Distribution: GENERAL
E/ECA/CODI/4/12

23 April 2005

UNITED NATIONS
ECONOMIC AND SOCIAL COUNCIL

Original: ENGLISH

**ECONOMIC COMMISSION FOR AFRICA**

Fourth Meeting of the Committee on
Development Information (CODI-IV)

Addis Ababa, Ethiopia
23 – 28 April 2005

# Scan-ICT: Understanding ICT Penetration and Usage in Africa

## Results of the Scan-ICT Pilot Project: A Synthesis

CRDI IDRC

October 2003

## Table of Contents

# Acronyms

| | |
|---|---|
| ADP | Accelerated Development Programme 2000, Ghana |
| AISI | African Information Society Initiative |
| ANRT | National Agency of Telecommunications Regulation, Morocco |
| ART | Agence de Regulation de Telecommunications, Senegal |
| CETIC | Centre for Information and Communications Technologies Among Enterprises, Morocco |
| DMU | Dispensary-Maternity Unit |
| ESTC | Ethiopian Science and Technology Commission |
| ETA | Ethiopian Telecommunications Agency |
| ETC | Ethiopian Telecommunications Corporation |
| EU | European Union |
| GDP | Gross Domestic Product |
| GMPCS | Global Mobile Personal Communications System |
| ICT | Information and Communications Technology |
| IDRC | International Development Research Centre |
| IIQ | Information Intelligence Quotient |
| INCM | Instituto Nacional des Comunicacoes de Mocambique |
| INEXSK | Infrastructure Experience Skills Knowledge |
| INIIT | International Institute for Information Technology, Ghana |
| ISDN | Integrated Service Digital Network |
| ISP | Internet Service Provider |
| ITIGEO | Informatics Information Technologies and Geomatic, Morocco |
| LAN | Local Area Network |
| NCST | National Commission for Science and Technology, Uganda |
| NFRD | National Foundation for Research and Development, Uganda |
| NICI | National Information and Communications Infrastructure |
| NORAD | Norwegian Agency for Development Co-operation |
| OFPPT | Office de la Formation Professionnelle et de la Promotion du Travail, Morocco |
| OSIRIS | Observatoire sur les Systemes d'Information les Reseaux et les Inforoutes au Senegal |
| QSAE | Quality and Standards Authority of Ethiopia |
| SME | Small and Medium Enterprises |
| TDM | Telecomunicacoes de Mocambique |
| UEM | Eduardo Mondiane University, Mozambique |
| UNECA | United Nations Economic Commission for Africa |
| USF | Universal Service Fund |
| VOIP | Voice Over Internet Protocol |
| VSAT | Very Small Aperture Terminal |
| WAN | Wide Area Network |

# Executive Summary

The use of Information and Communications Technologies (ICTs) is spreading faster than any technology in the history of humankind. But while benefits for human development from ICTs are beginning to be felt in many countries, Africa still lags behind in the global transition to an information economy. It has the lowest rate of Internet users in the world, and the second lowest rate of users of fixed telephone lines. In most African countries there is a serious lack of basic information on key ICT and related economic and social indicators, as well as on ICT-related activities and the impact of ICT policy decisions and plans.

Africa cannot afford to miss participating in this revolution if it hopes to improve the quality of its citizens' lives and to alleviate the widespread poverty that seriously undermines human development. The successful deployment of ICTs can contribute to the development of knowledge societies in all nations of the continent, bridging the digital divide.

In 1996, UNECA and others – multilateral, bilateral and non-Governmental institutions, as well as representatives of the private sector and of African member States – launched the African Information Society Initiative (AISI) as an action framework that has been the basis for ICT activities in Africa ever since. Constituting a fundamental part of the AISI initiative is the formulation and development of a National Information and Communication Infrastructure (NICI) plan in every African country, which provides an integrated set of decisions, guidelines, laws and other mechanisms for the sustainable development of the information society in Africa.

In addition to building the capacities of telecommunications policymakers and regulators and building networks on ICTs for development, AISI has a major focus on analysing and evaluating ICTs and content trends in Africa. With regard to this, the Scan-ICT initiative was implemented in November 2000 as a collaborative project between the Acacia Programme of the International Development Research Centre (IDRC) and UNECA, with financial support from the European Union (EU) and the Norwegian Agency for Development Co-operation (NORAD). It monitors the penetration, impact and effectiveness of ICT applications across Africa, providing added value to AISI implementation at the national, regional and global levels.

The Scan-ICT project is a multi-donor initiative that seeks to build support for the phased development of a comprehensive African capability to define, collect and manage key information needed to support the growing investment in ICTs as well as the transition of Africa to an Information Society. In addition, Scan-ICT describes an opportunity to build capacity in Africa -- the capacity for Africa to influence ICT investments, to extend their impact, to develop sound policies and to encourage the development of *made-in-Africa* solutions, applications and content. The goal is to create a pan-African ICT network, that would collect, analyse and disseminate all levels of ICT-related knowledge in an open-source manner.

In the pilot phase of the project, Scan-ICT baseline studies were carried out in six African countries, namely, Ethiopia, Ghana, Morocco, Mozambique, Senegal and Uganda. The pilot phase concerned the setting up in the participating countries of institutional structures and organizational mechanisms for the collection of reliable indicators in ICTs, according to a harmonized methodology. Minimum and common areas identified for data collection included infrastructure, sectoral applications (education, health, public administration, private sector) and the information economy. Moreover, the pilot phase included the development of selected Pan-African thematic studies, including a mapping exercise on the state of connectivity in Africa and another focused on a baseline study of schoolnetworking activities in Africa.

This final Scan-ICT synthesis has been undertaken as a compilation of the six country reports and the two Pan-African thematic studies, by extracting summaries from the submitted reports.

Under the comprehensive Scan-ICT methodological framework, two major approaches were employed in generating data for the study in each country: quantitative and qualitative analysis. Data were collected from both primary and secondary sources, and extensive national consultations were sometimes employed as a mechanism to facilitate the collection and analysis process.

The connectivity maps that are part of the Scan-ICT project are quite revealing of the state of connectivity in Africa. A total of 226 secondary cities and towns are now 'online' in Africa. Mobile subscribers have surpassed fixed lines (about 24m vs 20m in 2001) and mobile coverage has generally spread beyond the reach of fixed-line infrastructure. In most cases, fixed lines are concentrated in the capital city, leaving the vast majority of villages unconnected for Internet access due to the high cost of using mobile GSM phones. Internet growth is constrained by both these factors as well as the extent of the electricity grid, the availability of computer equipment and low levels of literacy.

Diversity of languages is also an important factor as there is little locally developed content - a 'chicken and egg' factor which will hopefully be addressed by the growing number of e-government and indigenous content development initiatives. Cost is still the key issue: with low incomes per head, in many countries the bulk of users who can afford a computer, telephone and Internet Service Provider (ISP) subscription have already obtained connectivity. The opportunity for socio-economic development that the information society offers Africa will depend on enlightened public access policies promoting the rapid deployment of telecentres and cybercafés in the vast rural areas via new low-cost infrastructure such as Very Small Aperture Terminal (VSAT), WiFi and Bluetooth.

Measuring the numbers of Internet users is not easy in developing countries because many people share accounts, use corporate and academic networks, or visit the rapidly growing number of cybercafés, telecentres and business services. Furthermore, simply measuring the number of users does not take into account the extent of use, from those who just write a couple of emails a week, to people who spend many hours a day on the net browsing, transacting, streaming, or downloading. To attempt to compensate for this, the Scan-ICT project attempted to look at alternative means of measuring Internet use. One idea that came to mind was to measure a country's Internet bandwidth. A "bits per capita" indicator was derived

by dividing the country's total projected population for mid-2002 by the country's total amount of outgoing international bandwidth in bits per second. The result is the "out-of-Africa" map, which reveals interesting conclusions about Africa's Internet use.
The map clearly shows that there is almost no intra-African Internet connectivity and the vast majority of international bandwidth lands are in the G8 countries - principally North America followed by Europe; Belgium, France, Germany, Italy, Netherlands, Norway, Portugal, and the UK. High intra-regional telecom prices have limited the establishment of links between neighbouring countries to just five - Gambia-Senegal, and South Africa's links to Namibia, Lesotho, Swaziland and Botswana. As a result, increasing amounts of intra-African traffic must be transited through high-cost, cross-continental links.

On the issue of ICTs and education, a key ICT application area that underpins much of the work done in ICT for development, the baseline study on schoolnetworking in Africa is also quite revealing. This Baseline Scan marks an important beginning in the systematic generation of knowledge and learning on the experience with ICTs in African schools. Because it is the beginning of this process, there remain many gaps in the research that further research processes can fill. This Scan focused mainly on schoolnet initiatives in the form that they existed in 26 African countries. This rich piece of work highlights the gaps in Africa's infrastructure, ICT development mediums, school attendance ratios, and efforts to introduce innovative teaching methods in national education systems amidst skyrocketing poverty, the HIV/AIDS pandemic and malnutrition. The study also gives us reason to hope, for it presents the variety of initiatives already being pursued, often with very limited resources, to install computers in schools and facilitate Internet access for African pupils.

The conclusions with regard to the country-level Scan surveys in Senegal, Morocco, Uganda, Ethiopia, Ghana and Mozambique are also of interest. It is noted that a number of constraints exist with regard to expansion of the ICT sector in the Scan-ICT pilot countries. Interestingly, the major constraints cited include lack of infrastructure and the high cost of ICT equipment and connectivity, although figures from the sectoral applications show repeatedly that there is wide underutilization of computers and Internet access. Overall, what this indicates is that another strategy may be necessary to make better use of existing facilities.

Underpinning these specific constraints in the Scan-ICT pilot countries, however, is the lack of a critical foundation in terms of an enabling policy environment that encourages innovation – and the skills and institutions to adapt new technologies to local needs – so that countries can exploit the opportunities of the technology revolution. Indeed, innovations in technology must be matched by innovations in policy to mobilize people's creative potential to turn global technological advances into a tool for human development.

More specifically, the survey at the country level covered education, health, public administration and the private sector/private ICT firms. Overall, major findings included:

- ICT penetration is generally higher among educational institutions and public administration facilities than among health institutions;
- Individual staff using ICTs appear widely spread, so that although, for example, 62 per cent of institutions in a certain sector may report staff using

computers and Internet, only a few staff in each individual institution will actually have that capability;

- Shortage of qualified staff appears to be a critical issue for all sectors. The proportion of ICT experts is very low; often this is a result of the fact that comparatively few schools and universities have fully incorporated ICT into their curricula;
- Computers are widely used as traditional office tools only; and
- Although home pages and elaborate sites on the World Wide Web have become very popular throughout the world, the percentage of institutions in the surveyed sectors with websites is low. The content of the sites also is frequently limited to information of a very generic nature. Thus, the resources of the Internet as a tool for business and commerce have yet to make a substantial impact in the Scan-ICT sectors and industries.

At the same time, while competition has spurred the demand for skilled ICT personnel of all sorts, training institutions are concentrated in urban areas, resulting in an acute shortage of ICT professionals in rural or semi-urban areas. In addition, the study results suggest that on-the-job training opportunities remain very low across all sectors and emphasize the need for better co-ordination in ICT training through standardization of courses.

The Pan-African thematic studies tell us that major recommendations of the pilot phase of the Scan-ICT Project can be divided into three categories – policy issues, human resources development, and infrastructure – where substantive and coordinated efforts were identified as needed. Specific recommendations included:

- Create an enabling policy environment for ICT for development by strengthening regulatory frameworks, instituting policy reforms in the telecommunications sector and taking measures to reduce tax and duty rates on computers and accessories, Internet connections and access charges;
- Encourage enterprise development and private investment by increasing the availability of credit facilities and creating venture capital;
- Increase access by empowering citizens economically through implementation of innovative poverty-reduction programmes;
- Prepare and implement comprehensive ICT for development master plans for addressing current and future ICT needs at all levels;
- Provide priority to small ICT projects with bigger and immediate development impact, e.g., telecentres, instead of mega-projects requiring huge investments;
- Design and launch ICT training programmes at all levels, starting from the tertiary level and gradually extending the coverage to lower levels, including a general awareness creation campaign on ICT issues;
- Encourage and support the private sector engaged in research and development and applied research activities in software development, subcontracting with client firms, and entry into joint research ventures with foreign companies, taking advantage of the low-cost labour available; and

- Expand infrastructure to increase ICT access points in basic telecommunications services, to bridge the urban-rural ICT infrastructure gap.

With respect to the Scan-ICT process itself, all countries indicated that the methodological framework developed for the pilot phase served the intended purpose. This implies that the methodology, with further linkages with the global Millennium Development Goals (MDGs), can be used to roll out research to more countries if resources permit. In the end, it is crucial to monitor and capture data continuously to facilitate informed decisions.

# I. Background to the Scan-ICT Project

Around the world, people have high hopes that new ICTs will lead to increased knowledge, more productive livelihoods, greater social freedoms and healthier lives. The information revolution is spearheading the growth of knowledge societies and, as a result, more than 350 million people are now wired around the globe; about 1 billion will be online by 2005. One clear result of this trend is that knowledge is the critical component in nearly all areas of human activity, often disseminated and accessed through an interesting and innovative mix of both old and new technologies.

While benefits for human development from ICTs are beginning to be felt in many countries, Africa still lags behind in the global transition to an information economy. Although its 800 million people account for about 13 percent of the world's population, only 1 African in 50 has a fixed telephone line, 1 in 130 has a personal computer and 1 in 160 has access to Internet (Gyewu, 2003). It has the lowest rate of Internet users in the world, and the second lowest rate of users of fixed telephone lines. In most African countries there is a serious lack of basic information on key ICT and related economic and social indicators, as well as on ICT-related activities and the impact of ICT policy decisions and plans.

Yet the use of ICTs is spreading faster than any technology in the history of humankind. Now, in countries worldwide:

- Students study and research using computers, multimedia and networks;
- Doctors diagnose, aided by information accessed through global networks;
- Decision-support systems for debt management help cut external debt by up to 50 per cent;
- Drought and famine warnings arrive in time to change planting seasons;
- Businesses compete more effectively with timely and accurate market information;
- Transport costs are reduced, also resulting in less pollution; and
- Cultural heritage is captured electronically, documented and globally disseminated.

Africa cannot afford to miss participating in this revolution if it hopes to improve the quality of its citizens' lives and to alleviate the widespread poverty that seriously undermines human development. The successful deployment of ICTs can contribute to the development of knowledge societies in all nations of the continent, bridging the digital divide. Moreover, ICTs also offer the potential to reduce the need for migration to the cities; the information age can break the link between jobs and urbanization, creating the conditions that enable rural Africans – who constitute up to 80 per cent of the population – to make a living where they are and not feel ignorant and isolated. Rural professionals and academics can keep up to date electronically.

At the urging ECA member States, the Commission has taken the lead in helping to prepare African countries to overcome the gaps in information and technology and utilize these new forces to promote social and economic growth in the region. In 1996, ECA and others – multilateral and bilateral partners and NGO's, together with representatives of the private

sector and of African member States – launched the African Information Society Initiative (AISI) as an action framework that has been the basis for ICT activities in Africa ever since.

As a fundamental part of the AISI initiative, the formulation and development of a National Information and Communication Infrastructure (NICI) plan in every African country was proposed, providing an integrated set of decisions, guidelines, laws and other mechanisms for the sustainable development of the information society in Africa. Such plans, now in place in more than 28 countries, are driven by national development challenges including debt management, food security, health, education, population, unemployment, job creation, industrialization, land reclamation, water, tourism and trade. The emphasis is on the need to support decision making at all levels and provide ICT infrastructure for government, business and society to enlighten the overall process of development. Likewise, partnerships are stressed among African countries to share the success of accumulated AISI implementation experiences and stimulate regional development in ICTs.

The creation of an African information infrastructure is thus both a necessity and an opportunity to accelerate development in all spheres of economic and social activity. By enabling African leaders, decision-makers and planners to position Africa in the world's rapidly expanding global economic system, AISI is opening up great potential for the continent to leapfrog several development stages through the creation of effective digital opportunities by Africans and their partners.

In addition to building the capacities of telecommunications policymakers and regulators and building networks on ICTs for development, AISI also has a major focus on analysing and evaluating ICTs and content trends in Africa. With regard to this, the Scan-ICT initiative was implemented in November 2000 as a collaborative project between the Acacia Programme of the International Development Research Centre (IDRC) and UNECA, with financial support from the European Union (EU) and the Norwegian Agency for Development Co-operation (NORAD). It monitors the penetration, impact and effectiveness of ICT applications across Africa, providing added value to AISI implementation at the national, regional and global levels.

## 1.1 Objectives

Scan-ICT aims to build support for the phased development of comprehensive African capability to collect and manage the key information needed to support growing investment in ICTs and the transition of Africa to an information society. In addition, it describes an opportunity to build capacity in Africa – the capacity for Africa to influence ICT investments, to extend their impact, and to encourage development of made-in-Africa solutions, applications and content.

The goal is to create a Pan-African ICT network, connecting all levels of ICT-related issues that will be coordinated and supported by an observatory/research institute. In order to monitor progress made in implementing the national policies developed under the AISI initiative, it has been recognized that the development of ICT indicators and baseline studies is a prerequisite for better understanding of the current situation and for setting the benchmarks.

Activities undertaken in the Scan-ICT project include four major components: indicators and benchmarks, policy issues, human resources, and sectoral applications. Within these, the project is meant to:

- Determine ICT status and collect and disseminate ICT-related information in Africa;
- Develop and continuously refine a set of indicators that can be used to measure ICT activity and progress in Africa and to guide investments that can enhance social and economic development;
- Develop a continuous benchmarking strategy that can be implemented to improve performance of ICTs in Africa;
- Promote effective use of national capacity; and
- Create public awareness about the importance of ICTs for development.

In the pilot phase of the project, Scan-ICT baseline studies were carried out in six African countries, namely, Ethiopia, Ghana, Morocco, Mozambique, Senegal and Uganda, based on indicators developed and accepted during the Inaugural Scan-ICT Methodology and Workplan Workshop in November 2000. The countries and regions were chosen on the basis of the following criteria:

- Preferences of the different Scan-ICT partners, particularly with respect to country foci or programme objectives;
- Demand from the country or sub region to have a Scan-ICT study undertaken;
- Available capacity within the country or region to undertake a Scan-ICT study;
- Possibility of leading to reform of the ICT sector; and
- Desire to have a geographic and linguistic/cultural balance in Africa as well as representation from Francophone, Anglophone and Portuguese-speaking peoples.

The principal part of the pilot phase concerned the institutional structures and organizational mechanisms for the collection of reliable indicators in ICTs in each country, according to the harmonized methodology. Minimum and common areas identified for data collection included infrastructure, sectoral applications (education, health, public administration, private sector) and the information economy, with the possibility of going beyond these if time and resources allowed. Contributing "nodes" to undertake the studies were selected on the basis of experience and expertise in the area of ICTs both at the technical and policy levels, familiarity with the NICI studies, a preference for African civil society or university-based organizations, available capacity and resources to undertake studies and become a Scan-ICT node, and willingness to be a Scan-ICT node.

Scan-ICT activities in Ghana, Morocco, Senegal and Uganda, as well as the pan African thematic studies on schoolnetworking and connectivity mapping, were coordinated by IDRC, while UNECA coordinated activities in Ethiopia and Mozambique. [Websites where the full country reports can be found are listed in Annex A.] This final Scan-ICT synthesis was undertaken as a compilation of the six countries, with the summaries of two thematic reports completed between September and November 2002.

# II. Methodology

The Scan-ICT methodology essentially contains a set of indicators developed by IDRC based on the thematic areas identified for implementation of the AISI framework, namely, infrastructure, strategic planning, capacity development, sectoral applications, e-governance and information society, and the information economy. The overall methodological framework was adopted during the launching of the Scan-ICT project in Addis Ababa in November 2000, which was followed up in September 2001.

Because realities vary from one country to the next, the Scan-ICT methodology can be used as a guideline to further fine-tune and adapt the existing set of indicators to meet the particular needs of the countries, and to develop new ones as appropriate. Together with continuous improvements of the indicators and benchmarks, it is expected that the system can provide accurate and up-to-date data and information to decision-makers on progress monitored over time. The common denomination of data and the development of databases will also further regional analysis, monitoring and sharing of best practices and lessons learned.

Under this comprehensive methodological framework, two major approaches were employed in generating data for the study in each country, quantitative and qualitative analysis. Data were collected from both primary and secondary sources; data from the former were collected directly by members of national networks through interviews and questionnaires, while secondary sources largely consisted of documents from official, private and international sources. Extensive national consultations were sometimes employed as a mechanism to facilitate the data collection and analysis process. Presented below is a summary of the Topology of the Scan-ICT Methodology detailing for each of the Scan-ICT themes with relevant details relating to specific indicators.

## 2.1 Overall Scan-ICT Methodological Framework

The Scan-ICT project was implemented in six countries for its pilot phase: Ethiopia, Ghana, Morocco, Mozambique, Senegal and Uganda. In each of these countries, a local institution or Scan-ICT "node" is the focal point for defining indicators as well as gathering and analysing data on ICTs for development. The institutions involved were: OSIRIS (Senegal), ITIGEO (Morocco), INIIT (Ghana), UNCST (Uganda), University of Addis Ababa (Ethiopia) and CIUEM (Mozambique). Their work was based on a list of indicators – appropriate to the African context - within a methodological framework that was developed in consultation with numerous experts and stakeholders. A number of pan-African studies also resulted from the pilot phase, a baseline study on schoolnetworking in Africa and a study of new indicators in Africa. The end product is expected to be a continuously updated and open-source web-based collection of key information on ICTs in Africa that will support African ICT strategies, programmes and investments.

The methodological framework used to hold the Scan-ICT project together is based on the following model:

| ***ICT Themes*** | Infrastructure | Strategic Planning | Capacity Development | Sectoral Applications | Governance | Information Economy |
|---|---|---|---|---|---|---|
| ***Section of Inquiry*** | ***ICT Status*** | Sources of ICT Knowledge | ICT Indicators and Benchmarks | Case Studies and Best Practices | ICT Policy Research | Recommendations and Actions |
| ***Areas of Study*** | ***Country Profiles*** | Regional Thematic Studies | Pan-African Thematic Studies | | | |
| ***ICT Themes*** | Infrastructure | Strategic Planning | Capacity Development | Sectoral Applications | Governance | Information Economy |
| ***Section of Inquiry*** | ***ICT Status*** | Sources of ICT Knowledge | ICT Indicators and Benchmarks | Case Studies and Best Practices | ICT Policy Research | Recommendations and Actions |
| ***Areas of Study*** | ***Country Profiles*** | Regional Thematic Studies | Pan-African Thematic Studies | | | |

The following is a brief summary of the details of the methodology used in the country-level studies and the pan-African thematic ones.

## a) Schoolnetworking Baseline Study

The research in the schoolnetworking baseline scan covers the experience in 26 African countries where it is known that school networking activities are taking place. The main purpose of the Baseline Scan is to undertake an introductory study of the extent and nature of school networking in Africa as at July 2002.

1) More specifically, the key objectives of the study were to provide an assessment of all the relevant issues and factors which have a bearing on school networking in Africa, generate an analysis of important general thematic information, undertake a literature review of existing relevant documentation pertaining to the African experience in particular and generate an annotated bibliography of these.
2) The primary research questions for this study were:
    - What is the extent and nature of school networking activity in the 26 identified African countries?
    - What is the nature of support required by the existing school networking projects under way?
3) The study did not survey all countries in Africa. Instead it included a sample of countries where documented experience shows, school-networking activity

takes place. Data-gathering techniques included a comprehensive literature review and a methodological overview of e-readiness assessments that were available and that took account of ICT application in education. This information served as the background and contextual basis for the study. It also included an email survey and in-depth interviews.

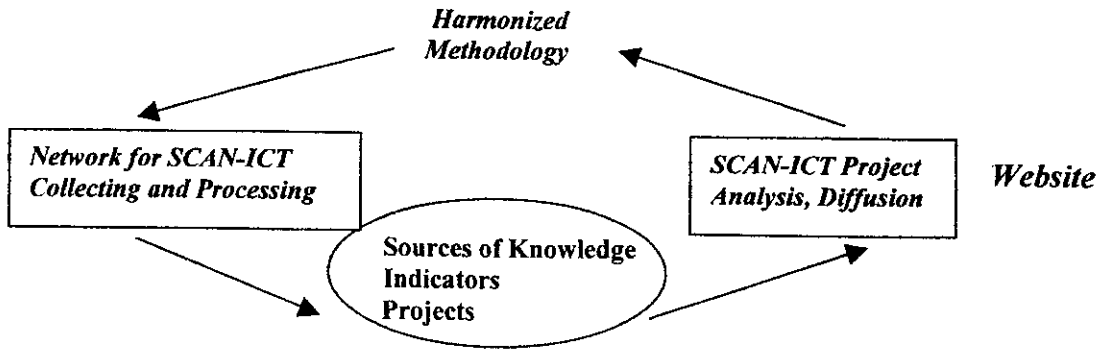
## b) Mapping connectivity indicators in Africa

The mapping exercise was more concerned with creating visual indications of secondary data on connectivity. One map, entitled "Out of Africa" actually suggested a new type of indicator, entitled "bits per capita". It is derived by dividing the country's total projected population for mid-2002 by the country's total amount of outgoing international bandwidth in "bits per second". Most of the Internet traffic in a developing country is international (75-90%), so the size of its international traffic compared to population size can provide a ready indication of the extent of Internet activity in a country. Data were collected from ISPs and Telecommunication Operators, who were contacted during March 2002 in almost every African country, as well as many of the international providers in Europe and North America. The International Telecommunication Union (ITU) and Telegeography also provided figures to help crosscheck the statistics. The "Inside Africa" map, essentially looks at tele-access as a multi-faceted connectivity indicator. It encapsulates how people communicate using fixed-line telephones, mobile telephones and the Internet. Data were essentially taken from secondary sources such as ITU statistics.

## c) Country Scan Studies

The detailed terms of reference of the country-level baseline studies, which were the result of discussions held at the Inaugural Scan-ICT Workshop in Addis Ababa, November 2000, are detailed in Annex C. Each of the six pilot countries created a national network for Scan-ICT data collecting and processing. Using the data collected on indicators, projects and sources of knowledge, six Scan-ICT analyses were prepared and individual websites established for diffusion of the analyses. From this pilot phase is arising a harmonized methodology to be used for full implementation of the project, leading back into the national networks. This is illustrated in Figure 2.1.

**Figure 2.1: Framework of the SCAN-ICT Project**



## 2.2 National Adaptations of the Scan-ICT Methodology

### *2.2.1. Ethiopia*

Under the guidance of the Faculty of Business and Economics at Addis Ababa University, two major approaches were employed for the study, survey and secondary data. A survey of public and private institutions/firms, as well as individuals, was undertaken using structured and pre-tested questionnaires as well as checklists. The survey was conducted in the federal capital, Addis Ababa, as well as in four major towns, namely, Nazareth, Bahir Dar, Mekelle and Awassa, which serve as the capitals of Oromiya, Amhara, Tigray and Southern Nations, Nationalities and Peoples' Regional states. A total of 12 different though similar sets of questionnaires and checklists were developed; data collected using nine of these questionnaires were analysed and reported, given incomplete data in the other cases. A systematic random sample survey was used wherever the population was relatively large, while a purposive sample was taken where the population size was small. In total, 2,192 respondents, both institutions and individuals, comprised the survey.

### *2.2.2. Ghana*

The International Institute for Information Technology (INIIT) led the Scan-ICT team in coordinating the survey, beginning with developing and customizing the methodology for Ghana. For each specific indicator under each Scan-ICT theme, the Ghanaian methodology provided specific details in relation to:

- Relevant information to be collected/gathered;
- Possible sources of the relevant information to be gathered;
- Methods to be used for obtaining or gathering the required information;
- Relevant types of questionnaires to be used in cases where a postal survey or face-to-face interviews were required; and
- Format in which the information gathered per indicator was to be presented or summarized.

Three main types of questionnaires were designed, including a graphic-based questionnaire for face-to-face interviews; standard text-based questionnaires, used for both face-to-face interviews and postal questionnaires; and electronic-based questionnaires, which were transmitted to target samples via email. All were field-tested among target populations. To facilitate data collection, a Research Network was set up with members from five universities, polytechnics and research institutions across the country. Some institutions served as regional coordinating nodes, with each partnering with a number of partnering nodes and collaborating nodes. Among the lessons learned was that face-to-face data collection was most successful, while postal questionnaires, emails, newspaper inserts, website direction and other methods had more limited success.

### *2.2.3. Morocco*

Implementing the project in Morocco was the Informatics Information Technologies and Geomatic (ITIGEO), which instituted a national network for Scan-ICT among 13 Government Ministries and national agencies. The project team comprised a Project Manager and Administrative Assistant from ITIGEO, consultants and investigators, and temporary personnel. Using approaches based on e-Readiness Assessments, Infrastructure Experience Skills Knowledge (INEXSK) and the Information Intelligence Quotient (IIQ) indices, Scan-ICT indicators were clustered into several domains, namely, telecommunications, Internet dissemination, computing, TV and radio, and sectoral applications. One nationwide survey on Internet connectivity involved 2,400 cybercafes and 59 ISPs, while another online survey on Internet usage collected 1,284 questionnaires. Lastly, a nationwide survey on ICT penetration in the industrial sector received 4,100 responses.

### *2.2.4. Mozambique*

A team from Eduardo Mondlane University (UEM), consisting of a Project Supervisor, Project Coordinator and two Project Assistants, had the responsibility of organizing and coordinating the process, including planning, monitoring, evaluating and reporting. The team also contracted temporary staff – primarily university students and Information Technology (IT) professionals – for the survey, database design, data input and analysis, web design and English translation. Following the recommendations of the Scan-ICT framework, the team decided to use a combination of desk rescarch, interviews and questionnaires for the study. Having recognized that the success of the project would benefit from enhanced awareness and commitment among all stakeholders, the team first organized an awareness-raising workshop for all Ministries, other public institutions and the private sector. Participants also helped identify focal points for Scan-ICT within their institutions. The process was piloted in Maputo, the capital, before expanding the activities to the rest of the country. About 1,500 people in 780 institutions were interviewed nationwide. Results of the pilot study were decisive for the following phases. Questionnaires were sharpened following the pilot study.

### *2.2.5. Senegal*

Senegalese indicators were identified through a national workshop conducted by a team from OSIRIS (Observatoire sur les Systemes d'Information les Reseaux et les Inforoutes au Senegal), the focal point for the Scan-ICT study. Face-to-face interviews were extensively employed throughout the survey. Secondary data were obtained from a Senegal ICT sector survey conducted in October 2001.

### *2.2.6. Uganda*

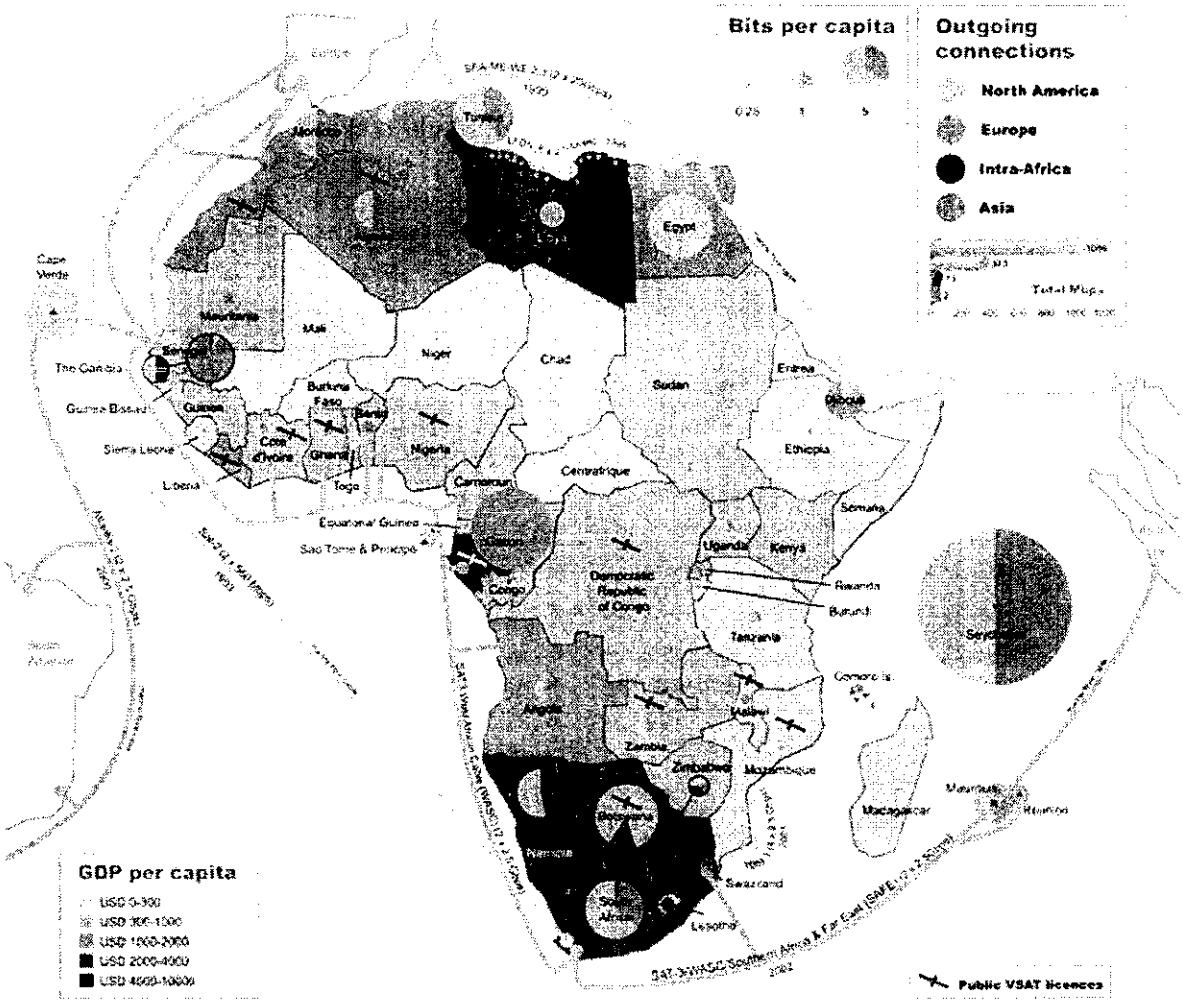
In line with the Scan-ICT methodological framework, benchmarks were adopted that indicated the level and extent of ICT diffusion in the country. On the basis of the Scan-ICT themes, specific indicators were also adopted and used to track various ICT sector trends in Uganda. The executing agency for Scan-ICT was the Uganda National Council for Science and Technology (NCST), while the implementing institution as the National Foundation for

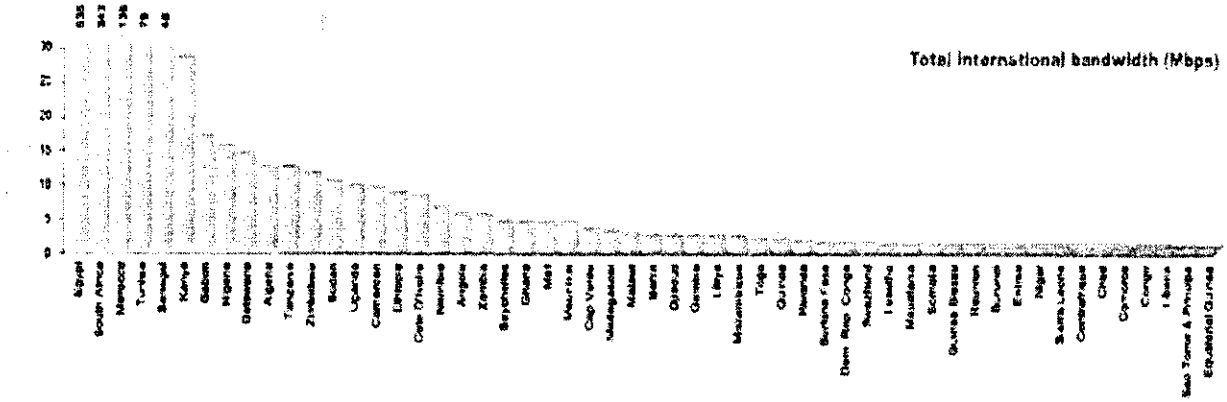
Research and Development (NFRD). Questionnaires were designed to collect primary data, and the study was conducted in two phases, with the first part covering the Kampala metropolitan area (national capital) and the second encompassing upcountry and outlying areas. Primary data were collected through the questionnaires and personal interviews. The study was carried out in 32 primary and secondary schools, with an average student enrolment of 1,094; in more than 36 health facilities; and in 29 government institutions. In the end, a stakeholders workshop was organized to review the data and to obtain comments and consensus. Serious constraints were encountered given the lack of concrete data and slow responses to the questionnaire.

# III. African Connectivity Indicators

The Scan-ICT project also included a series of mapping exercises, which attempted to explore innovative ways in which one could illustrate and think of connectivity in Africa. Two very successful maps were developed looking at a new indicator entitled "Bits per Capita", illustrated in the "Out of Africa map" and another looking at tele-access in the "Inside Africa" map. The methodology, analysis and conclusions related to the maps are explained below.

## 1. Bits per Capita: Out of Africa






The size of the Internet infrastructure is a good indication of a country's progress towards an information-based economy. Africa's Internet infrastructure is the least developed in the world, with on average less than 1 in 100 people having access. However averages obscure the great diversity of the African continent, which is reflected in wide variations in levels of Internet-use.

But measuring the numbers of users is not easy in developing countries because many people share accounts, use corporate and academic networks, or visit the rapidly growing number of cyber cafés, telecentres and business services. Furthermore, simply measuring the number of users does not take into account the extent of use, from those who just write a couple of emails a week, to people who spend many hours a day on the net browsing, transacting, streaming, or downloading. As a result, new measures of Internet activity are needed to take these factors into account.

One indicator that is becoming increasingly popular is to measure the amount of international Internet bandwidth used by a country - the 'size of the pipe', most often-measured in Kilobits per second (Kbps), or Megabits per second (Mbps). Most of the Internet traffic in a developing country is international (75-90%), so the size of its international traffic compared to population size provides a ready indication of the extent of Internet activity in a country. In Africa, some of these international links may only be as big as the circuit used by a small or medium-sized business, or even a broadband home user in a developed country - about 128Kbps, or about 3-4 times standard modem dialup speeds. In most cases, these are confined to very small and poor African countries, but there are many other regulatory, historic and social factors that also influence the extent of Internet use.

To better understand the Digital Divide in Africa, and to help prioritize development assistance efforts, IDRC commissioned a survey of international Internet gateways in Africa to determine the size of their infrastructure and to map this against current total population levels. ISPs and Telecommunication Operators were contacted during March 2002 in almost every African country, as well as many of the international providers in Europe and North America. The ITU and Telegeography also provided figures to help crosscheck the statistics. Corporate and private networks such as those operated by the World Bank and many multinationals and diplomatic organizations were not included in the survey - only international bandwidth used for public access facilities - ISPs, cybercafés, etc.

The title of the map underlines the use of outgoing bandwidth as the indicator because it is more reliably obtained - there are fewer, more well known outgoing gateways and the speed or size of these circuits is more consistent. ISPs often augment their outgoing international bandwidth (which often has to be purchased at high prices from monopoly telecom operators) with grey-market incoming satellite circuits at un-committed information rates.

The coloured circle in each country on the map shows to exact scale the international bandwidth available in bits per capita (BPC) available in mid-2002 on publicly accessible IP networks. It is derived by dividing the country's total projected population for mid-2002 by the country's total amount of outgoing international bandwidth in bits per second. The absolute data are displayed in the ranked bar graph running along the bottom of the map. The countries are shaded according to their wealth as measured by World Bank GDP/capita figures for 1999. (See figure on page 35).

As is evident from the map, there is an extremely large variation in the BPC index, ranging from 0.02 to over 40 - a factor of over 1000. These figures reflect the wide range of wealth in different countries. However, GDP per capita only varies by a factor of about 30, which indicates that there are other influences also at work: Bandwidth price varies considerably on the continent and this impacts heavily on demand. Price is in turn influenced by the regulatory environment - the presence of competition, availability of wireless and VSAT licences, as well as access to international fibre-optic bandwidth.

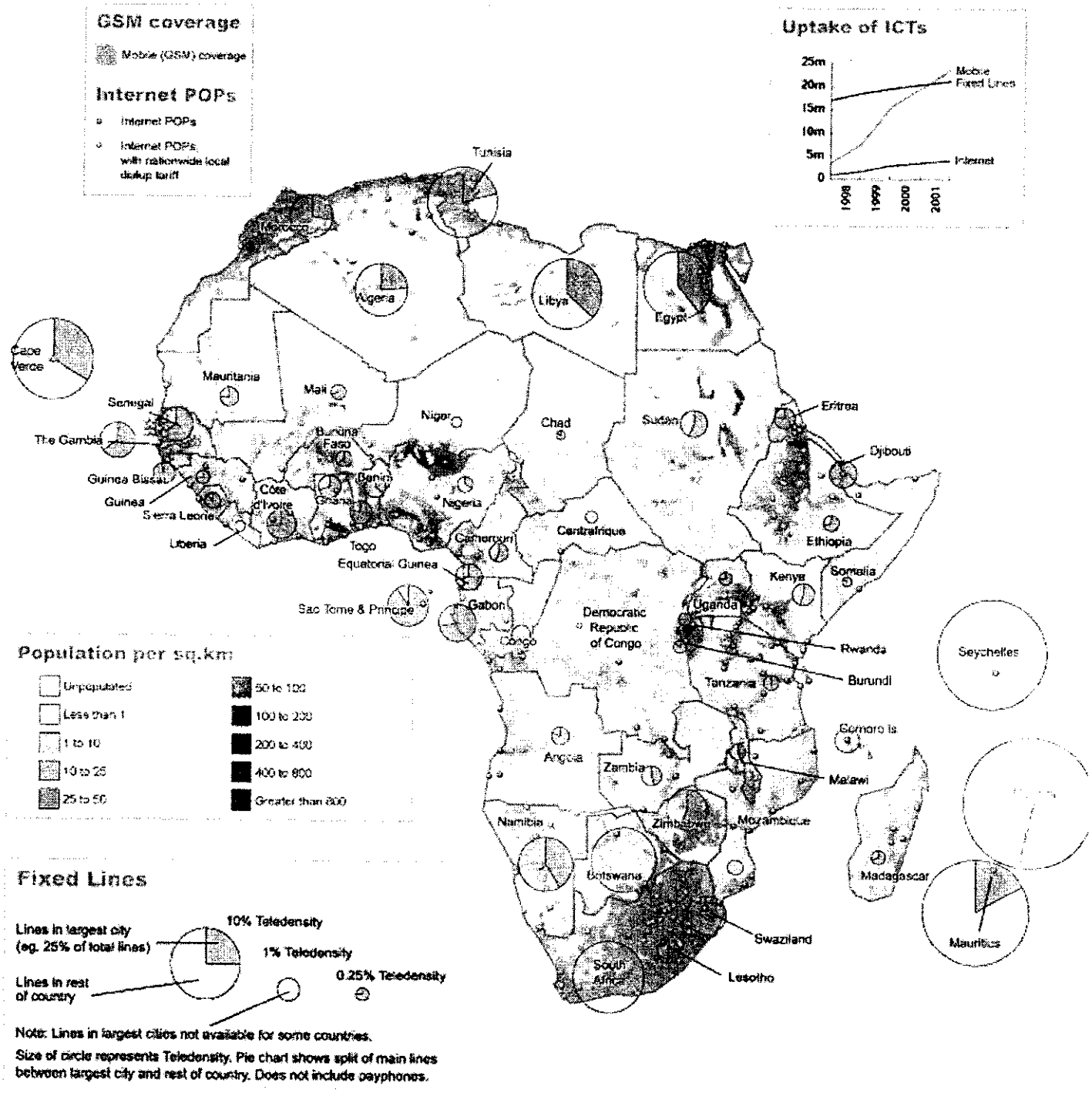
Clearly shown by the map is that there is almost no intra-African Internet connectivity and the vast majority of international bandwidth lands in the G8 countries - principally North America followed by Europe (Belgium, France, Germany, Italy, Netherlands, Norway, Portugal, and the UK. High intra-regional telecom prices have limited the establishment of links between neighbouring countries to just five - Gambia-Senegal, and South Africa's links to Namibia, Lesotho, Swaziland and Botswana. As a result, increasing amounts of intra-African traffic must be transited through high-cost, cross-continental links.

However, the recent establishment of the West African marine fibre cable (WASC) has already resulted in plans by operators in Gabon, Cote d'Ivoire, Namibia, Nigeria and Senegal to establish large international Internet links and this may substantially increase the available Internet bandwidth. Senegal has already proceeded in this direction with its 45Mbps Internet circuit to France via the recently installed Atlantis-2 cable, which it is now sharing with neighbouring Gambia. Senegal is planning to become a regional hub and will shortly be linking its Internet backbone to Mauritania and Mali, much like South Africa has done with its neighbouring countries.

Similarly, the availability of low-cost VSAT licenses is expected to have a major impact on the Internet infrastructure in countries that allow it, now that consumer and small-business oriented services have become available over the whole continent via Ku-band satellite footprints from operators such as Panamsat, Intelsat and News Skies. Satellite hubs can even be built at the new marine cable landing points to more provide economical onward satellite connectivity to regions without terrestrial telecommunication infrastructure. In addition ISP associations in

Africa are planning to interlink their national Internet exchange points via fibre and satellite to reduce the amount of internal traffic that must flow off-continent.

# 2. Status of TeleAccess: Inside Africa



**Teleaccess** encapsulates how people communicate using fixed-line telephones, mobile telephones and the Internet. Teleaccess underpins the development of an information-based society and its indicators help to map the contours of the 'digital divide' challenge to connect every village in the world through at least one of these ICTs before the World Summit on the Information Society (WSIS) - in 2005.

This map shows the current status of connectivity for people in Africa, depicting fixed lines, mobile and local Internet access superimposed over population density. It shows the geographic and cultural patterns of ICT penetration and uptake in Africa, and helps to identify areas of high population density that remain unconnected.

The circle in each country represents fixed lines. The size of the circle indicates, to exact size, teledensity in each country. The pie chart shows the split of fixed lines between the largest city (darker segment) and the rest of the country (lighter segment). The blue areas show the geographic extent of mobile GSM coverage. The small red and green dots show the locations of Internet points of presence (POPs) where ISPs have installed equipment for local access. The dots are coloured green in countries where there is a local call tariff nationwide for dialup Internet access. This reduces the pressure on ISPs to put up local infrastructure until demand in that location warrants the cost savings. The dots indicate at least 1 publicly accessible POP in the city or town, and do not include Internet access for private VSAT connections.

A total of 226 secondary cities and towns are now 'online' in Africa. Mobile subscribers have surpassed fixed lines (about 24m vs 20m in 2001) and mobile coverage has generally spread beyond the reach of fixed-line infrastructure. In most cases, fixed lines are concentrated in the capital city, leaving the vast majority of villages unconnected for Internet access due to the high cost of using mobile GSM phones. Internet growth is constrained by both these factors as well as the extent of the electricity grid, the availability of computer equipment and low levels of literacy. Diversity of languages is also an important factor as there is little locally developed content - a 'chicken and egg' factor which will hopefully be addressed by the growing number of e-government and indigenous content development initiatives. Cost is still the key issue: with low incomes per head, in many countries the bulk of users who can afford a computer, telephone and ISP subscription have already obtained connectivity. The opportunity for socio-economic development that the information society offers Africa will depend on enlightened public access policies promoting the rapid deployment of telecentres and cybercafes in the vast rural areas via new low-cost infrastructure such as VSAT, WiFi and Bluetooth.

# IV. Schoolnetworking Baseline Scan

This study has been commission by the International Development Research Centre (IDRC)'s Acacia Programme in partnership with the United Nations Economic Commission for Africa (UNECA) and SchoolNet Africa, as an important sectoral contribution to a broader study entitled *Scan-ICT*. SchoolNet Africa is an independent non-government organization, which promotes education through the use of ICTs in schools across Africa.

**Introduction**

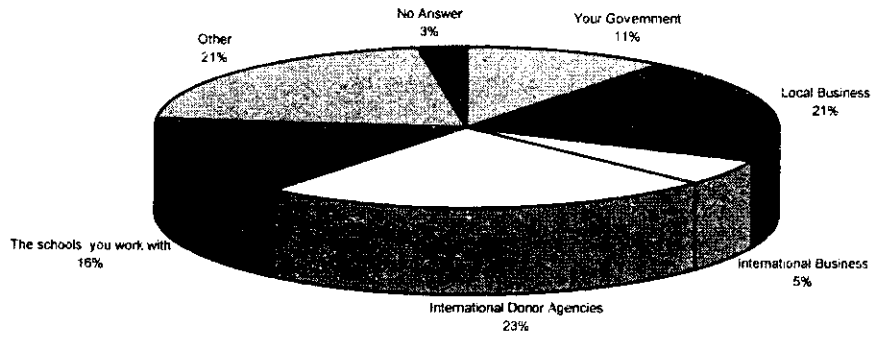
Email questionnaires were sent to SchoolNets in 26 African countries. Of these, 16 questionnaires were returned. To complement the quantitative data obtained from the questionnaires, telephonic interviews were conducted by SchoolNet Africa to follow up on specific issues in more detail.

In this chapter, the results of these questionnaires and interviews are presented. The main aim of the chapter is to provide an overview of school networking in Africa. This will be done in three sections. The first will describe the organizational structure and issues faced by SchoolNets across Africa. This will be followed by a discussion of the services provided. The final section will provide additional details on the context of the member schools.

**SchoolNets in Africa – organizational issues**

According to the survey, one of the oldest schoolnet organizations in Africa is the initiative started in Egypt in 1996. Of the sample, most of the SchoolNets (31%) started in 1999, 25% in 1998 and 13% each in 2001 and 2002. These SchoolNets have different numbers of schools involved in their programmes. In 43% of cases, there are 25 or fewer schools and in 13% of cases there are between 25 and 50 and between 50 and 100 schools.

**Figure 1: Sources of Funding for SchoolNets**




Funding for these organizations comes from a variety of sources, the most common being international donors (23%). Local business provided support in 21% of cases and governments in 11% of cases. These figures are important as they show the role that public-private partnerships play in integrating ICTs into schools across Africa. Interestingly, in 16% of cases, the member schools also provided funding. There is insufficient information to know whether this money was contributed as membership fees or in other ways, but it is significant that there appears to be such willingness and ability on the part of schools, many of which face severe resource constraints, to contribute funds to their relevant SchoolNet. However, this statement should be qualified with the fact that 77% of member schools are estimated to be in urban areas. It is thus likely that the schools participating in the SchoolNets at present are the better resourced in each country. Figure 8 below shows the sources of funding for the running of SchoolNet organizations.

Interview questions about experiences with devising financially sustainable platforms for a SchoolNet organization revealed the following responses.

*"It seems to me that partnerships building is the strongest platform for sustainability. Regular contributions and fees from telecentres or member schools will never be sufficient to cover all the operations of our SchoolNet. We need to establish a local partner who should agree to underwrite some of our operations and then supplement this with donations from other local and international donors/partners. We also need to raise funds by charging for some of our services especially to non-member institutions".*

*"Sustainability is the key to success and survival. Each project/programme should have a sustainability plan else we will be dependent all the time. This might be threatening to the continuation of any project. The plan should be put in place to ensure the sustainability and success of the SchoolNet as well as the programmes. It is very important and critical. We have*

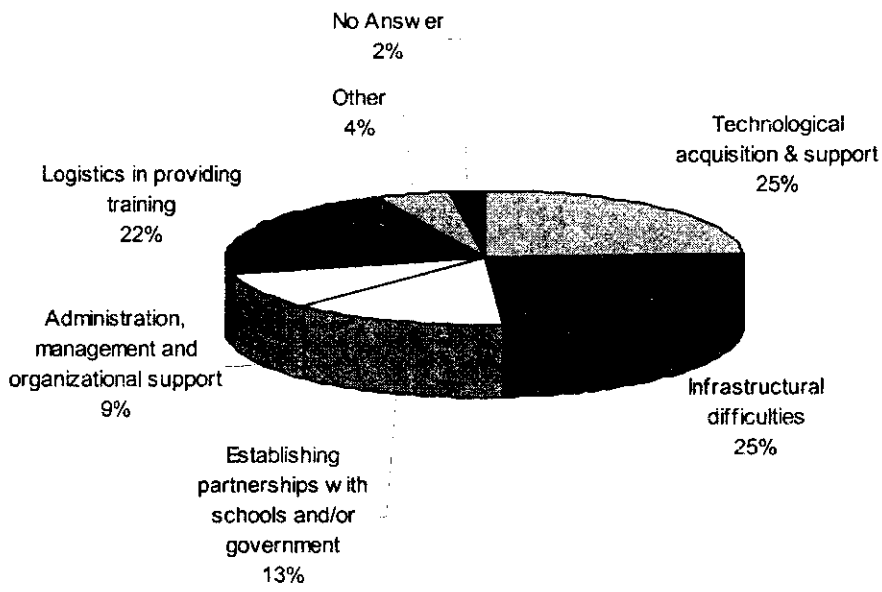
*worked out a plan...it is short-term plan and long-term plan that reflects the different activities".*

Most of the SchoolNets, 47%, are structured as an independent NGO; 26% are part of an international programme and 16% are based in the Ministry of Education or Telecommunication. While there are many advantages to SchoolNets being independent of governments, the integration of ICTs into teaching and learning at all levels of the education system in a country requires the support of the relevant ministries and government departments, and as such, more SchoolNets could be based in government ministries or departments than the 16% at present.

SchoolNets were also asked to describe the management structure of the organization. Some SchoolNets have a more formalized management structure than others, but the most common management structure appears to be a Board of Directors/Trustees or a national steering committee. For example, SchoolNet SA is a registered non-profit company with a board of directors of around 5-7 members, including audit and human resources committees. The board appoints a Chief Executive Officer (CEO). The CEO and senior management staff form a management team and this team meets every 2nd week. The Computer Education Trust (CET), a schoolnet project in Swaziland, is also run by a board of directors with His Majesty, King Mswati III, as the patron. The national director is responsible for the everyday running of the organization. CET also has a 4-member technical team and two part-time support staff. The Zimbabwean SchoolNet has a national steering committee chaired by a representative from the Ministry of Education.

Questions about the difficulties faced by school networking organizations revealed that technological support and infrastructural problems were the main difficulties reported (25% for each). Figure 2 provides more information about the types of difficulties experienced.

**Figure 2: Difficulties Faced by SchoolNets**




These quantitative questions were also followed up with open-ended questions about difficulties. The responses indicated difficulties in several areas. Perhaps most often cited was a lack of buy-in from government departments and other stakeholders as the following few quotations highlight.

*"Most difficulties are as a result of lack of local buy-in from various government agencies and stakeholders and minimal understanding of the benefit accrued to supporting SchoolNet project".*

*"It has been difficult to engage with some provincial government processes".*

*"We have difficulties to engage the partners and government in the programme".*

The problem of lack of government support, as noted above, has implications for integration of ICT into school systems rather than an approach that views ICT as an add-on only. This issue was clearly expressed by a respondent.

*"As ICT training has not been institutionalized in our schools, it is not considered a part of the curriculum and appears as extra work for youth and youth cyber-club facilitators".*

Lack of funds was also commonly cited. These funding problems related to purchasing of hardware, telephone costs, and networking costs. Difficulties due to infrastructure problems were also highlighted. This means that in some schools, computers are not networked, and there is a general shortage of workstations. The need for sourcing alternatives for hardware was

noted by one respondent. Capacity and training issues were also seen as difficulties in some cases. The difficulty of obtaining help from well-trained professionals, as well as a lack of appropriate training materials and unavailability of trainers due to tight schedules was noted.

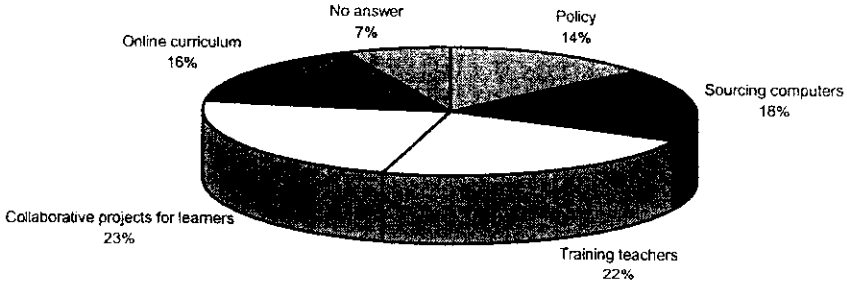
The following response perhaps sums up the difficulties faced by SchoolNets in Africa more broadly.

*"This is a relatively new approach to learning and as such there is quite a large percentage of shortfalls in all areas".*

The establishment of SchoolNets not only requires infrastructural and organizational change but, for many countries, changes in pedagogical practice in order to integrate ICT into curricula and into education systems more generally. As a result, many challenges emerge. It is hoped that this baseline research will provide a platform from which an overarching body such as SchoolNet Africa can provide a forum for tackling such issues.

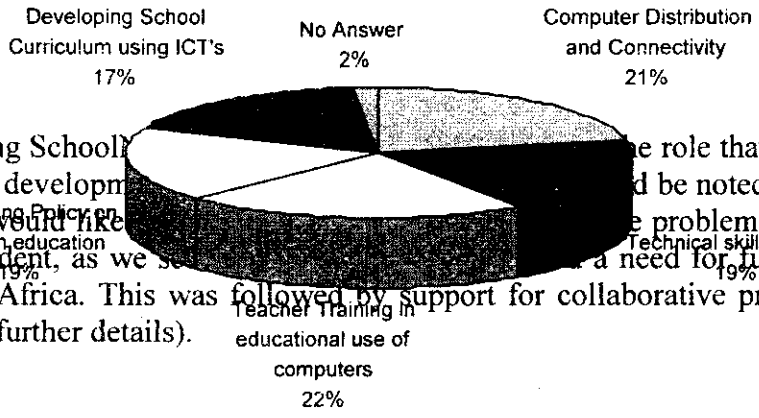
Respondents were asked whether they had plans to develop their organizations further; 87% said YES and 13% did not answer. No respondents directly responded NO. Figure 3 shows the areas in which these 87% wish to develop their organizations.

**Figure 3: Areas in which SchoolNets Plan to Develop**




We see here that it is in support services, namely collective projects for learners and teacher training, that most SchoolNets plan to develop. Sourcing computers remains an important area of activity, but it appears that SchoolNets across Africa see their role as far more than the provision of computers to schools. These support services will be discussed in more detail in the next section.

**Figure 4: Support Required from SchoolNet Africa.**

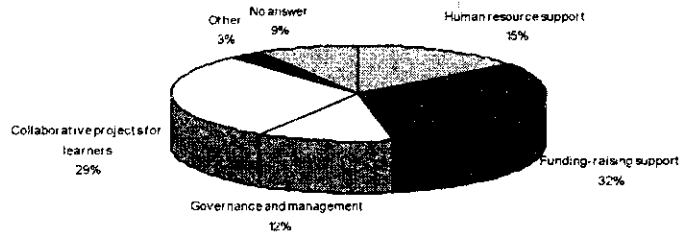



Before considering School[illegible] role that SchoolNet Africa might play in the developm[illegible]d be noted. SchoolNets were asked how they would like [illegible]e problem of lack of funding once again is evident, as we s[illegible] a need for fund-raising support from SchoolNet Africa. This was followed by support for collaborative projects for learners (see Figure 4 for further details).

**SchoolNets in Africa – Services provided**

Figure 5 shows the activities that SchoolNets are involved in and so provides an introduction to this section. This section will provide additional information on what is required to support school networking in the African context. We see that teacher training and computer distribution and connectivity have been the two main activities of SchoolNets thus far (22% and 21% respectively). These two areas are closely followed by activities supporting policy on ICT and education and technical skills training (19%). Developing school curricula is also an important activity.

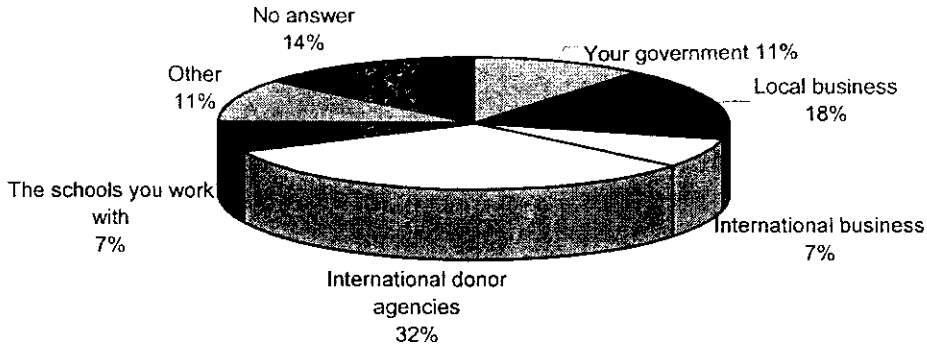
**Figure 5: Activities in which SchoolNets are Involved**



Various other activities were also listed in response to the related open-ended question. Awareness-raising activities about the role of ICT in education have been undertaken. These include annual conferences for ICT in education, national Internet days, the promotion of collaborative projects and the sharing of experiences. Collaborative projects and experience sharing are important for developing a culture of ICT and education within schools and education systems.

As noted above, computer distribution and connectivity accounted for 21% of SchoolNet activities. Most SchoolNets noted that they sourced these computers from local suppliers (49%) and some from outside of the country (28%). Funding for computers specifically was again found from a variety of sources, with international donor agencies being most common (see Figure 6 below). Additional technical services provided to schools included technician visits, technical training, back-up systems, helpdesks, training on computer maintenance, website services, and assistance with software acquisition and installation.

**Figure 6: Sources of Funding for Computers Specifically**

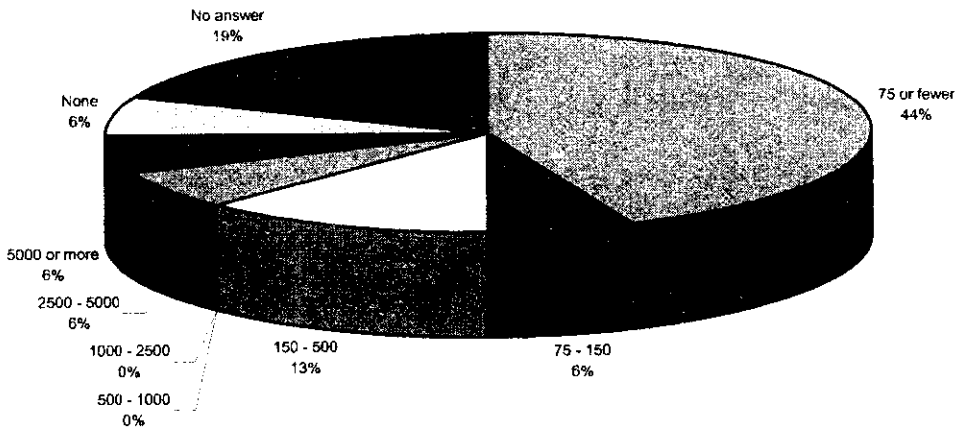



We see from Figure 6 that only in 7% of cases do schools provide funding for computer acquisition. This is in comparison to the 16% of funding provided by schools for SchoolNet functioning. It thus seems that, while schools are willing and/or able to support to some extent the running of SchoolNets, they are not as willing or able to provide support when it comes to sourcing computers specifically.

Teacher training is the main activity in which SchoolNets have been involved (22% - see Figure 5). The questionnaire responses allow us to explore this important area of activity further. Figure 14 shows the numbers of teachers that have been trained by SchoolNets in Africa. Although this area of activity has been noted as dominant, numbers of teachers trained remain fairly low. In 44% of cases, 75 or fewer teachers have been trained. While all teachers

training is of fundamental importance, a critical mass of trained teachers is needed if Africa is to see ICT being integrated into teaching and learning across curricula. Thirteen per cent of SchoolNets did report training between 150 and 500 teachers. The respondents estimated that 59% of teachers who have been trained are male and 41% female.

**Figure 7: Number of Teachers Trained by SchoolNets**




SchoolNets were further asked to describe the structure of teacher training and the skills taught. Different approaches to teacher training were noted, with most including a computer literacy component, and, in some cases, integration of ICT into education more broadly. A 'train-the-trainer' approach, where teachers are trained and then assisted with training of other teachers, was also noted. A modular approach was specified in three cases. The following examples show the types of modules included.

Example One: These modules are taught using a combined distance and face-to-face education and the focus is on integration of ICT into teaching and learning using the following modules:

- Word Processing for educators;
- Spreadsheets for educators;
- Finding information;
- Using Web resources;
- Designing Web Pages;
- Questioning and Thinking Skills; and
- Assessing Information Literacy.

Example Two: Four main modules, some short-term programmes and some long-term programmes:

- Basic ICT Skills;
- Networking and Connectivity;
- Advanced IT tools and the Web; and
- Engaged learning programmes (collaborative).

Example Three: Phased professional development:

- Phase 0: Computer Literacy
- Phase I: Introduction to Internet for Teaching and Learning
- Phase II: Introduction to Tele-collaborative Projects
- Phase III: Curriculum – Technology Integration
- Phase IV: Diffusion of Technological Innovations
- Phase V: Planning for School-based Telecentres.

**Participating Schools**

In this section, further details about the schools participating in SchoolNets will be provided in an effort to further contextualize the situation within which school networking takes place. As noted above, 77% of participating schools are estimated to be in urban areas and 23% in rural areas. One reason for this may be lack of infrastructure such as electricity and telecommunications in many rural areas, which complicates the introduction of ICT. In addition, rural schools are likely to be poorer than urban schools and may not have the resources to be able to join SchoolNets. However, it is also likely that the predominantly urban base of SchoolNets makes it easier for them to work with urban schools.

Representatives of SchoolNets who completed questionnaires were asked to provide information about the availability of computers in their member schools. Responses indicated that 24% of schools had five or fewer computers and only 13% of schools had 25 or more.

Figure 7 shows the accessibility of computers to learners at the school level.

**Figure 7: Numbers of Learners Accessing Computers on a Weekly Basis**

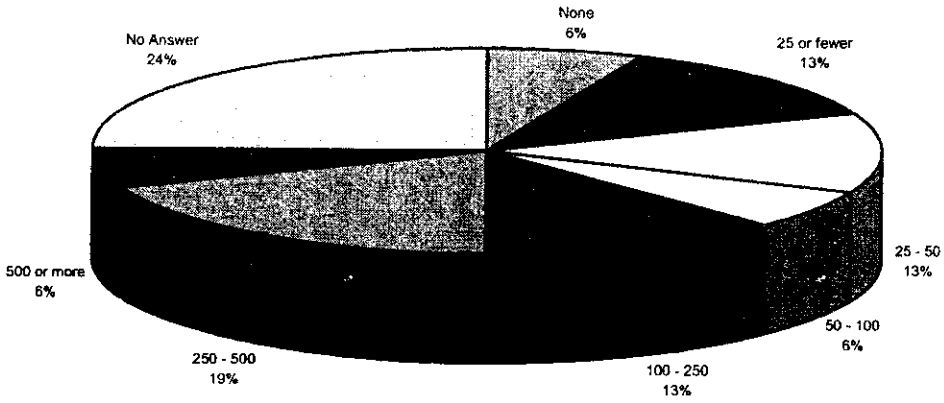
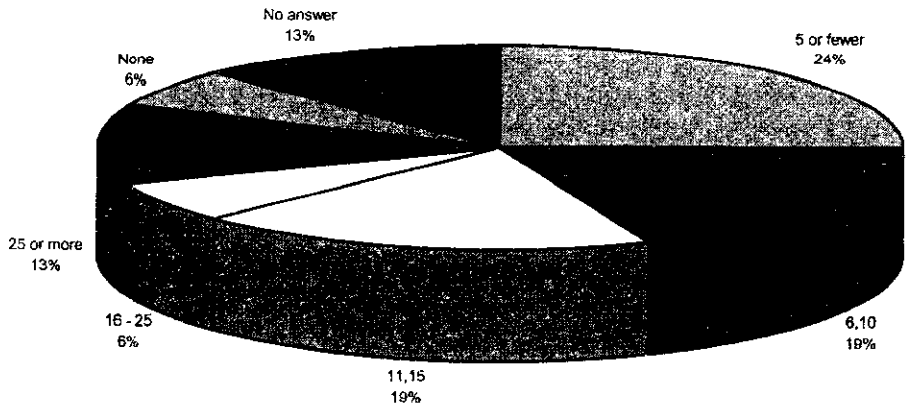



**Figure 8: Number of Computers in Schools on Average**



Of these computers, 27% were estimated to be Pentium 1s, 23% Pentium 2s, and 19% Pentium 3s and 486 IBMs or older. A range of different types of computers are available. This needs to be taken into account when developing educational materials, in order to ensure that all schools have the required platforms to make use of the materials. Further, in 56% of cases, only five or fewer computers in a school have access to the Internet. Only 6% of respondents reported 25 or more computers providing Internet access, 13% reported 11-15 computers and 6% 6-10 computers with Internet access.

It is important to note that the Internet should not necessarily be seen as the most important application of ICT in an educational context. In many cases, and for various reasons, it may be more practical to begin with CD Roms and other computer applications before schools begin to make use of the Internet. This low level of Internet access does have implications for school networking. It may be that, in these early stages of projects, other means of communication will be more effective for ensuring networking at the school level and this may need to be integrated in SchoolNet Africa's approach.

Figure 8 shows the types of applications typically available on computers in participating schools.

**Figure 8: Software Typically Available of Computers in Schools**

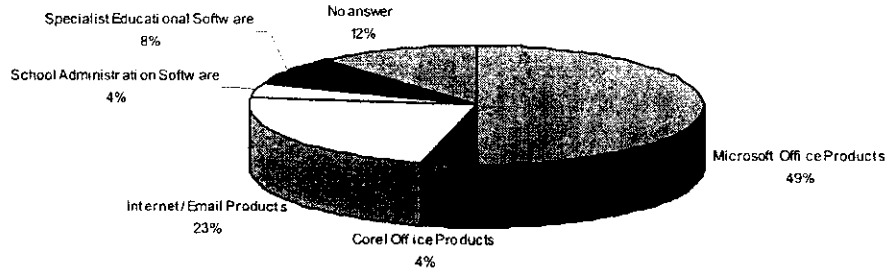



Figure 8 shows that Microsoft Office products represent 49% of software available, followed by 23% Internet and email products. Comparing the low numbers of computers with Internet access noted above with the relatively high percentage of Internet and email products available leads to the conclusion that low levels of Internet use is likely to be due to connectivity and cost problems out of the control of local SchoolNets and SchoolNet Africa. The potential role of ICT to assist in educational administration tasks is often noted in the literature, yet we see that only 4% of software typically available is administration software. It could be that schools

make use of Microsoft Office products for many of these functions, but this may an area that could be further developed at the school level. We also see from figure 16 that 8% of software is typically specialist educational software.

Open-source software has been noted as an important option for school networking, especially where funding is problematic. Figure 9 shows the responses to a question about the use of open-source software in schools.

**Figure 9: Use of Open-Source Software**

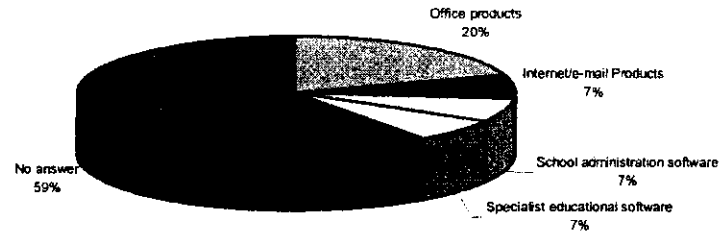



Figure 9 shoes that 59% of cases no answer was given. This may reflect lack of awareness and low levels of use of open-source software. Further responses about the role of open source software were gained from telephonic interviews. The following two responses provide some indication of why use of open source software is currently low. We see that lack of capacity and skills appears to be the main constraints.

*"Open-source software is a good solution for schools that cannot access/ purchase the licensed software. The only challenge is that it is not widely spread. I believe that teachers and students should have a basic knowledge of open source. They need to learn how to access them and do the upgrade. This is one of the skills and knowledge that needs to be acquired".*

*"At present hardly anyone is using open-source software. However there is no doubt that as teachers and students get more technical and needs become more customized, this will be the way to go. My belief is that open-source requires more experience and support and that those who offer it are in a way trying to create business. The real benefits can only be realized if open-source software is implemented wide scale as part of a national SchoolNet plan so that maximum benefit can be realized through sharing information".*

Telephonic interviews also included questions about the factors considered important when making choices about which technologies are most appropriate for schools in a SchoolNet. The following are some of the factors noted:

- Support and involvement of the school (including the principal, teachers, and students);
- A champion who will drive the project/programme at the school level;
- Availability of qualified people who are ready to be trained to work within the schools;
- Sustainability and management factors;
- Initial versus maintenance costs – it is better to pay a relatively high initial cost and secure a system that requires minimum technical support. This applies to both software and hardware choices.
- Scalability – this is also important, both in terms of physical infrastructure and actual technical resources. Schools want a technology that can be adapted to suit a growing number of users.
- Technology design – most technologies are designed with the commercial and industrial sector users in mind. They depend on specialist support and not so much user intervention. School requirements are just the opposite. They want technology that cannot only be operated by a teacher but can also be maintained reasonably easily by school staff. This is because, once technology is deployed in rural and remote areas, it is more sustainable if basic first-line maintenance is offered by a local technician or trained teacher rather than a technical specialist having to travel long distances to perform a very trivial task.

Finally, when exploring the context of networking at the level of schools, it is also important to gain an understanding of the involvement of the community in schools. ICT resources can be used to provide services to the community and community support is also vital for the success of many of the school-level projects. Figure 10 shows the types of community activities in which schools are currently involved.

**Figure 10: Use of Computers for Community Activities**

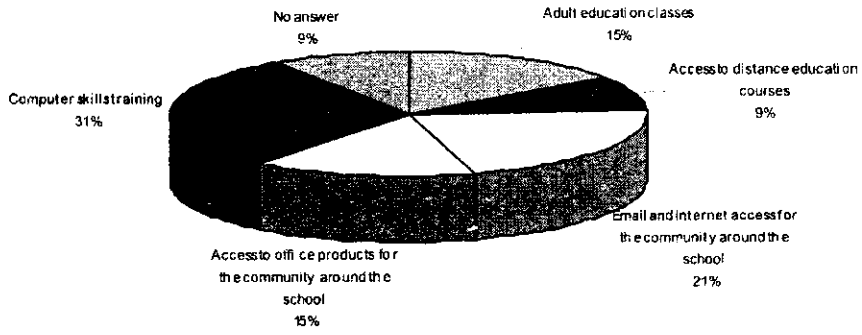



Figure 10 shows that computer skills training is the most common community activity at 31%. This is important because, not only is this a means of increasing the skills base of a country at the community level, but is also a potentially important source of income for a school. We also see use of email and Internet access at 21%. Schools are thus providing an important (business) service to their communities, many of which may not have any other means of accessing email or the Internet. As such, school networking initiatives do have the potential to become community networking initiatives. Some other community activities noted included entrepreneurship training, ICT literacy training, the piloting of tele-health, HIV/AIDS information, DSTV viewing for the school and community, and small business skills development.

## Conclusions

This chapter has provided an overview of the results of the questionnaire and telephone interview research carried out. School networking activity in Africa was described by considering three areas, the organization of SchoolNet organizations, the services provided by SchoolNets and the context at the level of the schools themselves. We have seen the many achievements made with respect to school networking across the continent, as well as the vast range of challenges still to be overcome. Given the low levels of infrastructure, sustainability issues, lack of funding and low levels of support from many government departments, it is useful to conclude this chapter with a quotation from a SchoolNet practitioner about the positive educational effects witnessed when using ICT for education. We thus conclude with a deeper understanding of the challenges faced when developing school networking in the

African context, but also with a clear sense of why it is of such great importance to continue the effort.

*"The most common expected effect is improvement in performance in public examinations. We are not aware of any direct measure of this though we believe that it is certainly being realized to some degree. However the good example we have is one of students from what were perceived as poor high-density schools producing world-class educational websites and collaborative project material. By using ICTs, those of our students who have access seem to get better at expressing themselves not just to people around them but also to a worldwide audience. The result is that they develop a better self-image, personal and national identity and yet at the same time realizing that they are part of a global community".*

This Baseline Scan marks an important beginning in the systematic generation of knowledge and learning on the experience with ICT in African schools. Because it is the beginning of this process, there remains many gaps in the research that further research processes can undertake. This Scan focused mainly on schoolnet initiatives in the form that they existed in 26 African countries. The schoolnet organization was the unit of analysis and much of the focus of the study was on the experiences of schoolnet organizations. Because it was not part of the research brief, very little if any information was gathered on the experiences at school level such as the extent to which investment in ICT in schools affects the schools financial, social and educational environments. Very limited information is also available on the experiences of African learners, teachers and school managers of the use of ICTs. Very limited information is available too, on the supply chain of ICT in schools – the nature and extent of government ministry involvement, the involvement of the parent and residential communities in which the schools are located and the role of the private sector. This Baseline Scan therefore opens the way for further investigation into these areas.

At the same time, the Baseline Scan research instruments can be used as a basis for continuous monitoring of progress with schoolnet organizations. In this regard, the research instruments can be refined to fulfill this purpose.

There remains considerable skepticism about the efficacy of investing in ICT in African schools. Many still believe that the priority investment should be in textbooks, school infrastructure and teacher development instead. This necessitates conscious investigation of the evidence that ICT has made a difference to the learning experience of both African learners and teachers. The research agenda on ICT in African schools remain wide. This Baseline Scan marks an important stepping-stone towards achieving the objectives of this research agenda.

# V. Country Level Scan-ICT Studies

In the pilot phase of the project, Scan-ICT baseline studies were carried out in six African countries, namely, Ethiopia, Ghana, Morocco, Mozambique, Senegal and Uganda. This final Scan-ICT synthesis was undertaken as a compilation of the six country reports by extracting summaries from them, which were completed between September and November 2002.

## 1 Brief ICT Profiles by Scan ICT Country

### *1.2.1. Ethiopia*

Virtually all social and economic development indicators reveal that Ethiopia is pitifully behind the rest of the world in human development. The country, with a population of 65 million – the second-largest in sub-Saharan Africa – has neither tangible mineral resources nor rich agricultural potential to help accelerate development. However, it can make use of new technologies and improve the efficiency at which its available resources are used, thereby achieving rapid growth.

Nonetheless, ICTs in Ethiopia are generally highly underdeveloped, although the telephone made its debut in the country in 1894. In spite of the recent liberalization and privatization in various other sectors, the telecommunications industry has remained under Government control. The Ethiopian Telecommunications Corporation (ETC) is the only provider of fixed and mobile telephone, facsimile, Internet Service Provider (ISP), telegraph and telex services.

Teledensity is very low in Ethiopia and varies from region to region. Moreover, the main lines serve only 65 per cent of the expressed demand of the country, and the proportion of the waiting list relative to main line connections was 55 per cent in 2000-2001. Low speed, together with high service charges, has undermined the benefit of Internet connections in particular. The waiting time for connections and uploading/downloading documents is very long, especially during peak hours. Apart from discouraging individual users, existing Internet service has become very expensive, and many institutions have restricted Internet access. Mobile telephony, meanwhile, is restricted to the capital, Addis Ababa, and to two nearby towns, but plans for expansion are underway.

ICT penetration and usage in schools and health facilities vary markedly by type of ownership (Government vs. non-Government). Government-owned facilities lag behind those owned by the private sector, and the dissemination of ICT beyond the capital and a few major regional towns – to the rural areas, where most people live – is extremely low. In addition, ICT penetration was generally higher among the sample public administration institutions than education or health facilities. Employees in the selected sectors personally own some basic ICT items, but the rate of ownership varies by sector and was highest among health professionals.

### *1.2.2. Ghana*

Like most African countries, Ghana faces a poor infrastructure base for ICT. Electricity covers only 65 per cent of the country, and illiteracy is high, estimated at 38 per cent of the population of 18.4 million (Gyewu, 2003). All this serves to constrain ICT development. Even so, Ghana's ICT sector has undergone a remarkable transformation during the past 15 years, including the introduction of FM radio, cable TV, mobile phones and Internet. The emergence of these communications services also gave rise to a number of institutional and regulatory initiatives, including liberalization of the telecommunications sector through deregulation in 1994. At that time, the Government authorized two national network operators, a duopoly that ended in February 2002 when the exclusive status of both companies was lifted.

The expansion of the telecommunications sector has in recent years led to significant employment and job creation, especially in the service sector. For example, every small neighbourhood of about 20 households has about 3 to 5 communications centres, each employing about 2 to 3 people, the vast majority of them women. The Ghanaian ICT sector is dominated by computer vendors and distributors of computer products and services. The hardware sector is mainly comprised of small enterprises involved in the sale of computers and peripheral equipment. Some limited local assembly of computers exists, as does limited local software development. Overall, it appears that ICT is making a small but positive contribution to GDP, through "multiplier effects" on other sectors of the economy.

### *1.2.3. Morocco*

Among the six Scan-ICT pilot countries, Morocco seems to be the most advanced country overall. Opportunities in the Moroccan telecommunications sector are increasing exponentially, making the country one of the fastest-growing markets in the world, particularly for mobile telephony. In addition, the Moroccan Internet market ranks second in all of Africa, and the entry of foreign competitors has forced prices and subscription fees to come down, making Internet more accessible and fostering a huge presence of Internet cafes. This foreshadows continued strong growth despite a currently modest subscriber base and high tariffs.

The Morocco 2000-2004 Economic and Social Development Plan outlines telecommunications as the country's strategic sector for its 31.5 million inhabitants. The strategic plan for ICT, known as e-Maroc, aims at developing new technologies for use in education, administration and the private sector, focusing on e-learning, e-commerce, and e-governance, and reaching 10 million Internet users by 2010. Morocco has been ranked as having the most autonomous telecommunications regulator in all of Africa and the Middle East, and the Government has been aggressive in combating software piracy (Eastern Michigan University et al., 2003). Two segments of the ICT sector are very active in exports: software development and teleservices.

### *1.2.4. Mozambique*

The political stability in Mozambique following 30 years of attempting to bring about a lasting peace has been a decisive factor in its overall recent economic success. Indeed, before the devastating floods of 2000, Mozambique had been considered among the countries with the fastest economic growth in the world. The economic growth trends continued after the floods, but the country has needed time to re-establish its previous levels of development.

The national telecommunications network, which is primarily limited to urban and semi-urban areas, has not yet been fully liberalized. However, the Government has devoted considerable effort to moving toward creation of an enabling environment for ICT development, although more substantial changes still are required to benefit the 18 million citizens of Mozambique. In December 2000 the Government adopted a National ICT Policy, followed by its respective Implementation Strategy in June 2002. The ICT Policy identifies six priority areas: education; human resources development; health; universal access; infrastructure and governance. To address the challenges faced in each area, the Implementation Strategy presented 37 priority projects, divided into short-, medium- and long-term.

### *1.2.5. Senegal*

Compared to other African countries, Senegal is considered to have one of the best telecommunications networks on the continent. It is connected to the outside world by submarine cables and satellites, and the network is fully digitalized. At the national level, mobile and fixed telephone networks are accessible by most of the population of 9.8 million, and numerous ICT workshops have been organized for marginalized groups such as women, youth and the disabled. ICT represents 7 per cent of Senegal's GDP, with mobile telephony in particular as an important driver of the connectivity market. A hallmark of Senegal's telecom development is also found in the thousands of privately run telecentres, ranging from small public phone offices to multi-computer cybercafes. These successful enterprises, which have been cited as a potential model for other countries, provide access to telephony, fax, Internet and message services for the vast majority of Senegalese, particularly in the rural areas.

The national operator, Sonatel, has a monopoly on fixed national and international telephony, data, leased lines and fixed satellite service, although liberalization has begun. Despite the monopoly, and unlike most sub-Saharan African countries, the network has grown fairly rapidly in recent years. Sonatel has an aggressive rollout programme and has connected 2,000 towns and villages to its advanced fibre and microwave backbone. Telecommunications revenues represent 3.5 per cent or more of GDP, well above Africa's average (Centre for Strategic Planning, 2002). Although literacy in Senegal is low, at only about 37 per cent, the Government's commitment to expenditure on education, at one-third of its budget, is very high and bodes well for future ICT potential.

Senegal is also planning to become a regional telecommunications hub, having already built a VOIP-based link to Gambia. It is in the process of installing fibre links to Mali and Mauritania (ibid.).

### *1.2.6. Uganda*

Like Mozambique, Uganda's economic performance has been impressive in the past decade. Since 1990/1991, the average GDP growth has been 6.9 per cent per annum, and significant progress has been made in trade liberalization, privatization, civil service reform, financial sector reform and decentralization. ICT, like other economic sectors, registered significant growth over the same period (Government of Uganda, 2002).

Less than a decade ago, Uganda's communications infrastructure was among the least developed, not only in Africa, but also in the world. Now, however, Uganda is transforming itself into a service-oriented economy where ICT plays an important role in supporting the expanding business sector, agriculture, manufacturing, tourism and related industries for its approximately 24.7 million people.

The telecommunications sector was liberalized in 1996 by a policy framework that provided for the introduction of competition and licensing for multiple operators. Although overall ICT coverage remains concentrated in urban areas, technologies now adopted include: mobile telephony, which has experienced tremendous growth; paging and courier services; and multipurpose community telecentres.

The current status of ICT in Uganda has been influenced not only by the Uganda Communications Act of 1997, with the objective to increase the penetration and level of telecommunications services in the country through private sector investment, but also through the Rural Communications Development Policy of 2001. The latter policy is to provide access to basic communications services "within reasonable distance to all people in Uganda," since large parts of rural Uganda still have little or no telecommunications infrastructure.

In general, the penetration of computers in both the public and private sectors is fairly high compared to many other African countries. Most institutions of higher learning, both private and public, offer some level of ICT skills training; other privately owned institutions offer a range of training as well. A curriculum for ICT training for secondary schools has been adopted.

## 1.3 Conclusion

Table 1.1 below summarizes the overall status of the telecommunications sector (liberalized or Government monopoly) in the six Scan-ICT pilot countries.

**Table 1.1 Liberalized Telecommunications Sector**

| | **Ethiopia** | **Ghana** | **Morocco** | **Mozambique** | **Senegal** | **Uganda** |
|---|---|---|---|---|---|---|
| Yes | | X | X | | X** | X |
| No | X | | | X* | | |

*Privatization of national operator is under way and expected to be completed in 2004.

** Liberalization of local, national and international telecommunications services is expected to be completed in 2004. Mobile telephony services have been liberalized since 1999.

The Scan-ICT survey results show clearly that the six pilot countries are following different ICT development patterns – from highly challenged to comparatively advanced – which have resulted in different ways of addressing ICT challenges. In some cases, building infrastructure has been emphasized, while in others education/training and a strong skills base are paramount. In all, however, some combination of unshackled telecommunications systems and the sufficient regulatory capacity to sustain and manage ICT activities is requisite to overcome the considerable constraints to ICT that still exist in Africa.

# 2 ICT Infrastructure

## 2.1 Telephony (Fixed and Mobile)

Telecommunications sectors in most Scan-ICT pilot countries have experienced tremendous growth, primarily attributable to the liberalization of telecommunications services. Local capabilities are now wide-ranging, involving digital switching, optical and microwave transmission, wireless equipment and satellite communications. Even so, large parts of rural areas lack telecommunications infrastructure, and the cost of services is still too high for most Africans.

Overall, network evolution is occurring rapidly, from fixed lines to mobile; in Uganda, for example, there are more than 400,000 mobile lines completed to 60,000 fixed lines. By 2002, the number of mobile telephones in Senegal – which as recently as 1996 had totaled only about 100 – also had nearly doubled the number of fixed telephones, to about 550,000. Mobile teledensity in Morocco is estimated at 17 per 100 people. Different reasons have been given for this trend, but mobile services provide a viable solution to challenges arising out of inadequate spread of the fixed-line infrastructure, the need for quick deployment and ease of installation, and requirements for general mobility.

Even though mobile costs are coming down, the majority of people cannot afford handsets or other such products. Because the cheapest brand-name mobile phone still costs, on average, about $US50 in Mozambique, a country where salaries average $US33 a month, many people prefer to buy non-brand-name or secondhand sets. Also in Mozambique, many mobile subscribers – usually those with the least financial resources – have joined a pre-paid system whereby they purchase the cheapest card and simply "beep" others they want to call them back. Costs of name-brand mobile handsets in other countries, such as Ethiopia, range from $US70 to as high as $US435.

Despite the growth of mobile telephony, overall teledensity in Africa remains generally very low and basic telephone services fall short of real needs; in many cases, the quality of the support network and associated services is below International Telecommunications Union (ITU) standards. Teledensity also can vary enormously by region; in Ethiopia the number of people per main telephone line ranges from 15.4 for the capital, Addis Ababa, to 1,935 in Somali, a region mainly inhabited by nomadic pastoralists. Copper is still generally used for connecting end users to a secondary network, and fiber-optic networks are still in the early stages in some countries. Both dial-up and leased lines are offered, as are ISDN services;

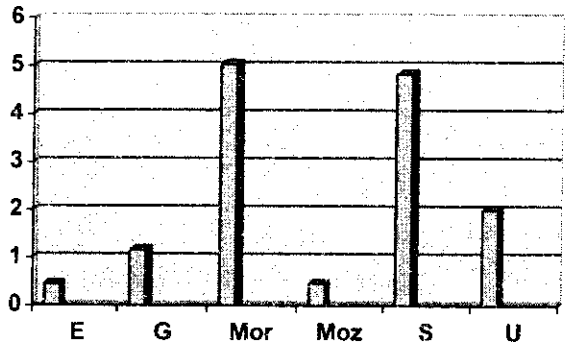
however, given the high cost of bandwidth, leased lines and ISDN are generally used only by commercial enterprises such as ISPs, Internet cafes and banks.

Table 3.1 and Figure 3.1 show the average teledensity per 100 inhabitants for each of the six countries:

**Table 3.1 Average Teledensity Per 100 Inhabitants**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Teledensity | 0.45 | 1.16 | 5.03 | 0.46 | 4.84 | 2.0 |

**Figure 3.1 Average Teledensity Per 100 Inhabitants**




The accessibility of public pay telephones also varies widely, from about .000001 per 100 people in Ethiopia to 3.1 in Morocco, as shown in Table 3.2.

**Table 3.2 Number of Public Pay Telephones Per 100 Inhabitants**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Number pay phones/100 people | .000001 | .16 | 3.1 | N.A. | N.A. | * |

*At least 1,500 pay phones exist in the country, but no precise figures are available.

Although overall figures are still very low, the number of fixed-line subscribers has sometimes increased by as much as 10 per cent annually, as have waiting lists for phone lines. Table 3.3 shows the current number of fixed lines in the pilot countries.

**Table 3.3 Total Number of Fixed Telephone Lines**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Number of fixed telephone lines | 283,693* | 242,000 | 1,425,000 | 89,488* | 280,000 | 60,000 |

*Number of fixed-line subscribers

Meanwhile, mobile telephony subscribers have grown exponentially, as in other parts of the world, and surpass fixed subscribers in at least three pilot countries; mCel, the mobile service provider in Mozambique, increased its subscriber base from 2,500 in 1997 to 152,652 in 2001. The Ghanaian base, meanwhile, rose from 6,200 in 1998 to the current 230,000. As might be expected, the vast majority of mobile phones – up to 92 per cent, in some cases – are in the private sector, where demand remains very high. Table 3.4 illustrates the number of mobile subscribers on a country-by-country basis.

**Table 3.4 Total Number of Mobile Telephony Subscribers**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Number of mobile telephony subscribers | 27,532 | 230,000 | More than 5 million | 152,652 | 550,000 | 276,000 |

## 2.2 Television and Radio

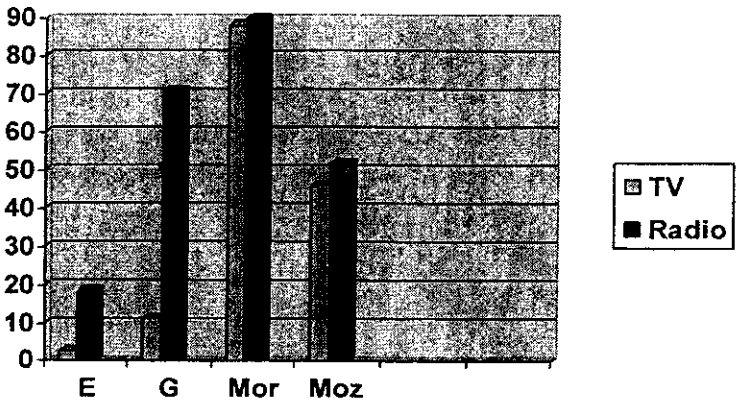
Although television sets continue to be luxury items for most Africans and is primarily an urban phenomenon, progressive improvement in TV penetration on a national scale has been evident. For its part, radio remains the most popular and accessible medium. Table 3.5 and Figure 3.2 show the comparative percentages in each pilot country for TV and radio ownership.

**Table 3.5 Percentage of Ownership of Television Sets and Radios**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Television | 2.8 | 11.4 | 88 | 46 | N.A. | N.A. |
| Radio | 18.4 | 71 | 89.8/76.9* | 52 | N.A. | N.A. |

*Urban residents/rural residents

**Figure 3.2 Percentage of Ownership of Television Sets and Radios**




At the same time, the liberalized telecommunications sector in most of the pilot countries has allowed private television and radio stations to flourish. A notable exception is Morocco, where the figures are comparable to those under the state-controlled Ethiopian regime. Table 3.6 and Figure 3.3 illustrate the number of private TV and radio stations by country.

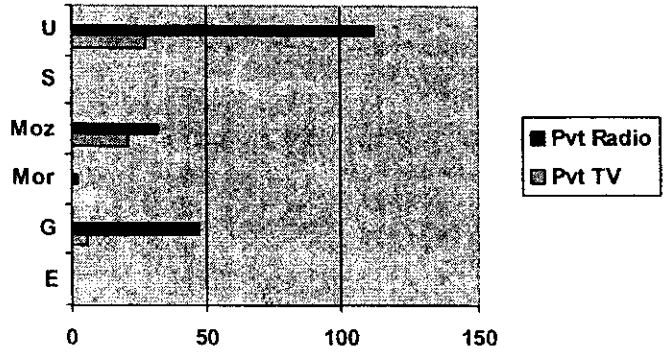
**Table 3.6 Total Number of Private Television and Radio Stations**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Private TV stations | 0 | 6 | 0 | 3 | N.A. | 27 |
| Private radio stations | 1* | 47 | 2 | 4** | N.A. | 112 |

*The "private" radio station, Radio Fana, is not strictly privately owned. It was originally a clandestine radio of the Ethiopian Peoples Revolutionary Democratic Forces before the resistance force took power in 1991.

**Total figure N.A., but partial figure includes Radio Miramar, RTK, Radio Terra Verde and RTPAfrica

**Figure 3.3 Total Number of Private Television and Radio Stations**



## 2.3 Computers and Internet Connectivity

The cost of a computer is still very high relative to average income in most African countries; in Ethiopia, for example, it is nearly 16 times – or 1617 per cent of – a GDP per-capita income of $US106 [a TV set costs about four times the per-capita income]. High costs of computers, not surprisingly, have been identified as one of the most important constraints in the expansion of ICT on the continent, as outlined further in Section 3.6.

Few countries register the number of computers available. Morocco, however, estimates that the total number of its computers tops 500,000, for an average of 1.67 computers per 100 Moroccans. Fuller statistics are generally available on Internet subscribers or users, given that the Internet service market often is one of the most dynamic and competitive areas of the ICT sector. Robust growth has occurred in Ghana, for example, where the number of Internet users has soared to 40,500 from 300 in 1995, giving a penetration of 19.36 Internet users per 1,000 people. In Senegal, however, the Internet market remains relatively small, with the number of *internautes*, or frequent users, estimated at only 11,000; in large part this is due to a lack of dynamism rising from a monopoly by the national operator over international IP connectivity. Also in Senegal, many small and medium-sized businesses maintain email accounts for business communications but make little use of other Internet services.

Table 3.7 gives the estimated number of Internet subscribers or users in the six pilot countries; the estimated number of users is usually several factors higher than actual subscribers. [Again in Ghana, it is estimated that there are 6 Internet users for every .76 subscribers.]

**Table 3.7 Estimated Number of Internet Subscribers or Users**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Estimated number of Internet subscribers | 6,487 | 40,500* | 500,000* | 60,000** | 100,000* | 5,999 |

*Estimated number of Internet users

** E-mail users only

### *2.3.1. Telecentres*

Existing telecentre models in the Scan-ICT pilot countries represent different typologies. Some are basic, community-owned telecentres, while others are business-oriented or multipurpose centres. Many have been established in partnership with local organizations. Although "telecentre" may be used for anything from a simple public phone to the most sophisticated facility, most offer a mix of basic services, including email and Internet access; basic computer skills training; access to computers and CD-ROMs; information dissemination; telephone; word processing and design; printing; photocopying; scanning; CD writing; binding; and electronic library.

Again, wide variations are found; Uganda currently has 47 telecentres, up sharply from just 1 in 1996, but still a minuscule amount compared to Morocco's 2,500 cybercafes and Senegal's estimated 12,492 telecentres. Given the extensive network of telecentres in Senegal, it has been estimated that 90 per cent of people in Dakar, the capital, can now receive telephone calls; messengers from the telecentres bring them messages or will inform them that they have to return a call (Centre for Strategic Planning, 2002).

## 2.4 Content

Local content development remains relatively new and usage still very low in most of the Scan-ICT pilot countries. In Mozambique, for example, the first significant steps toward content development were made only in 1997, while in Ethiopia the total number of local websites was only 88 in 2002-2002. Reasons include low penetration of the Internet; limited access to Internet; limited institutional connectivity; limited skills of web design; and high cost of local web-hosting services.

Most sites display commercial content, with relatively few non-profit sites, such as on rural community development or academic and research activities. In general, many Government websites do not have information that is useful to the general public or institutional customers, and few applications or enquiries can be submitted through the Internet. Little legislation exists on web content.

## 2.5 ICT and Gender

In many of the Scan-ICT pilot countries, girls, especially in rural areas, still have limited access to education. The involvement of women in business-related activities in many of the countries is also often low. Virtually no information was available on differences in gender usage of ICT. In Mozambique, however, it was found that only 38 per cent of computer users in the schools were female and overall female usage tends to be less than 50 per cent that of males. Other studies have found that men make up 86 per cent of users in Ethiopia and 83 per cent in Senegal. This is an area where more research and initiatives are required.

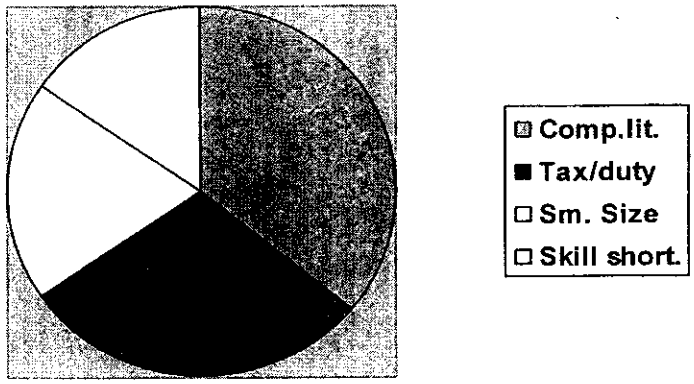
## 2.6 Constraints

A number of constraints exist with regard to expansion of the ICT sector in the Scan-ICT pilot countries. Interestingly, the major constraints cited include lack of infrastructure and high cost of ICT equipment, although figures from the sectoral applications in Section V show repeatedly that there is wide underutilization of computers and Internet access. [In Ethiopia, for example, the high cost of computers was the leading constraint, along with poor telecommunications infrastructure, lack of equipment and high Internet charges.] Overall, what this indicates is that another strategy may be necessary to make better use of existing facilities.

In Ghana, meanwhile (see Figure 3.4), 26 per cent of respondents cited the low level of computer literacy as the biggest inhibiting factor; 21 per cent noted high taxes and import duties; 14 per cent, the small size of the Ghanaian market; and 11 per cent, the shortage of ICT

skills. Other factors cited included lack of infrastructure, lack of capital investment, difficulties in monitoring and benefiting from rapid advances in ICT, ergonomics issues and continued resistance by staff in some organizations to technological developments. Industrial relations issues did not appear to be a factor.

**Figure 3.4 Factors Inhibiting Expansion of ICT (Ghana)**




Underpinning these specific constraints in the Scan-ICT pilot countries, however, is generally the lack of a critical foundation in terms of an enabling policy environment that encourages innovation – and the skills and institutions to adapt new technologies to local needs – so that countries can exploit the opportunities of the technology revolution. Indeed, innovations in technology must be matched by innovations in policy to mobilise people's creative potential to turn global technological advances into a tool for human development. Section IV examines the regulatory constraints in detail.

## 3. Strategic Planning for ICT

Strategic planning is an important means of addressing the need for a strengthened ICT sector in all Scan-ICT pilot countries. Most important, a strategic approach is needed to nurture and promote widespread and effective use of ICT in any country in support of overall national development priorities. A national ICT strategy serves as the blueprint for ICT sector development, containing a coherent set of aims; at the same time, objectives, priorities and constraints are clearly defined. In turn, this enhances the achievement of clearly defined milestones for national ICT sector development. Table 4.1 shows which Scan-ICT pilot countries have an ICT strategic policy and which do not.

**Table 4.1: Existence of ICT Strategy/Policy**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Yes | | | X | X | | X |
| No | X | X | | | X | |

Among the six countries, Ethiopia in particular faces challenges in strategic planning because of the continuing Government monopoly of the telecommunications sector. Closed-market policies have made it very difficult to benefit from technological innovations, and a conducive policy environment, favourable legal and regulatory mechanisms and a strong regulatory body are necessary to ensure a well-functioning, competitive market.

Of the other countries with a liberalized telecommunications sector, most began the liberalization process between 1994 and 1997 as part of overall telecommunications industry reform. Under such reform, the separation of telecommunications regulatory responsibilities from operational functions was a key component.

## 3.1 Regulatory Framework

A country-by-country synopsis of the current regulatory framework and strategic planning initiatives follows:

### *3.1.1. Ethiopia*

As noted above, the liberalization and privatization initiated in the early 1990s throughout the Ethiopian economy has yet to be extended to the telecommunications sector, which still faces a Government monopoly. Communications networks remain highly concentrated in Addis Ababa, and the rural-urban digital divide, as measured by telephone and Internet penetration, is very wide.

The Ethiopian Telecommunications Agency (ETA), established in 1996, is the national telecommunications regulator; with no private sector participation, the Agency is primarily engaged with the parastatal ETC. Meanwhile, the Ethiopian Science and Technology Commission (ESTC) is entrusted with formulating the national science and technology policy but is still in the process of developing an ICT strategy. Facing similar challenges is the Quality and Standards Authority of Ethiopia (QSAE), which was re-established in 1998 with the objective of promoting and coordinating standardization of applications at all levels. Nevertheless, the Authority has not yet begun its work in the area of ICT. The Ethiopian Information Technology Professional Association may eventually help in setting standards and issuing competence permits, but the Association is not yet fully operational.

Meanwhile, some encouraging steps have been taken in Ethiopia: A recently established Ministry of Capacity Building includes development of the ICT infrastructure in its capacity building strategy, and the Government has decided to equip high schools with computers.

### *3.1.2. Ghana*

In 1994 Ghana initiated the five-year comprehensive restructuring and liberalization of the telecommunications industry under the Accelerated Development Programme 2000 (ADP 2000). The aim of the ADP was to increase the teledensity of the country, allow private participation and permit other network operators to compete with the national operator. A National Communications Act passed the following year provided for the creation of a fixed-network duopoly as well as a wholly owned Ghanaian company to provide rural telecommunications in southern Ghana.

The National Communications Authority was established in 1996 as an independent communications regulatory agency, while in 1998 the Ghana NICI process began with a number of national workshops and meetings, resulting in a draft document on national ICT projects that could be undertaken by the Government with the involvement of the private sector and civil society.

The change of Government in 2001 gave rise to a new impetus to develop a comprehensive ICT policy and plan, using an extensive national consultative exercise, as part of the AISI initiative. Now, the Co-ordinated Programme of Economic and Social Development of Ghana (2003-2012), has as its goal to transform the Ghanaian economy to a knowledge-based economy. To achieve this, the programme identified ICTs, along with agro-based industrial development, as two pillars of economic growth.

### *3.1.3. Morocco*

Law 24-96 of 1997 put an end to the monopoly of the State in telecommunications and defined a new, liberalized regime, emphasizing efficiency, transparency, universal service and job creation. The obligations of universal service represent a first step toward the goal of extending and generalizing affordable telephone service, particularly in rural areas. The National Agency of Telecommunications Regulation (ANRT), also created in 1997, serves as the existing regulatory tool and provides legal, economic and technical functions. It assigns licenses for the fixed telecommunications network, Global Mobile Personal Communications System (GMPCS) and VSAT, among others.

Overall, the national strategy e-Maroc serves for development of ICT and includes at least 21 specific "strategic orientations" for ICTs and telecommunications within the framework of the Five Year Plan 2000-2004. Among other initiatives, a Moroccan Centre for Information and Communications Technologies Among Enterprises (CETIC) was created in July 2001, with the objective to sensitize the private sector to the contribution of ICTs. The Economist Intelligence Unit has ranked Morocco as having the second-best overall regulatory structure for ICT in Africa and the Middle East (Eastern Michigan University et al., 2003).

### *3.1.4. Mozambique*

The Instituto Nacional das Comunicacoes de Mocambique (INCM), an independent body established in 1992, is the national communications regulatory authority. The National

ICT Policy was adopted in December 2000, and some projects are already being implemented, e.g., a national transmission network (marine cable), telecentres and SchoolNet Project.

Legal instruments for the fiscal regime are still not in place; however, the ICT Policy Implementation Strategy considers this issue as a major priority for the success of ongoing telecommunications reforms. The Government intends to undertake the following actions, among others: (a) Adopt measures to reduce the cost of tariffs for telephone access so as to extend the network to a bigger number of users; (b) Set a single tariff, equal to the cost of a local call, for calls to ISPs from any point in the country; (c) Create incentives for suppliers of telecommunications services in deprived zones where profits are not sufficiently attractive to the private sector; and (d) Define a community tariff for electricity and telecommunications supplied to community access points.

Privatization of the incumbent operator, Telecomunicacoes de Mocambique (TDM) – which has a monopoly on fixed telephony – has begun and is expected to be finalized in 2004. Regulations for implementation of universal service are still being prepared, but the law defines universal service obligations for the operators of public telecommunications services. A critical element in this process has been the creation of the Universal Service Fund (USF), to be managed by INCM. Other mechanisms for promoting universal service will include cross-subsidies and special incentives for operators and other telecommunications investors.

### *3.1.5. Senegal*

The origin of Senegal's telecommunications policy goes back to the early 1980s, when telecommunications was separated from other activities of the Post and Telecommunications Office and Sonatel, the national company, was set up. Since the Fifth Four Year Development Plan, Senegal has considered telecommunications a primary sector; in its Ninth Plan (1996-2001), the Government specifically included ICT to meet the needs of the population and to take advantage of global economic opportunities. The new Constitution adopted in 2001 likewise highlights ICT. The Government Vision Plan Senegal 2015 also recognizes the global impact of new ICT and identifies a number of possible responses, which include adaptation of the educational system, expansion of social communications and revitalization of rural areas. Underscoring the Government's commitment to providing access to at least basic ICT for the entire population, the President himself has criticized the high cost of telephone services and suggested lowering rates. Moreover, the Ministry of Culture and Communications pledged to connect a total of 7,000 villages to Internet during the period 2000-2003. Nonetheless, Senegal still lacks a formal national strategy and action plan for ICT.

With the adoption of a new telecommunications law in December 2001, the Agence de Regulation des Telecommunications (ART), was created to serve as an efficient, transparent telecommunications regulator. However, challenges still remain in implementing a regulatory framework, particularly with regard to mobile services, where a duopoly exists. Indeed, uncertain implementation is believed to have had an impact on the mobile sector's growth to an extent; in a particularly damaging example, one company's mobile license was withdrawn by the government in October 2000 without advance notification or the agreement of the regulator. On the positive side, Senegal, in 2000, lowered its tariffs on imported goods, and the

new tax regime favours new investments in telecommunications networks despite the small size of the market.

*3.1.6. Uganda*

Uganda's communications sector structure is supported and enabled through legislation passed in 1997, nameless the Uganda Communications Act. Under the existing structure, the Ministry of Works, Housing and Communications provides oversight and policy guidance to the ICT sector. The Communications Department within the Ministry oversees the Uganda Communications Commission, which is the regulator of the sector, implementing the Government's communications policy through licensing and standardization.

A Ministerial policy statement of 1996 provided the basis and focus of the current ICT plan, as well as the background to ICT sector reforms that have facilitated private sector participation and introduced competition. The fundamental goals underpinning the policy include: (a) Increasing the geographical coverage of services throughout the country; (b) Servicing unmet demand for telecommunications services, estimated by the ITU as being about 184,000 lines in 1997 and set to grow to 380,000 by 2006; (c) Ensuring a balanced, well-coordinated network through appropriate licensing, regulation and standardization; (d) Improving the quality of telephone service; (e) Developing competition across a broad spectrum of telecommunications services; and (f) Providing basic services for urgent communications in times of emergency

A "big push" strategy for [illegible] areas of investment in ICT in the effort to make Uganda a major centre of excellence in the region. In addition, the Rural Communications Development Policy of 2001 has established a Rural Communications Development Fund.

## 3.2. Legal and Regulatory Challenges

Lack of human and financial resources is perhaps the biggest crosscutting challenge facing most Scan-ICT pilot countries with regard to their regulatory framework. In Ethiopia, for example, a shortage of qualified personnel has constrained both the ETSC in developing an ICT strategy and the QSAE in setting standards and issuing competency certificates in the area of ICT. In Mozambique, meanwhile, a major challenge for INCM is the lack of required technical skills; the Government has included capacity building of the agency in the list of priority projects under its ICT Policy Implementation Strategy. In contrast, for Senegal an uncertain overall regulatory framework has proven a factor in slowing market development.

In several countries, challenges also have been identified related to tax, copyright and customs regulations in particular. Nearly 70 per cent of respondents in Ethiopia believed that the tax rates in the country were too high and the tax policy was not transparent; in Ghana, 21 per cent noted high taxes and import duties as a constraint. The latter were singled out as contributing to the availability of contraband goods in the market, which affected business operations. Other problems related to the absence of laws related to hackers and viruses.

# 4. Sectoral Applications

This section presents the results of the Scan-ICT survey with regard to ICT applications and penetration in different sectors, based on questionnaires and interviews at both the institutional and individual levels. The survey covered education, health, public administration and the private sector/private ICT firms.
Overall, major findings included:

- ICT penetration is generally higher among educational institutions and public administration facilities in most of the six pilot countries than among health institutions;
- Individual numbers of staff using ICT appear widely spread, so that although, for example, 62 per cent of institutions in a certain sector may report staff using computers and Internet, only a few staff in each individual institution actually will have that capability;
- Shortage of qualified staff appears to be a critical issue for all sectors. The proportion of ICT experts is very low;
- Computers are widely used only as traditional office tools; and
- Although home pages and elaborate sites on the World Wide Web have become very popular throughout the world for disseminating information and documentation electrically, the percentage of institutions in the surveyed sectors with web sites is low. The content of the sites also is frequently limited to information of a very generic nature or basic contact information.

## 4.1 Education

The move toward globalization requires a fundamental shift in thinking about the methodology of education. The importance of information underscores the importance of adopting ICT in the education sector. Most important, transformation in education and learning requires a shift from traditional textbook methods to one where students learn through various media such as computers, the Internet, video, radio and newspapers. Modern technologies create the opportunity for the best minds to exchange information across the world.

The Scan-ICT study showed that, while the majority of educational institutions have access to radio and television for education, computer penetration remains highly variable, often dependent on Government vs. non-Government status and/or whether the institution is primary, secondary or tertiary. As with several indicators in all sectors, responses indicating simple computer ownership or usage did not fully reflect the extent of knowledge among staff.

### *4.1.1. ICT Penetration*

Usage of television and radio for educational purposes generally appeared high. The percentage of educational institutions using television for education ranged from 58 per cent in Ethiopia to 69 per cent in Uganda, while the same countries reported 68 per cent and 75 per cent usage of radio, respectively. For its part, Morocco has undertaken a model tele-education

project in three rural provinces using interactive TV technology, with the aim of generalizing the project nationwide by 2005.

Turning to computer penetration, in Ethiopia, distribution of basic ICT strongly favoured private rather than public schools. The number of Government primary and secondary schools with computers was 47 per cent, compared to 100 per cent of non-Government primary and secondary schools; with regard to Internet access, the respective numbers were only 5 per cent for Government schools but 42 per cent for non-Government schools.

Mozambique and Uganda showed marked differences between primary and secondary access. In Mozambique, no primary schools had computers or Internet, while 46 per cent of secondary schools reported owning computers – although the majority had less than 5 computers – and 39 per cent had Internet access. Of Ugandan schools owning computers – an overall total of 63 per cent – 30 per cent were primary schools and 70 per cent were secondary schools; Internet connectivity was very low. Also in Uganda, the average student-computer ratio was 1:191, which is too high for students to spend quality time using the computer.

In Morocco, meanwhile, the Government has undertaken an ambitious programme to introduce and generalize ICT use at all levels of education from now until 2009-2010; 7,000 primary schools, 590 secondary schools and 1,000 colleges already have computers, although precise percentages for current penetration were not available. Table 5.1 offers a comparative look at the percentages of primary and secondary schools in Scan-ICT pilot countries with computers.

**Table 5.1 Percentages of Primary and Secondary Schools With Computers**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Primary | 47/100* | 79** | N.A. | 0 | N.A. | 63* |
| Secondary | | | N.A. | 46 | N.A. | |

*Government/non-Government primary and secondary schools combined

** Primary and secondary schools combined

In tertiary institutions, percentages of computer ownership and Internet access generally were much higher, indicating that the penetration of ICT generally begins at this level. Basic computing as part of all degree programmes appeared to be included in some institutions, such as in Ghana, where 52 per cent offered such instruction. By contrast, in Mozambique no university has yet established a chair for ICT despite ICT-related subjects being taught. In the pilot countries reporting computer and Internet data, the percentage of tertiary institutions with computers varied from 87 to 100, while the percentage with Internet ranged from 42 to 100. Table 5.2 gives the details.

**Table 5.2 Percentages of Tertiary Institutions with Computers and Internet Access**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Computers | 87/100* | 95 | N.A. | 100 | N.A. | N.A. |
| Internet | 50/100* | 42 | N.A. | 100 | N.A. | N.A. |

*Government/non-Government tertiary institutions

Reasons for not using Internet tended to concentrate on lack of access and high costs.

Although full details were not available, the percentage of tertiary institutions with LAN and WAN appeared low. In Ethiopia, 20.4 per cent of institutions reported having LAN, while only 3.9 per cent had WAN.

The percentage of computer-literate lecturers again varied considerably, and appeared related to the overall status of ICT penetration in a country. In Ethiopia, computer literacy among instructors varied from 17 per cent in Government primary and secondary schools to 48 per cent in non-Government tertiary institutions, while in Ghana 85 per cent of schools and 97 per cent of tertiary institutions reported computer-literate instructors. Having said that, the actual numbers who were computer-literate within Ghanaian institutions remained very low, at about 16 per cent. Moreover, Ghana reported that in nearly 3 in 5 educational institutions at all levels, fewer than 10 per cent of teachers used computers in school.

Despite the penetration of computers into educational systems, length of computer ownership tended to be relatively short. In Ghana, for instance, 13 per cent of educational institutions had owned computers for less than one year, while 26 per cent had purchased them between one and two years earlier, and 18 per cent had owned them for two to three years. Nearly half of the computers in Ugandan schools, meanwhile, had been purchased in the year 2000 alone.

*4.1.2. Users and Usage*

Overall, it appears that educational institutions in all the Scan-ICT pilot countries overwhelmingly use computers primarily for traditional office tool applications (word processing, databases, etc.) and personnel administration, not fully utilizing their potential. In Ghana and Ethiopia, which are typical of the results reported, 85 and 86 per cent of institutions used office tool applications, while 53 per cent of Ghanaian primary and secondary schools and 35 per cent of tertiary institutions used computers for personnel administration, compared to 46 per cent in Ethiopia; in Uganda, a similar 45 per cent was reported in this category.

Usages of computers and Internet tended to fall into four major categories: email, web browsing, research and downloading information. By contrast, emphasis on development of web content was virtually nonexistent at the primary and secondary levels – as low as 0.23 per cent in Morocco – while much higher at the tertiary level. Table 5.3 and Figure 5.1 compare the figures in Ethiopia, Ghana and Mozambique for Internet usage, while Table 5.4 and Figure 5.2 show the percentage of tertiary institutions with websites.

**Table 5.3 Internet Usage in Educational Institutions**

| | Email | Browsing | Research | Downloading |
|---|---|---|---|---|
| Ethiopia | 87 | 80 | 56 | 55 |
| Ghana | 30 | 26 | N.A. | 24 |
| Mozambique | 30 | N.A. | N.A. | 33 |

**Figure 5.1 Internet Usage in Educational Institutions**

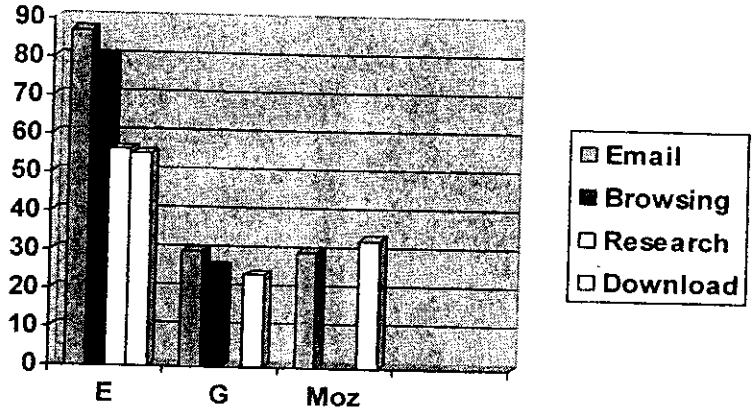
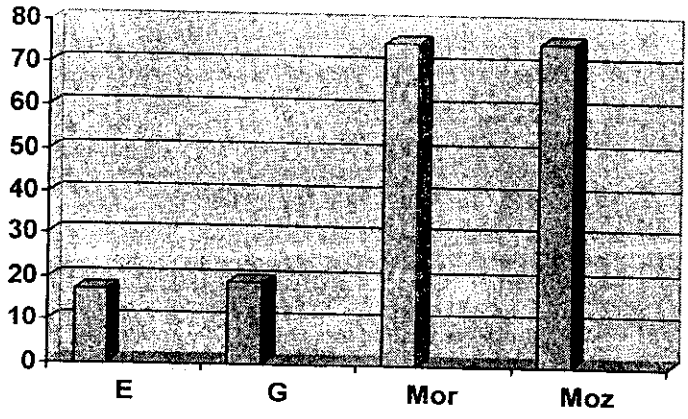



**Table 5.4 Percentages of Tertiary Institutions with Websites**

| | Ethiopia | Ghana | Morocco | Mozambique |
|---|---|---|---|---|
| Percentage of tertiary institutions with Web sites | 17/27* | 19 | 75 | 75 |

*Government/non-Government

**Figure 5.2 Percentage of Tertiary Institutions with Web Sites**

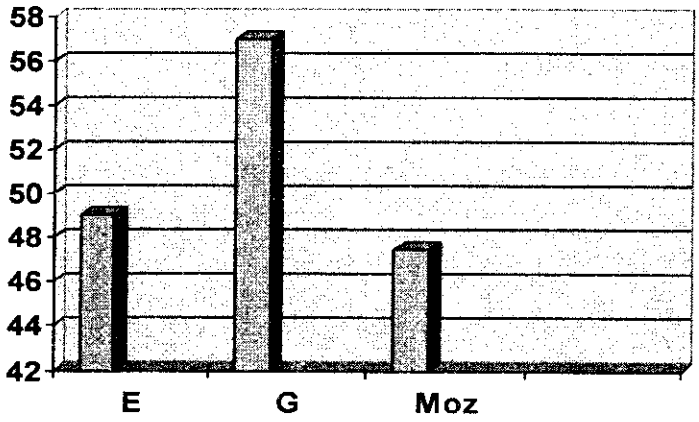



At the level of individual students and teachers, three reporting countries showed that about half of overall students are using computers. Again, in at least one case, a cautionary note must be sounded: In Ghana, while 57 per cent overall were said to be computer users, nearly one-quarter of responding institutions said fewer than 10 per cent of their students accessed ICT, while an equal number said all their students were users. This indicates the wide variability of responses to the indicators. Table 5.5 and Figure 5.3 illustrate the percentage of overall students using computers.

**Table 5.5 Percentages of Overall Students Using Computers**

| | Ethiopia | Ghana | Mozambique |
|---|---|---|---|
| Percentage of overall students using computers | 49 | 57 | 47.5 |

**Figure 5.3 Percentages of Overall Students Using Computers**




The percentage of students using Internet was reported only in Ethiopia and Mozambique. Ethiopia indicated 19 per cent of students overall used Internet, while the breakdown in Mozambique was 6 per cent of primary students, 59 per cent of secondary students and 35 per cent of tertiary students. Likewise, Mozambique was the only pilot country reporting the percentage of teachers using computers or Internet, at 21 per cent for primary level and 58 per cent for secondary level.

Educational staff with access to computers at home tended to be low in the primary and secondary levels, higher at the tertiary level. In Ghana, 25 per cent of primary staff had home computers, less than one-third the 82 per cent of tertiary staff with such home access. Ethiopia reported 11 per cent of overall educational staff with home computers, while Mozambique found that, of students and teachers with computers and Internet, 42 per cent had access at home.

*4.1.3. Investments in ICTs*

Overall, investments in ICT in the educational sector appear fairly low, although investment data were not complete for many institutions. Mozambique reported that 20 per cent of its educational institutions spend less than $ US1,000 a year on such investments, while 52 per cent spent between $ US1,000 and $ US3,000. In Ghana, nearly one-half of institutions spent only 10 to 25 per cent of their budget on ICTs, while more than one-third spent less than 10 per cent. Morocco reported 8 per cent of all education budgets dedicated to ICTs. This

indicates that, while great policy emphasis is often being placed on the introduction of ICT in the educational sector, the financial resources with which to implement such ambitions are not available in commensurate fashion or are not being used.

*4.1.4. Capacity Building*

Morocco was the Scan-ICT pilot country with the most ambitious plans for capacity development in the near future. Among other projects, it is planning to develop 10,000 specialists in ICT by 2005, 4,000 with private-sector diplomas, 3,000 as vocational graduates of the Office de la Formation Professionnelle et de la Promotion du Travail (OFPPT), 2,000 with bachelor's degrees in data processing and telecom, and 1,000 from engineering schools. In addition, it plans to create a National Education Resources Centre for production of multimedia and interactive educational tools; a virtual university to help sensitize educators to integrate ICT in their programmes; multimedia rooms (12 computers, printer and Internet connection) and dedicated ICT instructors in every school;

More typical is Ghana, which over the last five years has had an average output in computer science and engineering of about 46 undergraduates and 3 post-graduates, hardly enough to sustain the ICT sector for a country of more than 18 million.

Meanwhile, available figures for on-the-job training in educational institutions appeared low; for example, only 27 per cent of schools and colleges in Ethiopia provide on-the-job training for staff. Again, private schools and tertiary institutions offer relatively more skills upgrading than do public schools.

*4.1.5. Conclusion*

Most of the Scan-ICT pilot countries still face considerable challenges in introducing and promoting ICT in the education sector, in computer and Internet penetration, in disparities between levels of institutions and Government/non-Government ownership of institutions, and in capacity building. Use of computers tends to differ by type (public/private) and level of education overall, and vast underutilisation of computer resources available appears to be the norm. However, given the wide variations in responses to the Scan-ICT survey, generalization is difficult.

On the positive side, some projects expected to have major impact on the education sector are under way: Morocco's MARWAN Network is a 2MB computer network dedicated to education research, facilitating information exchanges between educational institutions on a national regional and international scale. Mozambique is establishing the Mozambique ICT Institute (MICTI), among the biggest challenges of the country's ICT Policy Implementation Strategy. The Institute, assisted by the Eduardo Mondiane University, will have three components, research and learning, technology incubator and a science park. Following a feasibility study and business plan, implementation of the Institute is in the initial stages. Uganda is participating in the SchoolNet Project, which aims at connecting selected schools to the Internet using VSAT. It remains to be seen, however, how quickly individual countries progress.

## 4.2 Health

Developing countries can benefit immeasurably from using ICT to improve health care. ICTs provide opportunities for health professionals to obtain information, communicate with other professionals, deliver first-line support and promote preventive medicine programmes.

Nonetheless, ICT penetration in the health sector – beyond telephone service – appeared low relative to other sectors in nearly all Scan-ICT countries. Even in Morocco, usually the leading pilot country in various ICT areas, penetration is characterized as weak. In some cases, such as Uganda, the country is still in the process of recovery from decades of civil strife, which left the health system in serious disrepair. Some countries, such as Mozambique, have declared the sector a priority area and have initiated projects there, including an information system for HIV/AIDS. With rapidly declining costs in hardware and telecommunications, however, it is likely that interest and corresponding activity in telemedicine and tele-health will rise.

On the positive side, it should be noted that Senegal is a pioneer in the field of telemedicine, with a well-equipped centre where students can learn telemedicine techniques. In addition, an ongoing project interconnects the Dakar, Diourpel and Saint-Louis hospitals, while another intends to extend telemedicine services to the Tambacounde and Ziguinchor regions. To cover the most remote regions of Senegal, three hospitals are also linked via satellite communications to mobile units with necessary medical equipment such as X-ray, electrocardiography, microscopes and so forth.

### *4.2.1. ICT Penetration*

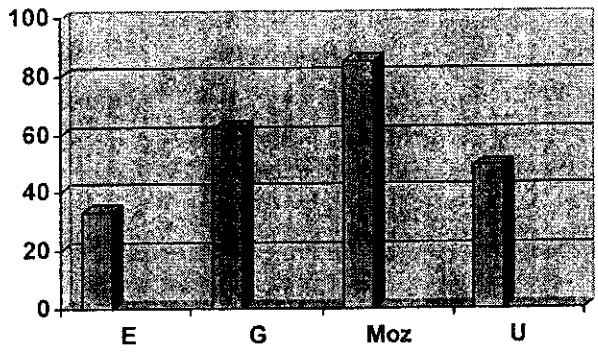
Virtually no pilot countries had any comprehensive, long-term health strategy that takes into consideration the new ICT uses. At the same time, the percentage of health institutions with computers varied from 33 in Ethiopia to 85 in Mozambique, although most institutions owned fewer than five computers.

Generally, larger institutions such as hospitals owned computers, as well as facilities located in urban areas; for example, in Uganda more than three-fourths of hospitals surveyed had computers, compared to one-third of health centres, dispensaries and dispensary-maternity units (DMUs). [Also in Uganda, it should be noted there was generally a very low level of response to the Scan-ICT survey in the health sector.] Constraints primarily were attributed to high costs of ICT equipment. Table 5.6 and Figure 5.4 show the country-by-country results of percentages of health institutions with computers.

**Table 5.6 Percentages of Health Institutions With Computers**

| | **Ethiopia** | **Ghana** | **Morocco** | **Mozambique** | **Senegal** | **Uganda** |
|---|---|---|---|---|---|---|
| Percentage of health institutions with computers | 33 | 62 | N.A. | 85 | | 48.9 |

**Figure 5.4 Percentages of Health Institutions with Computers**




Levels of ICT professionals in the sector were very low, with Ethiopia reporting only 0.3 per cent of such professionals among health employees. Nearly half of Ghana's health institutions had no ICT professionals at all, while another 42 per cent reported less than 1 in 10 staff with a professional ICT background.

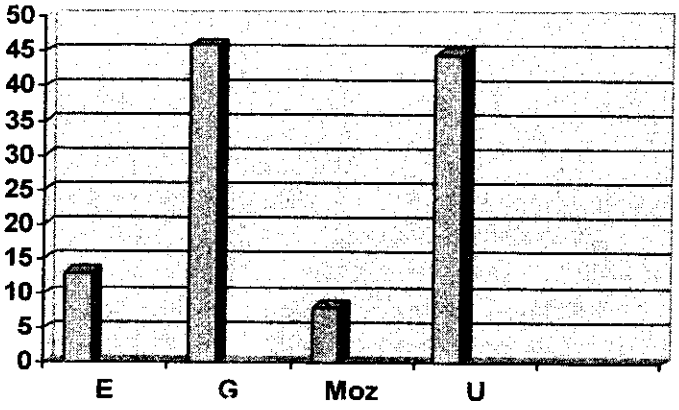
With regard to Internet access penetration was generally much lower than for computers – in Mozambique, 8 per cent compared to 85 per cent – and high variability again was found. Table 5.7 and Figure 5.5 illustrate.

**Table 5.7 Percentages of Health Institutions with Internet Access**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Percentage of health institutions with Internet access | 13 | 46 | N.A. | 8 | | 44.6* |

*Percentage of health institutions using computers with Internet access

**Figure 5.5 Percentages of Health Institutions With Internet Access**




Only three pilot countries reported the percentage of health institutions with LAN. Ethiopia said none of its institutions had LAN, while Ghana reported 19 per cent and Mozambique reported 35.3 per cent.

*4.2.2. Users and Usage*

Many common usages of computers in the health sector have little to do with the development of comprehensive health management information systems or other professional applications, the Scan-ICT survey revealed. For example, a total of 91 per cent of health respondents in Mozambique said they did not use computers or Internet to access "medical information," indicating the overwhelming level of usage of manual systems sectorwide.

As in the education sector, computers are most often used for office tools (word processing). For personnel/administration, the percentages of computers for this use were 28 and 42 per cent in Ethiopia and Ghana, respectively, while Uganda reported that all health units use computers for human resources management.

Data for the overall percentage of health staff using ICT focused on Internet usage. In Ghana, while nearly half of overall health staff were reported to have used Internet, again the specific numbers per institution were very low, generally less than 10 per cent of the staff. Similarly, in Mozambique more than one-third of health institutions reported that less than 5 per cent of their staff used Internet regularly, while only 3.8% of institutions said that half to all of their staff were users.

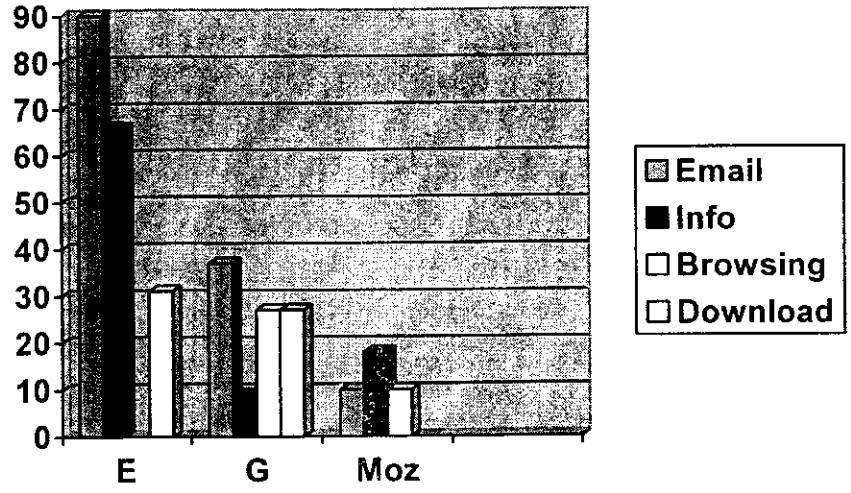
As with education, usages of Internet fell into four broad categories: email, research, browsing and downloading information. In addition, data for numbers of health institutions with web sites were generally not available. Table 5.8 compares the percentages of usage of Internet in Ethiopia, Ghana and Mozambique.

**Table 5.8 Internet Usage in Health Institutions**

| | Email | Information | Browsing | Downloading |
|---|---|---|---|---|
| **Ethiopia** | 90 | 66 | N.A. | 31 |
| **Ghana** | 37 | 9 | 27 | 27 |
| **Mozambique** | 10 | 18* | 10** | N.A. |

*Access database
** Research

**Figure 5.6 Internet Usage in Health Institutions**




Meanwhile, while up to 70 per cent of health institutions reported staff with home computers (Ghana), the proportion of individuals per institution was very low, again at less than 10 per cent of staff.

*4.2.3. Investments in ICT*

In overall trends, it was clear that expenditures on ICT generally did not constitute a major component of the total expenditures of health institutions. Ethiopia reported such investments as "low but rising." The total expenditure of Ethiopian health facilities on ICT in 2000-2001 was only about $ US23,456; nonetheless, that was up 71 per cent over the previous year. Morocco, meanwhile, reported a higher average, of about 4 per cent of health budgets dedicated to ICTs. In Mozambique, more than one-quarter of health institutions spent less than $ US1,000 annually on ICTs, while only 6 per cent had a budget of $ US1,000 to $ 3,000. Finally, Ghana noted that nearly 3 in 5 health institutions spent less than 10 per cent of their budget on ICTs, with another third spending between 10 and 25 per cent in such fashion.

*4.2.4. Capacity Building*

Very little data was reported from pilot countries on specific capacity building or on-the-job training opportunities in health institutions.

*4.2.5. Conclusion*

An urgent need exists to bridge the gap between the health care and ICT communities at all levels in the Scan-ICT pilot countries. The potential of ICT still has not been harnessed systematically to bring about important improvements in the health of populations in these countries, particularly for the poor and isolated.

Wide and diverse opportunities exist for ICT in the health sector to complement provision of basic health services. At this time, however, the mechanisms for human and financial collaboration are weak and the sector remains cumbersome, mired in inefficiency. Indeed, information poverty appears to be one of the most serious obstacles facing most African health sectors. This leads to the ominous possibility that technology will soon be out of the grasp of many health-related workers in the pilot countries and the communities they serve. Only a consistent national framework that promotes the application of ICT can work to overcome these challenges.

## 4.3 Public Administration

Usage of ICTs in public administration, while generally better than in the health sector, also still faces many challenges. In at least one Scan-ICT pilot country, Mozambique, most public administration institutions still do data processing and storage manually and use typewriters for daily activities. Likewise, in Uganda, despite reports of a 100 per cent ownership rate of computers among public administration institutions, it was noted that "computer presence" in a department might consist solely of providing a secretary with a computer to be used mainly or exclusively for word processing. In Ghana, meanwhile, only 17 per cent of institutions had all staff using computers, despite more than 4 in 5 actually owning computers. Ethiopia provided a contrast by reporting ICT penetration is higher in public administration institutions than in education or health.

On a positive note, in Morocco, the Ministries of Finance and Planning have used ICT to make the budget process more efficient, creating a common platform to share data on tax revenue, auditing and spending management. The time required to prepare a budget has been halved, and budgets better reflect actual revenue and spending. Likewise, in Senegal, electoral files to be used in presidential elections are now online, enabling the media to report immediately on election results via mobile telephone; ICT has also been incorporated in many other public administration usages, such as customs clearing and databases of national identity cards.

*4.3.1. ICT Penetration*

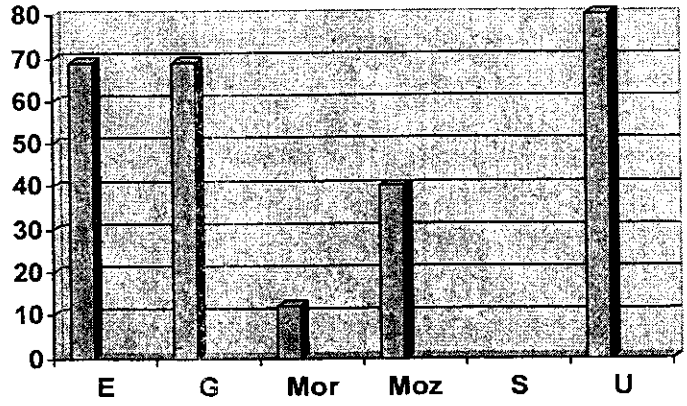
Overall, most Scan-ICT countries reported little or no specific data on the percentage of public administration institutions with computers. Despite its leading role in ICT in the education sector, Morocco reported weak penetration in public administration, with 1 computer for every 30 civil servants.

However, more data were available with regard to Internet access. Again, Morocco was very low, with only 12 per cent Internet connectivity, compared to Uganda's 80 per cent. Table 5.9 and Figure 5.7 give complete details.

**Table 5.9 Percentages of Public Institutions with Internet Access**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Percentage of public institutions with Internet access | 69 | 69 | 12 | 40 | | 80 |

**Figure 5.7 Percentages of Public Institutions with Internet Access**




In at least one pilot country, Ghana, it was reported that a high percentage of public administration institutions employed ICT professionals and had ICT strategic plans, 78 per cent and 66 per cent, respectively. In the case of ICT professionals, however, about two-thirds of the institutions said that less than 10 per cent of their staff fell in that category. Figures in the same categories for Ethiopia, the only other country reporting, were 44 per cent with ICT professionals and 39 per cent with strategic plans.

Public administration institutions also reported that high percentages of their civil servants were computer literate; in Ethiopia, the figure was 81 per cent, while Mozambique was 73 per cent. Even so, the percentage of staff using Internet appeared to be less than half [see Section 4.3.2, Users and Usage], indicating that the proportionate numbers of staff per individual institution who are making full use of ICT is very low.

Constraints to ICT use and expansion were reported as including the high cost of computers, poor telecommunications infrastructure, lengthy waiting time for Internet

connection, high Internet charges and ICT skills shortage, although no clear trend emerged from the data gathered.

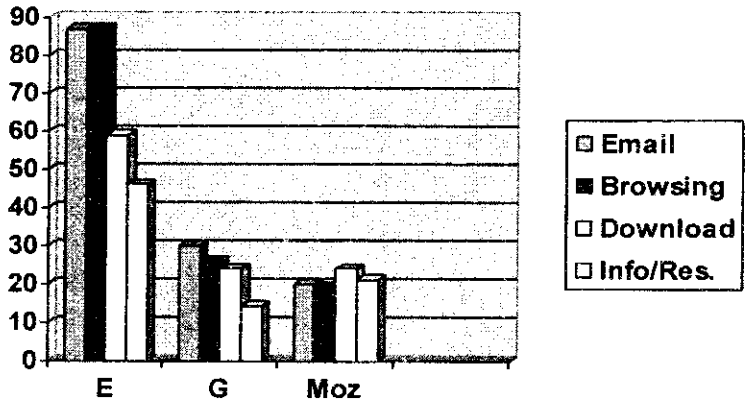
*4.3.2. Users and Usage*

As with the education and health sectors, the vast majority of public administration institutions reported using computers mainly for office tools, while a smaller proportion reported using them for personnel administration and for financial and accounting packages. Usages of Internet in public administration fell into the same four broad categories as in education and health, as Table 5.10 and Figure 5.8 show.

**Table 5.10 Internet Usage in Public Administration**

| | Email | Browsing | Downloading | Info/Research |
|---|---|---|---|---|
| **Ethiopia** | 87 | 87 | 59 | 46 |
| **Ghana** | 30 | 26 | 24 | 14 |
| **Mozambique** | 20 | 19 | 24 | 21 |

**Figure 5.8 Internet Usage in Public Administration**




As noted in Section 5.3.1, although the percentage of public administration institutions reporting computer ownership was high, the percentage of staff using the Internet was much lower. In Ethiopia, for example, it was reported to be 45 per cent overall, while in Ghana 54 per cent of institutions reported that less than 10 per cent of their staff use Internet. Again, this points to underutilization of ICT resources.

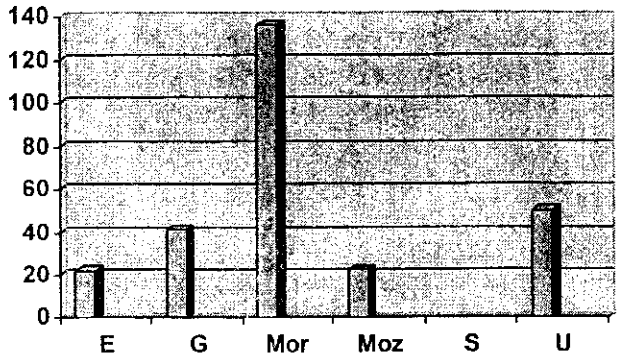
The number of public institutions with websites was generally less than half. Morocco, despite its low level of ICT penetration, proved the exception with a ratio of sites to organizations of 1.36:1. However, other Scan-ICT pilot countries were much lower, as shown in Table 5.11 and Figure 5.9. Most important, it was reported that few websites offered information on governance and public administration that would be useful to the public.

**Table 5.11 Percentages of Public Administration Institutions with Websites**

| | Ethiopia | Ghana | Morocco | Mozambique | Senegal | Uganda |
|---|---|---|---|---|---|---|
| Percentage of public administration institutions with web sites | 22 | 41 | 136* | 22.5 | | 50 |

*136 per cent of sites reported compared to 100 per cent organizations

**Figure 5.9 Percentages of Public Administration Institutions with Web Sites**




*4.3.3. Investments in ICT*

Adequate budgets for ICT investment and expenditures are necessary to be able to carry out successful reforms in public administration. However, it appears that current ICT budgets are limited in nearly all Scan-ICT pilot countries and are mainly destined for institutions at the central level. Ethiopia represented an exception, given that public administration institutions in regional towns are experiencing the fastest growth of ICT expenditures. Meanwhile, 83 per cent of Mozambique's public administration institutions had no ICT budget, 60 per cent of Ghana's public administration institutions dedicated less than 10 per cent of financial resources to ICT, and Morocco's figure stood at just 1 per cent overall.

*4.3.4. Capacity Building*

Little data were reported from pilot countries on specific capacity building or on-the-job training opportunities for public administration staff.

*4.3.5. Conclusion*

E-governance is a very timely development being recognized as a potential driver, as well as enabler, in the way governance can be reinvented to deal with issues efficiently and deliver services in a more responsive, responsible manner. Among other things, it can allow citizens to take over tasks – such as deciding what types of benefits or grants they should apply for – that once were the domain of clerks. Give Government agencies the ability to easily share

data and communicate, moreover, and they can enjoy the same productivity gains that the Internet has produced for businesses worldwide.

However, based on data gathered in the six Scan-ICT pilot countries, it appears that e-governance is still a very long way off in Africa. The Internet enables people to communicate and obtain information in ways never before possible, dramatically opening up possibilities to participate in decisions that affect their lives. But without two-way communication political participation cannot be enhanced, nor greater transparency in planning and implementation of development initiatives achieved.

## 4.4 Private ICT Firms/Private Sector

The private ICT sector represents one of the most dynamic and profitable areas of the world economy. Moreover, it is central to education, health care, governance, entertainment/leisure and other economic and service sectors. It appears that most of the private ICT firms surveyed are small and medium enterprises (SMEs) with fewer than 50 employees. Data were gathered in some of the Scan-ICT pilot countries (Ethiopia, Ghana, Uganda) from private ICT firms alone, while other countries appeared to cover both ICT and non-ICT private enterprises (Morocco, Mozambique).

### *4.4.1. ICT Penetration*

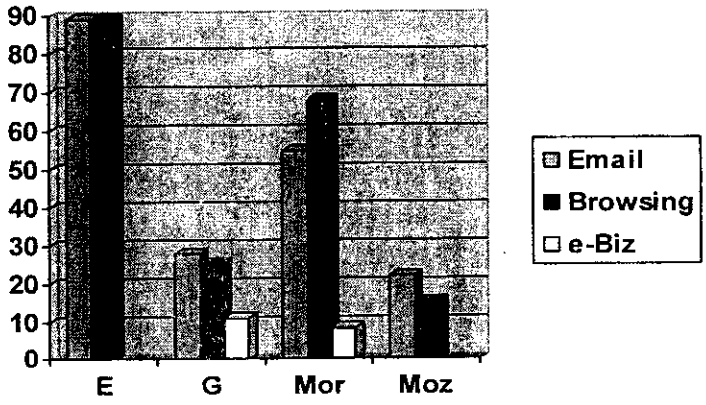
Overall, ICT firms in the Scan-ICT pilot countries are arrayed primarily among ICT education/training, consulting, hardware maintenance/support, and computer networking. The majority of ICT-related companies and service providers trade in products and services with very little local context, mainly providing ICT services rather than manufacturing, the ICT-Scan survey found. Both Ethiopia and Uganda reported that the numbers of ICT firms have grown substantially in the last several years and that performance is encouraging. In addition, the Ghana survey revealed that most companies, because of their small size, have multi-sectoral clients.

Given the nature of the industry, the percentage of ICT firms with Internet access was found to be quite high in those countries reporting. Ethiopia reported 89 per cent of firms with connectivity, compared to 86 per cent for Ghana. Usages of Internet still tended to fall into the same categories as in other sectors, email and browsing in particular, but in some cases, with the important addition of better usage of e-business/e-commerce. Nonetheless, countries such as Mozambique reported surprisingly low levels of the most common usages. Table 5.12 and Figure 5.10 compare the categories of usage.

**Table 5.12 Percentages of Internet Usage in Private ICT Firms/Private Sector**

| | Email | Browsing | e-Business |
|---|---|---|---|
| **Ethiopia** | 89-100 | 89-100 | N.A. |
| **Ghana** | 28 | 25 | 11-12 |
| **Morocco** | 55 | 68 | 8 |
| **Mozambique** | 22 | 15 | N.A. |

**Figure 5.10 Percentages of Internet Usage in Private ICT Firms/Pvt. Sector**




Lastly, the proportion of private ICT firms/private sector firms with websites was far higher than in other sectors – more than 1 in 3 – but still not as high as might be naturally assumed. In Ethiopia, Ghana and Mozambique, countries that reported this data, the figures were 39, 35 and 30 per cent, respectively.

*4.4.2. Users and Usage*

Usage by individuals/staff among the private ICT firms/private sector was generally not reported, although it is notable that in some countries less than one-third of companies surveyed have websites.

*4.4.3. Investments in ICT*

Specific investments by private ICT firms/private sector were generally not reported.

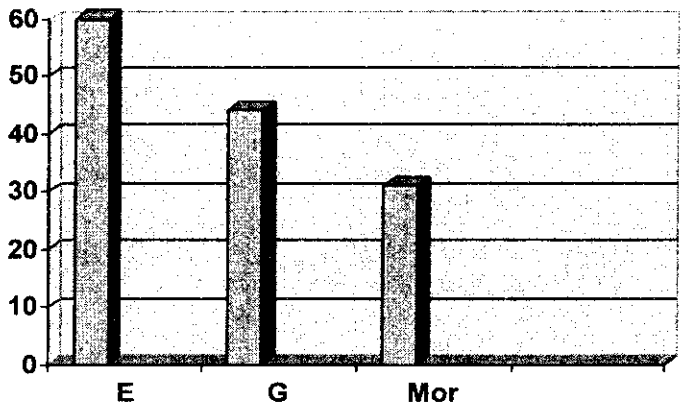
*4.4.4. Capacity Building*

The percentage of private firms with on-the-job ICT training was generally much higher than in other sectors, but still was lower than might be reasonably expected. In the three reporting countries, Ethiopia, Ghana and Morocco, the rates were about 3 in 5 for Ethiopia, less than half for Ghana and about one-third for Morocco. Table 5.13 and Figure 5.11 give a comparison.

**Table 5.13 Percentages of Private Firms with On-the-Job ICT Training**

| | **Ethiopia** | **Ghana** | **Morocco** |
|---|---|---|---|
| Percentages of private firms with on-the-job ICT training | 60 | 44 | 31 |

**Figure 5.11 Percentages of Private Firms with On-the-Job ICT Training**




*4.4.5 Conclusion*

The net opportunities of the network age require the creation of a critical mass of entrepreneurial activity that can generate its own momentum; having said that, high-tech start-ups in developed countries has thrived on venture capital. But in many developing countries, where even basic financial services are often underdeveloped, including the Scan-ICT pilot countries, there is little prospect of such financing. Moreover, those ICT firms that exist in the pilot countries have not yet fully utilized their potential for manufacturing or for applications such as e-business/e-commerce. Strong initiatives must be undertaken to encourage usage that will enable better African-led innovations in all sectors.

Without appropriate investments in private ICT firms, repercussions will be felt in all areas that could benefit from ICT. Technological progress is not a simple hand-me-down in an appropriate form and cost to developing country users. Rather, it must also be a process of knowledge creation and capacity building in developing countries, as Section VI indicates.

# 5. Capacity Development

New global and local competitive opportunities for ICT put a premium on skills development. Developing countries need to address the capacity gap to secure not only a critical number of technically qualified people but also to acquire the expertise to assess, design and implement national ICT for development strategies. Even so, the extremely high illiteracy level of sub-Saharan Africa – nearly half the population (UNDP, 2001) – means that a substantial segment of the society cannot participate in the ICT revolution being wrought.

In the Scan-ICT pilot countries, competition resulting from the liberalization of the telecommunications sector has particularly spurred the demand for skilled ICT personnel of all sorts. Numerous initiatives are now under way in the six countries, given the high demand for professionals including network administrators, planners and operators; telecommunications engineers; systems analysts; programmers; and web designers/masters. In Ghana, for example, the Kofi Annan Centre of Excellence in ICT, which is nearing completion, will be a training ground in mainly software development for a core of ICT professionals in Ghana and elsewhere in Africa. Likewise, under the African Virtual University, three leading Ghanaian universities are running distance-education programmes in computer science. Finally, Section 5.1.4 has already noted Morocco's ambitious plan to train 10,000 more ICT specialists by 2005, adding to its current skills base of 80,000; Senegal similarly is aiming to create 100,000 jobs in the coming four to five years by developing teleservice industries.

In countries such as Uganda, all educational institutions at the tertiary level have integrated ICT into their programmes. Nonetheless, formal education is only part of the skills-creation system. Vocational and on-the-job training are just as important and are an essential complement to new investment in technology, plants and equipment. Several studies have shown the high impact of enterprise training on firm productivity. The costs of enterprise training tend to be low compared with those of formal training, although employers lose part of the benefit if employees leave. Nonetheless, the Scan-ICT study results suggest that on-the-job training opportunities remain very low across all sectors.

A particularly noteworthy capacity-building initiative exists in Senegal, where 300 so-called "Joko clubs" teach literacy and computer skills to urban and rural dwellers alike. The Joko initiative, launched in 2001 in partnership with the Institut Superieur d'Entreprenariat et de Gestion, with the intent to train 100,000 people in computer skills by the end of 2002, from illiterate people to relatively advanced users. Most of the adults participating in the Joko literacy training are tradespeople and small-business owners – many of them women – seeking computer training that can help them manage their businesses; a "voice-over" technique in both the French and Wolof languages is used. Joko club members get free email, computer skill lessons, usage of web cams, Internet access at a special Joko tariff, telephony services, good-quality computer equipment and accessories such as printers and scanners.

## 5.1 Supply and Demand for ICT Skills

Until the last decade, most ICT professionals in Africa had to be trained abroad. With increased initiatives in both the public and private sectors to computerize most operations, however, this has created a need for an enhanced ICT skills base and corresponding capacity-development programmes. This has translated into an increasing number of privately owned ICT training institutions and the establishment of courses in many African universities and other facilities.

Nonetheless, there remains a need to assess national requirements for ICT skills based on national ICT policies, to establish how much of this is available, and then to determine the best strategy of meeting the appropriate ICT skills demand. Skyrocketing demand for ICT personnel make top professionals globally mobile. Emigration for employment reasons remains a challenge in several Scan-ICT countries such as Morocco, where about 2,600 ICT professionals are trained annually but up to one-third emigrate. Many Governments in particular face a serious challenge with regard to ICT staff retention, since the private sector, even within the country, invariably offers more attractive salaries. Some Governments are adopting a combination of measures to reduce the impact of the phenomenon, including additional training opportunities, career development, payment of a percentage of consultancy income, housing, transport and other fringe benefits.

Other challenges include the fact that training institutions are concentrated in urban areas, usually the capital, and still are unavailable in large parts of some countries, resulting in an acute shortage of ICT professionals in rural or semi-urban areas. (For example, in Ethiopia the percentages of Government and non-Government schools with IT professionals in Addis Ababa were 11 and 83, while in the towns it was 0 and 30.) Lack of access to basic training materials and other critical resources in local languages also remains a serious concern.

Lastly, a critical emerging issue includes the need for better coordination in ICT training. According to the Scan-ICT reports, basic ICT literacy courses themselves are of widely varying content and duration, making it impossible to judge the competence of graduates from various institutions by simply looking at their certificates. There appears to be an urgent need to standardize short ICT courses so that the market can have a means of telling what it is getting.

# 6. The Information Economy

Because global spending on ICT is projected to grow to $ US 3 trillion in 2003 – up from $2.2 trillion in 1999 – this provides many niche opportunities for service providers in developing countries. There are now about 2.5 billion unique, publicly accessible Web pages on the Internet, with 7.3 million new ones are added every day. With Internet access through wireless devices, including mobile phones, expected to outstrip personal computer access by 2005, people and businesses in developing countries such as the Scan-ICT pilot countries will become increasingly able to access valuable information. Developing countries that can establish the required infrastructure also can participate in new global business models of intermediation, business process outsourcing and value chain integration.

Global business-to-consumer e-commerce is projected to grow from $25 billion in 1999 to $233 billion by 2004; business-to-business e-commerce projects range from $1.2 to $10 trillion this year. Africa will have to strive for a share in this information economy

## 6.1 E-Commerce and E-Business

As is evident from the figures available in the Scan-ICT comparative sectoral applications, the resources of the Internet as a tool for business and commerce have yet to make a substantive impact – often any impact – in the Scan-ICT sectors and industries. Given the universally low level of web presence, this is not surprising. Some countries, including Uganda, have earmarked e-commerce as a priority area for export development, but more typical is Mozambique, which reported that e-commerce and e-business do not formally exist except for isolated initiatives.

One e-business initiative that has particularly succeeded occurs in Senegal, where the company, Manobi, delivers online services for producers and distributors of fish and agricultural products. The aim of Manobi, which was launched in 2001 in association with IDRC, the national telecommunications provider, a GSM equipment supplier and a non-profit organization specialized in fishing activities, is to improve the productivity of local fishermen and others with better access to market data, weather reports, transportation capacities and timetables for hauling their catches from shore. It has created an Internet website that fishermen can access from telecentres and hopes to provide future access through the use of mobile phones (Centre for Strategic Planning, 2002).

Major obstacles to the development of these areas include the need for a regulatory framework, including appropriate legislation and security instruments with regard to cybercrime; poorly developed telecommunications infrastructure, especially in rural areas; high illiteracy rate; and cultural factors. It was reported that when it comes to purchasing advertised goods on local ISPs, the sense of insecurity and distrust is often so high that very few people are willing to take the risk. Many people in the developing world believe money must be "live," not electronic, indicating further challenges to e-business; in Morocco, generally a leader in ICT-related issues, it was found that only 860 out of 3 million credit cards in circulation can be used for online payment.

# 7. Conclusions and Recommendations

It took 38 years for radio to reach 50 million people and 13 years for television. The same number of people adopted the Internet in just four years. Still, the digital divide is real: There are as many telephones in Tokyo as in all of Africa (Annan, 2001). In the global Human Development Report 2001, which employed for the first time a "technology achievement index," Ethiopia, Morocco and Uganda were rated as "marginalized," meaning that "technology diffusion and skills building have a long way to go. Large parts of the population have not benefited from the diffusion of old technology." Ghana, Mozambique and Senegal were not even rated (UNDP, 2001).

To fully appreciate how the digital revolution can stimulate economic growth and development, it is necessary to grasp several of its core features. First, it has created a completely new economic sector that simply did not exist before. As the countries at its forefront devote ever-larger shares of their economies to this sector, a high-value space is opened up for others to occupy throughout the world economy.

Second, the capital that matters most in the digital revolution increasingly is intellectual capital. Clearly, the requisite intellectual capital is not universally available, but it is far more widespread in the developing world than is finance capital.

Third, the digital revolution, besides creating a new economic sector, is also a means to transform and enhance many other activities: telemedicine and distance learning; virtual banking, coupled with microcredit; checking weather forecasts before planting and crop prices before harvesting; and having the world's largest library at one's fingertips.

Finally, the core product in this sector – information – has unique attributes, not shared by others. What is new and different about ICT as a means for eradicating poverty in the 21st Century? It is a pervasive input to almost all human activities; it has possibilities for use in an almost endless range of locations and purposes. In addition, ICT breaks barriers to human development in at least three ways not possible before:

- Breaking barriers to knowledge – not only is it available for multiple users, but it also becomes more valuable the more it is used;
- Breaking barriers to participation; and
- Breaking barriers to economic opportunity.

Not all countries need to be on the cutting edge of global technological advance. But in the network age, every country needs the capacity to understand and adapt global technologies for local needs so as to advance human development. In particular, sound public policy can make a difference. It is necessary to understand better how the economics of information differs from the economics of inherently scarce physical goods and how it can be used to advance policy goals.

The key is to create an environment that mobilizes people's creative potential to use and develop technological innovations. Nurturing creativity requires flexible, competitive,

dynamic economic environments. For most countries, that means building on reforms that emphasize openness – to new ideas, new products and new investment, especially in telecommunications. Major recommendations of the Scan-ICT Pilot Project relate directly to this idea.

## 7.1 Specific Recommendations from the Scan-ICT Pilot Projects

Major recommendations of the pilot phase of the Scan-ICT Project can be divided into three categories, where substantive and coordinated efforts were identified as needed:

- Policy issues
- Human resources development
- Infrastructure

### *7.1.1. Policy Issues*

Human poverty and weak institutions widen the digital divide even further. Low incomes, low literacy and skill levels, unreliable power supplies, weak administrative infrastructures – all are barriers to diffusing and using technologies designed for rich countries in poor ones. As a result diffusion can stall, and poor people often end up paying more than rich for the same services. In addition, weak institutions slow innovation as well as diffusion of products specific to developing countries.

Numerous institutional impediments to expanding ICT for development exist in the Scan-ICT pilot countries, including unsupportive regulatory environments and exorbitant charges imposed by national authorities. In particular, reforms to make telecommunications competitive are vital for giving people and organizations better access to ICT.

The Scan-ICT country reports emphasized the policy aspects for appropriate measures that Governments should take so as to improve the diffusion and utilization of ICTs for development. They strongly suggested that Governments must recognize that ICT policy affects a host of development issues, including education, health and job creation.

Specific recommendations included:

- Create an enabling policy environment for ICT for development by strengthening regulatory frameworks, instituting policy reforms in the telecommunications sector and taking measures to reduce tax and duty rates on computers and accessories, Internet connections and access charges. Enactment of relevant computer crime cyberlaws and necessary e-business and e-commerce legal and legislative provisions was stressed, as was enactment of regulations to support an information-driven economy, such as copyright law, to protect ICT-related intellectual property rights. Implicit in the recommendations was the need to ensure the protection of individual and collective privacy, and security and confidentiality of information in order to spur e-commerce;

- Encourage enterprise development and private investment by increasing the availability of credit facilities and creating venture capital. Promotion of the development of business-to-consumer, business-to-business and business-to-Government e-commerce was emphasized, along with Government-to-citizens e-Government;
- Increase access by empowering citizens economically through implementation of innovative poverty reduction programmes;
- Preparing and implementing a comprehensive ICT for development master plan for addressing current and future ICT needs at all levels. Needs included long-term plans with set targets, sector-specific policies and strategies for implementation; and
- Provide priority to small ICT projects with bigger and immediate development impact, e.g., telecentres, instead of mega-projects requiring huge investments.

*7.1.2. Human Resources Development*

Human capacity is a crucial factor for the development of any society. The Scan-ICT study showed that the lack of people with ICT skills often resulted from the fact that comparatively few schools and universities have fully incorporated ICT in their curricula. With the rapid development of ICT, it has become crucial to teach basic computer skills to children. Still, greater resources and higher enrolments alone are not enough. The quality and orientation of education at each level are critical for mastering technology. In addition, standardization of basic computer skills training was repeatedly cited as necessary to provide benchmarks by which graduates of training institutes could be rated.

Overall, the Scan-ICT study showed that not only was better ICT penetration required in selected key sectors – to enable equitable, efficient health care, to improve planning of public administration programmes -- but also that a critical need exists to expand use of ICT beyond traditional applications.

Specifically, it was suggested that countries should:

- Design and launch ICT training programmes at all levels, starting from the tertiary level and gradually extending the coverage down to lower levels, including a general awareness-creation campaign on ICT issues; and

- Encourage and support the private sector engaged in research and development and applied research activities in software development, subcontracting with client firms, and entry into joint research ventures with foreign companies, taking advantage of the low-cost labour available for development of the ICT_industry. A specific need to establish, promote and strengthen centres of excellence in ICT research and development was identified, as was the need to greatly expand the development of web sites for content.

### *7.1.3. Infrastructure*

The Scan-ICT study made clear that telecommunications and ICT infrastructure tends to be poorly developed in most of the pilot countries and focused primarily on urban areas. For Internet in particular, users tended to be heavily concentrated in the respective capitals and a few other major towns. All Scan-ICT country reports noted the necessity of reducing the significant gap in infrastructure between rural and urban areas. Such inequality can exacerbate the effects of market and policy failures on growth, and thus on progress against poverty, but the digital divide need not be permanent if technological adaptations expand access.

Overall, the recommendation is to:

- Expand the infrastructure and increase ICT access points to basic telecommunications services, by building partnerships with the private sector and funding agencies, to bridge the gap between urban and rural ICT infrastructure.

## 7.2 The Scan-ICT Process

With respect to the Scan-ICT process itself, all countries indicated that the methodological framework developed for the pilot phase served the intended purpose. This implies that the methodology, with further linkages with the global MDGs, can be used to roll out research to more countries if resources permit. To sustain the Scan-ICT process and increase its responsiveness to strategic planning and ICT investments, it is recommended that it be linked with various ICT initiatives such as national e-strategies, harnessing ICTs for decentralization of public administration, e-governance projects and so forth. In the end, it is crucial to monitor and capture data continuously to facilitate informed decisions.

# Annex A

## Websites for Accessing Individual Scan-ICT Country Reports

**Ethiopia:** http://network.idrc.ca/ev.php?ID=8049_201&ID2=DO_TOPIC

**Ghana:** http://network.idrc.ca/ev.php?ID=8049_201&ID2=DO_TOPIC

**Morocco:** http://www.scanict.marwan.ac.ma

**Mozambique:** http://www.scan-ict.uem.mz

**Senegal:** http://www.osiris.sn

**Uganda:** http://network.idrc.ca/ev.php?ID=8049_201&ID2=DO_TOPIC

# Annex B
## Additional Sources of Knowledge

Annan, Kofi A. "We the Peoples: The Role of the United Nations in the 21st Century." Millennium Report of the Secretary-General of the United Nations. New York, September 2000.

Centre for Strategic Planning. "Senegal: Rural ICT Market Opportunities Report," prepared by Intelecon Research and Consultancy Ltd. Vancouver, 4 October 2002.

Eastern Michigan University/U.S. Department of Commerce Information and Communications Technology Team. "Morocco: Best Prospects in the ICT Market, Telecommunications Equipment and Services." 30 March 2003.

Government of Uganda, Ministry of Work, Housing and Communications/The President's Office/National Council for Science and Technology. "National Initiatives Concerning ICT and Education/Training," for International Labour Office, Revision of the Human Resources Development Recommendation. July 2002.

Gyewu, David K. "ICT for Socioeconomic Development in Ghana." Presented at the Sixth Regional Session of the United Nations Commission on Science and Technology for Development. Geneva, 5-9 May 2003.

Hailemariam, Asfaw. "ICTs in Ethiopia: An Emphatic Look at the Infrastructure." Presented at Ethiopia in the Knowledge Age: A Conference on ICTs in Development. Addis Ababa, 18-20 June 2001.

United Nations Development Programme. *Making New Technologies Work for Human Development*. Human Development Report 2001. Oxford University Press, New York: Oxford. 2001.

United Nations Economic and Social Council, Economic Commission for Africa. "Report on Indicators of Information and Communications Technologies and the Impact of Information and Communications Technology at the Country Level." Presented at Third Meeting of the Committee on Development Information. Addis Ababa, 10-17 May 2003.

Annex C

Terms of Reference of Initial Scan ICT Methodological Framework

These Terms of Reference were the result of discussions held at the Inaugural Scan-ICT Workshop in Addis Ababa, November 2000. The following is an outline of the country baseline studies.

***2.1.1. Introduction***

Background on the Scan-ICT process

Definition of concepts discussed [ICTs, ICT environment, ICT sector, e-commerce, tele-density, universal access and so forth]

Discussion of the methodological aspects of the baseline studies [explanation of the methodology used, primary sources, secondary sources, questionnaires and so forth]. It should be noted that much of this information is available from secondary sources [ITU African Telecommunications Indicators, BMI], although the study should address issues concerning the reliability of these data sources

List of definition of concepts and acronyms

Global trends in ICTs and trends in Africa

***2.1.2. General country profile***

Brief situational analysis of the country to be studied, including relevant statistics:

| Category | Data/Indicators |
|---|---|
| Demographic | Population<br>Population growth<br>Population distribution by geographic area (including rural vs. urban)<br>Population distribution by age<br>Educational levels<br>Household patterns<br>Others |
| Economic | GDP (per capita, sectoral distribution, etc.)<br>Unemployment rate<br>Inflation<br>Debt<br>Principal exports and imports<br>Income distribution (poverty levels, etc.)<br>Others |
| Political | Political system<br>Party in power (ideology)<br>Historical context<br>Others |
| Cultural | Principal religions and their distribution<br>Principal languages (local and foreign) and their distribution |

### *2.1.3. AISI theme areas*

This section outlines the status, as well as indicators and benchmarks and the sources of information, for each AISI theme area. The first sub-section (*1- ICT Status: General description, indicators and benchmarks*) focuses on indicators and statistics of ICT activity by AISI theme area. The second sub-section (*2- ICT status: Establishing inventories of past, existing and proposed ICT-related projects)* is concerned with a potentially large number of measures for a basic stock-taking of ICT activity by AISI theme area. Therefore, it will establish inventories of past, existing and proposed ICT-related projects (national, private sector and donor-funded). They will generate "volumetric" information covering who is doing what, where. Finally, the last sub-*section (3- Sources of ICT knowledge*) summarizes the principal studies and outputs, in an annotated bibliography related to ICT activity in the different AISI theme areas.

## A-INFRASTRUCTURE

This section will describe the status of the *ICT infrastructure* – which relates to telecommunications infrastructure, Internet Service Providers, available technology, technological opportunities and so forth – in the respective countries

### *A-1- ICT Status: General description, indicators and benchmarks*

A general description of the status of ICT infrastructure could be enhanced by the use of the following indicators (* Historical and forecast trends when available):

**A-1-1 Telephony**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Telephone | Teledensity statistics (including average number of people per telephone)<br>Geographic proximity to a telephone, i.e. +/- 5km or walking distance (Total and %; (*))<br>Telephone communication charges: Average cost distributed be either local, international, business and domestic, differential (USD and % of GDP per capita (*))<br>Telephone connectivity: mapping and distribution (by government, private sector, international orgs, NGOs, rural vs. urban, age and sex; and by domestic, business or public access)<br>Average duration of usage per year<br>Failure rate<br>Time to repair |
| Telecentres | Description<br>Typology<br>Number of telecentres (Total and %; total and per 1000)<br>Telecentre phone charges |
| Operators | Number of operators (long distance; local; mobile) |
| Flow of traffic | ratio of incoming/outgoing international calls; (*)<br>ratio of local calls to international (*) |
| Mobile phone | Mobile phone subscribers (Total and %; total and % of total subscribers that are pre-paid phone card users )<br>Mobile communication charges: Mobile communications charges (Average charge per minute at peak and non-peak hours); average mobile handset cost<br>Mobile connectivity: mapping and distribution by: Government, private sector, international orgs, NGOs, other sectors; rural vs. urban; age and sex |

**A-1-2: Internet**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Internet users | Internet users (Total and per 1000, (*))<br>Geographic proximity to an Internet connection, i.e. +/- 5km or walking distance (Total and per 1000) |
| Internet connectivity | -Internet connectivity distribution (mapping and statistics):<br>➢ Government, private sector, international orgs, NGOs, other sectors<br>➢ Geography (rural vs. urban, etc.)<br>➢ Age and sex<br>➢ Domestic, business or public<br>-Internet bandwidth (average bandwidth to the ISP and long hall bandwidth from the ISP to the Internet backbone) |
| Local Internet content | Local Internet hosts and web sites (Total and % of population; (*)) |
| Local Internet Service Providers | Number of ISPs (Total (*)) |
| Internet access charges | ➢ Internet access charges (as % of GDP per capita and in nominal USD terms)<br>➢ Telecentre Internet charges(as % of GDP per capita and in nominal USD terms)<br>➢ Break-down of costs by telephone charge, computer use, and service charges |
| Internet usage | ➢ Home vs. work usage and access (ratio of domestic users to business users)<br>➢ Use of the Internet<br>❑ e-mail<br>❑ www<br>❑ ICQ<br>❑ Teleconference<br>❑ FTP<br>❑ DNS<br>❑ Other |

**A-1-3 Computers**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Stock of computers | Number of computers (total and % of population, (*)) |
| Computer costs | Average retail cost (as % of GDP per capita and in nominal USD terms (before and after duty and taxes)) |
| Computer usage | Ratio home-to-work usage |

**A-1-4 TV**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| TV stock | Number of TV sets (total and % of population, (*)) |
| Local content | Number and type of channels and local broadcasters (public or private, etc..) |
| Costs of TVs | Average costs of TV sets1 (Nominal USD and % of GDP per capita (before and after duty and taxes)) |
| Cable and satellite | ➢ Availability of cable and satellite |
| TV and cable distribution and access | -Geographic distribution/accessibility (total area served):<br>➢ TV sets (Mapping and statistics)<br>➢ Cable/satellite (Mapping and statistics)<br>➢ Distribution rural/urban<br>➢ % of population served<br>-Age and sex distribution |

**A-1-5 Radio**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Stock of radios | Number of radios (Total and % of pop, (*)) |
| Local content | ➢ Geographic dissemination of local frequencies (Mapping and statistics)<br>➢ Local channels/broadcasters (Number and type (public or private; urban or rural)) |
| Cost | Average cost2 of radio (nominal USD and % of GDP per capita) |

1 Average TV set is defined as a 20-inch brand-name TV

2 Average radio defined as lowest cost multi-band brand-name radio.

### *A-2- ICT Status: Establishing inventories of past, existing and proposed ICT-related projects*

This section will cover an inventory of projects, past, present and planned in the area of *ICT Infrastructure* to be divided in three sub-sections:

- Donor and NGO projects
- Public sector projects
- Private sector projects

Each project listing should include a short description, which includes information on:

- Project objectives
- Partners involved
- Length
- Cost
- Target group
- Availability of evaluation information

### *A-3- Sources of ICT knowledge*

This section will consist of an annotated bibliography of all studies, reports or books – originating from either the private, NGO, donor or government sectors - on the subject of *ICT infrastructure*.

## B- Strategic Planning

This section will ascertain the core management capacity of national governments and countries, measured in part through the presence and implementation of strategic planning through, for example, National Information and Communication Infrastructure plans (NICI's). This could also include the notion of national and regional ICT related policy, planning and management capacities, etc.

### *B-1- ICT Status: General description, indicators and benchmarks*

NATIONAL LEGISLATION CONCERNING ICTs
This sub-section is concerned with national legislation related to ICTs, such as the regulatory regime; licensing, universal access regulation and obligations. More specifically, issues to describe are:

- Licensing regime
- Services subject to licensing
- Fiscal regime applicable to ICTs
- Status of the incumbent operator
- Level of competition
- Universal service obligations
- Mechanisms for financing of universal service obligations
- Tools for effective regulation (existence of a regulatory authority, enforcement power, independence, financing of the RA through license/numbering/spectrum fees, transparency, dispute resolution mechanisms, etc.)

NICI PLANS
This section will describe the current national ICT plan, whether it is a National Information and Communication Infrastructure (NICI) strategy or some other form. In addition, this section should describe the level at which the country has achieved and/or adhered to the plan. Benchmarks used for the purpose of the national ICT plan would thus be used as a measurement.

### *B-2- ICT Status: Establishing Inventories of past, existing and proposed ICT related projects*

Inventor of projects, past, present and planned in the area of *Strategic Planning and ICT Policies* (National ICT plans), as above. This section will follow the same framework as in A-2.

### *B-3- Sources of ICT knowledge*

This section will consist of an annotated bibliography of all studies, reports or books – originating from either the private, NGO, donor or Government sectors – on the subject of *Strategic Planning and ICT Policies*

## C- Capacity Development

This theme area covers the important dimensions of human resources development, institutional development and strengthening and other dimensions of capacity at the broader environmental level, the organizational level and the individual level (including the African Diaspora issue).

### *C-1 - ICT Status: General description, indicators and benchmarks*

This section will describe the status of the country with respect to human resources and ICT skills. Relevant information and indicators would include:

**C-1-1 General trends (ICT jobs and skills)**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Labor market in general | ❑ Definition and description<br>❑ Emigration and immigration statistics (total and %)<br>❑ Current and future trends in the labour market<br>❑ Unemployment rate<br>❑ % Sectoral and gender distribution (service-industry-agriculture) (*) |
| ICT professionals and the ICT labor market | ➢ Definition and typology<br>➢ Geographic, gender and age distribution of ICT professionals<br>➢ Description of ICT professional associations |
| Support for ICT human resource development | National structures to Support ICT human resource development<br>➢ number of universities and colleges offering computer science programs and courses<br>➢ number of private computer training institutes providing basic computing, advanced, certificate or diploma<br>➢ level of in-company training and skill upgrading services<br>➢ the degree of incorporation of computing courses in the university curriculum |

**C-1-2 Supply and demand of ICT skills**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Supply: International recruitment | Total number internationally recruited ICT professionals and % of total ICT workforce (gender distribution) |
| Supply: Length of service | Average length of service ICT workers (Length in years (gender distribution)) |
| Supply: Availability | ❑ Pool of ICT graduates (gender distribution) |

| | |
|---|---|
| | ❑ Number of graduates per year (gender distribution)<br>❑ Emigration of ICT professionals (distribution)<br>❑ Type of skills (programmers, software developers, system analysts, system managers, computer scientists, telecommunications specialists, trainers, service sector profession skills, etc...) and annual output per qualification |
| Demand : Employment levels in the ICT industry | Current level of Employment in the ICT industry (in absolute terms and % of total workforce (gender distribution)) |
| Current and Forecast Supply and demand trends | ❑ Baseline survey of IT firms, NGOs and government |

**C-1-3 Remuneration**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Salaries | ❑ Salary for ICT professionals by type of ICT employment (software, hardware, consulting, etc.) (Annual average salary rates (USD))<br>❑ Distribution of salary rates by private, NGO and government sectors<br>❑ Gender distribution |
| Retention strategies | Type of retention strategies (stock options, benefits in-kind, continuous training, etc...) |

***C-2- ICT Status: Establishing inventories of past, existing and proposed ICT-related projects***

Inventory of projects, past, present and planned in the area of *Capacity development* (relates to skills availability [ICT skills, planning and management, training availability, etc.]), as in A - 2.

***C-3 - Sources of ICT knowledge***

This section will consist of an annotated bibliography of all studies, reports or books – originating from either the private, NGO, donor or government sectors - on the subject of *Capacity Building.*

## D- Sectoral Applications

This theme encompasses ICT activity across the different sectors of at the state and civil society levels, including their interactions. Priority ICT applications identified for study include education, health, culture and heritage, natural resource management, public administration, among others (where such priority areas will vary by country). *N.B. The private sector, including issues related to e-commerce will be dealt with in Section F (Information Economy).*

### *D-1 - ICT Status: General description, indicators and benchmarks*

This section will outline the indicators and relevant information concerning ICT application and penetration in different sectors, namely education, natural resource management, health, government, etc...

**D-1-1 Education**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT Penetration | ❑ Total and % of schools with computers (distributed by primary and secondary school)<br>❑ Total and % of schools with Internet connectivity (distributed by primary and secondary schools)<br>❑ Total and % of colleges and universities with computers (distributed by department when possible)<br>❑ Total and % of colleges universities with Internet connectivity (distributed by department)<br>❑ Geographic distribution of schools (all types) with connectivity and/or computers |
| ICT investments | ❑ Level of ICT investments and expenditures in the educational sector (total and distribution by type of institutions; USD and % GDP) |
| Users | ❑ % of students (sub-divided by educational establishment type (i.e, primary school, secondary, university, etc...) that have used or use computers and/or the Internet and those that have used it for educational purposes<br>❑ % of teachers or professors that use the Internet and/or computers and those that have used it for research or academic purposes<br>❑ gender distribution |
| Usage/access: | ➢ Where do students/teachers get access to computers or the Internet?(% of students/teachers that get access to computers and/or Internet through (distributed by age and gender): School, Telecentres, Household, Other) |

| | |
|---|---|
| | ➢ For what purpose do students/teachers use computers/Internet (E-mail, Research, Employment opportunities, Application software, etc…)<br>➢ Is usage free, if not, is cost an obstacle? |
| Content (Internet and computers) | ❑ Availability of local education content (Number and % of schools/universities that use locally made educational content and number of web-sites that have educational content<br>❑ Availability and source of distance learning<br>❑ Availability of TV or radio educational programs<br>❑ Principal languages of educational content (% in local languages) |
| Educational management Information Systems | ➢ Number of universities using EMIS<br>➢ Number of schools using EMIS<br>➢ Degree of use of ICTs to support the activities of the ministry of education (and related departments) |
| Non-formal education | Use of computers/Internet in non-formal education programs (compared to formal education ) |

**D-1-2 Culture**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT penetration | Number of cultural institutions (Museums, Art galleries, art councils, archives, theatre etc…) that use ICTs |
| ICT investments and spending | Level of ICT investments and expenditures in the cultural sector (total and distribution by type of institutions; USD and % GDP) |
| Local content | ❑ Typology of local Internet web-sites<br>❑ Number and % of local web-sites with local cultural information and % in local languages<br>❑ Types of institutions that support the creation and provision of content like radio, academic libraries and museums for example |

**D-1-3 Health**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT Penetration | ❑ % of health institutions using ICTs (by type of health institution: private clinic, government, university hospital, pharmacy etc… and type of ICT)<br>❑ geographic distribution of health institutions with computers, telephone and Internet connectivity |
| ICT investments and spending | Level of ICT investments and expenditures in the health sector (total and distribution by type of |

| | |
|---|---|
| | institutions; USD and % GDP) |
| Users | ❑ % of doctors that use ICTs for medical purposes (research, tele-medicine, e-mail, etc…) by type of ICT (computer, Internet…)<br>❑ % of population that have used or use the Internet for health information |
| Usage | Principal purposes for the use of ICTs by health institutions:<br>❑ tele-medicine<br>❑ e-mail<br>❑ research (health information, etc…)<br>❑ continuing medical education or distance learning<br>❑ health promotion<br>❑ including health information systems<br>❑ database<br>❑ Software applications, (type)<br>❑ etc… |
| Content (Internet) | ❑ number of local web-sites with medical information<br>❑ availability of local language health information (with typology) |

**D-1-4-Natural Resource and Land Management (Environment)**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT penetration | Number of institutions in the area of NRM that use ICTs (by type of ICT) for the purpose of NRM |
| ICT investments and spending | Level of ICT investments and expenditures in the NRM sector (total and distribution by type of institutions; USD and % GDP) |
| Usage | Principal purposes for the use of ICTs in NRM:<br>❑ geomatics<br>❑ early warning systems<br>❑ research<br>❑ e-mail<br>❑ database<br>❑ Software applications, etc… |
| Content (Internet) | ❑ % of local web-sites with NRM/env. Information<br>❑ typology of environmental information content |

**D-1-5 Public Institutions**[3]

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT Penetration | ➢ total and % of government departments that have access to ICTs (by type of ICT and department) |

3 Other than health, educational or cultural institutions

| | |
|---|---|
| | ➢ type of system installed (LAN, stand-alone, etc…) |
| ICT investments and spending | Level of ICT investments and expenditures in the government sector (total and distribution by type of institutions; USD and % GDP) |
| Users | ❑ % of government workers that use ICTs (by type of ICT)<br>❑ Distribution of Internet users by government department and bureaucratic category<br>❑ ICT personnel as a % of the total personnel<br>❑ Level of ICT literacy<br>❑ Distribution of computers and/or Internet by gender and age |
| Usage | Purpose of use ICTs:<br>❑ e-mail<br>❑ research<br>❑ database work<br>❑ geomatics<br>❑ Application software, etc… |
| Content | Availability of government information and applications on the Internet<br>❑ Number of government departments with web-sites (existence of a portal site?)<br>❑ Typology of government information on the Internet<br>❑ Typology of public service functions (income tax, car registration, voting., etc…) that can be done using the Internet. |

**D-1-6 Agriculture**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT Penetration | ➢ % involved in the exploitation and deployment of ICTs to the sector |
| ICT investments and spending | ➢ Level of ICT investments and expenditures in the agricultural sector (total and distribution by type of usage; USD and % GDP)<br>➢ Level of IT Training expenditures |
| Users | ➢ % of ICT users (level of connectivity and spread)<br>➢ Level of ICT awareness (including Internet information sites on agriculture or weather)<br>➢ Number and category of IT personnel |
| Usage | Typology of usage of ICTs in the agricultural sector (R&D, business, weather, prices, etc..) |
| Content | ➢ Number of Local web-sites with agricultural information |

| | |
|---|---|
| | and content (or web-sites with local information on agriculture<br>➢ Key databases and information systems in use |

***D-2- ICT Status: Establishing inventories of past, existing and proposed ICT-related projects***

Inventory of projects past, present and planned in the different *Sectoral Applications* areas (education, government, culture, health and natural resource management), as in A-2.

***D-3- Sources of ICT knowledge***

This section will consist of an annotated bibliography of all studies, reports or books – originating from either the private, NGO, donor or government sectors - on the subject of Sectoral *Applications* (education, government, culture, health and natural resource management).

## E- Governance and the Information Society

Due to the qualitative and analytical nature of this AISI thematic area, it will be dealt with in the second phase of the Scan-ICT country profile (Impact and analysis of ICTs).

## F- Information Economy

This area addresses the specific economic/industrial dimensions of ICT: IT industry, investment and capital, electronic commerce, business formation, private sector development, and related aspects.

***F-1- ICT Status: General description, indicators and benchmarks (Generally Accepted Accounting Practices [GAAP] standards for business information)***

**F-1-1 ICT Industry**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Overview of the ICT industry | ❑ Composition and definition of the ICT industry (Telecom, Hardware, software, etc…)<br>❑ Total market capitalization, revenue, employees,<br>❑ % of GDP<br>❑ Turnover and profitability, revenue earned, growth rates (international and national),<br>❑ IT spending<br>❑ R&D spending<br>❑ Investment flows |
| ICT players | Ownership structure (i.e. state or private), revenues , |

| | |
|---|---|
| | profits, market capitalization, market share, growth (forecast) and number of employees for each company in each sector:<br>❑ Hardware<br>❑ Telecom<br>❑ Software<br>Professional services |
| Hardware sector | ❑ Mainframe, midrange and PC installed base<br>❑ Computer hardware sales, revenues, profitability, growth rates<br>❑ R&D spending<br>❑ Total employees |
| Software sector | ❑ Sales, revenues, profitability, growth rates<br>❑ Software sales by software type<br>❑ Sales of locally developed software type<br>❑ Total employees |
| Telecommunications (hardware and operator) sector | ❑ Sales, revenues, profitability, growth rates<br>❑ Structure (mobile, landlines, cable, etc…)<br>❑ Total employees<br>❑ Degree of competition in the different services (local, long distance, international, leased lines, mobile) |
| Professional services (consulting, etc.) sector | ❑ Sales, revenues, profitability, growth rates,<br>❑ Typology of services offered |

**D-1-2 Informal ICT Sector**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Overview | ➢ Definition<br>➢ Number of people involved and % of total workforce<br>➢ Revenues generated (USD) and % of GDP and % of ICT formal sector |
| Usage | Type of informal section uses of ICTs (mobile telephony sub-contracting; pirate VSATs, etc..) |
| Actors | Typology of Informal sector (typology and distribution by sex and age) |

**D-1-3 E-Commerce**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| Overview | -Availability of e-commerce portals (centers):<br>❑ EC-DC<br>❑ Trade points, etc…<br>-E-commerce revenues, including projections (USD)<br>❑ Business to business |

| | |
|---|---|
| | ❑ Business to consumer<br>-Value of on-line transactions, with projections<br>-top 10 e-commerce sites (with description)<br>-geographic distribution of e-commerce activity<br>-value of "imports" and "exports" through the use of e-commerce |
| Usage | ❑ Typology of transactions (type of products or services offered)<br>❑ Typology of usage (teleservices, etc…) |
| Content | ❑ % of local web-sites that are used for e-commerce |
| Users | ❑ number and % of consumers who have used e-commerce (or plan to) |

**D-1-4 ICTs and the Commercial Sector (E-Business)**

| SUB-CATEGORIES | INDICATORS AND TYPE OF INFORMATION (METHOD OF MEASURMENT) |
|---|---|
| ICT penetration | ❑ % and number of firms that use ICTs, notably the Internet; by type of sector (agriculture, industry, services [banking, consulting, etc…]) and by size of firm (SMEs, LE, MNE…)<br>❑ % and number of firms that have a web-site<br>❑ % of expenses on investments in ICTs |
| Usage | -Purpose of the use of ICTs:<br>❑ e-mail<br>❑ e-commerce<br>❑ Internet research (marketing intelligence, partnerships, distribution or client searches, etc…)<br>❑ Software applications, etc…<br>-Business use of the internet:<br>❑ Revenue generation<br>❑ Customer service<br>❑ Cost-saving<br>❑ Marketing, etc…<br>-Types of Internet Information sought:<br>❑ Technical and computer<br>❑ General<br>❑ Financial market<br>❑ Economic and government<br>❑ Supplier, etc… |

***F-2- ICT Status: Establishing inventories of past, existing and proposed ICT-related projects***

Inventory of projects, past, present and planned in the area of the *Information Economy* (addresses economic/industrial structural issues as well as issues related to e-commerce), as in A -2.