow of information from developing countries (the South) to the North has improved, albeit at a slow pace. Various ICT initiatives have been introduced in Africa to improve this situation (see section 2.2 below), and these could help to reduce imbalances in the sources of information. There is also a lot of useful local information within Africa that, if it were easily accessible, could be used for development.

2.1.5 The impact of ICTs depends on users' attitudes and expectations, as well as on institutions' organization and management. These impacts should be analysed using generalized and expanded treatments of both qualitative and quantitative techniques, rather than simply quantitative tools. More interdisciplinary research is needed on the social impact of ICTs, as this would help planners and implementers to design and evaluate better uses for them. Awareness of ICTs, however, does not lead to their immediate application. Adoption of ICTs involves a substantial learning curve and a high level of investment from users, whether they be individuals or organizations.

2.1.6 ICT initiatives in Africa have sometimes been started by donors or international organizations, using systems that may be inappropriate for local conditions. Once handed over, these initiatives are not sustainable. African countries therefore need to develop clear strategies for sustainability beyond donor aid. Indigenous capacity-building is vital for this sustainability. More local initiatives and greater private-sector investment in ICTs should be encouraged. ICT initiatives must take account of the local situations in individual countries; blanket developments/recommendations will often not work.

2.1.7 The role of the youth in ICT developments in Africa is crucial, but has not been examined in many ICT publications. One exception is the edited proceedings of an IDRC workshop, African Youth on the Information Highway [see 129]. Various programmes to incorporate youths in ICTs and community development are discussed in these proceedings.

2.1.8 The monitoring and evaluation of ITC projects in Africa have often been carried out with the use of surveys/questionnaires. The CABECA project (see 2.2.7 below) highlighted some.
Section I: Review of Selected Literature

important points regarding the design and administration of these. For example, the administration of questionnaires by e-mail led to some problems, as respondents were not used to responding in this format. In some cases, respondents were unwilling to respond to what they considered to be 'sensitive' questions unless they received an 'official' request [see 98]. It is therefore particularly important that questionnaires are carefully designed, taking into account the likely nature and expertise of the respondents and being clearly structured and unambiguous. The responses to such surveys might also be more reliable if the anonymity of the respondents is maintained.

2.2 Information Infrastructure

General

2.2.1 A number of projects have been initiated since the 1980s to advance ICTs in Africa, many having been established by international organizations or Western countries working throughout the continent or with regional groups or selected countries. These projects have tackled ICT issues such as infrastructure, policy, Internet connectivity, information management, capacity-building and networking. Some of these developed within the context of other projects and their activities have often overlapped.

2.2.2 One of the first of these projects was PADIS, the Pan-African Documentation and Information System. PADIS was established in the early 1980s with funding from the United Nations Economic Commission for Africa (UNECA), UNESCO, the IDRC and others. Its primary objective was to promote information management in Africa, and thus to provide access to published and unpublished documents produced in Africa, assisting member states of the ECA to strengthen their national information infrastructures so that they could participate fully in the proposed developments.

2.2.3 The African Information Society Initiative (AISI) was formed in 1996 following the African Regional Symposium on Telematics for Development at UNECA, Addis Ababa, in 1995. AISI strove to assist members states in moving towards the new global economy based on information and knowledge, focusing on policy issues, infrastructure, infostructure and human resources.

2.2.4 National informatics policies have been surveyed in several African countries such as Nigeria and Tanzania [see 11 and 151], while Furzey and Werner examined social, economic, technical and policy issues with respect to the expansion or initiation of information and communication infrastructure in Ethiopia and Mozambique, respectively [see 53 and 158]. These surveys have generally revealed that national policies with respect to the development and use of ICTs are not yet well established in Africa. There are also reports on ICT policy formulation in two papers from the ECA in 1999 [see 48 and 49].

2.2.5 Twenty-two African countries are taking part in the National Information and Communication Infrastructure (NICI) initiative of the ECA. These countries are regionally and linguistically (anglophone, francophone and lusophone) representative. NICI strategies cover many aspects of ICTs, including policy, infrastructure, applications and technology [see 49].

2.2.6 Another ICT project, the Acacia initiative, was started by the IDRC in 1997 to enable sub-Saharan African countries to apply ICTs for social and economic development [see 1]. In general, the Acacia initiatives in different countries were aimed at achieving equitable,

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5 Several researchers have reviewed the progress of various projects/country developments within PADIS [see 71].
6 The development of AISI is outlined by Oyinloye [see 134]
ICTs in Africa

2.2.7 The Capacity Building for Electronic Communication in Africa (CABECA) project commenced in 1995, with the aim of promoting computer-assisted networking throughout Africa [see 98]. The project was funded by the IDRC and executed through PADIS. The main objective was to provide technical assistance in order to bring about sustainable computer-based networking at an affordable cost to a wide variety of users in the private and public sectors. Ethiopia, Senegal, Uganda and Zambia were some of the beneficiaries of the project [see, respectively, 145, 44, 21, 29]. The various country studies of the CABECA project highlighted such problems as different levels of computer skills, poor telecommunications infrastructure and prohibitive costs for private/individual users.

2.2.8 Another project aimed at developing Internet connectivity and improving national ICT capacity in Africa, was the Internet Initiative for Africa (IIA) of the United Nations Development Programme (UNDP) <http://www.undp.org/rba/intrinit/iia-toc.htm>. At the completion of the project, the IIA should have twelve countries with new, fully operational or enhanced Internet nodes with the respective governments working towards equitable access at reasonable cost.

2.2.9 Some African countries have become popular sites for multiple ICT projects, while others have been neglected. Action programmes need to be developed to provide an entry point to these marginalized and disadvantaged countries.

Networks

2.2.10 There have been many initiatives to develop networks in African countries, usually funded by international organizations or Western agencies. One such initiative was the Regional Informatics Network for Africa (RINAF) conceived by the Informatics Program of UNESCO and financed by grants from Italy and Korea [see 142]. The project established five regional nodes and ten national nodes throughout Africa and was implemented in co-operation with IDRC programmes in these areas.

2.2.11 The Sustainable Development Network Programme of the UNDP was initiated in 1992 [see 159]. Its main objectives were to facilitate access to information for decision-making purposes in support of sustainable development and to encourage broad participation in planning and implementing sustainable development. In essence, this programme tried to plan the successful marriage of the Internet to sustainable development issues.

2.2.12 Other projects that developed Internet access included the Leland Initiative, UNDP's IT for Development, the World Bank's WorldLink, the IDRC's Acacia project and the FAO's Communication for Development approach. These projects have focused on different downstream applications of the Internet such as health, education and rural development.

2.2.13 Several types of network protocols have been tested in Africa including UUCP, FidoNet and TCP/IP. Regional Fidonet networks linking users according to particular areas of interest have been established, including Esanet, HealthNet and MUKLA. Among lessons learned that have been reported are the need to build as many Local Area Networks (LANs) as possible, to start good network management practices from the beginning, to ensure interactivity of the networks, to assist in building local information sources, and to encourage reasonable payment by users to ensure the sustainability of the network.

2.2.14 The importance of the financial sustainability of the networks has been discussed by many writers, who have considered many aspects including the costing of services, subsidization of
services, sharing of resources, Internet tax revenues, repayment of loans, sources of soft finance, joint ventures, etc. Collaborative efforts between networks have been suggested, such as the proposal for CAUNet in Central Africa [see 22]. Shared resources could reduce costs and increase sustainability of the unified network. Computerization

2.2.15 The problems (technical, economic and cultural) in implementing ICTs in Africa have been documented by many researchers. Nevertheless, there have been many advances in the use of ICTs over the past decade. In particular, computerization has occurred in both the public and private sectors in Africa, in such diverse fields as business, health, travel and education.

2.2.16 A few researchers have mentioned control of temperature, humidity and sterility as imperative conditions for the effective use of electronic equipment in Africa [see 66].

2.2.17 Education and training are vital cornerstones in meeting the challenges of ICTs, but the curricula of higher education institutions in Africa in the early part of the decade were criticized for the poor design of their ICT training programmes [see 161]. For example, these institutions made no clear distinction between computer architecture and the management aspects of computer systems.

2.2.18 By 1992, some Kenyan companies were exporting locally assembled computers to neighbouring countries and local industries had developed sector-specific software packages [see 152].

2.2.19 Computerized library networks have been developed in several African countries, while others have been planned but not yet been implemented. It is therefore vital to have government involvement/endorsement and financial support at the start to develop these networks.

2.3 The Information Economy

2.3.1 Available evidence reveals that most leading industrialized nations are seeing the rapid rise of the information sector as a contributor to their national income. However, there have been relatively few studies with which to assess the effect of the information sector on national economies in Africa. Those that have been completed to date focus mainly on South Africa, although there are others on Botswana and Ghana.

2.3.2 The findings of Boon et al. showed that at the time of their study, the information sector played a significant role in the South African economy but contributed only a small percentage to its GDP [see 27].

2.3.3 A study by Duncombe and Heeks focused on small enterprise development in Botswana, in which it was found that investment for Internet access was significant in terms of initial financial outlay, running costs, time and skills [see 46]. They concluded that a holistic approach to the information economy is required which provides information skills, communication skills and assistance with improving organic-, literate- and intermediate- technology based systems as well as the more obvious ICT-focused areas. In Ghana, public-private partnerships were perceived to be the best approach for ICT development, in which public money guided private initiatives and resources to meet public purposes [see 133].

2.4 Information Management

General and policy issues

2.4.1 The need for policy on ICTs in Africa has been raised in many studies between 1990 and 2000, some of which have been discussed in previous sections. Early in the decade, Mchombu
and Miti noted that the call for these policies in Africa had largely ignored existing policies and subsequently caused inaction [see 97]. This was partly due to governments’ interest in information as a ‘source of power’ rather than as a vital factor for development.

2.4.2 Early ICT policy development in some African countries tended to focus on limited applications of ICTs in libraries, information services and local publishing.

2.4.3 In 1993, Alegbeyele noted that there was a general neglect of internally and externally generated information in the government and consequently a disregard of its role in policy-making [see 14]. He stressed the importance of training information managers/professionals in Africa to ensure that they have a broad range of skills to enable them to work in the emerging information economy.

2.4.4 There have been a number of case studies on different aspects of information management in Kenya. Katama studied the Environmental Publishing Network (ENVIRONET) at the International Centre of Insect Physiology and Ecology (ICIPE) Science Press [see 73]. The main lessons learned from this project revolved around better administration and training issues. Mutunga discussed the development of management information systems (MIS) at the Kenya Medical Research Institute (KEMRI) and noted a major growth in the use of computers for research activities, the greater use of standardized software and the use of online literature searches which led to production of quality publications [see 112].

2.4.5 Desktop publishing (DTP) has brought about many changes in the publishing process, allowing manuscript preparation to be undertaken in-house. Tindimubona discussed the introduction of DTP at the African Academy of Sciences in Kenya [see 153].

2.4.6 Van Heusden gathered data about current and planned initiatives on the use of ICTs that add value to development programmes in sub-Saharan Africa. This IDRC-funded study assessed 17 projects [see 155].

2.4.7 Multicultural groups are increasingly working together through technology and group support systems (GSS) can assist in the understanding of technology used in other cultural environments. De Vreede et al. conducted the first detailed field study of GSS applications in Africa, and their findings suggest that there is potential for mapping GSS in Africa to support capacity-building efforts [see 42].

**Libraries**

2.4.8 University libraries in Africa are generally keen to extend their application of ICTs, subject to resources being available. This extension is not likely to reduce the need for printed books and journals as sources of information, but might provide links to the outside world and increase intra-African exchange of information.

2.4.9 Many of these libraries have progressed in their implementation of ICTs, but they have relied heavily on donor funding. Rosenberg looks at the benefits that ICTs have brought to nineteen university libraries in twelve African countries, but wonders what will happen when donor aid ceases since, at the time of the survey, no library had made any practical proposals for financial sustainability [see 147]. Muwahwi describes the problems of automating the University of Zimbabwe library [see 106]. Clear communication between key players and project implementation within the stipulated budget were identified as some of the lessons learned from this project.

2.4.10 Librarians face challenges in integrating traditional information delivery based on print with modern computerized and networked delivery of digital information. With the trends
towards the extension of intellectual property rights and the commodification of informa-
tion, library and information workers must pay more attention to the changing political
economy of information [see 39]. As libraries become more 'electronic', there is a possibility that they will
converge with computer centres, although currently links between the two are weak in Africa.
Advantages include the consolidation of budgets and mutual learning, while disadvantages
include 'culture clashes' over access, and role confusion among staff [see 89].

Electronic publishing, CD-ROMs and databases

2.4.11 At the end of the decade, there were several efforts to promote access to African journals
on the Internet through various electronic publishing projects. Two such projects were African
Journals OnLine (AJOL), run by the International Network for the Availability of Scientific
Publications (INASP), and the inclusion of several African journals in Bioline through the work
of the Electronic Publishing Trust for Development (EPT) [see, respectively, 146 and 81]. These
initiatives have generally sought to increase Internet access to research conducted in Africa, to
strengthen the African academic publishing sector, and, where possible, to increase the
subscription base for African journals. Bakelli noted that, although the Internet and electronic
publishing offer many opportunities for scholarly publishing, there needs to be improved
understanding, behaviour evolution and new skills development by authors, publishers, librarians
and readers [see 24].

2.4.12 Various studies during these ten years examined the use of CD-ROMs in Africa,
especially in libraries [see 16, 86, 99, 117]. In the early 1990s, many questioned whether CD-
ROMs were an appropriate technology for information delivery in Africa; by 1996, the focus had
changed to considering the crucial issues for introducing CD-ROMs effectively. With dwindling
budgets prevalent in many libraries and institutions, it became critical to evaluate CD-ROM
databases to ensure their relevance to African teaching and research.

2.4.13 Local database development and maintenance is another important component of ICTs in
Africa. The success of a project on database development at the National Institute of
Development Research and Documentation in Botswana is credited to its implementation as part
of the normal activities of the host institution [see 103]. To guarantee sustainability, the project
focused on strengthening the in-house staff base instead of soliciting the services of external
experts, even if this took longer to achieve.

2.4.14 An initiative in Ghana to increase the availability of information through the Ghana
National Scientific and Technological Information Network (GHASTINET) concentrated on
indigenous scientific and technological information and developed an efficient system for
bibliographic control, created computerized databases, established a facility for micro-filming,
and arranged training for participants [see 156].

2.4.15 In order to use databases effectively, users need to be trained in search techniques for
obtaining information from thesauri, and abstracting and indexing journals - in both the
electronic and traditional print mediums.

2.4.16 Information professionals are often ignorant of copyright issues in the dissemination
of digital information [see 30]. There appears to be a lack of literature on this subject in Africa, and
there possibly needs to be greater awareness and more debate about digital (and printed)
copyright issues in Africa. Information consultancy and brokerage

2.4.17 There is limited knowledge about information consultancy and brokerage in developing
countries, and investment in these services is generally an unknown consumer environment.
Ocholla investigated the need for such services in Botswana and concluded that the success of
these services depends on a positive information culture and attitude of the users, who currently may be reluctant to pay for information services [see 127].

2.5 Socio-cultural and Political Issues

Socio-cultural issues

2.5.1 The impact and interaction of ICTs and African culture are complex. Many researchers have tried to analyse these complexities. Blake believed that, even though African nations have different attitudes towards cultural regeneration and dissemination, the continent is struggling to 'get a handle on' the complex role and position of culture in order to forge ahead with its development agenda and find its position in the global information revolution [see 26]. African countries must ensure that the adoption of these technologies does not destroy their cultural heritage. ICTs could, in fact, have a positive impact on the cultural renaissance of Africa, by increasing the flow of information about its cultural heritage within the continent and the Diaspora, particularly for the future generations.

2.5.2 Communication in Africa is categorized into urban and rural forms, the former being largely associated with Western influences. Rural communication has largely been oral, whereby people expect immediate feedback, and so any modern communication channel should take this into consideration. Obijifor suggests that the telephone could therefore be the technology of choice for the future as it embraces the African mode of communication [see 125].

2.5.3 However, other authors have suggested the use of the Internet as a way of communicating content of interest to Africans. The creation of relevant content is important to encourage the interest of local users in the Internet, and the problems associated with this are discussed by Chisenga [see 31]. A number of activities are already being implemented in this respect, although some are small and not well co-ordinated. African Web sites should also find ways to encourage publications in indigenous languages. Adam has tabulated some of the popular Web sites on social and economic development in Africa [see 2 and 3].

Political issues

2.5.4 Onyango notes that globalization has had an effect on regional and state management [see 130]. African governments should take advantage of this, erect or strengthen institutions that support the exchange of information, and encourage a competitive culture of debate and ideas that could consolidate the current information-based development wave. Good governance is important if African countries are to make profitable contributions to the global information society.

2.5.5 The interactions between ICTs and politics have been examined by a number of researchers in South Africa. Nassimbeni examines how library and information services could play a key role in the Reconstruction and Development Programme in South Africa [see 115], while Man examines the impact of politics on information access in the context of the 'new' South Africa (following post-apartheid elections in 1994) [see 92]. Wild and Mncube examine access to government information in South Africa and suggest that the problem was not lack of information, technology or expertise, but rather the lack of mechanisms which could bring these to bear on real development problems that required solutions [see 160]. Since the completion of their paper, a number of initiatives have been taken at the policy level including the implementation of the Green/White paper on information society issues and the National Information Technology Forum on the civil society side.

2.5.6 One challenge (that has caused alienation in many African countries) is how to integrate highly technical, Eurocentric parliaments with African traditions and experiences. Lyons and
Lyons consider whether ICTs would bring the South African Parliament closer to the people or would cause alienation [see 90]. The majority of citizens in South Africa do not have access to ICTs, therefore if parliaments use ICTs (television, radio and the Internet) to disseminate information, how can participatory democracy be facilitated?

2.5.7 Electronic communication may have the potential to empower civil society by fostering networking among civil servants involved in public administration reform. Qureshi used the development of GOVERNET (an African administrative reform network) as a case study to describe key considerations that drive the need for the building of civil associations, concluding that access and sharing of information and expertise are enabling factors in building civil societies in Africa [see 138].

2.5.8 Community networks may provide the best opportunity for citizens and civil society to counter the hegemonic drive for power. The culture of communication and information sharing is, in general, well ingrained in the history of many African peoples and countries. However, a study by Manji et al. of 103 human rights and advocacy organizations in central and southern Africa found that the culture of sharing resources or information was not present in many of them as a result of their being developed in a culture of 'information starvation' [see 93]. Sudden access to the Internet led to information overload and 'hoarding'.

2.5.9 Sensitivity to gender issues is often ignored in the context of ICT development, with many women excluded from access to information. However, where communication technologies have been made available, they can lead to a new era of information democratization. In some cases, African women are now able to discuss issues once considered 'taboo', especially with the anonymity provided by the ICTs. Further discussion of the gender issue appears below in section 2.7.

2.6 Education and Training

2.6.1 Lack of trained/skilled personnel in ICTs has been consistently cited as one of the major obstacles to ICT development in Africa, yet relatively few studies or reports were located that dealt specifically with ICT education and training on the continent. These issues are, however, broadly dealt with in many papers examining general ICT developments and problems.

2.6.2 In the early part of the decade, there were relatively few educational institutions in Africa with substantial IT content in their curricula. Only two institutions out of the ten library and information schools in Africa surveyed by Aina offered postgraduate-level training in IT [see 8].

2.6.3 A formidable problem in ICT education is the possibility of a continued brain drain of lecturers, most of whom have received postgraduate training in the West. Attracting them back, or encouraging them to stay, is a major challenge.

2.6.4 Moahi notes that challenges to the teaching of ICTs at the University of Botswana occurred when enrolling new university students who were ignorant of computers and lacked typing skills [see 101]. Likewise, Crafford and de Villiers show that first-year Information Systems students had different levels of computer literacy when they first arrived at training institutions and propose the use of telecentres for IT-supported co-operative learning, to help lecturers and students cope with the demands of these first-year courses [see 37].

2.6.5 ICTs have great potential value for distance education in Africa by allowing 'distant' access to library services, the e-mailing of study material to students, or even two-way voice communication and remotely navigated Web-based lessons [see 23 and 120]. However, this will require the appropriate technological infrastructure and requisite training for all involved. The future may demand that more and more service will have to be provided by fewer librarians, with
funds and less resources, because the expectations will be that technology can bridge more with less [see 23].

2.6.6 In South Africa, it is suggested that more resources could be spent on opening up ICT access to marginalized communities in innovative and cost-effective ways, otherwise ICTs serve only to perpetuate economic and educational marginalization [see 28].

2.7 Gender

2.7.1 The first operational activities associating gender and ICTs appeared in 1995 in Africa [see 56]. As women have often been marginalized in their access to and use of ICTs, many projects have been implemented over the past five years to try to improve this situation. These projects have incorporated issues of policy, access, benefits, roles in production and dissemination of information, and the setting up of gender-specific networks, among others. A book entitled Gender and the Information Revolution in Africa discusses some of these activities [see 141]. However, Hafkin notes that the area that has received the least attention is the role of the women in the information economy, specifically with regard to jobs and economic opportunities created by ICTs [see 56].

2.7.2 Telecommunications policies adopted by many African governments do not make distinctions between the attitudes and needs of male and female users. These gender-neutral policies tend to favour men as they are more likely to have the income to purchase ICTs and have slightly higher levels of education, which predisposes them to trying new technologies. Although the introduction of new ICTs can marginalize both men and women, women are likely to be slower in adopting the new technologies unless strategies are developed to deliberately include them.

2.7.3 A number of researchers have highlighted the need for more ICT education and training opportunities women in Africa [see 72, 78, 128]. These, however, have to be built on a foundation of increased literacy and science and technology education for girls and women.

2.7.4 In order to encourage the use of ICTs by women, the ICTs should be located in local institutions to which women have open and equal access. Examples are health centres, women's NGOs and churches [see 63]. Information resource centres (agencies for the creation, collection and delivery of communication/information) are not usually women-friendly. Therefore, in order to encourage greater use by women, they need to have more women-friendly systems and relevant training and information. Women's information needs and access to information sources should be given more consideration in research, particularly the inclusion of local information and/or culturally relevant information.

2.7.5 Developing support networks to enable women to participate in decision-making should be encouraged and assisted by access to modern means of communication and many. gender-related and/or international organizations in Africa are now working in this direction. Examples of these include the Association for Progressive Communications women's networking programme, the Women's Environmental and Development Network (WEDNET), and a women's information and communication network on the South African SANGONet [see 63]. However, research into computer networking among women's organizations in Africa cites language barriers as a common problem, particularly for women in francophone Africa [see 20].

2.7.6 ICTs have also been used to promote women's rights in a number of African countries [see 132]. Examples come from Uganda, where women have used the Internet to support their contribution to parliamentary debates, and Zimbabwe, where women have created and used alternative communication channels to support their efforts, defend their rights and diffuse information on their activities. It is suggested that, with the advent of ICTs, women need to
discuss the use of gender-sensitive material in order to decide whether to create their own closed space on the Internet or to assert their presence in mixed spaces.

2.7.7 Despite the increase in computer-linked networks in women's organizations in Africa, radio and fax are still important means of communication amongst grassroots women's organizations, in addition to oral communication and 'snail mail'.
3 Some conclusions

Over the decade, a number of authors highlighted the need for clear policies in order to incorporate the development of ICTs successfully into national strategic plans. It is worth noting the amorphous nature of the terms used by various authors for these policies: a Networking Policy, an ICT policy, an IT policy, an Information Policy, a Computer Networking Policy, a Computer Policy, a National Policy for Telecommunications and Information Technology, a National Information Technology Policy, a National Communication Policy, a National Informatics Policy, and even a National Information Policy. One author recommended that the government must establish a clear set of national objectives before developing a policy for ICT. Clearly, from some of the other publications reviewed, it is too much to expect national governments to do this alone and all stake-holders should therefore participate. An agreed definition would be useful, but this should certainly not be the focus of discussion and draw attention away from the wider issues. However, it can also be argued that without a clear definition even researching effectively with a common understanding may be difficult, especially in the African context. This may explain why Kole recommended, from lessons learned in gender-related research in Africa, that there should be a definition of Internet applications according to regional use to avoid confusion [see 84]; but, again, what is ‘regional use’? Some of these ICT issues and terms already have standard definitions. Should not the aim be to educate the respondents rather than to 'Africanize' or 'regionalize' a standard definition? Alternatively, there should be a clarification of working definitions before data are collected from respondents.

Many of the efforts to analyze the implications of ICTs for Africa have their limitations. First, they have tended to be based on a priori reasoning about the nature and expected impacts of the technologies and the skills needed to use them effectively. Further, they have made use of rather broad characterizations of specific conditions in developing countries which are expected to influence diffusion - for example, the weaknesses of telecommunication systems, of powersupply systems, and of other crucial aspects of infrastructure. However, there have not been many attempts to collate basic information about the experience of actual applications in specific countries, so that the factual basis for making some policy decisions is rather weak. There are recent examples to address this situation, including the NICI processes, but these are still in embryonic stages.

Secondly, many of the ideas about ICT policy have come from discussions about particular fields of application - in production sectors, for example, or in particular service applications. The policy proposals that have come from such specific studies are seldom related to broader issues of national concern.

From the studies reviewed, it is clear that the lack of substantive analytical work on the implications of the ICTs for Africa arises from a number of issues. Firstly, the paucity of accurate statistics on the African region hampers any meaningful empirical analysis. Secondly, the phenomenal rate at which ICT applications continue to grow has meant that attempts to collate empirical evidence have been inevitably out of step with the realities on the ground. As a result, useful indicators for many of the least developed countries in Africa are virtually non-existent. This empirical vacuum has sometimes been filled by unsubstantiated claims as to the opportunities and threats posed by the information society, obfuscating in-depth analysis of the realities. Moreover, much of the debate on the impact of economic restructuring, ICTs and development erroneously perceives Africa as a homogeneous continent in which the problems - and hence solutions - are universal. In reality, the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.
It is generally agreed that the economic gap between Africa and the rest of the world is wide - and that it will continue to widen unless African countries grasp the opportunities of the information age, particularly the potential of ICTs to accelerate socio-economic development. It is presumed that ICTs will lead to decreased costs of access to and dissemination of information, and therefore aid rural development by increasing agricultural productivity, enhance the competitiveness of African economies, and so on. Where such statements are sometimes 'silent' is in a well-grounded analysis of how ICTs can actually achieve this in the context of a realistic understanding of existing systems.

One of the most interesting initiatives during the decade was the collection of case studies from different African countries written by Africans (also referred to as 'bridge builders') who give a first-hand account of how ICTs have been successfully introduced into institutions for the benefit of scientists and engineers in the region [see 116]. Such first-hand and specific studies are rare.

Most gender-related studies were published in 2000, although this does not mean that this was when the studies were undertaken. The recommendations from many authors writing on gender-related ICT issues are somewhat similar, primarily that policy-makers need to establish access to ICTs for both women and men and to formulate relevant educational and training services for women and young girls in the ICT sector. But the underlying question is how? These studies need to go beyond the potential and give practical examples of how this can be done - something that policy-makers can implement both the short and long term.

In one gender-related study, Hafkin argues that the ICT area that has received the least attention is the role of women in the information economy [see 56]. However, evidence from this review shows that the information economy is an area that has received little attention, regardless of gender. The same applies to that of education and training for the effective utilization of these technologies.

The issue of language was also constantly cited in relation to appropriate content for women, especially on the Internet. Although increasingly multilingual, the Internet is still largely an English-language medium because of its origins in the United States. However, many African countries have found it impossible to choose an indigenous language for political and tribal reasons, coupled with the heritage of colonization. This has been an underlying problem in traditional print publications over the years. The multiplicity of languages in Africa is a very complex issue and one that cannot be dealt with adequately in this review. Suffice it to say that there is no easy solution to the language dilemma in Africa. It may be that the long-term deployment and exploitation of the Internet by developing countries will depend less on technology and costs and more on their capacities to educate their young populations.

With their use of statistics, many reports from African countries seem to over-emphasise the number of ICT products being made available. These are important, but more meaningful is a clear indication of who is using them and what for. This is a necessary requirement if one is to measure productivity and the impact of ICTs on development. Some studies refer to the need for policy development with the help of local research and development institutes. R&D is a critical component world-wide, and many countries are trying to develop National Systems of Innovation (NSIs) that attempt to harness the combined resources of national academic institutions with research enterprises within the public and private sectors. The focus on 'national' systems reflects the fact that national economies differ regarding the structure of their production system and general institutional set-up. Therefore, within an NSI are sub-systems - for example, National Information and Communication Infrastructures (NICIs). These include institutions, processes and mechanisms to facilitate the production and utilization of ICTs\(^7\). It is expected that

NICIs must be connected to and inter-operable with the emerging global information infrastructure.

Given that access to information and communications infrastructure is so abysmal in most African countries, achieving 'universal access' to information infrastructure is seen as the sine qua non of widespread socio-economic development in an era of globalization and an information economy. Accordingly, any effort to build the information highway in Africa must focus on telecommunications, the fundamental foundation on which other information services are constructed. But heavy concentration on this area can be detrimental to other socio-cultural and economic concerns. Ideally, a balance should be maintained.

More studies are required that investigate the work practices, organizational structure and concurrent attitudes in the African environments where ICT is being introduced. It can be inferred from several studies that some organizations that are introducing ICTs are not overly conscious of the social set-up within the countries studied. For example, Ryckeghem's concluded that IT did not enhance productivity in the organizations he investigated, because of a staff culture ingrained in communal which was reflected in their information-seeking behaviour [see 148]. Generally, many Africans would prefer to consult colleagues or friends rather than visit a library or documentation centre. Although the organizations where the research was conducted are not clearly identified, people who have been used to a communal social system must surely see the new ICTs as being at least equally beneficial, as the face-to-face interaction they have been used to, if not more so.

It is worth noting that only one distinct study sought to measure the number of information workers [see 27]. Yet this is a crucial requirement if policy-makers want to determine where the potential jobs are and what kinds of skills are needed. A useful follow-up to this study would be to find out whether their methodology could be applied to other African countries, or whether a similar study of another sector or country could be conducted with an appropriate methodology.

Concerning socio-cultural and political issues, the argument that African citizens will be able to realize their basic human rights by using computers to transmit information is debatable. Myers attempted to address this, arguing that more could be done through use of computers and specifically the Internet [see 113]. Interestingly, some statistics show that more Africans have access to television than to computers. However, anecdotal evidence suggests that the television may not be the most effective medium for human rights issues in many African countries for a multitude of reasons, one being government censorship. In many African countries, the power of oral communication is still the most effective human rights channel; a huge geographic area cannot be covered as easily as with electronic communication.

Many of the problems raised in studies reviewed are repeated over the years, to the point of cliché. It is worth noting that most studies stressed the absence of required skills and the need for education and training. However, few studies gave 'implementable' solutions to this problem, but constantly repeated that a solution was needed. In some recommendations for ICT policy, there is reference to the 'availability of sufficient support to ease working with the Internet' and the need for 'sufficient training'. What is 'sufficient'? How is a policy-maker meant to assess this or make a decision? Duncombe and Heeks's study recommended that IT skills training should not be separate but should form one component of task-focused training [see 46]. A training programme should be called, for example, 'Better Marketing' not 'Using the Internet'. Likewise, in the case of organizational change interventions, the aim might be, for instance, 'to improve the enterprise's accounting systems' not 'to introduce computers'. From other studies, it was clear that there is a need to examine or re-examine the curricula for ICT-related courses to ensure that institutions of higher learning are producing graduates with the right kinds of skills.

The lack of skilled personnel was one of the obvious obstacles frequently listed, although one study mentioned that two institutions offered 'semi-professional IT education' [see 158]. When
phrases like this are used, it is important that more detail is given so that those who have to implement the recommendations know what is involved. It is ironic that one of the problems faced by some institutions or organizations in Africa is the huge demand for internships but a lack of qualified in-house staff to undertake them or, in some cases, a lack of resources to maintain them. In effect, applications from potential students have been declined. Internships for students and continuing ICT education for working professionals are critical to capacity-building. These are issues that have largely been ignored in many educational institutions in numerous African countries; few institutions encourage their students to seek internships as part of a credit programme.

Despite the aforementioned constraints, it is indisputable that there have been rapid developments in the ICT environment in Africa over the last decade, especially in infrastructure, networking and gender-related issues.

**A Way Forward: Some Thoughts**

There is clearly a need for more analytical research in the thematic areas identified as well as in other overlapping areas. There needs to be more research on education and training issues, as the development of human capital is crucial if African countries are to be competitive in the global information society. There is a need for more research on the social impact of ICTs using an interdisciplinary approach, as this would help planners and implementers to make better use of them.

Given the increasing globalization and restructuring of the world's social, political and economic systems, the requirements for knowledge, education and learning have changed dramatically. The objective of education is no longer simply to convey a recognized body of knowledge, but to enhance the ability of each learner to generate, access, assess, adopt and apply knowledge and information to complex problems. Information-age learners should not be presented with 'ready-made' problems, but should be expected to make contributions to identifying problems. The new educational paradigm says that students should be taught how to think critically and independently, exercise appropriate judgement, collaborate with others, adapt to new and uncertain situations, identify problems and then solve them, and synthesise old information with new.

The accumulation of technological capability is a critical requirement for the development of ICT in Africa. A capacity for ongoing learning is a crucial requirement in this information age, as technological developments diminish the usefulness of already acquired skills. Both physical capital - like the computers and computer networks - and human capital fall under the umbrella of infrastructure. Human capital includes the skills needed to run ICT systems. Thinking of infrastructure as capital allows an ordered approach to an analysis of the infrastructure - for example, in terms of equipment and skills available. Construction and reconstitution of infrastructure requires major investments, which will have various gestation periods and so require careful attention to timing. It must be stressed that simple access to information or information infrastructure is not in itself sufficient to enable the potential offered by that information to be applied towards the goals of African countries. In reality, access to information (whether local or global) is meaningless unless it can be converted into relevant knowledge. Therefore, there is an urgent need for investment in human resources and education parallel to investment in infrastructure.

The development of the information economy has demanded new skills on the part of the people using the new systems. These new skills are frequently built up by hands-on learning. The
reliance on hands-on learning arises simply because the support systems are lacking. For example, if no technical support is available to typists in their use of word-processing software, they may be driven to experiment with the application until they find solutions to problems that they encounter. The learning that is acquired in this way can often lead the people involved to develop other capabilities and to take on new roles in relation to the information system. A great deal of the ordinary knowledge needed for operating information systems effectively is of this kind - and the important skills involved are often acquired by non-codified informal learning processes, usually on the job. It would be useful to document this aspect of technology education in specific African countries and to consider its implications for policy. Hypothetically, the higher is the rate of technological change, the greater will be the role of informal learning processes in the acquisition of relevant skills. It would also be useful to investigate mechanisms that exist for skills acquisition in each country, but taking into account the fact that formal systems of education and training are usually slow to adapt to changes that have been or are being brought about by ICT applications. Formal systems are best at providing codifiable and general skills, but the skills needed to encompass dynamically changing new technologies are hard to codify.

It also appears that the slow development of some aspects of ICTs in many African countries has largely been a consequence of poor technical and financial management (and other inefficiencies) on the part of the telecommunications sector. The delay observed in adopting ICTs could place the very survival of some organizations in certain sectors in jeopardy. It may therefore be important to assess the adoption and diffusion of ICTs in key sectors of the economies of African countries. However, prior to this it is important to collate basic information about the actual and potential applications of ICTs and also to have a clear understanding of the specific policy environments. Adoption and diffusion issues need some kind of measurement. Considering the fact that ICT environments in most African countries are still developing, diffusions may be difficult to measure without proper awareness of the current realities on the ground. As Lefebvre and Lefebvre said from their research conducted in (OECD) countries, 'reaping the full benefits of IT adoption and diffusion requires full understanding of IT applications, their potential and a readiness to change.'

It is only with this full understanding that one can then ask the following questions:

- How can we promote and facilitate the introduction and implementation of ICTs?
- How can we accelerate ICT diffusion in the various sectors of the economy?
- How can we assess the impacts of ICTs?

Therefore, there should first be an effort to collect basic data on the existence of quite simple applications in the first phase of any ICT development, and an investigation into how skills involved in the use of such simple applications might be developed to make more sophisticated use of ICTs.

In addition, policy formulation must take into account the overlap of previously distinct areas - industry, telecommunications and ICT - as well as identifying the institutions involved in this process. With reference to policy analysis (subject to the availability of basic information) it will be important to distinguish two aspects of the application and diffusion process of new ICTs:

- the supply side (for example, growth of ICT-related industries, products, services, etc.)
- the demand side (for example, actual use to which the technologies are put)

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Comparative work on ICTs in African countries is difficult, though not impossible. A good starting point would be a clear research design that is selective within the areas to be addressed - for example, ICT applications in the health, education and agriculture sectors in a particular country. This might present similar issues for studies in other countries. These could be considered in the light of broader processes of policy formulation with respect to ICTs in each country. Then, while examining the current approach to policy formulation, the researchers could also focus on the specific activity of formulating policy. Policy-makers themselves rarely have any particular theoretical framework in their heads and often mix various models together. Greater focus would make it easier for them to think about analyses of key policy segments. If, for example, the focus were on the building of information infrastructure, the key segments would be quite different from those if focus were on health-care applications.

In that sense, ICT policy is really an umbrella under which a whole collection of stakeholders with different interests gather. Trying to map out details of who all these stakeholders are is a huge undertaking. A researcher should be aware that stakeholders need to see benefit to themselves and also to see that the proposal is responsive to some agenda that they want to push forward. In order to attempt inter-country comparisons, it is easier to focus on some subset of these stakeholder interests and to come to grips with the similarities and differences across countries. The alternative, of course, would be not to attempt inter-country comparisons but to do one or more focused within-country studies of the vertical and horizontal networks of allegiances among stakeholders (internal and external) that generate and implement policy. Even here, it would be best not to study all possible ICT applications but rather a selected number that will provide illustrations of processes.

In summary, there is a need to have more focused, single-country studies of ICTs in Africa. Some countries have become popular sites for multiple projects and action programmes should be therefore be developed to provide an entry point to marginalized and disadvantaged countries. Examples of the countries in both divisions would be useful for future initiatives.
Section II: Select Annotated Bibliography

Annotated Bibliography

<http://www.idrc.ca/insitution/e1_acacia.html>

The Acacia project was started in 1997 'to promote equitable, sustainable, and self-directed development among disadvantaged and rural communities in sub-Saharan Africa'. The Acacia initiative has three major objectives:

- to discover and demonstrate how disadvantaged sub-Saharan African communities, especially their women and youth, can use information and communication in solving local development problems;
- to learn from Acacia's research and experience and to disseminate this knowledge widely;
- to foster international interest and involvement in using ICTs to support rural and disadvantaged community development, thereby increasing community access to information and communication.'

The Acacia Project focuses on four African countries. The findings from Mozambique include the need to restructure the telecommunications sector. It is noted that there was no framework for national ICT policy-making but that there was enthusiasm in the government to rectify this. In Senegal, there was 'good progress' in establishing a reliable modern digital network, but the challenge of extending the scope of policy to social objectives remained. Telecentres were generally successful in this country and provide access and employment. In South Africa, the challenge of expanding telecommunications networks to previously disadvantaged people remains. The South Africans were experimenting with telecentres as a means of rapidly decentralizing communications infrastructure.


Examines how ICTs have brought about a transformation in research and scientific publishing in Africa. Although there is still a need to build human resources capacity and to invest in infrastructure, the urgent need is for a reduction in the cost of access to information. There is a general overview of developments in various communication technologies, including the Internet, and their implications for science and technology.


eventually they became leading users of the national hub developed during one of the phases of the project. The growing user base justified the upgrade to a full Internet connection. A major challenge was in the selection of appropriate hardware that could work with poor telephone lines.

Adam charts the development through long-distance dial-up to UNIX hosts in Canada and the USA, the United Nations's Alternative Voice and Data (AVD) leased line to the Institute of Global Communications (IGC), the conversion of local FidoNet messages into UUCP format before leaving the PADIS host via gateway software, and a HealthNet link after PADIS had secured its ground-station licences. He describes other developments towards full Internet connectivity, as well as the national infrastructure and policy constraints. The major benefit of the project was the development of a new 'tool' that would not attract the high communication costs associated with fax, telephone and other conventional systems. In addition, there were improved opportunities for training that resulted in an expansion of knowledge in the field and improved skills. Some of the lessons learned included: building as many Local Area Networks (LANs) as possible; starting good network management practices from the beginning; ensuring interactivity of networks; assisting in building local information sources; and encouraging reasonable payment for the sustainability of the network.


The authors found that understanding ICT users within the context of their application of ICTs is necessary for impact assessment: 'The constructionist behaviour in which individuals, organisations, professionals and groups map their world and situation, and the complex action and interaction between them, imposes the structure of ICT use' (p. 307). They decided to use a purely qualitative approach to examine the interpretative understanding of users. The respondents were drawn mainly from Ethiopia. Some of the findings showed that

- being aware of ICTs did not lead to their immediate application;
- the adoption of ICTs involved a substantial learning cycle and a level of investment that was difficult for many respondents to meet;
- a lack of maturity in organization and management and a lack of good planning made the process of investment in ICT difficult.

The main positive impact of ICTs in most countries was found to be in the area of information systems development. On the other hand, under-use of ICTs was widespread and signalled the need for indigenous capacity-building. Adam and Wood conclude with a detailed discussion of their findings and note areas for further research. The latter include more research on the social impact of ICTs from an interdisciplinary approach, as this would help planners and implementers to design, evaluate and make better use of ICTs.

This workshop was convened to discuss how to reduce the isolation of African scholars caused by a number of barriers to communication, such as undependable telephones, unreliable postal systems and expensive airfares. Electronic networking is defined as 'any of several forms of information exchange between two or more computers through any of several methods of interconnection'. The status of African networking at the time is reviewed, looking at such projects as ESAnet and the various networking projects under PADIS. The workshop also aimed to facilitate productive donor-recipient relationships in this area. The workshop considered leadership and participation through all stages of networking - from planning to implementation. Participants recommended setting up representative national co-ordinating bodies to sensitize users and policy-makers. With reference to hardware, compatibility of technologies should be carefully assessed in the context of local conditions.


[9] Aina, L. O. 'Education and Training for Information Technology in Africa.' Inspel, 27, no. 4 (1993): 242-250. Discusses the results of a survey of the curricula of ten library and information schools in Africa. The selection is drawn from the oldest schools, such as the University of Ibadan in Nigeria, and the newer ones, such as the Faculty of Information Sciences at Moi University in Kenya. The research was inspired by the concern that there are inadequately skilled people in Africa, a barrier to the effective utilization of IT. The researchers in this survey considered the proportion of IT modules of the Institute of Information Scientists that are covered by training institutions in Africa. The findings revealed that only four training institutions had substantial IT content in their curricula, two of which had post-graduate-level training. Two obstacles identified as likely to militate against IT education and training in many African countries are, firstly, the attitudes of information managers towards IT, and, secondly, the prevalent brain drain of Africa's best professionals, including lecturers.

[10] Ajayi, G. O., R. Isalawu and T. I. Raji 'A Century of Telecommunications Development in Nigeria: What Next?' Virtual Institute of Information, 1999. <http://www.vii.org/papers/nigeria.htm> One of several studies that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.

[11] Alabi, G. A. 'Case Study Effectiveness of Informatics Policy Instruments in Africa: Nigeria.' United Nations Economic Commission for Africa, 1994. <http://www.bellanet.org/partners/aisi/policy/infopol/nigeria.htm> Alabi was tasked to carry out a survey of the effectiveness of national informatics policy instruments that had been implemented in Nigeria. Gives various definitions of informatics and summarizes them by saying that 'informatics is the totality of computerised information technology'; however, in the study 'informatics' is nearly synonymous with 'computers'. The primary objective of the study presupposes, to some extent, that these policies existed. However, Alabi notes that 'a National Informatics Policy when eventually established must be viewed and implemented as complementary to the existing National Communication Policy'. Generally, Alabi gives a detailed overview of the application of IT in Nigeria and the potential for the development of human resources. He concludes: 'In actual fact, there is no national informatics policy in the country.'

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[12] Alabi, G. A. 'Empowering Socio-Economic Development in Africa Utilizing Information Technology: A Case Study of Nigeria for the African Information Society Initiative (AISI).' United Nations Economic Commission for Africa, 1996. <http://www.bellanet.org/partners/aisi/policy/cntry/nigeria.htm> A critical examination of the social, economic, technical and policy issues relating to the IT industry in Nigeria. Discusses Nigeria's information sector, telecommunications sector, the status of science and technology, the constraints to telecommunications development, and the 'infrastructure' in development, including capacity-building. Describes the framework developed for 'national communication policy' and ongoing initiatives in telecommunications development. There is a detailed discussion of initiatives to increase human resources in the IT field - for example, the Regional Informatics Network for Africa (RINAF) [see 142]. The author recommends that, in the case of IT, the government must establish a clear set of national objectives, such as universal services, technological leadership, and broadband capability into all population centres, through a comprehensive and up-to-date 'National Policy for Telecommunications and Information Technology'.

[13] Alcorta, L. 'The Information Revolution and Economic and Social Exclusion: The Experiences of Burkina Faso, South Africa and Tanzania.' Maastricht: United Nations University, Institute for New Technologies Discussion Paper Special Series 2002-6, [2000?]. <http://www.intech.unu.edu/publications/discussion-papers/2002-6.pdf> Reviews and discusses studies conducted in Burkina Faso [see 25], Tanzania [see 13] and South Africa [see 59] which addressed the issue of social and economic exclusion. The studies were mainly guided by the following questions:

- How far away is the information revolution in these countries?
- What factors led to existing patterns of inclusion and exclusion?
- What was being done to improve access?

As expected, the diffusion of computers in Tanzania and Burkina Faso happened much later than in South Africa. It was found that there were two main patterns of exclusion/inclusion. Firstly, a pattern of 'basic' or 'fundamental' exclusion, especially in Tanzania and Burkina Faso, where the number of computers and telephones was 'very small'. Secondly, and this applied only to South Africa, there was a pattern of 'limited exclusion' because there was access to a wide range of IT hardware and applications. In summary, the author believes that the reduction of the 'distance' to the information revolution will continue to require the concerted effort of private and public institutions, NGOs and the international donor community.

[14] Alegbeyele, G. O. 'Reflection on Information Issues and Information Professionals in Africa: Some Lessons from Records Management Workshops in the Gambia and Ghana.' Journal of Information Science, 19, no. 4 (1993): 309-316. Asserts that there was a general neglect of internally and externally generated information in the government and consequently a disregard of its role in policy-making. Examines the level of preparedness of information professionals for the information economy in the two countries. Includes a discussion of the importance of training information managers/information professionals in Africa to ensure that they have a broad range of skills to enable them to work in the emerging information economy.


findings showed that all had open access and users were 'very satisfied' with the services. The findings are tabulated into: sources of information about CD-ROM facilities; use of material from CD-ROMs; and impact of CD-ROMs.

[17] Alema, A. A. 'The Impact of New Information Technology in Africa.' Information Development, 15, no. 3 (1999): 167-170. Describes the usual opportunities and challenges, such as wider access to research opportunities, distance learning, appropriate content and access to hardware. The main barrier identified is the absence of national information policies. Recommends the formulation of these policies and suggests that external support should be sought to develop 'information network infrastructures'.

[18] Alema, A. A. 'Information in African Society.' Information Development, 14, no. 2 (1998): 69-73. Decries the lack of information policies for information development in African countries. The importance of oral traditions in Africa as a source of information is discussed, the main argument being that there is a great deal of information within Africa that could be useful for development if it were appropriately accessed. It is recommended that governments should allocate financial resources towards documenting such information.

[19] Allotey, F. K., and F. K. Akorli 'Telecommunications in Ghana.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/ghana.htm> One of several studies [see 10, 54, 61, 75, 139, 153, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.


Reports on research conducted into computer networking among women's organizations in Africa. The purpose of this study was to contribute to the global research implemented by WomenAction and undertaken on behalf of the International Information Centre and Archives for Women's Movement (IIAV) in Amsterdam. The main objective of the latter was to better anticipate how to enable women around the world to communicate with each other about Beijing +5 and to exchange information. The respondents in the global study, drawn from about 200 organizations, answered questions about their current communication habits, information retrieval techniques, information dissemination methods, their skills in using the Internet effectively, and training and support required.

Some of the key findings were predictable - for example, that radio and fax were still important means of communication, especially in grassroots organizations. The common problems of lack of skills, language of content, and access are discussed, though it was mostly women from francophone Africa who expounded on the language problem. The respondents in this study were also concerned about the lack of 'women-friendly systems', support and training, time-saving tools, and local-regional input appropriate to their needs. Oral communication, and to some extent older systems such as 'snail mail', still ranked high in reaching those at grassroots level.


13 For details, see <http://www.undp.org/gender/beijing5/>. 
Building for Electronic Communication in Africa (CABECA) project, sponsored by the IDRC [see 98].


Gives an overview of the telematic and networking status of the Central African region in general. The common problems and opportunities are discussed - for example, the lack of national networking policy, awareness, clear vision and strategy. The authors underline the importance of and need for a unified approach to networking in the sub-region, and highlight the major initiatives by local public- and private-sector organizations. They list the various Internet connectivity projects in the region and concluded with a proposal for a unified collaborative network for the sub-region, CAUNet. One of the reasons for this proposal was that many of these countries have increasing foreign debt and they need to team up in order to share specific resources with a view to sustainability. The authors note that, even though the donor community has been instrumental in networking in the region, sometimes their efforts are viewed 'negatively', as donors want to project the image of their own country or organization.


With reference to the University of Namibia, discusses how IT has the potential to enable students who, because of distance, work schedules or other reasons, are unable to attend traditional classes. Avafia's main question is how the University could help provide library services to these distance learners. They planned to establish a file server at the University, with students connected either via simple dial-up telephone systems or via dedicated telecommunication lines. Then materials - such as study guides, assignments, references, possibly in full text, and bibliographic references - could be sent by e-mail to students or be placed on the file server. The recommendation was for detailed teaching materials such as photographs and diagrams to be placed on a home page developed by library staff. However, for this huge undertaking, Avafia emphasizes the need to address the technological infrastructure requirements and the need for appropriate training for all involved.

On the challenge and expectations of librarians in Africa in the digital age, he concludes with the following: 'It is my hope and belief that the extra mile librarians are willing to go in order to serve the off-campus learners would become the norm for service to all users. The future holds demand for more and more service to be provided by fewer staff, less funds and resources because the expectations will be that technology can bridge more with less.'


Details an appropriate model of best practices. Argues, for example, that although many opportunities are brought about by the Internet and electronic publishing, there is a requirement for understanding, behaviour evolution and new skills from authors, publishers, librarians and readers. The aim of the overview of the scholarly publishing system in Algeria is to under-stand the context in which to discuss the opportunities for and of ICTs, which the author does qualitatively and quantitatively.

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[26] Blake, C. 'The New Communication and Information Technologies and African Cultural Renaissance.' African Journal of Library, Archives and Information Science, 2, no. 2 (1992): 93-98. What is the impact of new ICTs on 'African culture'? This is what Blake strives to answer. He believes that, even though African nations have different attitudes towards cultural regeneration and dissemination, the continent is struggling to 'get a handle on' the complex role and position of culture in order to forge ahead with its development agenda and find its position in the global information revolution. According to the author, the single most important obstacle to access is the refusal of African nations to plan collectively. This would ensure that they developed joint strategies to participate in the IT revolution instead of simply being spectators - at IT fairs, for example. These strategies would include not only pooling resources for purchases, but also learning about the technologies to a point where they could replicate and modify them and reduce dependence on external sources. Policy developers should be able to organize strategies and means of accessing information to apply towards the aggregation of cultural artefacts and their subsequent dissemination, and create capacities for data collection and exchange of information across sectors.

Many of the sources for the aggregation of African cultural content are dying away, without this information being passed on. ICTs may be the tools to facilitate these aggregation efforts. The author argues that a lot of content exists in Africa that is begging to be recognized and treated accordingly. In essence, the new ICTs could have a positive impact on the cultural renaissance of Africa.

[27] Boon, J. A. et al. 'The Information Economy in South Africa: Definition and Measurement.' Journal of Information Science, 20, no. 5 (1994): 334-347. Proposes a framework for measuring the information economy in South Africa. By emphasizing that the framework must satisfy macro-economic principles and simultaneously accommodate the unique nature and characteristics of information, the authors apply an information-science as well as economic perspective to this framework. They argue that past efforts (in the 1980s) to determine the contribution of the information-based activities in the economy had many shortcomings. For example, quantification of the information sector was not based on in-depth research. A standard methodology was lacking, and as a consequence it is difficult to compare results at national and international levels. In addition, information activities are considered in the context of total economic activities but it is necessary to demarcate information, even though it is intertwined in all economic sectors.

[28] Butcher, N. 'The Possibilities and Pitfalls of Harnessing ICTs to Accelerate Social Development: A South African Perspective.' Johannesburg: South African Institute for Distance Education, 1998. <http://www.saide.org.za/butcher1/unrisd.htm> Centres on education in South Africa as a key developmental activity. Suggests that the repetition of rhetorical statements on the developmental potential of ICTs has started to ring hollow, raising more questions than answers. Butcher outlines what he considers to be the key features and processes of South African society with respect to ICTs, such as their use to support education and training. He found that, in South Africa, in order to harness the potential of ICTs a lot of emphasis has been put on the concept of community centres as a strategy for implementation. With reference to education, the author argues that practical examples of the use of new technologies tend to reinforce the notion of the expanding the gap between the rich and poor rather than demonstrating practical solutions to the problem. He suggests that more resources should be spent on opening up access to marginalized communities in innovative and cost-effective ways; otherwise ICTs serve only to perpetuate greater economic and educational marginalization. The key lessons learned are outlined to ensure that future initiatives build on these experiences rather than repeating costly and educationally pointless exercises.

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14 Also referred to as community learning centres, multi-purpose community centres, community information centres and community colleges. All have the same basic concept.


[31] Chisenga, J. 'Global Information Infrastructure and the Question of African Content.' Paper presented at the 65th IFLA Council and General Conference, Bangkok, Thailand, 20-28 August 1999. <http://www.ifla.org/IV/ifla65/papers/118-116e.htm> Questions how African countries can make a meaningful contribution to the development of African local content in the absence of African information and cultural content in the global information infrastructure. The creation of relevant content is important for encouraging access to the Internet. Although activities or projects are being implemented, covering local information content on Web sites, creating subject-based information gateways, creating electronic data-bases, digitization of artefacts, and indigenous language orientation, these are often small and poorly co-ordinated. In summary, Chisenga insists that African government Web sites should not concentrate on generating information targeted at potential foreign investors but should also provide information for local users and find ways to encourage publications in indigenous languages.

[32] Chowdhury, G. G. 'The Changing Face of Africa's Information and Communication Scenario.' International Information and Library Review, 30, no. 1 (1998): 1-21. This study is based partly on the lessons learned from recent surveys and case studies and includes a detailed discussion of Internet connectivity issues and developments in electronic communication in Africa. The author argues that the situation in African countries with regard to information and communication is far from satisfactory: 'The only encouraging point is that there has been an awareness of the importance of having effective and efficient information and communication facilities. Consequently, a number of international and national bodies have come forward recently to improve the situation.' The author recapitulates the problems prevalent in most developing countries, such as the lack of awareness of IT and the shortage of trained manpower. In addition, the author uses Masters dissertations of students from the School of Information Studies for Africa in Ethiopia to describe the state of library and information systems in some African countries. Chowdhury refers to the Plan of Action from the ECA Conference of Ministers in May 1995 [see 47], and other initiatives discussed are the AAAS's CD-ROM projects in the provision of bibliographic databases for African libraries [see 86]; the IDRC/UNECA-led CABECA project [see 98]; USAID's AfricaLink; ORSTOM's RIO network; and RINAF [see 142]. Chowdhury conjectures that content development and links to the Internet will help African institutions become active contributors to 'national and global information resources and facilitate the improved management of people and resources in Africa'.

[33] Chowdhury, G. G. 'Developing Modern Information Systems and Services: Africa's Challenges for the Future.' Online and CD-ROM Review, 20, no. 3 (1996): 145-147. An examination of the development of 'modern' information systems and services in Eastern and Southern Africa, especially the challenges they face as a result of the 'lack of developments of home-grown databases and OPACs in libraries and information centres'. Also outlines the development of PADIS, which included the automation of information systems, the development of low-cost electronic communications facilities in African institutions, and Internet connectivity.
[34] Cochrane, J., and J. Brunner, 'Africa and the Internet: The Cost of Doing Business.' Paper presented at the 3rd ESS Conference on Telecommunications, Washington DC, 7 August 1998. <http://comet.columbia.edu/ESS/events/conf98/proc/cochrane.html> Reviews the cost of doing business in Africa, especially with reference to Internet access. The findings are mostly experiences from Kenya, Uganda and Niger. For example, in Kenya, high prices were attributed to hidden taxes. The authors therefore employ a simple model to examine wholesale costs and their impact on retail prices. They conclude that the use of any Internet tax revenue remains a matter to be resolved in the political arena.

[35] Cogburn, D. L. 'Background to Africa's Information Society Initiative (AISI).’ In his (ed.) Information and Communications for Development: Nationalism, Regionalism, and Globalism in Building the Global Information Society. Washington DC: Center for Strategic and International Studies, 1996: 3-19. AISI was formed to assist member states in accelerating their transition towards the new global economy based on information and knowledge. It was formed partly as a result of the African Regional Symposium on Telematics for Development, held at the UN Economic Commission for Africa, Addis Ababa, in April 1995. The main AISI areas were policy issues, infrastructure, infrastructure and human resources, a wide avenue for a number of partnerships and collaborators. Cogburn reviews some of the papers presented at this meeting.¹⁵

[36] Cogburn, D. L. 'Globalization and State Autonomy in the Information Age: Telecommunications Sector Restructuring in South Africa.' Journal of International Affairs, 51, no. 2 (1998): 583–604. Discusses how the world system is experiencing fundamental structural changes characterized by the globalization of production and distribution. The implications for South Africa's autonomy as a state is discussed within the context of how globalization and the information revolution present increasing difficulties for countries as they attempt to make choices about public policy. The telecommunications sector is a crucial component of this transformation, hence his concentration on the telecommunications industry in South Africa. He argues that existing literature on globalization and the information revolution is largely theoretical and overly speculative. There is a need for a clear theorization of globalization and the transformation occurring in the world economy that is grounded in an empirical analysis of local realities, including the process of 'high-technology' policy formulation. Therefore, he examines the changes occurring in international telecommunications that are influencing national sector restructuring and how global and domestic factors have influenced the restructuring of South Africa's telecommunications sector.

The analytical framework was based on the Global Innovation Mediated Paradigm Shift (GIMPS). In conclusion, the developments in ICTs and their application in South Africa have corresponded to changes and developments in the political economy. Each of the societal groupings (public sector, private, voluntary) is responding to globalization in different ways - for example, the public sector by reorganization of its use of ICTs. The conclusion emphasizes the importance of liberalizing the telecommunications markets to drive costs down while providing quality networks and services.

[37] Crafford, L., and C. de Villiers 'Evaluating the Planning of Information Technology Supported Co-operative Learning (ITCL) Centres for the Teaching of Information Systems'. In Proceedings of the International Academy for Information Management Annual Conference, Atlanta GA, 12-14 December 1997. (ERIC Database No. ED422931.) Proposes how the use of co-operative learning and IT might help lecturers and students cope with the demands of a first-year course on Information Systems. This was based on the argument that many first-year Information Systems students have different levels of computer literacy when they first arrive.

¹⁵ These papers (both English and French) can be found at <http://www.sas.upenn.edu/African_Studies/Padis/menu_telematics.html>.
The paper focuses on how telecentres could be used for IT-supported co-operative learning, because telecentres were considered crucial for such an endeavour.

[38] Cyamukungu, M. 'Development Strategies for an African Computer Network.' Information Technology for Development, 7, no. 2 (1996): 91-94. Proposes an evolutionary path for African computer networks, arguing that the network infrastructure in the continent had been installed and mainly driven by the interests of donor agencies. The model proposed was based on existing technologies, such as FidoNet, UUCP and Internet nodes. The author looks at the provision of services and network architectures and proposed network paths aimed at providing 'universal' access to a large number of African users at the lowest cost. The paper is highly technical, identifying a data capture architecture, based on cost-effective technology and leading towards the provision of real-time data transmission. There is a diagrammatic representation of a network architecture which would build towards a capacity suitable for real-time data transmission. The architecture incorporates African users' requirements but would require African input on the development of interfaces, software and transceivers. Cyamukungu claims that the final result would be an evolving network that could be upgraded without difficulty and would guarantee an optimized quality-cost ratio during each phase of its evolution.


[40] Darch, C., and P. Underwood 'Dirt Road or Yellow Brick Superhighway? Information and Communication Technology in Academic Libraries in South Africa.' Library Hi Tech, 17, no. 3 (1999): 285-297. Stresses that ICT development in South African libraries must be understood within the context of the post-apartheid period. The authors imply that much research has been conducted with little concrete results, yet government policy emphasizes the importance of connectivity in redressing inequality. The main development in their view was the emergence of an academic library consortium, which is attracting funding from a number of donors. However, without information literacy, these developments have little impact and are grounds for 'technopessimism', as digital information resources are seen by developed countries as commodities for which payment must be made.

[41] de Boer, S. J., and M. M. Walbeek 'Bridging the Telematics Gap in Developing Countries: Research Bits for Development Policy.' University of Twente, Department of Technology and Development, Working Paper 84, 2nd. edn., 1998. <http://ubalpha.civ.utwente.nl/cgi-bin/nph-wwwredir/cat.ub.utwente.nl:3187/X?%5CTOO+S1+5> A project designed to bridge the information gap between the North and the South, funded by the Netherlands Directorate General for International Co-operation and executed by the University of Twente, the Netherlands Consultancy Organization for Post and Telecommunications (NEPOSTEL) Foundation, and the TOOL Foundation. The project focused on how the application of telematics (defined as a combination of telecommunications and informatics) in developing countries could be improved, with special emphasis on connectivity issues. They used questionnaires in twenty countries to assess and quantify the current status of telematics - for example, trends and supporting/inhibiting factors, telematics service provision, and the application of telematics. In-depth studies were then conducted in six countries, three of them in Africa (Burkina Faso, Ethiopia and Zimbabwe).
SWOT analysis was used to assess the strengths, weaknesses, opportunities and threats in the telematics environment of each country. Generally, it was found that the telematics sector was characterized by small, vulnerable organizations with committed employees. The main threats were in the weak telecommunications infrastructure, limited energy supply, restrictive laws, low purchasing power, computer illiteracy and lack of awareness. In Ethiopia, for example, the findings showed that the government did not allow private companies to provide telematics and that PADIS was the only connectivity provider. It was therefore recommended that the Dutch development organizations should concentrate on the installation of off-line telematic nodes in the major cities and the provision of shared facilities. In Zimbabwe, several connectivity providers existed in Harare, but development organizations could still help by setting up a communication centre for small enterprises, financing computer equipment and training programmes for public administration, and by supporting a provider to set up a node in other cities. In Burkina Faso, the sector was dominated by ORSTOM, and access to ICTs by many in the country was still a major challenge. According to de Boer and Walbeek the role for donor agencies in this country would be to provide subsidies for the use of computers, and to donate equipment, give training and help in the establishment of communication centres.

[42] de Vreede, G. J., N. Jones and R. Mgaya 'Exploring the Application and Acceptance of Group Support Systems in Africa.' Journal of Management Information Systems, 15, no. 3 (Winter 1998/ 1999): 197-234. The first detailed field study of group support systems (GSS) applications in Africa, built on the work of Davis et al. 16 The importance of this research was to show that understanding technology use in other cultural environments is becoming very relevant, considering the increasing global nature of organizational workers. Increasingly, multicultural groups are working together through technology, especially as the Internet becomes more accessible in developing countries. The cultural context of the African countries studied is significantly different from those in which GSS research has been conducted in the past, hence a unique setting in which to investigate the cross-cultural application of GSS. Grounded theory methodology was used to collect and analyse data on eleven projects in which GSS meetings were organized in Malawi, Zimbabwe and Tanzania.

A model of GSS acceptance suitable for these cultural environments was developed. It was also useful in understanding and predicting how users accept and adopt the new technologies. The findings suggested that there is potential for mapping GSS in Africa to support capacity-building efforts. The data suggested that endorsement of GSS technology by top management, computer literacy and satisfaction with use would stimulate GSS acceptance. However, a preference for oral communication combined with referent power issues appeared to have a negative impact on the acceptance of technology. The low level of computer literacy amongst some of the participants did not seem to hinder the acceptance of the technology, despite initially low levels of enthusiasm. This had a lot to do with the alternative room set-up where several participants shared a single workstation, not common in Euro-American settings, where individual workstations are preferred.

[43] Dierks, K. 'Namibia's Telecommunications: Link to Africa.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/namibia.htm> One of several studies [see 10, 19, 54, 61, 75, 139, 153, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.

The results of four country surveys - in Ireland, Tanzania [see 100], Ethiopia [see 76] and Nigeria [see 123] - on IT development. Most of the research was on-desk, under the auspices of the UNU/Trinity College Dublin informatics research project, with a financial grant from the government of Ireland. This study focused primarily on the transfer of technological know-how, as opposed to technological products. Ireland's selection was not intended as a model for IT development but to investigate lessons that could be learned about the process of innovation from recent Irish experiences. The authors acknowledge Ireland's positive locational advantages (within the European Community), discuss the main features of IT innovation that occurred in the previous two decades, and show how this might provide insight for developing countries.

F. D. Davis et al. 'User Acceptance of Computer Technology: A Comparison of Two Theoretical Models.' Management Science, 35, no. 8 (1989): 982-110. [46] Duncombe R., and R. Heeks 'Information, ICTs and Small Enterprise: Findings from Botswana.' Manchester: University of Manchester, Institute for Development Policy and Management, Working Paper 7, 1999. <http://idpm.man.ac.uk/idpm/diwpf7.htm> The main argument is that the potential contribution of ICTs in small enterprises can be assessed only by first understanding current information practices and needs. The three main components of their approach were:

- information is the key to understanding ICTs;
- ICTs are not the only 'technology' that handles information; and
- information systems are more than just technology and information.

It was evident that investments for Internet access were significant in terms of initial financial outlay, running costs, and of time and skills. Such investments need to be accompanied by significant benefits in terms of the frequency of use and the quality of the information provided. It was clear that only in specific sectors - such as technical services, the IT sector, and travel and tourism - could benefits of information access be achieved. These are all sectors that require regular access to information and/or software across borders. The researchers note that information-related interventions by entrepreneurs or institutions must recognize the critical and continuing role to be played by informal information systems and human interaction. They conclude that a holistic approach is required that provides information skills, communication skills, as well as the more obvious ICT-focused areas.


Economic Commission for Africa (ECA) 'An Overview of ICT Trends and Policy in Africa.' May 1999. Concentrates heavily on the International Telecommunication Union (ITU) publications and Mike Jensen's Web site on the status of Internet connectivity in Africa <http://www3.wn.apc.org>. Therefore emphasis is on telephony, Internet connectivity status and the major donor initiatives to support ICT infrastructure. Notes that 'a number' of donor agencies are making valuable contributions to 'developing and implementing ICT policies in Africa', and lists two - IDRC's Acacia [see 1] and the ECA's AISI [see 35] projects. However, it also reports that some countries have become popular sites for multiple projects and that action programmes should be developed to provide an entry point to marginalized and disadvantaged countries. The report concludes that very few countries had embarked on the ICT policy formulation process, while in many the mechanism fell short of integrating social considerations, such as gender.
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[49] Economic Commission for Africa (ECA) 'The Process of Developing National Information and Communication Infrastructure (NICI) in Africa.' October 1999. The United Nations ECA is the driving force behind the NICI process, and in this publication they note that many countries are in the process of ICT policy formulation. Twenty-two African countries are taking part in the NICI process; they are regionally and linguistically representative (anglophone, francophone and lusophone). NICI strategies are rooted in four major themes - policy, applications, infrastructure and technologies - with the following cross-cutting programmes: gender, youth, research, community participation, and human resource development. The implementation is conducted by NICI development teams whose assignments revolve around four broad areas: Firstly, to carry out surveys and needs analysis in order to identify the economic and social development priorities of the country under study. Secondly, to identify the needs, priorities and aspirations of various stakeholders related to ICTs. Thirdly, to identify the priorities and opportunities of NICI in the economy and assess existing ICT projects in the country. Finally, to assess the status of ICT in the country with a view to evaluating its prospective development in the main AISI areas.

[50] Entsua-Mensah, C. 'The Internet: New Challenges for Information Professionals in Ghana.' Information Development, 14, no. 3 (1998): 118-123. Addresses how information professionals in Ghana were confronting the challenges of ICTs. According to Entsua-Mensah, information professionals in Ghana lacked the necessary organizational infrastructure to benefit from Internet access and claimed that development of the requisite infrastructure has been given low priority in Ghana. Many of the 'traditional information professionals' lacked the skills to operate modern systems. There is an overview of Internet development in Ghana, including initiatives like Leland, PADIS and the Ghana InfoDev project, which was initiated in 1996 with initial support from UNESCO under AISI.


[52] Fisseha, F. 'Internet and Intranet Services in the Ethiopian Agricultural Research System.' Paper presented at the 3rd ESS Conference on Telecommunications, Washington DC, 7 August 1998. <http://comet.columbia.edu/ESS/events/conf98/proc/frehiwot.html> Discusses the need to establish a distributed information management and communication system in EARS, a network for the agricultural research partners in the country. Restates how the Internet (and intranet technology) could enhance information sharing, knowledge exchange and collaboration to their geographically dispersed partners and from a concern that there needs to be increased dissemination of indigenous scientific information. The study details the structure of a proposed information system.

[53] Furzey, J. 'Empowering Socio-Economic Development in Africa Utilizing Information Technology: A Case Study of Ethiopia for the African Information Society Initiative (AISI).' United Nations Economic Commission for Africa, 1996. <http://www.bellanet.org/partners/aisi/policy/cntry/ethiopia.htm> A critical examination of the social, economic, technical and policy issues, with respect to the expansion or initiation of information and communications infrastructure. Most of Furzey's paper on Ethiopia is based on facts, with a description of the telecommunications infrastructure and an institution offering IT-related training. There is heavy focus on Internet connectivity and the common constraints to access in many African countries, such as a lack of skilled people. The author concludes with a look at the potential of the Internet for Ethiopia.

[54] Ganywa, E. B., and B. Tshilombo 'Perspectives on Telecommunications in Zaire.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/zaire4.htm> One of several studies [see 10, 19, 43, 61, 75, 139, 153, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries
ICTs in Africa are a combination of those problems experienced by other countries and those created by each country's unique history.

[55] Grobler, L. M. 'Information Support to Distance Postgraduate Business Students at the Graduate School of Business Leadership, University of South Africa.' Proceedings of the Off-Campus Library Services Conference, 1 (1995): 163-174. Argues that distance libraries must be the 'missing link' for those students who rely on independent learning, as possibilities are limited for remedial instruction.

[56] Hafkin, N. J. 'Convergence of Concepts: Gender and ICTs in Africa.' In E. M. Rathgeber and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000, Chapter 1. <http://www.idrc.ca/books/focus/903/04-chp01.html> Offers an overview of the emergence of the 'gender and ICTs' theme. Provides a historical perspective on how the concept of ICTs and development and of gender and development converged and gained more recognition. According to the author, the first operational activities associating gender and ICTs appeared in Kenya, Senegal and South Africa in 1995, but to date the area that has received the least attention in Africa is the role of women in the information economy, specifically the jobs and economic opportunities created by ICTs. Hafkin concludes with a brief overview of the future of ICTs for women in Africa. She envisions that women in Africa will take advantage of this medium and fit it into their economic, social and cultural context to empower themselves. However, the new technologies are not gender neutral and if women do not grasp the opportunities then societal forces will prevail and they will be left further behind. Hafkin mentions a US$1 million grant made by the Gates Foundation in 1999 for WomenConnect, a project aimed at providing connectivity to rural women in Africa.

[57] Hasan, H., and G. Dista 'The Impact of Culture on the Adoption of IT: An Interpretive Study.' Journal of Global Information Management, 7, no. 1 (1999): 5-15. Compares the relationship between culture and the adoption of IT in West Africa and the Middle East. The purpose was to raise questions for further research. Eight cultural dimensions were contrasted with those in a developed country, Australia, where the authors reside. The eight cultural dimensions used were based on the work of Hofstede

In considering the factors for the adoption of IT, the researchers argued that, despite its importance to the success of IT projects, culture is the most difficult to isolate, define and measure. They used qualitative methodology and took particular care to select, where possible, representatives of the local IT community rather than foreign advisers or members of multinational corporations. Data were mostly text-based and comprised organizational documents and transcripts of semi-structured interviews with IT staff at all levels.

In West Africa, the study concentrated on Ghana, where the authors noted that the government was receptive to IT developments. From their conclusions, every country must have an IT policy that recognizes its culture and ensure that the adoption of IT does not destroy the cultural heritage. It seems that problems arise when there is a difference between 'the culture of an IT product and the culture of its user'. The following are suggested studies for further research:

'The Cultural Identity of IT' (based on the argument that IT comes mainly from the West and that certain products may be inappropriate for other cultures).

'Cultural Values and IT' (based on the argument that work practices may be culturally ingrained and can affect the success of an organization's information system and hence its adoption of technology).

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Heeks, R. 'Information and Communication Technologies, Poverty and Development.' University of Manchester, Institute for Development Policy and Management, Working Paper 5, 1999. <http://idpm.man.ac.uk/idpm/diwpf5.htm> This study, on whether ICTs can help to alleviate poverty in low-income countries, could provide a worthwhile basis for a theoretical framework for empirical studies. Heeks suggests that ICTs play a role mainly as communications technologies rather than as information-processing or production technologies. Among his priorities for the development agenda are:

- the poor need knowledge to access, assess and apply existing information and need resources for action more than they need access to new information;
- the poor need access to new, locally-contextualized information more than access to existing information from an alien context;
- the poor’s information needs may be met by more informal information systems than by formal ICT-based systems;
- the poor will reap the fullest benefits of ICTs only when they know and control both the technology and its related know-how.

These apply not only to many people in Africa but in the developing world generally.

Hodge, J., and J. Miller 'Information Technology in South Africa.' Paper presented at the international workshop on the Information Revolution and Economic and Social Exclusion in Developing Countries, Maastricht, 23-25 October 1996. One of three papers whose findings are synthesized by Alcorta [see 13].

Holmes, L., J. Turner and M. Grieco 'Gender, New Communication Technologies and Decentralised Regional Development Planning: Networks as the Nexus of Progressive Action.' Paper presented at the Workshop on Decentralised Regional Development Planning. University of Dortmund, November 1998. <http://www.geocities.com/margaret_grieco/womenont/gndr_nct.html> Developing support networks to enable women to participate in decision-making should be encouraged and assisted by access to modern means of communication. The authors are right in noting that the new ICTs make the old processes of policy neglect of gender issues more transparent and create a new strategic opportunity for gender planning in Africa.

Horowitz, R. B. 'South African Telecommunications: History and Perspectives.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/horwitz2.htm> One of several studies [see 10, 19, 43, 54, 75, 139, 153, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.

Hussein, J. 'Science Journals in Zimbabwe: Will Electronic Publishing Improve Their Long Term Viability?' Paper presented at the Workshop on Scientific Communication and Publishing in the Information Age, Oxford, May 1999. <http://www.inasp.info/psi/scpw/papers/hussein.html> Discusses how the Zimbabwe Scientific Association (ZSA) decided to disseminate its science journals electronically through BIOLINE in an attempt to reduce the delays and costs faced in the production and distribution of traditional printed journals. It was also hoped that this would increase the international visibility of the journals, but the ZSA still faces the problem of the lack of accessibility to electronic publications for many Zimbabwean readers.

Huyer, S. 'Supporting Women's Use of Information Technologies for Sustainable Development.' International Development Research Centre (IDRC), 1997. <http://www.idrc.ca/acacia/outputs/womenicts.html> Discusses issues of access, the benefit to African women of using ICTs, and their role in the production and dissemination of information.
The author discusses how to empower African women through ICTs and the barriers to their full use of these technologies, the first being the high rates of illiteracy. There are five case studies (four from South Africa and one from Uganda) to explain the importance of developing 'women-friendly ICT systems'. According to the author, one of the major findings was that the type of information accessed by women is an important consideration. It is recommended that ICTs be located in local institutions to which women have open and equal access, such as health centres, women's NGOs and churches. The appendices include a number of case studies, one of which involved the setting up of networks in francophone Africa for women's communication needs. The purpose of the project was to identify women's groups who were able to make successful electronic connections and follow up those experiencing difficulties, integrate groups working on the same topic through the networks, and connect more groups. One of the emerging issues was that 'women's access to IT also seems to be a major hindrance'. Other examples are drawn from responses of women researchers (mostly from the Association of African Women for Research and Development, AAWORD), who complained that only secretaries had access to the computers in their departments. They did not have decision-making powers in determining how computers should be used or where modems should be installed. Other initiatives outlined are the APC Women's networking programmes, the Women's Environment and Development Network (WEDNET) research project, and building a women's information and communication network in South Africa on SangoNet. The APC study cited the following as priority research areas:

- the potential use of ICTs for women and market trade;
- the state of national-level ICT policy, the degree of involvement of women in the process of this development, and gender analysis within it.
- The WEDNET research project explored the possibilities of using e-mail as an effective method of communication among African women researchers working in an IDRC-funded project, Women's Indigenous Knowledge in Natural Resources Management.

[64] Iwe, J. I. 'Automating Library Processes in the University of Calabar.' Information Development, 16, no. 1 (2000): 24-29. Shows how a local area network (LAN) could be developed for library activities at the University of Calabar in Nigeria. Recommends that this could eventually be expanded to create a national library network linking all 33 universities in the country to enable them to share their resources.

[65] Jalloh, B. 'A Library Network for Swaziland: Preliminary Investigations and Formulations.' Information Development, 15, no. 3 (1999): 178-185. Considers the development of a computerized library network for Swaziland, using a proposal drawn up in 1993. One of the objectives of SWALINET (Swaziland Library and Information Network) is to facilitate access to the various libraries' information resources through shared computer systems and networks.


- the potential technical, economic and cultural problems in implementation of IT; and
- possible solutions that may enable investors to achieve higher levels of effectiveness.

'Temperature, humidity and sterility' are given as imperatives for electronic equipment to work effectively in Africa. However, while environmental concerns may be important to highlight, they are not the main issues highlighted in other studies. With reference to the IT technical environment, Janczewski listed power supply, telecommunications and maintenance issues as the main infrastructural problems. The author appears to discuss socio-cultural issues in a very general manner. It is true that computers are products of Western civilization, and anyone who wants to implement them must be aware of cultural differences, but computers are merely tools: it is the content that may have cultural implications. This explains the increasing concern for
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Africans to stop being merely passive consumers and become active suppliers of their rich cultural heritage.

[67] Jensen, M. 'Bridging the Gaps in Internet Development in Africa.' International Development Research Centre (IDRC), 1996. <http://www.idrc.ca/acacia/studies/ir-gaps.htm> Identifies the gaps in the initiatives to steer Africa towards universal access to low-cost electronic communications. A secondary aim of the study was to identify the countries, regions and sectors in the continent that would benefit most from the increased involvement of the IDRC. The author shows that over 100 Internet-related studies had been conducted, the bulk of these in Southern Africa. There are brief summaries on the lessons, problems, opportunities and successes of Internet development in each African country. The findings show that political instability in some countries is a major barrier. However, it does not disqualify opportunities inherent in these countries and Jensen notes that there is a need to gather more information about activities taking place in some countries. He concludes with a detailed priority list of 'unfulfilled' needs and opportunities for improved Internet development in Africa, such as the identification of sources of soft finance for local business start-ups and international partners willing to invest in joint ventures.


[69] Jensen, M. 'Kick Start for a Demand-driven National Information and Communication Infrastructure in Africa.' In H. W. Maltha et al. (eds.) ICT and Third World Higher Education: The Means and the Ends. Amsterdam: Nuffic, 1999: 28-37. The only Africa-focused paper in this collection, which concentrates generally on the NICI process and specifically on the need to building a demand-driven NICI [see 49].

[70] Jensen, M. 'Toward an African Information Society: Lessons Learned in Harnessing New Information and Communication Technologies (ICTs) for Development in Africa.' In Information & Communication Technology and Development, The Hague, Netherlands Development Assistance Research Council (RAWOO), RAWOO Lectures and Seminars 18, 1998: 51-58. <http://www.nuffic.nl:3500/rawoo/publicatie_ict.pdf> Attempts to answer how African countries, in support of their national development objectives, can best harness ICTs. He discusses development assistance initiatives to support these needs - for example, the roles of AISI [see 35] and NICI [see 49] plans are mentioned under policy-support issues. In addition, strategies are given - such as the need for greater awareness among decision-makers at the highest levels and the establishment of national ICT forums made up of regulators, operators, service providers and users. The major constraints of a limited telecommunications infrastructure are listed. The author also notes the need for clear strategies for subsidizing Internet services, shared access and public access facilities in rural areas, such as telecentres. The IDRC is mentioned as the major player in this initiative and the telecentre model is one of the cornerstones of the IDRC's Acacia programme [see 1]. Other issues outlined are the need to prioritize the development of local content development and capacity-building.

[71] Kangulu, C. M., and F. E. Wood 'An Evaluation of the Pan-African Development Information System (PADIS): With Particular Reference to Zambia.' Journal of Information Science, 21, no. 5 (1995): 343-358. Kangulu and Wood claim that their study was the first evaluation covering the whole period of PADIS, though they consider this with specific reference to Zambia. The major objective of their study was to investigate the extent to which PADIS had been implemented. Data were collected in 1992 and they examined previous studies
on PADIS conducted by Aiyepeku and the ECA. Their findings show that PADIS was not an effective mechanism for dealing with development information in Africa. Their criticism of PADIS was partly based on the non-provision of relevant records by the National Co-ordination Centres for their PADIS databases; therefore, many researchers searching for development information did not know of the existence of PADIS. In Zambia, hardly any publications were being produced for the PADIS project. The authors conclude that Zambia and many other African countries were not ready to undertake the PADIS project because they lacked clear strategies for its implementation; therefore, the project was a failure in their view. The problems mentioned include lack of consultation within government in the choice of a National Co-ordination Centre (NCC). For a project like PADIS to succeed, the authors recommend that it must be established within the context of a clear national information policy. In addition, there should be enforcement of legal-deposit laws, training at national level, clear acquisition policies of materials from overseas, and all relevant institutions must be included in the process from the beginning.


Discusses the types of skills needed by women, for 'full' participation in the information society in anglophone and francophone Africa. This is not a comparative study, as Karelse writes about anglophone Africa and Sylla about francophone Africa. According to Karelse, the lack of educational opportunities is a major obstacle to African women's participation in the information society; her argument relies heavily on Huys's study [see 63]. The first obstacle cited is that of high rates of illiteracy among African women. The language issue was the second, justified by an assertion that African women have less time, money and opportunity to learn English so there is a need to translate information into other languages. There is description of initiatives to use ICTs to advance the position of women.

The francophone part basically draws on the argument that African countries should not be mere consumers but contribute to the content development of the continent's rich cultural heritage. The author introduces the section with the results of a two months' experiment with two girls and two boys who were introduced to the computer and basic programs. The author found that the boys were more interested in technology than the girls, though this conclusion is based on a very small sample number! We are not told the characteristics and background of the participants, nor how representative they were. The author later concentrates on Senegalese women and the causes for the disparities between the genders in utilization of ICTs, with a questionnaire survey of 52 women and 48 men being undertaken. The men based their responses on the impact they thought they would have as fathers on their daughter's education and choice of jobs. One useful recommendation is that, as computers are introduced in schools, there should be systematic training for teachers.


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establishment of a training programme. With an aim of self-sustainability it took four years to design and implement the project; sale of their expertise was a key element. SWOT analysis was used to evaluate the project's impact on users. One major benefit of the project was the University Students Attachment Programme (USAP) which accepted only women students; the reasons for this are propounded. An offshoot of USAP was the establishment of Women in Management (WIM) and Women in Science (WIS), which help towards the professional promotion of undergraduates. Many students on attachment have benefited from graduates (part of an alumni programme of past trainees) in employment/industry. A long-term plan was conceived to establish a USAP Resource Centre. The main lessons seem to revolve around better administration and training issues.

[74] Katama, A. 'Implementing ALPID in Uganda: Challenges and Possibilities.' In O. Ogbu and P. Mihyo (eds.) African Youth and the Information Highway: Participation and Leadership in Community Development. Ottawa: International Development Research Centre (IDRC), 2000: Chapter 4. <http://www.idrc.ca/books/focus/914/05-chp04.html> One of several chapters about ALPID, a Youth Leadership Programme on ICTs for Community Development in Africa [see 129]. Katama reports that challenges and possibilities in Uganda were grounded in responding to one key question: How can ICTs and their development help the country?

[75] Kavanaugh, A. L. 'Telecommunications in Algeria, Morocco and Tunisia.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/algeria.htm> One of several studies [see 10, 19, 43, 54, 61, 139, 153, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.


[77] Khalil, O. E., and M. M. Elkordy 'The Relationship of Some Personal and Situational Factors to IS Effectiveness: Empirical Evidence from Egypt.' Journal of Global Information Management 5, no. 2, (1997): 22-34. Khalil and Elkordy tested the relationship of some personal and situational characteristics of the users of information systems to the systems' effectiveness in Egyptian banks. They inter-. viewed 120 managers in 22 Egyptian banks. Their findings indicate that user satisfaction was associated positively with age, organizational level and education. The authors warn that the findings should be interpreted cautiously, considering that most of the systems investigated were MIS. They recommend that Egyptian banks who want to plan for successful information systems and to address their IT adoption process more successfully should carefully address the personal and institutional factors that they have control over.


Khasiani conducted a project on 'Women and Governance' but the chapter focuses on the role of ICTs within this project. The study was conducted in Kakamega and Makueni districts in Western and Eastern Kenya. She argues from the basis that the new development paradigm emphasizes partnerships between the state, the market and civil society. This results in existing gaps, especially in civic knowledge and in skills needed to use ICTs, and these gaps set a new agenda for development work. The author assumes that 'women's lack of access to information is a reflection of the disparity in women's and men's access to development resources'. There is a table of the gender-based disparities in all policy areas in Kenya between 1960 and 1997; these
include: Education and training; Labour, employment, human-resource development, and civic service; Information and media; and Members of Parliament.

Information for the project was obtained from both primary and secondary sources, including consultative meetings - for example, a needs assessment among women in Kakamega and Makueni, a stakeholders' conference, and a curriculum and materials development workshop. The study provides evidence on how community-based resource centres, equipped with ICTs, can play a key role in information development. The findings are tabulated, one showing that socio-economic and cultural governance of women in these two districts remains elusive, the second showing the respondents' views on the qualities of a good leader, and the last detailing the main sources of information for these women. In summary, these Kenyan women (who may be representative of others in similar regions) depend largely on traditional sources of information and lack control over the most effective sources.

[79] Kibati, M. 'Wireless Local Loop in Developing Countries: Is It Too Soon for Data? The Case of Kenya.' M.S. Thesis, Massachusetts Institute of Technology, 1999. <http://rpcp.mit.edu/Pubs/Theses/WLLThesis.pdf> Describes 'a cost model that contrasts GSM and CDMA networks'. It is based on research into access to communication services for the low-income, mostly rural, population in Kenya. Therefore, it was set in a situation where there was a lack of, or inadequate, information infrastructure. Kibati also investigated current ICTs as well as the projected evolution towards more advanced technologies that are capable of handling broadband data communication. The model conceived 'determines that CDMA deployments instil flexibility and better evolutionary properties to the network without the burden of extra costs for the operator'. He recommends that 'the Kenyan government de-link wireless local loop regulation from the regulation of wire based local access' and 'allow the immediate private provision of fixed wireless local loop services'. The research was a combination of on-desk research, sensitivity analyses and baseline parameters.

[80] Kiplang'at, J. 'An Analysis of the Opportunities for Information Technology in Improving Access, Transfer and the Use of Agricultural Information in the Rural Areas of Kenya.' Journal of Library Management 20, 1/2 (1999): 115-127. The working definition of IT in this study includes CD-ROMs, computer networks, DTP, satellite communications, and geographical information systems (GIS). The author uses case studies to illustrate the way in which organizations and institutions use IT to disseminate agricultural information to rural Kenya. He found that the following factors make IT relevant for rural development: 'vast storage, fast and inexpensive communication channels, links between different media'. However, for IT to have a significant impact in rural development, it must be needs-driven rather than technology-driven.


[82] Knight, P. et al. 'Increasing Internet Connectivity in sub-Saharan Africa: Issues, Options, and World Bank Group Role.' Washington DC, World Bank, 1995. [A 'Draft', edited by Etienne Baran- shame et al., appears at <http://www.highway.idsc.gov.eg/ai1/iiic1.htm> ] The authors' aim was twofold: to outline the broad range of initiatives to increase Internet access, and simultaneously to advance the World Bank's strategic objectives in areas of donor co-ordination, capacity-building, and so on. Also documented are their experiences from the implementation of a pilot network project in Mozambique and interaction with the network community in Southern Africa. The lessons learned include the importance of:
- African ownership of the project to ensure sustainability and donors playing a supportive role;
- country-specific responses, as 'technical, human capacity, and regulatory limitation to network development differ from country to country';
- businesslike management of the networks for sustainability purposes;
- training for both engineers and users; and
- incremental support (supporting existing networking initiatives) and Bank group support of the network with a focus on Bank group needs.

The lessons are mostly positive, basically suggesting that the World Bank has been successful in most cases.


[84] Kole, E. S. 'African Women Speak on the Internet: Research Report Electronic Survey WomenAction Africa prepared for WomenAction and APC-Africa-Women'. Amsterdam, May 2000. <http://www.xs4all.nl/~ekole/public/endrapafринh.html> Kole's report essentially brings to fruition the 1999 work of APC-African Women [see 20]. The study was conducted electronically, with a total of 25 questionnaires being returned. The findings show that most organizations had at least a computer and telephone. However, face-to-face communication was still the preferred method of reaching the grassroots. In the 1999 study, the respondents recommended that Web-content developers should ensure that the relevant information on the Web sites could easily be repackaged into traditional media forms. However, Kole found that many organizations repackage information from the Web and redistribute it orally, via traditional print publications, and even on radio and television. The following are some of the recommendations for practice and policy:

- Multi-disciplinary support, meaning that financial support should be matched with technical support.
- More support for organizations functioning as intermediaries in 'communication, information and media' fields.
- Sufficient training, especially non-technical, such as in information management.
- Ensuring the women-friendliness of the system, training and information.
- Attention to disparities and respect for differences between anglophone and francophone users.
- Links between computer networks and other media.
- Emphasis on text-based information.

Areas suggested for further research are:

- In-depth elaboration of some topics, such as what kind of technical problems women encounter, and what exactly is meant by 'women-friendly' systems?
- Suggestions to cope with problems and limitations that are unique to the African context, and comparison with other regions.
- Evaluation criteria based on women's needs and preferences.

Lessons learned include:

- Directly e-mailing potential respondents in the appropriate language in order to get a greater response to questionnaires,
- Definition of Internet applications according to regional use to avoid confusion.
Anticipating deviant ways of answering the questions electronically, and lay-out problems in the transfer process.

[85] Levey, L. A. 'Africa Goes Digital: African Content on CD-ROM and the Web.' Project on Information Access and Connectivity, 1999. <http://www.piac.org/digital> A study carried out under the auspices of the Project on Information Access and Connectivity (PIAC), sponsored by the Ford Foundation and Rockefeller Foundation, to seek out and evaluate selected African resources in digital format. The result is a reference source, with brief evaluations of Web sites under key headings such as 'Media and publishing', 'Social sciences', 'Gender', and 'Education'.

[86] Levey, L. et al. (eds.) CD-ROM for African Research Needs: Guidelines for Selecting Databases. Washington DC: American Association for the Advancement of Science, 1996. In 1995, there were 8 000 entries in the annual edition of CD-ROMs in Print. With dwindling library budgets, many African institutions found it difficult to evaluate and choose databases relevant to their needs. The AAAS Sub-Saharan Africa Program therefore initiated a project to evaluate databases in science and social sciences. The assessments were conducted in universities in Ethiopia, Tanzania, Ghana, Malawi and Zimbabwe. All the universities selected had CD-ROM capability and were participating in the AAAS's CD-ROM pilot projects. Studies were also conducted in three South African institutions but specifically for a cost-benefit analysis between CD-ROM and online searching. For each database, the evaluators checked:
- how many citations there were from sources published in Africa and from which specific countries; and
- how many relevant citations were published about Africa and from which countries.

The result is a publication on the criteria for selecting CD-ROM databases. In addition, and as a result of the spread of the Internet in sub-Saharan Africa, there are chapters on document delivery, current-awareness services, and online searching. 18 CD-ROMs in Print, Meckler Publishing, 1995.

[87] Lor, P. 'Information Dependence in Southern Africa: Global and Sub-regional Perspectives.' African Journal of Library, Archives and Information Science, 6, no. 1 (1996): 1-10. Lor approaches information dependence - simply defined as undue dependence on foreign information sources - from a global perspective with the following sub-divisions:
- Inadequate production of information in the South.
- Inadequate North-South flow of information.
- Dominance of the North-South flow of information.
- Inadequate South-South flow of information.
- Lack of indigenous information-handling capacity.

The author's thesis is that dependence on foreign sources is an unhealthy situation as it results, for example, in an outflow of badly-needed foreign currency and a country may not even receive information relevant to local needs. He suggests that Southern African countries should consider Parker's 'national/regional or reciprocal/communal' model, whereby all participants utilize the services of one of the others. Hence, a country that is significantly well endowed (in this case, South Africa) can take on additional responsibilities towards the other countries, but must ensure that it does not regress into a donor-recipient relationship. The less well-endowed countries must also contribute to the relationship. The country taking the leadership role must do so with sensitivity and a willingness to learn.

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[88] Lubbe, S. et al. 'Determining the Significance of Decision Criteria in the Selection of IT Investments in South Africa.' Information Technology for Development, 6, no. 3/4 (1995): 125-138. A study to determine the criteria that South African managers responsible for investments in IT regarded as being more important than others. The findings show a heavy emphasis on managerial decision criteria, such as support of business objectives and support of managerial decision-making, over financial or developmental-type decision criteria. Fifteen criteria were applied and the prima facie evidence suggests a strong association between the decision criteria actually used and the decision criteria that should be used. The findings indicate that South African managers attached the same rating to the decision criteria as their overseas counterparts did. Nevertheless, the authors caution that this should be a guarded conclusion because of weaknesses in correlation.

[89] Lwehabura, M. J. F., and D. S. Matovelo 'Convergence of Libraries and Computer Centres for African Universities: A Strategy for Enhancing Information Services.' Information Technology for Development, 8 (1999): 221-229. Aims to stimulate universities in Africa to enhance information provision by shifting towards the convergence of computer centres and library services in their institutions. Convergence was defined as 'a process of strategic realignment of learning and researching support activities aimed at providing a more effective customer service in dynamic teaching and learning environment'. The justification for their proposition was drawn from the increasing convergence of libraries and computer centres in the USA and UK and the argument that it would be an advantageous venture for the consolidation of budgets and mutual learning. The disadvantages of convergence are based on experiences in the UK, where some argued that convergence could create a 'culture clash'; for example, libraries are meant for free open access, while computer centres are not. In addition, there could be a confusion of roles among professionals in the two services. It is not clear from the conclusion whether the authors favour convergence for African institutions. They simply recommend that any institution considering convergence should consider the following factors: culture, economy, academic politics and power, history and geography, and managerial and personality structures.

[90] Lyons, C., and T. Lyons 'Challenges Posed by Information and Communication Technologies for Parliamentary Democracy in South Africa.' Parliamentary Affairs, 52, no. 3 (1999): 442-450. Considers whether ICTs would bring the South African Parliament closer to the people or cause further alienation, based on the hypothesis that the introduction of new ICTs to African parliaments affect the existing challenges faced by African nations. There is a discussion of the forms of ICTs used by Parliament, these being television, radio and the Internet. The paper tends to be rather futuristic on the opportunities and possible pitfalls, and disregards actual experiences. The remedial steps suggested include ensuring that those responsible for the development of ICTs take into account the socio-economic context, increasing education for the population on ICT skills, and considering the facilitation of Internet access in constituency offices.

[91] Maltha, H. W., J. F. Gerrissen and W. Veen (eds.) ICT and Third World Higher Education: The Means and the Ends. Amsterdam: Thela Thesis, 1999. Collates the results of an expert meeting on how to draw the attention of higher education institutions in the developing world to the potential of the content-related uses of global data-communication networks for improving education and research programmes. The aim of this study was to encourage these institutions to develop more collaborative ventures, assess institutional needs and priorities regarding use of the Internet and the development of content, and examine these against current local technical and human capacities. Although most of the issues discussed are relevant to the African situation, there is only one Africa-focused paper [see 69].

The impact of politics on information access is examined under the following headings: the Reconstruction and Development Programme; implications for library and information services; and changes in government structure and impact on serials. The potential of technology for information access is examined under: the new government and information; telecommunications; sanctions and technology; new technological developments; and general concerns.

[93] Manji, F., M. Jaffer and E. N. Njuguna 'Enhancing the Capacity of Human Rights and Advocacy Organizations in Southern Africa.' Ottawa: International Development Research Centre (IDRC), 1998. <http://www.idrc.ca/acacia/04053/index.html> A survey of 103 human rights and advocacy organizations in Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe to assess the feasibility of a programme for enhancing organizational capacity. This included an assessment of the technical capacities, training needs and potential resource people. ICT in this study refers mainly to the use of computers and, more specifically, the Internet. The authors used structured interviews and focused-group discussions with organizations individually and in groups. The findings are arranged into size of organization, availability of computers, availability of modem, access to computers, Internet access and training, sources of income, and technical knowledge of ICTs. Some of the findings, common to every country, include the wide disparity between organizations in their access to the Internet: those with access 'hoarded' it and created even greater divergence between the 'haves' and 'have-nots'. The researchers found very few examples of a culture of sharing - of either the resources or the information - with those who are poorly resourced. In their brief analysis, they attribute this to the organizations being brought up in a culture of 'information starvation' with the sudden access to the Internet leading to information overload and a desire to consume everything while 'hoarding'. The authors then concentrate on how these organizations might use the Internet to develop training materials. They recommend that organizations should not simply be provided with basic training in the use of the Internet but should be trained in how to develop effective research capabilities.

[94] Marcelle, G. M. 'Getting Gender into African ICT Policy: A Strategic View.' In E. M. Rathgeber and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000: Chapter 3. <http://www.idrc.ca/books/focus/903/06-chp03.html> ICT policy is defined here as 'an integrated set of decisions, guidelines, laws, regulations, and other mechanisms geared to directing and shaping the production, acquisition, and use of ICTs'. This chapter, intended as a guide for policy-makers, includes a look at the current state of national ICT policy-making in Africa - the policy-making apparatus, the challenges and the successes so far - especially in Mozambique, Senegal, Uganda and South Africa, and includes a review of the policy formulation process in an international context, such as in the OECD countries, and UNCSTD's set of best-practice guidelines. The author argues that conceptual frameworks, systems of data collection, indicator construction and evaluation methodologies in the ICT policy-making process are still in their rudimentary stages, hence real change in the structure and functioning of the ICT sector out-paces policy intervention. She notes that with the exception of Nigeria, South Africa and some of the Northern African countries, there has been very little R&D capability in ICTs. The case studies cited are drawn from AISI [see 35] and IDRC's Acacia initiative [see 1]. A number of key actions are suggested for the incorporation of gender considerations into national ICT policies:

- Allocate ICT development resources to women;
- Provide and improve telecommunications infrastructure;
- Build technological capability (the human-resource component);
- Facilitate and encourage the involvement of women in technological innovation; and
- Create culturally relevant content.

Five key steps are recommended for African governments:

- Define and specify measurable goals and objectives for the ICT sector and applications.
• Create the necessary institutional structure to develop and steer a vision of ICTs and development and to achieve the goals set out in that vision.
• Secure advice and strengthen technical expertise in ICT-related fields.
• Develop consultative mechanisms to ensure that the process of policy formulation, implementation and review involves all key actors.
• Develop improved capacities to review policy objectives, monitor and evaluate programmes, and respond to changes in the technological and socio-economic environment.

[95] Mbambo, B. 'Disseminating African Women's Information on the Internet: Issues and Constraints.' Information Development, 15, no. 2 (1999): 103-107. Argues that, although African women's organizations have made strides in disseminating information, there is still a need to ensure that more women have access to it. Nevertheless, consideration should also be given to the type of information and the channels of dissemination.

[96] Mchombu, K. J. 'Designing Women Oriented Information Resource Centres in Africa.' Information Development, 15, no. 4 (1999): 212-217. Outlines the challenges faced by African women - specifically those from the low socio-economic category - in accessing information resource centres. His thesis is that women's requirements for information and their information-seeking behaviour must be taken into account within 20 United Nations Commission on Science and Technology for Development. 'Report of the Working Group on Information and Communication Technologies for Development', 1997. their socio-economic cultural and communication context, and that there is a need for information literacy. He suggests that information resource centres, which are defined as agencies for the creation, collection and delivery of communication of information, are not women-friendly; therefore, there are suggestions on how to design women-friendly resource centres.

[97] Mchombu, K. J., and K. Miti 'Formulation of National Information Policies in Africa: Some Unlearnt Lessons.' International Information and Library Review, 24 (1992): 138-169. Focuses on Botswana, Zambia and Tanzania. They note that the call for national information policies in Africa has ignored existing policies and consequently resulted in inaction. This is partly attributed to government interest in information as a 'source of power' rather than as a vital factor for development. The policies referred to in this paper concentrate on traditional print materials, especially relating to book development and with special reference to libraries.


Menou was the co-ordinator of the Capacity Building for Electronic Communication in Africa (CABECA) project. Part 1 provides the background to the project, its methodology and the problems it faced; the second part is devoted to the overall findings and conclusions of the project. More detail appears in the individual reports of the national investigators [see 21, 29, 44, 145]. The synthesis report 'tries to complement these by offering a common perspective'. The Capacity Building for Electronic Communication in Africa (CABECA) project, initiated in 1995, was aimed at 'connecting' Africa. It was sponsored by the IDRC and implemented by PADIS. The major CABECA studies, conducted between 1995 and 1996, involved baseline surveys, which included interviewing users in government, NGOs, the private sector and academia, to assess their use of e-mail.
Menou notes that the 'African scene of electronic communications has been changing so fast that it invalidated the original design of our study in less than one year. The story is worth meditating by all those who keep stressing the long time it would take for new technologies to reach Africa."

The major recommendation is that research is essential in the area of intellectual capital: 'It is in the changes of intellectual capital that the eventual impact of information should be sought. We furthermore strongly believe that no external or internal component in the complex system which a living intellectual capital represents can be held in itself as responsible for any transformation. It is the combined effect of all these factors which makes the impact. It is thus more important to observe how they interact among themselves and with the intellectual capital than to try and measure one or the other.'


[100] Mgaya, K. 'Development of Information Technology in Tanzania.' In E. Drew and F. G. Foster (eds.) Information Technology in Selected Countries. Tokyo: United Nations University Press, 1994: 134-148. <http://www.unu.edu/unupress/unupbooks/uu19ie/uu19ie0i.htm> One of four country surveys on IT development [see 45]. In 1974 the Tanzanian government commissioned a study by the National Institute of Productivity with collaboration from the International Labour Organization to formulate a national informatics policy. Despite its recommendations, nothing had been achieved by the time of Mgaya's study in 1991/1992. The author wonders where Tanzania would be today if these recommendations had been implemented. However, it is should be noted that the establishment of the National Science and Technology Policy for Tanzania in the late 1980s was a step towards the implementation of the recommendations.

[101] Moahi, K. H. 'Training African Librarians for the New Information Age: Progress in Botswana.' Information Development, 12, no. 2 (1996): 91-96. Describes the information-technology-related courses, at diploma, undergraduate and post-graduate level, in the Department of Library and Information Studies at the University of Botswana. Looks at the importance and challenges of teaching information technology and at the future of training in this area. One of the major challenges was that students were un-prepared to take the courses on arrival at the university, many lacking keyboard skills and being generally ignorant about computers.

[102] Momo, R. S. M. 'Expanding Women's Access to ICTs in Africa.' In E. M. Rathgeber and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000: Chapter 6. <http://www.idrc.ca/books/focus/903/09-chp06.html> Should the government facilitate women's access to information as it will enhance their contribution to economic development? This is the basis of Momo's chapter. There is a checklist of the 'actions' needed to establish a women's information centre. Examples of successful experiences are drawn from Burundi, Burkina Faso and Uganda, where some NGOs have used ICTs (with reference to videos, television and radio) to create awareness. The recommendations are somewhat similar to those of most authors writing on gender and ICTs.

The major objective of dissemination was lost in the early stages of the project because no contact was initiated with the relevant government ministries or other institutions that had been consulted during the project proposal stage. The reason given for not following up the prospective collaborations was time constraint, as it was necessary to give priority to the production of a printed version of DEVINDEX-Botswana produced by the IDRC. The compilation of the indexes with PADIS offered an opportunity for required training, though the indexes were later 'discovered' to be too general in subject coverage and it was difficult to target specific users. As a consequence of this undertaking, there were a number of requests for assistance with database development from other institutions/organizations locally and in neighbouring African countries. The major success of this project is credited to its implementation as part of the normal day-to-day activities of the institution. In order to guarantee sustainability, rather than soliciting the services of external experts, they concentrated on strengthening the in-house staff base, even if it took longer to achieve certain results.

[104] Moyo, L. M. 'Information Technology Strategies for Africa's Survival in the Twenty-first Century: IT All Pervasive.' Information Technology for Development, 7, no. 1 (1996): 17-27. Discusses the well-known barriers to the successful adoption and utilization of IT in Africa and the strategies used in preparing for the 21st century. The author notes the successful application of IT at sectoral level - for example, in the banking sector in Nigeria, in air travel in Zimbabwe, in software development in Mauritius, and the development of the HealthNet network in many African countries. However, he argues that, although policies to incorporate IT into national strategic plans may exist in some instances, there are no strategies to implement them. He emphasizes the urgent need for the development of indigenous manpower and notes that governments should not fund simply the procurement of IT but also local research to facilitate development of local IT.

[105] Munyu, H. 'Application of ICTs in Africa's Agricultural Sector: A Gender Perspective.' In E. M. Rathgeber and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000: Chapter 4. <http://www.idrc.ca/books/focus/903/07-chp04.html> Analyses the key problems facing women in the agricultural sector, particularly the communication issue, though this was dealt with as a parallel issue. The author's argument is basically that African farmers face similar problems but that the women's were more profound. The author asserts that traditional and modern ICTs could be used concurrently to speed up the circulation of information. The problems identified range from a lack of supportive policies, through the issue of land ownership, to limited access to credit. The issue of ICTs is revisited in an argument that a lack of 'reliable and comprehensive' information is a 'major hindrance to agricultural development', the author claiming that available local information is packaged in a raw form and difficult to access or use.

people), and poor organization and planning. The paper gives accounts from the key players of a library automation project, an outsider's viewpoint and lessons learned. These include implementing a project within the stipulated budget and ensuring clear communication between the key players, the librarians and the IT staff. The author aims to make the reader draw his/her own conclusions and work out appropriate solutions.


One of several chapters about ALPID, a Youth Leadership Programme on ICTs for Community Development in Africa [see 129]. Mureithi discusses the technical feasibility of implementing ALPID: 'The program will target small and medium-sized enterprises (SMEs) at the threshold of excellence in terms of product quality, product standards, market orientation, and export promotion. ALPID will also target rural communities with limited information sources, with a view to helping them acquire information for health, hygiene, and responsible community living. In addition, ALPID will mobilize information resources generated through local research on indigenous systems of production, biotechnology, and environment management; identify potential end-users of this information; and disseminate, popularize, and, in the long term, commercialize such information.'


- experimenting with alternative techniques for data communications between the five nodes;
- evaluation of various aspects of the communication network experiments; and
- dissemination of information to the research community within the region about the development and the results of the project with the aim of increase awareness.

MUKLA was mandated to provide e-mail services to NGOs within the NGOnet-Africa project [see 51] and also collaborated with the HealthNet projects, whose target audience was health professionals. With an increase in the number of users, there were evident management problems, especially due to a lack of technical capacity to handle new installations and user support. In a bid to make MUKLA more self-sustainable, training courses and consultancies were initiated. The lessons learned include the need for clear strategies to develop and support
the user base and clarity on what is to be supported, the need for training, and the need for an efficient and cost-effective recovery mechanism.

[111] Mutshewa, A. 'Disseminating Environmental Information in Rural Botswana: The Case of Nata Village.' Information Development, 15, no. 2 (1999): 96-103. This study to identify the various ways of disseminating environmental information focused on one village in Botswana. The respondents to the questionnaires used were drawn from those working on environmental issues and from the mass media. The findings show generally that there was poor attendance at tribal gatherings, little coverage of information by the media, and poor community participation in rural projects. It is recommended that for future study the views of the recipients (villagers) should be sought.

[112] Mutunga, J. 'KEMRI's Management Information System.' In National Research Council Bridge Builders: African Experiences with Information and Communication Technology. Washington DC, National Academy Press, 1996: 247-258. <http://www.nap.edu/books/0309054834/html> Discusses the development of a management information system at the Kenya Medical Research Institute (KEMRI). The primary objectives of this Carnegie Corporation-funded project were to improve the capability in data processing and information management, online/electronic searches, DTP, and human resource development. Firstly, a review of the current inventory was undertaken, including software and training needs. Interviews were conducted to find out 'the operational systems of staff, available resources for IT and needs for research production'. The author discusses the bureaucratic hurdles in implementing the project, partly attributed to inadequate knowledge of microcomputer systems and understanding of the magnitude of the task. Some of the positive results from the project were major a growth in the use of computers for research activities, the use of standardized software, online literature searches which led to the production of quality publications, and training of support staff for online searches. The recommendations include the need for ongoing evaluation systems from the beginning, each department being assigned a 'computer co-ordinator', and to look into ways of self-sustainability.

[113] Myers, J. 'Human Rights and Development: Using Advanced Technology to Promote Human Rights in Sub-Saharan Africa.' Case Western Reserve Journal of International Law, 30, no. 2/3 (1998): 343-371. From Myers's perspective, the technological needs of sub-Saharan Africa raise significant human rights concerns. She makes use of the Universal Declaration of Human Rights and related documents, arguing that any introduction of IT must be accomplished with these rights in mind - for example, the right to development of the personality in cultural, economic and social spheres. Only a small percentage of sub-Saharan Africa's population has access to advanced ICTs. Therefore, Myers argued that the concentration of IT in certain sectors of the population removes desperately needed economic resources from a portion of the population in need and denies those without access the ability to realize their human rights. She concludes that 'the solution is far from easy because sub-Saharan Africa lacks not only the monetary funding, but also the proper education and tools to implement change. Techno-logists and those able to implement change are severely lacking in sub-Saharan African nations.' IT (with reference to computers) is thus capable of helping African citizens realize their basic rights by transmitting information on relevant issues and enhancing their learning of implementing new systems and programmes to benefit the community and the nation as a whole.

[114] Naidoo, V., and C. Schutte 'Virtual Institutions on the African Continent.' In G. Farrell (ed.) The Development of Virtual Education: A Global Perspective Vancouver: Commonwealth of Learning, 1999: 89-124. <http://www.col.org/virtualed/chapter7.pdf> Sketches the general status of Internet connectivity in Africa, and satellite footprints over Africa for television and radio. The main focus of the study, however, is on the actual and potential impacts of these transformations on educational institutions. The key examples in the study are drawn mainly from South Africa, with brief illustrations from Egypt, Morocco, Zimbabwe, and a cursory
mention of some other African countries. There is also a discussion of the limitations to good virtual education in Africa.

[115] Nassimbeni, M. 'Information for Building a New Nation.' International Information and Library Review, 28 (1996): 359-369. With reference to the Reconstruction and Development Programme in South Africa, examines how library and information services can play a key contributory role. Concentrates on the importance accorded to information and IT by the new South African government and the relationship between new principles of governance and citizenship, of transparency and accountability. The author notes that the trajectory of South Africa towards an information society needed to take into account the requirements of the majority for information and information literacy.

[116] National Research Council Bridge Builders: African Experiences with Information and Communication Technology. Washington DC, National Academy Press, 1996. <http://www.nap.edu/books/0309054834/html> A collection of the personal accounts of the authors who have played important roles in introducing new information technologies into their institutions. These accounts illustrate the steps they are taking to bridge the gap between the information haves and the 'information have-nots' and to build bridges between their countries and the worldwide movements related to the global information infrastructure (GII). Individual chapters are annotated in this bibliography [see 4, 51, 73, 110, 112, 124, 144, 152, 156].

[117] Nawe, J. 'Information Technology for the Info-Poor: Experiences of the University of Dar es Salaam Library.' Information Development, 14, no. 4 (1998): 185-188. Describes the experiences of the introduction of IT at the Library of the University of Dar es Salaam, Tanzania. The focus is on the use of computers in general and the introduction of CD-ROMs in particular. The reported lessons learned dwelt more on the experiences of the staff. For example, the staff became aware of how to use CD-ROMs appropriately, which was a benefit of the training.

[118] Nawe, J. 'Using Information and Communication Technologies in Tanzania: Responses of Information Professionals.' Information Development, 16, no. 1 (2000): 24-29. Centres on the University of Dar es Salaam and focuses heavily on how ICTs have been used to improve library services, while the experiences of the information professionals is dealt with briefly.


[120] Ndinga, S. and P. Clayton 'Distance Education Infrastructure for Rural Areas Using Java as a Development Tool'. In H. Maurer and R. G. Olson (eds.) Proceedings of the WebNet '98 World Conference of the WWW, Internet and Intranet (Orlando, Florida, November 7-12, 1998). Charlottesville, VA: Association for the Advancement of Computing in Education, 1998: 750-755. (ERIC Database No. ED427725) Describes and discusses how an Interactive Remote Tutorial System (IRTS) was build to support distance education at Rhodes University in South Africa. IRTS is a World Wide Web-based distance education delivery system that allows an instructor sited remotely and connected via normal phone lines to provide two-way voice communication within a class and navigate Web-based lesson material remotely. The paper covers all the technical details about setting up the system, as well as other information such as lesson management.

out organizational alternatives for accelerating Internet access in Africa by enhancing co-
operation among donors and service providers. The authors review the economic context for
developing networks and the major consideration affecting development of the Internet on the
continent. The need for the collection of statistics on African Internet traffic and resource
allocation in African Internet networks is emphasized. The authors note that the critical aspect of
this complex problem involved pricing policies and ask how the costs will be financed. They
detail the various costs, showing that the commonly cited expense of network hardware is only a
small fraction of the overall costs. It is they who recommended the creation of the 'African
Internet Forum', which is operational today19.

[122] Ningo, N. 'ICT and Sustainable Good Governance in Sub-Saharan Africa: Countering the
Hegemonic Drive for Power.' Washington DC: World Bank, 1999. Asks how ICTs can assist
African countries in the process of good governance. The primary challenge lies in the re-
examination and rebuilding of the processes of governance. ICTs can only play an important
secondary role once a system of good governance is in place. Governance should be content-
driven, not technology-driven. The author argues that this study was 'prospective' in that there
were limited concrete data on the cause-effect relationship between ICTs and good governance.
However, there is a widespread belief that, if properly used, ICTs can assist in achieving good
governance. The obstacles to applying ICTs to good governance are analysed under the
following headings: government opposition, confiscation, censorship, universal access, legal
issues, and others ranging from education to infrastructure. Also considered is sensitivity to
gender issues in the context of ICT development. Most women are still excluded from access to
information, which essentially means access to power. According to Ningo's study, women were
not consulted during the phases of design, acquisition and installation of ICT-based systems;
they are hardly consulted on policy matters as they are considered passive recipients. From this
study, governance in Africa is driven by the hegemonic drive for power exemplified by the
ponderous bureaucracy of the state. The problem with governance is human, not technological; it
is not due to the lack of application of ICTs. The author concludes that, unless the foundations
for good governance are firmly in place, ICTs will not solve the underlying problems of human
attitudes that determine the course of good governance.

[123] Nwachuku, M. A. 'Development of Information Technology in Nigeria.' In E. Drew and F.
G. Foster (eds.) Information Technology in Selected Countries. Tokyo, United Nations
on IT development [see 45]. Examines the Central Computer Committee set up by the Nigerian
government in the late 1970s to compile national data on computing. The objectives of this
Committee included drawing up standards for users, vendors and consultants on computer
projects, and the development of inputs towards a national policy on computing. However, the
Committee's activities were instead dominated by reviewing applications for computer imports
and making recommendations to the Ministry of Finance on whether to grant import licences or
not.

in Malawi.' In National Research Council Bridge Builders: African Experiences with
Information and Communication Technology. Washington DC, National Academy Press, 1996:
177-188. <http://www.nap.edu/books/0309054834/html> Describes a venture to increase the
communication between the widely scattered university colleges and research institutes. This led
to the establishment of the Malawi FidoNet network, UNIMA, which eventually served all
sectors of the economy. UNIMA benefited from ESAnet [see 109], even though Malawi was not

19 For related information and further discussion on 'Emerging African Internet Institutions', see
one of the participating countries, through start-up modems and non-commercial FidoNet software. The pricing procedures are described in detail.

[125] Obijiofor, L. 'Future of Communication in Africa's Development.' Futures, 30, no. 2/3 (1998): 161-174. Compares the Western perspective of communication with the modes of communication in Africa. Communication in Africa is categorized into rural and urban forms, the urban being largely associated with Western influences. Rural communication is largely oral, with people expecting immediate feedback; any modern communication channel should therefore take this into consideration. His hypothesis is that African societies have strong and enduring socio-cultural influences and will therefore embrace technology that promotes greater interaction and sustains kinship. Based on this premise, he sees the telephone as the 'future' technology as it embraces the central element of African mode of communication - orality. The Internet is considered too impersonal. The challenge, therefore, lies in improving basic infrastructure and ensuring accessibility to, and affordability of, telephone services. An interesting perspective in this study is the emphasis that communication in Africa is largely gender-based. In general, traditional African societies had certain norms of communication, which limited the areas of discourse open to women. The author believes that new communication technologies will replace (and already have) this form of discrimination and gradually lead to a new era of information democratization. African women are now able to discuss openly issues once considered 'taboo', and sometimes the anonymity provided by the new ICTs has enabled this. His conclusion is summarized into three scenarios, the preferred one being an Africa that does not totally embrace the new technologies without matching them to its socio-cultural practices.


[127] Ocholla, D. N. 'Information Consultancy and Brokerage in Botswana.' Journal of Information Science, 24, no. 2 (1998): 83-95. There is limited empirical research on information consultancy and brokerage in the developing countries. Investment in consultancy and brokerage services is a generally unknown consumer environment, therefore in Africa it poses some complexities. For example, there is an information-conscious population on the one hand and a semi-literate population on the other. Ocholla conducted a study in Botswana investigating the need for such services. He defines an information consultant as a specialist who gives expert advice on information, while an information broker operates an enterprise that charge fees for information-related services and products. Data were collected in Gaborone, using questionnaires and interviews, from public and private sectors, information consultants and brokers. The objectives included investigating the existence of these people or organizations in Botswana and gauging the need for such services.

There were detailed responses to issues of information deficiency, and it is worth noting that the areas of information deficiencies of clients closely matched those of information needs identified by the consultants and brokers. Ocholla concludes that the success of information consultancy depends on a positive information culture and attitude by the users. He recommends the need for clients' awareness of the value of information management, and provides a basis for market analysis that can benefit training institutions in librarianship and information management in capacity-building.

[128] Odedra-Straub, M. 'Women and Information Technology in Sub-Saharan Africa: A Topic for Discussion?' In S. Mitter and S. Rowbotham (eds.) Women Encounter Technology: Changing Patterns of Employment in the Third World. London: Routledge, 1995: 256-277. For this study on women in IT, postal questionnaires were used to gather data from organizations in Kenya, Zambia and Zimbabwe. It was admitted that this method would not explain much about the
impact of IT on women but would give an indication of the role women were playing in the organizations. A plan to conduct face-to-face interviews generally led to negative responses, for example:

- 'Women are not playing much role in IT area.'
- 'There are many other important areas of priority, which need to be researched rather than women and IT.'
- 'IT has made little overall impact our countries.'

The author therefore relied on secondary sources and experiential knowledge on IT in Africa; 'IT' and 'computers' are used interchangeably. The status of IT in Africa is outlined, together with the overall status of women in Africa. She notes some of the general problems - for example, lack of financial resources to purchase the hardware and software, and a lack of sufficient computer education and training facilities which aggravates the lack of skills. She concludes that it was difficult to assess the impact of IT on African women properly. The main recommendation is the need for more IT education and training opportunities for girls and women in Africa. The author suggests more case studies on the importance of women and IT, and on the impact of IT on women, to show the differences in context across countries. These could help identify the potential of IT for women, the potential employment opportunities, and indicate how women are going to reap the benefits from IT.

[129] Ogbu, O., and P. Mihyo (eds.) African Youth and the Information Highway: Participation and Leadership in Community Development. Ottawa: International Development Research Centre (IDRC), 2000. <http://www.idrc.ca/books/focus/914> The role that the youth in Africa can play in the development of ICTs has hardly been addressed in mainstream publications. One exception is this report, produced as the result of an IDRC-sponsored workshop in 1998. The editors set the basis for further action with an introduction on how to develop a youth leadership programme for Africa. In the report, there is constant reference to ALPID, a Youth Leadership Programme on ICTs for Community Development in Africa [see 74, 83, 107, 109].

[130] Onyango, R. A. 'Global Information and Africa: On the Crest of a Mirage?' Library Management, 21, no. 1 (2000): 197-204. Good governance is important if African countries are to make profitable contributions in the global information society. Globalization is having an impact on regional and state management. African governments must take advantage of this, erect and strengthen institutions that support the widening of space for the exchange of information and a competitive culture of debate and ideas that could concretize the current information-based development wave. Governments must be creative in adapting to these waves, as this could be the road to sustainable progress rather than another mirage. With imagination and creativity, global information systems may yet deliver where previous paradigms failed. Onyango raises some pertinent issues, such as the need for meaningful cross-border relationships between professionals, which is gradually being addressed in the many forums in and about Africa. An issue that flows from this is the general lack of up-to-date information for many African researchers based in the continent. He notes that many may emphasize the issue of the brain drain but, from his experience, 'relocation means losing contact with the environment that inspires the need for new thinking and can be very disruptive and disorienting'.

[131] Opoku-Mensah, A. 'ICT Initiatives and the Role of Policies in Southern Africa'. In Information & Communication Technology and Development, The Hague, Netherlands Development Assistance Research Council (RAWOO), RAWOO Lectures and Seminars 18, 1998: 70-78. <http://www.nuffic.nl:3500/rawoo/publicatie_ict.pdf> Discusses current ICT initiatives in Africa and the role of policies in this process. There have been several initiatives to improve interconnectivity and networking in the continent, under- taken either by the private sector or by the donor community. According to the author, very few have been initiated or supported by African governments.
There is a lot of emphasis on the 'Learning Without Frontiers' programme in Zimbabwe, which was supported by UNESCO and Danish International Development Assistance (DANIDA).

The objective of this programme was to help teacher-training colleges contribute to educational reform by upgrading students' IT skills and establishing resource centres for teaching materials. The impact of the project was evidenced in schools that started using Internet resources for teaching, with some developing personal Web sites. However, some of the problems faced were predictable, such as technical problems and participants' relative lack of experience in using computers (even though the selection of participants was supposedly based on past experience with this technology). The author recommends basic training in computer applications before such an undertaking. One lesson derived from this study is that the impact of IT depends on attitudes, expectations, organization and management. This is a research-worthy area, and similar to the concerns raised by Duncombe and Heeks [see 46].

Discussing the role of policies, Opoku-Mensah emphasizes the need for private investment in the ICT industry and greater liberalization of the telecommunications sector. The AISI framework [see 35] is suggested as a basis for capacity-building and policy-making, and South Africa is used as a model of an enabling regulatory environment. The author, with reference to research on ICTs, says that there needs to be a more effective mechanism for disseminating results.

[132] Opoku-Mensah, A. 'ICTs as Tools of Democratization: African Women Speak Out.' In E. M. Rathgeber and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000: Chapter 7. <http://www.idrc.ca/books/focus/903/10-chp07.html> Opoku-Mensah stresses that, since the democratization process in most African countries is still in embryonic stages, ICTs could particularly support the participation of women in governance. She discusses how to promote women's use of communication resources in society, within the context of developments in women's participation in electoral and political processes in Africa. She proposes that, with the advent of ICTs, women need to discuss the use of gender-sensitive information to decide whether to create their own closed space on the Internet or to assert their presence in mixed spaces.

Opoku-Mensah gives specific examples from Zimbabwe, Uganda, Ghana, South Africa and Tanzania on how ICTs have been used to promote women's rights. In Zimbabwe, women have created and used alternative communication channels to support their efforts, defend their rights and diffuse their own forms of representation. In Uganda, women have used the Internet to support their contribution to parliamentary debates. There are tables that indicate the policy goals that governments should have and how to measure their success, and one specifically targeted at NGOs that shows constraints and potential resolutions.

[133] Owen Jr., W., and O. Darkwa 'Role of Multipurpose Community Telecentres in Accelerating National Development in Ghana.' First Monday, 5, no. 1, 1999. <http://www.firstmonday.dk/issues/issue5_1/owen> Examines the development and potential sustainability of small business communication centres in Ghanaian cities. The paper is the result of an investigation into the extent to which these enterprises were using modern communication tools to provide services, and their impact on rural development. The findings show that, even though users were willing to pay for the training or use of the technology available in these communication centres, a number could not. As these are small businesses there is still need for subsidies. Owen and Darkwa argue that financial assistance could also be used to offer other services and thus stimulate awareness and more demand. This could produce a spin-off of a wider user base, hence bringing in more money and providing an avenue to self-sustainability. The authors found that public-private partnerships are still the best approach for ICT development - for example, the post office Internet services, in which public money guides private initiatives and resources to meet public purposes.

[135] Oyinloye, A. M. 'Nigerian Universities Network: Gateway to the World.' Information Development, 14, no. 4 (1998): 181-191. Describes NUNet, which was aimed at creating a linked environment at the national level for access to and distribution of information by 42 institutions. Implies that the project was about to be implemented, but cautions that the success of the initiative hinged on co-operation between the Nigerian government, technology providers, and institutions of higher learning.


[137] Peterson, S. B. 'Saints, Demons, Wizards and Systems: Why Information Technology Reforms Fail or Underperform in Public Bureaucracies in Africa.' Public Administration and Development, 18, no. 1 (1998): 37-60. Examines why building computerized information systems is a challenge in weak African bureaucracies. Suggests a model for success based on the argument that African bureaucracy and information systems development are contingent structures and processes. Therefore, with the right combination of government reformers and appropriate technical assistance, African bureaucracies can facilitate the rapid introduction of IT reform.

[138] Qureshi, S. 'Fostering Civil Associations in Africa through GOVERNET: An Administrative Reform Network.' Information Technology for Development, 8 (1998): 121-136. According to Qureshi, electronic communication has the potential to empower civil society by fostering networking among civil servants involved in public administration reform. He uses the development of GOVERNET (an African administrative reform network) as a case study to describe key considerations that drive the need for building civil associations. It is the author's assessment that the major problems affecting public administrations throughout Africa relate to the structural inefficiencies that render the bureaucracies incapable of carrying out their functions. Some of the common problems of using IT in many African countries are listed and discussed, such as high costs of government-owned packet data networks.

The Commonwealth Network of Information Technology (COMNET-IT) developed the GOVERNET project. This began with a network of Management Development Institutions in Eastern and Southern Africa and gradually progressed to West Africa. The main objectives were to utilize and add value to existing electronic networks operating within Commonwealth countries in Africa, to develop a line of professional collaboration, and to provide access to information about administrative and managerial reforms.

Responses from some of the participating institutions showed that successful use of IT had to be demand-driven. Often it was the initiative of an individual that pushed for the use and development of electronic communications, and in some institutions there was genuine fear of machines becoming obsolete if that individual left. Training was a major component of the project. Qureshi concludes that access and sharing of information and expertise are enabling factors in building civil associations in Africa but a 'culture of communication and sharing of
information' needs to be developed before this form of networking can have any significant impact.

[139] Rachty, G. 'Telecommunications in Egypt.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/egypt.htm> One of several studies [see 10, 19, 43, 54, 61, 75, 153, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.

[140] Rathgeber, E. M. 'Women, Men, and ICTs in Africa: Why Gender Is an Issue.' In E. M. Rathgeber and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000: Chapter 2. <http://www.idrc.ca/books/focus/903/05-chp02.html> Argues that men's and women's attitudes, needs and perspectives on ICTs are likely to differ and it is important to address the specific needs of women. Therefore, a reconceptualization of the use of ICTs as tools for African development may be necessary, but this must be done in parallel with the reorganization of existing information. This could provide a new role for African universities and research institutions. Rathgeber emphasizes that, if African countries are to benefit from the use of new ICTs, there is a need for 'National Information-Technology policies' focused on improving the telecommunications sector but developed with the involvement of industry, management and local R&D institutes.

She argues that the telecommunications policies adopted by many African governments do not make distinctions between the attitudes and needs of male and female users. In addition, these 'gender-neutral policies' tend to favour men, as they are likely to have the income to purchase the ICTs and have a slightly higher level of education, which predisposes them to trying new technologies. In essence, Rathgeber's thesis is that, although the new ICTs can marginalize both men and women in Africa, women are likely to be slower in adopting the new technologies unless strategies are developed to deliberately include them. To prepare the ground there should be more emphasis on ensuring that girls become involved in science and technology at an early age. The information they access should be relevant to the them, comprehensible and easily available.

[141] Rathgeber, E. M., and E. O. Adera (eds.) Gender and the Information Revolution in Africa. Ottawa: International Development Research Centre (IDRC), 2000: <http://www.idrc.ca/books/focus/903> Most of the chapters in this collection were presented at an international conference. 22 They address three broad topics: the current state of ICT and telecommunications policy in Africa; current practical experiences in Africa; and sectoral applications of ICTs in agriculture, education and governance. Individual chapters are annotated in this bibliography [see 56, 72, 78, 94, 102, 105, 132, 140].

[142] Regional Informatics Network for Africa (RINAF) 'The RINAF Project.' 1998. <http://spcons.cmuce.cn.it/RINAF/articolo> The RINAF project aimed to provide Internet services to several African countries. It was conceived by the Informatics Programme of UNESCO and financed by a grant from the Italian government with a contribution from the Republic of Korea. As well as an international steering 22 'African Women and Economic Development: Investing in Our Future'. Hosted by the UN Economic Commission for Africa in Addis Ababa, Ethiopia, to mark its 40th anniversary in 1998. committee, an African committee was set up to approve all actions taken and to ensure the effective use of funds during and beyond the project implementation phase. The project established five regional nodes (in Algeria, Senegal, Kenya, Zambia and Nigeria) and ten national nodes. It was implemented in cooperation with other IDRC initiatives in the region and the RIO network of ORSTOM, France. The first phase included the purchase and installation of equipment, training courses and workshops. The second phase concentrated on extending and developing new national databases on the scientific and technical production of each of the countries involved. A major emphasis
was to strengthen end-user support in order to reach a level of self-sustained development and create a group of skilled technicians specialized in network services management.

[143] Richardson, D. 'The Internet and Rural Development: Recommendations for Strategy and Activity: Final Report and Executive Summary.' Sustainable Development Department, Food and Agriculture Organization of the United Nations, 1996. <http://www.fao.org/waicent/faoinfo/sustdev/Cddirect/CDDO> The FAO pioneered a 'communication for development' approach for catalysing Internet services for rural stakeholders, an approach that began with the needs of people in rural and agricultural communities. This approach was based on the premise that the Internet offers a bridge to the gaps between development professionals and rural people. The report details possible projects which had the potential to be linked with Internet activities, and includes countries in North, West and Southern Africa.

[144] Robinson, N. 'Bringing the Internet to Zambia.' In National Research Council Bridge Builders: African Experiences with Information and Communication Technology. Washington DC, National Academy Press, 1996: 191-214. <http://www.nap.edu/books/0309054834/html> Robinson's project at the University of Zambia started off with the ESAnet project, which provided a computer and modem to provide the hub for the first university e-mail system. The initial users were drawn from the University of Zambia Network (UNZANET). However, interest expanded and the university decided to establish a private company called ZAMNET Communication Systems Ltd. to install the connection to the Internet and sell access to the services provided. The process involved in the integration of FidoNet to the Internet is described in detail. This included the development of local information services, provision of training, users' documentation, computerized accounting and marketing of the product, including a pricing system.


[146] Rosenberg, D. 'African Journals Online: Giving Journals Published in Africa a Presence on the Web.' Paper presented at the Workshop on Scientific Communication and Publishing in the Information Age, Oxford, May 1999. <http://www.inasp.info/psi/scpw/papers/rosen.html> Discusses the establishment of the African Journals Online (AJOL) project, led by INASP and prompted by the reality that the Internet is an important means of promoting journals and that African-published journals have lacked visibility in their traditional form. The main aims of the AJOL project are: to make results of research conducted in Africa widely available; to strengthen the African academic publishing sector by providing income to encourage both traditional print and electronic publications; and to assess the impact of the Internet in promoting African-published journals.

[147] Rosenberg, D. 'IT and University Libraries in Africa.' Internet Research, 8, no. 1 (1998): 5-13. In 1995, Rosenberg conducted research on the current situation and future prospects of nineteen university libraries in twelve African countries. She looked at the benefits IT has brought to these libraries. Questionnaires were used to collect library statistical information. The rest of the data were gathered from open-ended interviews that detailed actual experiences, opinions and comments of those involved. Evidently, the level of IT adoption and the uses made of the new technologies differed widely between the libraries studied. Most libraries had progressed in IT implementation, with heavy reliance on donor funding, with the exception of the University of Botswana. Rosenberg wonders what will happen when the aid ceases, because no library had made any practical proposals to cover maintenance and development costs, for example, and there was the additional problem of a lack of knowledgeable and practically experienced people on the ground. The author concludes that IT would not reduce the need for traditional printed
books and journals in this region, but would be used predominantly to provide links to the outside world and increase intra-African exchange. IT was considered a necessity, although most interviewees noted that their priority would be the acquisition of more relevant books and journals (in multiple copies) and more physical space.

[148] Ryckeghem, D. V. 'Information Technology in Kenya: A Dynamic Approach.' Telematics and Informatics, 12, no. 1 (1995): 57-65. Provides a framework for understanding how IT and cultures interact, culture being used as a 'diagnostic' instrument. Highlights the ways in which culture influences IT, IT influences culture, and culture provides the condition to interpret IT's utility. The simultaneous interplay between these three levels is referred to as 'IT practice'. Ryckeghem asserts that IT may not increase the productivity level of some workers whose culture is ingrained in communality and is reflected in their work environment and information-seeking behaviour. Generally, many Africans would prefer to consult colleagues or friends rather than visit a library or documentation centre. How does one transform such an information culture? With IT? With the Internet? His conclusion is that it is important to understand the work practices, organizational structure and concurrent attitudes in the African environments where IT is being introduced or has been introduced.

[149] Sam, J., and D. Fokuo 'A Report on the Workshop on Sensitizing Policy Makers and Senior Managers on Critical Information Management Issues in Ghana: Accra, Ghana, 16-20 August 1999.' CAB International - Information for Development Programme (CABI-IFD). 1999. <http://www.cabi.org/IFD/content/ghanarept.htm> The aim of this workshop was to build capacity at the senior level in Ghana to access, disseminate and publish information, by enhancing participants' awareness of the potential of using new electronic media. Some of the recommendations from participants were:

- A need to organize frequent refresher courses in IT for senior managers and policymakers to keep them abreast with current trends.
- The existing telecommunications infrastructure in the country needs further improvement to enhance data communication at a faster rate than at present.
- More time should be allocated to practical sessions.

Recommendations from the resource people included:

- The slow access times to the Internet must be taken into account when planning future workshops because of the importance of practical sessions.
- Sessions dedicated to electronic publishing should be excluded from future programmes, with more attention to external dissemination of information, concentrating on decision-making on Web site content.
- Short, home-based and/or on-site training courses, offering an introduction to scientific information on the Internet for different categories of personnel.
- Exchange visits between the various institutes' personnel should be encouraged in order to sustain the co-operation resulting from the workshop.

[150] Sheba, M. K. 'Information for Development in Africa.' Information Development, 14, no. 3 (1998): 152-155. A simple delineation of the oft-cited barriers to information provision in Africa, such as a lack of trained personnel, poor infrastructure, financial constraints and access.

[151] Shila, H. 'Case Study Effectiveness of Informatics Policy Instruments in Africa: Tanzania.' United Nations Economic Commission for Africa, 1994. <http://www.bellanet.org/partners/aisi/policy/infopol/tanzania.htm> A survey of the effectiveness of national informatics policy instruments that had been implemented in Tanzania, similar to that of Alabi for Nigeria [see 11]. Includes a 'laundry list' of institutions that offer IT-related courses. The author notes that Tanzania has only a 'National Science and Technology Policy, which does not cover Informatics in its sectoral objectives'.

[152] Tindimubona, A. 'Innovations in Desktop Publishing at the African Academy of Sciences, 1989-1992.' In National Research Council Bridge Builders: African Experiences with Information and Communication Technology. Washington DC, National Academy Press, 1996: 109-120. <http://www.nap.edu/books/0309054834/html> Discusses the introduction and use of DTP at the AAS in Kenya. One of the lessons learned was that DTP first requires an understanding the publishing process, not simply the technology. The need to train in-house staff was also emphasized, as was strategic recruitment of young university graduates. The latter, especially, met the high standards set by the AAS for its work and had the aptitude to 'scale the heights'. Many went on to become trainers.

[153] Tsigie, A. and G. Feyissa 'Telecommunications in Ethiopia: Past, Present and Future.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/ethiopia.htm> One of several studies [see 10, 19, 43, 54, 61, 75, 139, 154] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.

[154] Tyler, M. et al. 'Telecommunications in Kenya: Facing the Challenges of an Open Economy.' Virtual Institute of Information, 1999. <http://www.vii.org/papers/tyler.htm> A detailed account of the challenges facing the telecommunications industry in Kenya, based on research conducted in the 1990s, in the wider context of the challenges of development strategy as a whole. The study considers aspects of Kenya's telecommunications experience that may be of special interest to other countries pursuing or considering market-oriented strategies for a national economy similar to Kenya's. The authors review research conducted in Kenya in the last decade on the economic role of the telecommunications sector and the benefits of investment in telecommunications infrastructure. One of several studies [see 10, 19, 43, 54, 61, 75, 139, 153] that analyse the history and development of the telecommunications industry, from which it is clear that the challenges facing African countries are a combination of those problems experienced by other countries and those created by each country's unique history.


[156] Villars, J. 'The Ghana National Scientific and Technological Information Network Project.' In National Research Council Bridge Builders: African Experiences with Information and Communication Technology. Washington DC, National Academy Press, 1996: 259-272. <http://www.nap.edu/books/0309054834/html> Describes the Ghana National Scientific and Technological Information Network (GHASTINET) located at the National Science and Technology Library and Information Centre (NASTLIC). The objective of the project was to increase the availability of indigenous scientific and technological information to a wide range of users. A major impact of the project was the increased awareness of users and newly acquired skills of staff in the application of new technologies. Some of the problems faced were: the general lack of a strong conviction of the importance of scientific and technological information in all spheres of national development; the lack of skilled personnel (with the few skilled ones leaving for 'greener pastures'); insufficient and inconsistent funding, attributed to low priority for library and information projects; and the perennially mentioned problem of maintenance of equipment. Villars claims that external funding was a useful bait for obtaining government funding. He recommends increased user-education and that external agencies should relate aid
programmes to scientific and technological information where relevant, with emphasis on IT and related services as an integral component of assistance.

[157] Wangwe, S., H. Semboja and M. Nzuki 'The Information Revolution and Economic and Social Exclusion in Developing Countries: Case Study of Tanzania.' Paper presented at the International Workshop on The Information Revolution and Economic and Social Exclusion in Developing Countries. Maastricht, 23-25 October 1996. One of three papers whose findings are synthesized by Alcorta [see 13].

[158] Werner, M. 'Empowering Socio-Economic Development in Africa Utilizing Information Technology: A Case Study of Mozambique for the African Information Society Initiative (AISI).' United Nations Economic Commission for Africa, 1996. <http://www.bellanet.org/partners/aisi/policy/cntry/mozambiq.html> 'A critical examination of the social, economic, technical and policy issues, with respect to the expansion or initiation of information and communications infrastructure'. Concentrates on telecommunications issues, covering teledensity and telecommunications indicators, such as the quality of services and telecommunication tariffs. The lack of skilled personnel is one of the obvious obstacles listed.

[159] Wild, K. et al. 'A Forward Strategy for the Sustainable Development Networking Programme (SDNP): 1998-2000: Report of an External Evaluation Commissioned by the United Nations Development Programme to Assess SDNP and Advise the Administrator on Its future', Sustainable Development Networking Programme, 1997. <http://sdnhq.undp.org/docs/evals/eval97.html> The main objectives of the SDNP were to facilitate access to information for decision-making in support of sustainable development and to encourage broad participation in planning and implementing sustainable development strategies. In essence, this project planned for the successful marriage of the Internet to sustainable development issues and initiatives. However, the Internet spread much faster than had been envisioned at the beginning of the project and there has been a proliferation of international programmes supporting access to the Internet in Africa. One recommendation is the need to judiciously select partnerships with other such programmes. This paper focuses not only on Africa but includes other SDNP projects such as those in Asia.

[160] Wild, K., and S. Mncube 'Information and Communication Policy: Issues and Initiatives on South Africa.' Information Technology for Development, 7, no. 4 (1996): 183-193. Examines access to government information in South Africa. Since the democratic election of 1994, more attention has been paid to information and communication policy development. The paper identifies the key information and communication policy issues on the public agenda in Canada and elsewhere, and examines related policy initiatives under way in South Africa. Following this, they discuss South Africa's capacity to develop content for the global electronic networks. They note the potential of ICTs for education and emphasize the need for a variety of actors, including information professionals, to play a more participatory role in the national information policy process. The initiatives of a number of NGOs to create community information centres and to enable government departments to communicate information to the community are addressed. Although the paper revolves around opportunities, there is emphasis on the need for co-ordination between local communities (to define their needs) and those providing information and technology. According to the authors, the problem in South Africa is not lack of information, technology or expertise but the lack of a mechanism that can bring these to bear on the very real development problems that are calling for a solution.

[161] Zilgi, R. M. 'Key MIS Issues in Basic (Under-Developed) Nations: The Cases of Two African Nations.' In S. Palvia, P. Palvia and R. M. Zilgi (eds.) The Global Issues of Information Technology Management. Hershey PA: Idea Group Publishing, 1992: 18-34. The results of a survey conducted in Kenya and Zimbabwe as representative examples of sub-Saharan African countries, largely concerned with issues of hardware and software at the time. The author criticizes the curricula of higher education institutions; in the curricula reviewed there was no
obvious distinction between computer architecture and management aspects of computer systems, and hardware and software were described simply as information systems. The author argued that the popular mixed-vendor shops (hardware and software) were a major detriment to efficiency and productivity, and government intervention was found to be a de-stabilizing factor which led to increased monopolies and 'virtual cartels'. The need for professional standards was considered a prerequisite to enable production of better quality systems and to contribute to productivity. The respondents in this study were mostly executives and senior government officials, so it is not surprising that they were more interested in issues that revolved around finding supply sources and the acquisition and upgrading of hardware and software. The interviewees expressed the need for locally manufactured computer hardware or the assembly of 'knock-down' kits, and local software development.

[162] Zulu, S. F. 'Africa's Survival Plan for Meeting the Challenges of Information Technology in the 1990s and Beyond.' Libri, 44, no. 1 (1994): 77-94. Zulu's survival plan is a 12-point policy framework proposal. The framework emphasizes education and training as the cornerstone of any development. He queries whether African countries possess the requisite IT and knowledge to continue 'sourcing' their information and other technologies from the West. This question could be a useful basis for data collection, when it will be possible to assess realistically which countries are in a position to respond to the challenges, both long and short term. The paper includes a discussion of the common barriers to this development, from infrastructural ones to an absence of national information policies. With reference to the role of international organizations, Zulu presumes the PADIS project to be the best prospect for IT in Africa.
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