

# INTRODUCTION

## **The Internet in Africa** **New Information Technologies:** **networks available or planned**

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The Internet and other communication networks are development tools, quite as important as educational, agricultural and training programmes. Information, Information Technologies and data networks have (and have had) a fundamental role in the development of 'northern societal and cultural environments', though the Internet is still seen by some people in developed countries simply as a pastime, as a new multimedia entertainment providing nice graphics and images. In a society satiated with information, the need for Information and Information Technologies are perhaps not always fully appreciated. The role of networks as valuable development tools may therefore be better understood in the African context. The purpose of this article, however, is not only to point out the importance of electronic communication networks such as the Internet in helping the processes of development in Africa, but also to offer readers of the *AFRICA BIBLIOGRAPHY* an up-to-date guide to the extent and kinds of connectivity currently operating or being planned in African countries, and to some of the problems - political, financial, technical - that the new information technology faces today.

### **1. *The African matrix***

The African continent has the least developed telecommunication network in the world. The International Telecommunication Union in 1994 gave a teledensity (number of telephone lines per hundred inhabitants) of 1.6 for the African continent as a whole, and 1.2 outside the large urban centres, compared to 45 for Europe. These numbers are much lower in sub-Saharan Africa (with South Africa as the exception) where the number of telephones is less than in Manhattan. The telecommunication infrastructure is insufficient, poorly adapted to the needs of the African environment and unequally distributed over the continent. Equipment is concentrated in urban zones, and rural areas where most of the population lives are forgotten. In outlining the current status of electronic communication networks in Africa, I am using the term 'matrix' to refer to the whole set of networks, the Internet as well as other networks such as BitNet, FidoNet and UUCP. Table 1 presents the four main types of networking connectivity in Africa.

**Networking Connectivity in Africa**  
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No.	Code	Country	Connection	Comments
1	AO	Angola (republic of)	FI	
2	BF	Burkina Faso	FI	
3	BJ	Benin	FI	
4	BW	Botswana	FI	
5	CF	Central African Rep.	FI	
6	CI	Ivory Coast	FI	<b>FI</b>
7	CM	Cameroon	FI	means Full Internet Connection
8	DJ	Djibouti	FI	This includes remote applications
9	DZ	Algeria	FI	such as teinet, ftp and internet
10	EG	Egypt	FIB	E-mail
11	ET	Ethiopia	FI	
12	GH	Ghana	FI	
13	KE	Kenya	FI	
14	LS	Lesotho	FI	<b>PFI</b>
15	MA	Morocco	FI	stands for a provisional full
16	MG	Madagascar	FI	internet connection
17	ML	Mali	FI	This is used when one or more of
18	MU	Mauritius	FI	the following is true:
19	NA	Namibia	FI	address not verified or lack of
20	NE	Niger	FI	address
21	NG	Nigeria	FI	net connection possible but
22	SN	Senegal	FI	not officially announced
23	SC	Seychelles	FI	premature official
24	SZ	Swaziland	FI	announcement of connection
25	TN	Tunisia	FI	
26	TZ	Tanzania	FI	
27	UG	Uganda	FI	
28	ZA	South Africa	FI	<b>B</b>
29	ZM	Zambia**	FI	stands for BitNet connection
30	ZW	Zimbabwe***	FI	
31	ZR	Zaire	PFI	
32	GN	Guinea	PFI	
<hr/>				
1	RW	Rwanda****	F	<b>FidoNet Network Connection</b>
2	SD	Sudan	F	
3	MW	Malawi	F	It is assumed that the Connection
4	GM	Gambia	F	is stable and reliable
5	ER	Eritrea	F	
<hr/>				
1	CG	Congo	U	<b>UUCP Connection</b>
2	SL	Sierra Leone	U	
3	TD	Chad	U	The country is reachable by
4	TG	Togo	U	E-mail
<hr/>				
1	SO	Somalia	0	
2	LY	Libya	0	
3	LR	Liberia	0	
4	GQ	Equatorial Guinea	0	<b>No Connection</b>
5	GW	Guinea Bissau	0	
6	GA	Gabon	0	
7	BI	Burundi	0	

\* Table compiled from data obtained on the Internet, on the World Wide Web Site developed by Oliver Crepin-Leblond, 'International E-mail Accessibility', available at: <http://www.ee.ic.ac.uk/misc/country-codes.html>.

\*\* Intermittent    \*\*\* Unstable Connectivity    \*\*\*\* Currently Cut

The latest survey (Crepin-Leblond, 1997) shows that thirty-two African countries have full Internet connection to the Internet. These countries are mainly located in North, West and South Africa. A full Internet connection means that users can take advantage of networking services such as e-mail, conferences, newsgroups, distribution lists, remote login, ftp (file transfer protocol), gopher, WAIS (wide-area information server) and the Web. Other countries are also connected to other networks such as BitNet, FidoNet and UUCP with which an Internet connection is possible.

The BitNet network offers three basic communication tools: messages, ftp and electronic mail. The electronic bulletin board can be used interactively. BitNet is connected to other networks such as the Internet. In Africa, Egypt is now the only country connected to BitNet.

The FidoNet network was established in 1984 to support electronic mail and the newsgroup service between different BBS (bulletin board system), at an attractive price. More than 25,000 computers are connected to the FidoNet network. FidoNet uses the traditional telephone network as a communication tool between computers equipped with networks. FidoNet Systems are batch-based store-and-forward technology widely used in Africa because they offer a low-cost networking platform optimised for use on low-quality phone lines. FidoNet systems are not internet-upgradeable, but are connected to the Internet and to the UUCP Network. In Africa, FidoNet is mainly used by NGOs. Table 1 shows that FidoNet is available in Eritrea, Gambia, Malawi, Sudan and Rwanda.

UUCP (Unix to Unix CoPy) is a set of protocols developed to copy files between UNIX systems, using phone lines and modems. UUCP was initially developed for UNIX systems and also performs on other operating systems. UUCP is a batch-based system, only suitable for low-volume data transmission. UUCP can run over different networks (packet switching, X.25 lines, leased line). Indirect connections to the Internet are possible via a computer connected to the Internet and transmission via a UUCP call.

UUCP is widely used in Africa because the system makes possible an easy transition toward the TCP/IP protocol<sup>1</sup>, which provides a direct connection to the Internet. In other words, UUCP systems are TCP/IP compatible and Internet upgradeable. The UUCP technology is very well adapted to the African communication infrastructure. UUCP Network is able to work with the simplest equipment, with bad telephone lines and on different types of networks. The main networks that use this technology are RIO in Francophone Africa and UniNet-ZA in southern Africa.

The differences between the types of services offered by the FidoNet and UUCP Networks and by the Internet are explained by the lack of interactivity, the unavailability of telnet and login applications that allow users to work on a remote computer and the lack of Internet services such as WAIS, FTP and The World Wide Web in an interactive mode (Coeur de Roy and Presno, 1997). Resources offered by electronic mail in batch mode are nevertheless very important. They allow participation in forums, discussion lists, WAIS database, FTP (file transfer protocol), the research of documents and computer programmes via Archie and Trickle servers, the access to information available on the World Wide Web (Web or WWW) via electronic mail, the search of electronic directories such as WHOIS and X500 and the reading of news and articles available on UseNet. Compared to the costs of voice and fax telecommunication, electronic mail (also known as e-mail) is the only type of technology that Africa can afford for international communications. While the main objective is to get access to new data which Africa has been lacking for several years, these networks are in the short term an excellent basis for training users to get to know and

<sup>1</sup> TCP/IP: Transmission Control Protocol / Internet Protocol. It is the communication protocol that connects different systems to the Internet.

enjoy the pleasures of cooperation and efficiency that can come with full direct Internet connections.

## **2. Main communication networks in Africa**

The main networking projects being developed or in working condition on the African Continent are mainly created by Non-Governmental Agencies and are also mainly research-education networks. The following section presents briefly the main communication networks in Africa.

### **2.1 GreenNet**

GreenNet is the network of a Non-Governmental Organization (NGO) member of the APC (Association for Progressive Communications) (Alliance for Global Communication). The Network is based on the Fidonet technology. The Fido Gateway of GreenNet (GnFido), with its store-and-forward technology, allows access to the basic services of the Internet (e-mail). GreenNet works conjointly with other networks in helping the development of local initiatives like HealthNet and SDN to participate in training programmes with CABECA. The main correspondents of GreenNet come from NGOs located in South Africa, Botswana, Ethiopia, Gambia, Ghana, Kenya, Mozambique, Uganda, Senegal, Tanzania, Tunisia, Zambia and Zimbabwe.

### **2.2 HealthNet**

HealthNet is a computer network for health care workers administered by SatelLife, an international non-profit organization based in the United States. The use of low-earth-orbit satellites allows an affordable transmission and the sharing of electronic mail and publications. Ground stations are operational in Botswana, Burkina Faso, Cameroon, Eritrea, Ethiopia, Gambia, Ghana, Kenya, Malawi, Mozambique, South Africa, Sudan, Tanzania, Uganda and Zimbabwe.

### **2.3 PADIS/CABECA**

PADIS (Pan African Development Information System) was developed in 1980 by UNECA (United Nations Economic Commission for Africa). The objectives of PADIS were to assure the management of development information and to promote exchange and access of information on scientific, technological, economical and societal aspects of development.

In 1990, PADISNET received financial help from IDRC (International Development Research Centre), a public company created by the Canadian Parliament to help research that can adapt science and technology to the needs of developing countries. The CABECA (CApacity Building for Electronic Communication in Africa) project was thus created and executed by the Pan African Development Information System (PADIS). The objective of CABECA is to provide technical assistance in developing a sustainable way in which computer networks in Africa can be accessible to all sectors of society. This help focuses particularly on the establishment and the strengthening of low-cost network systems and on the training of users and systems managers. CABECA worked with 20 African countries, establishing new nodes and strengthening existing ones. The latest project of CABECA has been in Chad, with the development of a node that was the country's first. PADIS is based in UNECA's headquarters in Addis Ababa (Ethiopia), and controls the PADISNET node, which connects on demand to Accra, London, Nairobi, Johannesburg and Washington. Fido systems have mainly been used, with the establishment of UUCP systems where possible.

## 2.4 RINAF

The RINAF project (Regional Informatic Network for Africa) was conceived in the framework of the Intergovernmental Informatics Program (IIP) of UNESCO and financed by the Italian Government. The technical management is provided by the CNUCE Institute in Pisa, Italy.

The objective is to facilitate exchanges between academic and research sectors in Africa and the international scientific community. The project provides basic services to several African countries by creating five regional nodes in Algeria, Kenya, Nigeria, Senegal and Zambia and 10 national nodes in Cameroon, Egypt, Ethiopia, Gabon, Guinea, Côte d'Ivoire, Mozambique, Swaziland, Tanzania and Tunisia.

Several networking technologies are used for this project. The goal is not to concentrate on a specific type of architecture but rather to adapt to local conditions and the state of lines and telecommunication systems. UUCP, Fido and TCP/IP will then be used as appropriate.

## 2.5 RIO

Initially named Réseau Informatique de l'ORSTOM<sup>2</sup>, RIO was re-named Réseau Inter-tropical d'Ordinateurs in 1992. ORSTOM decided to share its network with all participants in research and development. An official agreement is proposed to institutions who want to join the network. ORSTOM became the main partner of a network for research, academic and development sectors. RIO answers the needs of scientific and technical communication in Francophone Africa and allows it not to be isolated from the "information highway". The RIO Network is based on UNIX, Ethernet, TCP/IP and UUCP technologies. Users of RIO are mainly researchers (500 in sub-Saharan Africa) in the fields of natural sciences, life and human sciences, managers of development projects, and computer specialists.

RIO network is oriented toward the main themes of research in developing countries: agriculture, health, environment and education. To set up its network, ORSTOM works in association with engineering schools and scientific departments of universities. Several organisations share the RIO infrastructure such as CORAF (Conference of African Agromomic Managers), OSS (Observatory of Sahara and Sahel), FAO-SMIAR, Pasteur Institutes, CARI (African Committee for Research in Computing). Seventy institutions located in twelve countries take part in the development and growth of the RIO network. These countries are Senegal, Mali, Côte d'Ivoire, Burkina Faso, Niger, Cameroon, Madagascar, Seychelles, Kenya, Guinea and Togo.

## 2.6 Sustainable Development Network

The Sustainable Development Networking Program (SDNP) was initiated by the United Nations in the framework of the United Nations Development Program in 1992 with twelve countries in Africa, Asia and Latin America. The Program is mainly for, but not limited to, NGOs and based on FidoNet technology. The Program stresses the importance of sharing information at all levels of society in developing countries. Access to information sources by decision makers and by the different members of society is the essential element in understanding and developing the concept of sustainable development.

Access in developing countries is, however, limited and finding important information concerning the environment and development is difficult. Besides this, access to information is limited to certain sectors. In general, governments have preferential positions that allow them to receive updated information on development. Many decision-makers are not able to receive updated information to initiate and begin new policies. Other sectors of society such as the NGOs, the academic sector and national companies have an even more restricted and limited access to information.

<sup>2</sup> ORSTOM ('Office de la recherche scientifique et technique outre-mer) is a well-known acronym still used by today's Institut français de recherche scientifique pour le développement en coopération.

The SDNP approach is particularly interesting because it requires strong participation by the countries concerned. The programme is based on the following principles:

- the participation of all sectors of society (government, academia, NGOs, companies etc.);
- partnership: research by national partners;
- appropriate technology: the technologies provided to the participating countries are adapted and appropriate to existing infrastructures and human resources.
- national ownership of the project
- the project encourages the creation of a national body of experts.

SDNP has sixteen working nodes in developing countries today. The African countries which benefit from the SDNP initiatives are Angola (Fido/UUCP), Chad, Morocco and Tunisia. Other initiatives have been developed, with feasibility studies in Cameroon, Malawi, Mozambique and Zambia.

### **2.7 UniNet-ZA**

The project began in 1987 under the management of Rhodes University (Grahamstown, South Africa). UniNet is a network dedicated to research and the academic sector. It tries to develop, organise and promote a computer network adapted and thus compatible to Internet standards, available to every researcher, professor and student in South Africa. UniNet however is not limited to South Africa as it encourages, with technical assistance, neighbouring countries to connect to the Internet. The UniNet network links Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Swaziland and Zimbabwe. Connections with these countries are made using essential UUCP technology. UniNet, then, is an extension of the South African Internet network to neighbouring countries.

UniNet is now fully integrated to the Internet, with a digital leased line connection from Rhodes University to Washington DC and has local connections with all IP commercial networks in South Africa. All Internet services (e-mail, ftp, news feed, remote Logan) are available. Users can find ftp mirror sites (ftp.sun.ac.za), archie server (archie.uct.ac.za) and an Internet gateway by UUCP dial-up (kudu.ru.ac.za).

This description of African networks is not exhaustive. We are not reviewing private networks of organisations such as The World Bank (All in One), PNUD and USAID etc., which are instead internal communication tools. All networks presented above are important technical achievements that are currently available in Africa. They bring together a wide variety of users and point the way towards the information superhighway.

### **3. Obstacles and barriers to the development of electronic communication networks in Africa**

The exchange of information is the first objective in the process of connecting to the Internet. Countries must accept the propagation of information and information sources, national and international. Other than the language barrier, the Internet brings up important cultural issues. The Internet is an open environment, a window through which users are in touch with the rest of the world. This means that some elements of information related to the culture of some countries might offend either the religious or political agenda of some governments and be unacceptable for the individuals themselves. This environment generates a type of resistance toward this new Information and Communication technology.

Nevertheless, these elements should not be the reason for the over-regulation and censorship of access to communication or information dissemination technology. Appro-

appropriate measures should be taken to avoid 'culture shocks' via electronic networks. Training and consultancy should also be made available to demonstrate the benefits of sharing information and communication in societies that lack this 'information exchange' culture.

The second difficulty concerns the non-adaptability of the infrastructure. In most African countries, the telecommunication infrastructure is poor and delays the development of the Internet. 'What is really lacking in African telecommunications is ... the basic network infrastructure upon which telecommunications services can be developed' (Jipguep, 1993). Scientists, researchers, and the general population in most of the African countries have to face (and must learn to cope with) power outages & surges, telephone circuits that are unreliable even when available, the low availability of high band-width and digital systems etc.

However, infrastructure and technology is not an insurmountable barrier in the development of networks and the Internet. When terrestrial equipment is not usable or non-existent, new technologies such as VSAT (very small aperture terminal) and Packet Radio (Garriott, 1991) allow the connection to electronic networks. Terrestrial packet radio allows the communication of two computers via radio. Remote stations can form a network that can be connected to other networks. Packet radio with low-earth-orbit satellites is another attractive technology because of the small size and the low cost of VHF technology. The satellites store messages from ground stations and forward them when over a receiving ground station. However, the lack of interaction in the collection and distribution of data makes VSAT technology another interesting and practical way of transmitting data. VSAT (Schlegel, 1994) allows the purchase of space segments and the connection to the Internet through Internet Providers anywhere in the world. Data are transmitted from little satellite dishes to data transmission centres via satellites in a geostationary orbit.

The third element that needs to be addressed is the human element. The introduction of new technology has always brought up important human issues in developed and developing countries. Training individuals and helping them to adapt are necessary steps in the development and diffusion of the new technologies. Users (and future users) must be able to handle and apply the newly received information. Africa has the highest level of illiteracy worldwide (with more than half of its population unable to write). Human resources are a key element in the sustainable development of a communication infrastructure and in the success of economies. A large number of African countries do not have a sufficient pool of experts able to organise and develop information systems. This lack of qualified personnel results also in a lack of training facilities for users. Most of the institutions and professionals involved in the early development of networking in Africa face problems dealing with the unavailability of local expertise. They recognise (Knight, 1995) that technology, infrastructure and equipment are existing obstacles but add that they are not insurmountable, particularly with appropriate training and management of network projects.

In spite of the highest annual growth rate in 1995 since the beginning of the decade and a GDP of 2.3%, and despite the fact that several national economies recorded a growth superior to the growth of their population for the first time since 1970, the African continent faces a reduction of its share in world trade (2.2% in 1995). The financial aspect of network development in Africa is obviously an important concern. The development and installation of these new technologies requires a degree of financing that sometimes goes beyond the available resources of African countries. Ahmed Laouyane, Director of the Bureau of Development of Telecommunications (BDT) of the International Telecommunication Union (ITU), sees in the financial issue of networking development a new type of cooperation between countries of the South and countries of the North. This new environment gives rise to new types of relations, from assistantship to partnership, with a

greater participation and investment of private companies. However, the examples of Zambia and Ethiopia, among the least developed countries, show that there is not necessarily an association between economic level and the extent of connectivity. The dedication of some individuals, the availability of funds and loans and, above all, a change of perception of political leaders toward the impact of information technology are essential elements contributing to the appearance and development of electronic networks in the poorest nations.

Underlying all of these problems is the political issue. Many (Hall, 1995; Knight, 1995; Wilson, n.d.) recognise that key problems are not technical, cultural or financial, but lie in the political institutions. Governments are regularly setting up obsolete frameworks, insisting upon over-regulation, and putting artificially high charges upon imported telecommunication equipment and telecommunications. When telecommunications constitute an important source of revenue, independent new services are seen as contributing to a fall in profits and are not welcome. Governments who know telematics are aware of the power of the Internet and other networks as a tool to publicise and spread sensitive or embarrassing information. These obstacles make access to information (and to the development of the means to acquire it) politically impossible. Some leaders therefore need to show real political will if they are to take their country into this new planetary village.

#### ***4. Opportunities offered by information and communication technologies***

A poor knowledge of the possibilities and opportunities offered by information and communication technologies often produces an argument that puts communication infrastructures in second place in development programmes and gives rise to claims that Africa has other priorities. If one takes into account the characteristics of global economy and of the most active societies in world trade, one sees the essential role of these technologies in social and economic development in all countries, developing countries included. This essential role can be seen in a wide variety of sectors such as administration, research, education, health, statistics, agriculture, natural resources, development, planning, telecommunications, economy, cooperation and international organizations. Here I will consider, as examples of the possible effect of communication technologies, only research, health and education.

##### ***4.1 Research***

Electronic networks allow Africa to have access to information that was not available on the continent. Databases, centres for scientific documentation and publications can be browsed, searched etc. The best libraries in the world are then available with a few keystrokes, from any location on earth, allowing the acquisition, use and exchange of information. The problem is not solely access to information located outside the African continent but concerns the control and production of African data in Africa. These networks permit African scientists to repatriate back to Africa volumes of data and analysis originally obtained from African sources but now accumulated in research centres and libraries in countries of the North. This technology makes possible the creation and development of structured information, with the creation of directories and indexes such as the Index to South African Periodicals.

A large number of scientists and African researchers can, with this tool, make their writings known and distribute them electronically. Electronic communication networks thus facilitate acknowledgement of Africa's scientific production, contributing to the emergence of an African scientific community. In a research centre (but not only in this



context), the Internet is used as a support for international discussion (forums on development and environment), as a communication tool between researchers (writing of articles, exchange of bibliographic information, fast distribution of questions and answers, newsletters and request for information). The reciprocity in these 'new' exchanges breaks down the isolation which researchers and African teachers are suffering, and stops the 'brain drain', the emigration of intellectuals and other intelligent minds to the countries of the North. With these technologies, they can better participate in scientific exchanges between African regions, northern countries and international organisations, strengthening their participation in world activities. The Network becomes a place to meet, where different institutions and different competences exchange information and ideas, facilitating collaboration between development professionals.

#### **4.2 Health**

The health sector will also take advantage of these new communication tools. Where distance and people's isolation are a major factor in Africa, applications of telematics in telemedicine and healthcare services will improve services to the patients and will provide a better and more effective way to control the cost of these services. Patients and professionals and isolated medical and health staff will be able to receive and have access to information and consultant-level advice. The following are some of the services available with the emergence of these new technologies:

- telediagnosics from specialists;
- access to medical knowledge databases;
- liaison between medical centres and patients;
- developments of medical information systems allowing better management and therefore an improvement of health administration;
- access to international organisations (World Health Organisation, for example);
- creation and installation of health warning systems.

#### **4.3 Education**

Networks allow the contribution of new educational sources, such as the research of databases, of class material, of discussions and exchanges between students and teachers in the same country or in another country, either in Paris, Tokyo or Dakar, and the development of remote education (or 'distance learning'). These new technologies already have an important educational role in Africa where schools and the education system are in crisis and where backward schooling is a reality. These technologies are changing and challenging the ways of learning, and the acquisition of knowledge becomes more dynamic, creative, universal, electronic and interactive. The development of electronic networks prepares African nations to react to, and participate more actively in, the fast-changing world economy where the flow of free information and of ideas is important and influences all sectors of development and society.

### **5. The multiplication of networking initiatives for a connected Africa**

Networking development projects and other information technologies come from three different horizons - the commercial sector, the international institutions, and Africa - and are oriented toward the same objective: to bring Africa into the Information Age in order to stimulate development and economic expansion.

### **5.1 Commercial projects**

Commercial projects use two types of technology: satellites and fibre optic cables. A large number of geostationary satellites and low-orbit satellites are launched to provide global coverage, remote personal communications, low-cost telephone and global Internet. Among the different satellite projects, we can point to Motorolas Iridium, to Globalstar from Loral and Qualcomm, to Teledesic from Microsoft and to Mc Caw and Spaceway from Hughes Communications.

Among the projects using fibre optic cable, AT&T's Africa One has been the most publicised. Africa One is AT&T's project to encircle the continent with a fibre optic cable network. Africa One is a project of the ITU, RASCOM, PATU, ATT and Alcatel. The 32,000 kilometre submarine cable will ring the African continent from the Mediterranean Sea around the Cape of Good Hope and up to the Red Sea. The cable will provide ultimately a 2.5 gigabits/s link to 41 coastal nations, Italy and Saudi Arabia. The second step of the project will try to link all African nations with the development of a regional network that will integrate the existing infrastructure. The third step of the project will connect the fibre optic cable to the information superhighway.

Among other fibre optic cable developments, we should mention the Ninex Flag project between Japan and Europe that will take Egypt as its landing point, and Alcatel's Sea-Me-We 2 between Asia and Europe. Alcatel is also planning a second fibre optic cable from France to Morocco and then down to Cape Town, connecting 16 nations together. Telkom South Africa is also planning the development of a fibre optic cable (SAFE) between India and South Africa. AfriLink (Siemens) will link all countries between Senegal, South Africa, Europe and the U.S.A.

These projects from multinational companies will certainly improve the connections between the African continent and the rest of the world and especially intra-regional connections with a cooperation with existing African structures (see below). However, these projects alone cannot be the perfect solution to African demand and its environment (human and technical). Equipment and material that come along with these projects are from countries outside the African continent where the technical evolution is far too fast for this environment. Commercial networks will not accept extension to an isolated population that involves investments without financial return (Renaud and Torres, 1996). These initiatives will be a success for the African continent only if they are joined by initiatives from international organisations, African governments and individuals who take into account the African environment and give preference to a sustainable development of information and communication technologies.

### **5.2 International Organisations / governments**

The role of the major International Organisation comes at a time when information technology is recognised by these institutions to be a major key in the development process, as valuable as any agriculture, irrigation or health project. This awareness occurred as long ago as 1985 when the Maitland Commission<sup>3</sup> presented the Missing Link report which points out the significant role of telecommunications in the socio-economic development of countries, regions and continents of the world.

The World Bank is playing a major role in the dissemination of information technology by providing funding and training under the InfoDev (Information for Development) programme. The programme intends to show governments and decision makers the economic impact of communication and information dissemination technologies, and to provide training and grants with funds. The objective is to help developing countries to fully integrate the information economy.

<sup>3</sup> The Maitland Commission was an international committee of telecommunication experts set up in 1983 by the ITU.

The ITU has created WorldTel, a financing programme or development fund with the objective of helping developing countries to build telecommunication networks by mobilising private investment. According to Pekka Tarjanne, the Secretary General of ITU, the project will raise \$500 million from private and public sources. Specifically, funds will be dedicated to countries with a one per cent telephone penetration rate.

The Leland Initiative of the United States Agency for International Development (USAID) tries to bring the advantages and benefits of the global information revolution to African populations via connection to Internet and other technologies of the Global Information Infrastructure (GII). The project presents an approach based on public and private partnership between the U.S. and Africa to bring full connection to twenty countries in sub-Saharan Africa. The objectives of the Leland Initiative will be reached with the creation of an environment propitious to the construction of communication infrastructure, to the sustainable development of a sustainable industry of Internet Access Providers and to the improvement of applications for users in the framework of sustainable development.

The initiatives from the group of the seven most developed countries (G7) have included projects in education and training on the management of the environment and natural resources with particular attention to less developed countries, and sponsoring a conference held in South Africa in May 1996 on the information society and development. The initiatives of International Organisations and of developed countries show the importance of information technology as a developing tool in an increasing information-age world. It also reveals the necessity to close the gap between connected and non-connected countries and information 'have' and 'have-nots'. These initiatives of the international community should not however prevent African nations themselves developing more indigenous projects.

### **5.3 Indigenous initiatives**

The more encouraging initiatives are coming from the African countries themselves. Encouraging because it is recognised that to reach the development of sustainable networks, commitment from the beneficiary countries receiving international aid is necessary (Baran-shamaje et al., 1995). 'An international effort led by the Africans is now underway' (Knight, 1995), an effort that will help national leaders to be aware of the impact of electronic networks and information technology on the development of their countries.

This effort is illustrated by the measures taken by African leaders in May 1995 at the UNECA Conference of African Ministers Responsible for Economics and Social Development and Planning. 'Building the Information Highway in Africa is the name of the resolution signed by the ministers who are focusing their attention on the African information superhighway as a tool for planning and decision-making via the building of national information and communication networks and the creation of a group of African experts, the High Level Working Group on Information and Telecommunications Technologies (Knight, 1995).

Managed by PATU, the Pan-African Telecommunication Union (an institution founded in 1977), the Panaftel initiative offers Africans a telecommunication infrastructure or network dedicated to intra-African traffic. Panaftel countries such as Senegal, Mali, Togo, and Benin are upgrading independently their systems, while several other African nations are upgrading their system via fibre optic cable. The ITU is providing some assistance but most of the direction is coming from the countries themselves. These changes are encouraging as they lead to a greater utilisation of regional transit centres and a greater commitment of African nations to the development of electronic networks.

RASCOM is a pan-African satellite organization dedicated to providing Africa with its own satellite for relaying telephone, data and TV signals. The primary objectives of this

project were to provide telecommunication services to remote rural areas. The RASCOM initiative tries to emphasise a regional approach to the development of telecommunication, building a network of African nations to create a market and a demand sufficient to attract regional and international investors.

Finally, several countries are taking a voluntaristic approach in terms of democratisation and reform of the telecommunication sector. These changes allow a more important participation of the private sector, the privatisation of companies and the opening of the national market to competition, the separation of postal services and telecommunication services, the creation of regulatory organisations etc... Such measures and plans have been unveiled in Cameroon, Cape Verde, Congo, Ghana, Guinea, Senegal and Tanzania. Deregulation plans are not always so clear. One needs to be careful as these plans may be used strategically for receiving funds from international institutions, and reveal nothing about the true motivations of the countries involved.

The extent of Internet projects and of other information and communication technologies is wider than can be presented here. Nonetheless, among African projects, we should note:

- the Special Initiative on Africa, by the Secretary General of the United Nations;
- the African Networking Initiative (ANI), by UNESCO, ITU, IDRC and UNECA;
- the African Internet Forum (AIF);
- UNCTAD's TradePoint initiatives, which receives 30 million Ecu in financial help from the European Union for the development of local commercial networks in Africa;
- the InterAfrique programme in Africa (Internet en Afrique), in which several organisations of technical and scientific cooperation (UNITAR, ORSTOM, OSS) undertake to promote the development of national networks linking up the majority of institutions and projects producing or using technical and scientific information;
- the information servers which AUPELF-UREF is setting up in Francophone Africa via the REFER and SYFED projects.<sup>4</sup>

The list of projects is long. The profusion of networking projects oriented towards Africa reveals primarily a lack of telecommunication infrastructure and information technologies in most African, mainly sub-Saharan, countries. The emphasis of all organisations is upon the need to close the gap between connected and non-connected countries, between countries which are able to obtain and diffuse information and the ones which are completely isolated, information- and communication-wise. The message of everyone involved in development programmes stresses the urgency of providing Africa with ways to enter and participate in a world economy where information and communication technologies are a factor of economic development. However, the large number of projects raises questions regarding the duplication of effort. These projects might bring together different systems that cannot interconnect efficiently. A close collaboration between projects is strongly recommended; indeed it is necessary. Such close collaboration could be achieved, as a report from the African Networking Initiative (ANI) suggests, by the creation of an African Internet Society, a clearing-house for all networking development programmes, both completed and in progress.

<sup>4</sup> AUPELF-UREF is the Association des universités partiellement ou entièrement de langue français - université de réseaux d'expression française; REFER is the Réseau électronique francophone d'information; SYFED is the Système francophone d'édition et de diffusion.

## Conclusion

The initiatives and decisions taken by the different academic and research institutions, by governments, NGOs and private companies all show the fundamental role of Information and Networking Communication Technologies in the development of our social, cultural and economic environment. These technologies become essential in the acquisition of knowledge, the exchange of ideas and the development of individuals and societies. In a global economy based more and more on knowledge and in an information-age society, technologies of information diffusion become as important as any project dedicated to health, education and research. These projects and sustainable development can be achieved with the development of communication networks which provide a way to spread and share vital information in all sectors of the society.

However, we should not think of these technologies as a panacea, the solution to all the problems of developing nations. These technologies are only a tool of development, however fundamental and indispensable, that will both provide the continent with more resources and greater efficiency in its development programmes and will allow it to play an active role in a global economy that stresses the vital need to connect developing countries to the Internet in order to achieve a true Global Information Infrastructure. These technological developments in networking and communication infrastructure are not a luxury; they are a priority for Africa. Much is at stake - power, because nowadays being on the information highway gives power; prosperity, because of the huge investments involved with New Information Technologies; technology, because choices are being made over the infrastructure and methods of connection to be used in Africa and over whether New Information Technologies will be developed according to the priorities, needs and expectations of those who live on the African Continent.

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