Afriboxes, Telecenters, Cybercafes:
ICT in Africa

by MIKE JENSEN

African countries can make leapfrog jumps forward in communication connectedness by adopting new technologies—necessarily using different strategies than developed countries followed. The process in Africa must be tailored to such specific conditions as generally low income levels, limited formal business activity, the much greater importance of the rural population and small producers, and shared use of such communication resources as newspapers, Internet accounts and village TV sets. These factors are discussed by Mike Jensen, an independant consultant based in South Africa, who has helped establish information-communications systems in over 30 African countries, and internet services for nongovernmental organizations in Canada, Australia and South Africa.

THE POTENTIAL OF INFORMATION and communication technologies (ICTs) to transform development is now receiving great attention worldwide. Using the catch prase 'Bridging the Digital Divide', NGOs, corporations, national governments, and global compacts such as the UN and the G8 are all marshalling resources to use ICTs for improving development in the South.

ICTs are being seen as an enabling tool with a multiplier effect that can cut costs and improve the quality and delivery of basic infrastructure and services.

The prospect of new opportunities for economic growth is also heralded, which in turn will hopefully provide more finances for government programmes. ICTs are also given the potential of transforming governance and improving the ability of marginalized groups to participate—from the local grass root groups to national governments, to regional and global forums which often have insufficient representation from the South.

As the region with the most LDCs, Africa is often seen as the "perfect case" for the application of ICTs. But when basic facilities such as fresh water and primary education are still lacking in many African countries, questions have also been raised about the efficacy of such a strong focus on ICTs. This article attempts to identify some of the factors in developing appropriate strategies to use ICTs for development in Africa.

The term "ICTs" should first be clarified. Generally, ICTs are seen as the telecommunication infrastructure, computers and applications which have combined to give us the Internet. But we should also not forget that there are the broadcasting media—TV and radio—which have much higher penetration rates in Africa than telephones or computers. And with the convergence of all these technologies, there are a number of new developments in this area which can increase the potential impact of ICTs. And then of course, most important, ICTs also need to include the human resources that are needed to develop, install and operate the equipment and software, as well as to set and enforce policy around their use.

The use of ICTs has grown rapidly in most urban areas in Africa. As an indication, four years ago only a handful of countries had local Internet access; now the Internet is available in every capital city. Hundreds of new local and community radio stations have been licensed, and satellite TV is now also available throughout the continent. While penetration and use of ICTs is still very low compared to more developed countries, there are already many interesting examples of how these facilities are being exploited to improve the livelihoods of Africans.

Initially, the most immediate impact has been in the use of e-mail to reduce the cost of international communications. This has allowed many individuals, NGOs and other organisations to improve management, obtain resources and gener-

> *Four years ago only a handful of African countries had local Internet access; now the Internet is available in every capital city.*

ally achieve much better communications with their family, friends, colleagues and partners around the world. A visit to any of the rapidly expanding number of cyber-cafes and telecentres which are now springing up in secondary towns and even

remote villages shows that email is still the 'killer application', and that these centres are being used by increasing numbers of locals, and not just by computer literate western tourists.

While the low level of ICT penetration amongst the public in Africa has so far limited the use of ICTs by national governments for governance purposes, many administrations are beginning to streamline their operations and improve internal efficiencies by adopting ICTs within the organization. For example, the government of Lesotho recently declared that all announcements for cabinet and committee meetings would be made only by e-mail. Some administrations such as those in South Africa, Algeria and Tunisia now provide immediate global access to tenders via the web. Health and education departments in many countries are beginning to electronically transmit operational MIS statistics such as disease occurrences and pupil registrations. In South Africa, the results of blood tests are being transmitted to remote clinics that are off the telecom grid via mobile telephone text messages. As greater numbers of public officials are now gaining low-cost access to the web, the vast information resources available via Internet are becoming increasingly important tools in ensuring informed decision-making.

Lack of timely information is well known to be the largest constraint on small-scale agricultural production and natural resource exploitation—a sector that provides livelihood for 70 to 80 per cent of Africa's population. However so far, the potential for ICTs to impact this sector has not received the attention it deserves. An immediate and relatively simply fulfilled need is for improved access to market prices. Local farmers or miners often cannot obtain up-to-date market information, so travelling traders are able to negotiate low prices. With improved information systems they would be able to obtain much better market-related prices. Going a step further, farmer and fishing organizations will be able to band together to sell their produce directly to distributors. For example, in West Africa a women's fishing cooperative operates a web site for its 7,000-plus members. They promote their projects and market and negotiate prices with buyers overseas.

However, one of the most interesting trends to emerge has been in the area of job creation. The scaleability of ICTs lends itself to their adoption by small and medium-size enterprises which can provide much needed local communication services. Furthermore, the '"death of distance" provided by the Internet has meant that there are even greater opportunities to be found in exploiting the much larger information and communication-based economies of the more developed countries.

Some examples of these include:

- In Senegal public telephone and cyber cafe services are being provided by over 10,000 small businesses with about 15,000 to

20,000 employees.

- A local Internet service provider in Morocco has won a contract to digitize the paper archives of the National Library of France. They are scanned in France and sent by satellite link to Rabat where they are edited by keyboard operators .
- In Togo and Mauritius call centres now provide telephone support services for international companies with customers in Europe and North America. Callers don't realize they're calling Mauritius or Togo. They pick up the phone, dial a local number and are routed through to one of these countries, where operators provide the support that they require.
- In Cape Verde "virtual security guards" have found jobs using the Internet to monitor webcams in office parks on the east coast of the US. They notify local rapid response teams there if they see anything amiss.
- Many African craft makers are selling their wares in the worldwide web, supported by NGOs such as PeopleLink.

While these developments are encouraging, unfortunately there are rather too few of these examples, largely because of the low level of penetration of ICTs in Africa. There are only about 1,300,000 dialup Internet subscribers in Africa. Of these, North Africa is responsible for about 250,000 and South Africa for 750,000,

leaving about 300,000 for the remaining 50 African countries. As each computer with an Internet or e-mail connection usually supports a range of three to five users, the total number of African Internet users is around 4 million, with about 1.5 million outside of South Africa. This works out at about one Internet user for every 200 people, compared to a world average of about one user for every 30 people, and a North American and European average of about one in every 3 people. There are now about 38 countries with 1,000 or more dialup subscribers, but only 11 countries with more than 20,000 subscribers—Algeria, Botswana, Egypt, Kenya, Mauritius, Morocco, Nigeria, South Africa, Tunisia, Tanzania, and Zimbabwe.

Limited telecommunication infrastructure is seen as one of the principal causes of this low level of ICT penetration. In 1999 the ITU estimates that Africa had about 18 million telephone lines—about one phone for every fifty people. If North Africa and South Africa are excluded, about 3.5 million lines remain (less than the number of lines installed in China every year), which works out to about one in every 200 people. Access to public phones is similarly restricted, with about one for every 15,000 people, compared to a world average of about 1 for every 600. Aside from limited penetration, telecommunication costs are high, especially when compared to per-capita incomes, and these also contribute to high Internet costs. The average subscription fee of around US$50 per

month is more than the average monthly salary of a person in Africa.

Only 17 countries on the continent have local dialup Internet access in the secondary towns or urban areas outside the capital city. This means for the majority of people (the average urbanization rate in Africa is only around thirty percent) that even if they could afford an Internet subscription, a computer and a phone line, it would still be a long distance call to use the net. Even when better coverage is achieved, high local call charges still make it too expensive for most people to use. The average local call tariff is around US$ 2.50 an hour, in ten countries it is more than US $4, and in a few it is over US$ 8 an hour. Even more worrying, there is a trend to increase the costs of local calls relative to international calls as telecom operators rebalance their high international call charges in preparation for competition.

There are a variety of efforts under way to restructure national telecom operations and build better national and international infrastructure. But many of these have lacked a cohesive approach built on a clear understanding of the dynamics and impact of the blindingly fast changes in communications technologies. In identifying appropriate strategies for the provision of ICTs, the first point to note is that models of infrastructure provision are likely to be quite different from those employed in developed countries. This is so because of the generally low income levels, limited formal business activity and

the much greater importance of the rural population—up to 80 per cent of the people may live outside urban areas.

In addressing the low-income factor, innovative models may be necessary which focus on shared infrastructure, public access facilities and the use of intermediaries to interact with the public who may not have functional literacy, let alone be computer literate. In addressing the rural population issue, technology choice and design options are becoming more readily apparent as technologies mature. Perhaps more important, a re-assessment may be needed of the traditionally held view that rural communications services are unprofitable.

The need for subsidized rural communications emerged decades ago in developed countries. Then, telecommunication infrastructure costs were high, and most of the population resided in densely populated urban areas which could be serviced at relatively low cost in conjunction with high-volume business users. In this environment, cross-subsidization and Universal Service Obligations were needed to cover the relatively greater costs of serving the small minority of mainly residential users living in sparsely populated rural areas.

These factors are not generally applicable in Africa and other developing countries today. There, the bulk of the population is in rural areas, network infrastructure roll-out and usage costs have already plummeted, and will continue to do so for the foreseeable future. The exploding quantities of fibre, wire-

less and satellite bandwidth can make rural areas almost as easy to reach as urban ones. Also, technology convergence means that the same infrastructure can be used to provide many more services than just voice calls. In particular, the use of the Internet for transaction purposes vastly increases the added value potential of the infrastructure and thus the incentives to build it.

> *A reassessment may be needed of the traditionally held view that rural communications services are unprofitable in Africa.*

Added to all this, the overheads of centralized national network planning are no longer required. The Internet model of network development has emerged, allowing anyone to build a part of the network and be able to sell excess bandwidth and a wide variety of services to third parties in order to help cover their own costs. Examples of this already include the Universities of Zambia and Mozambique, which have become leading Internet Service Providers to the public following the establishment of their facilities for internal use. It is no coincidence that these service providers rely extensively on VSAT (very small aperture terminal) satellite communication ground stations and wireless systems to access and deliver their services independently of the monopoly voice operators in their countries.

Appropriate ICT strategies also need to take into account that averages across the continent obscure very large variations between countries. Aside from variations in annual per capita levels of gross domestic product, which range from $200 to $7,000, and market sizes which vary from 1 million to 100 million people, many other factors vary substantially and may affect strategy. The most notable of these are:

- The communications regulatory environment. Probably the most important immediate factor, the national regulatory environment in Africa varies greatly, from relatively open competition in Internet service provision or even mobile services and the local loop, to long-term monopolies in all of these areas. In particular, very few countries allow the use of VSAT, or if they do, they levy high bypass or license fees.

- The extent of the existing infrastructure and the cost of access to it. This not only affects potential new entrants in the provision of basic services, but also those providing value added services. This can vary from 20 per cent to less than 1 per cent penetration, depending on the country.

- The existing usage of the radio spectrum. Many countries have not had adequate resources to efficient-

ly manage their radio spectrum allocation for use by telecommunications and Internet operators, either nationally or regionally, resulting in congestion in some wavebands and lack of a transparent process and difficulties in obtaining spectrum from the regulators.

- The market orientation and openness of the national government to private sector investment. Some countries are still emerging from the 'nationalization era', and many sectors of the economy are still dominated by sluggish and inefficient parastatals with close links to top executives in government.

- The general investment climate of the country, such as the level of inflation, import duties, access to local capital and foreign currency, and regulations on the repatriation of profits for international investors.

- The resources that national governments and their international cooperating partners are allocating to national information and communication infrastructure building projects. In some countries there is strong if somewhat uncoordinated support from both multilaterals and bilateral development agencies in this area; other countries have yet to begin this process.

- The reliability and extent of penetration of the national electricity grid. In many countries the power grid is only available in the major urban areas, and even some capital cities have regular outtage periods.

- The size of the human resource pool, both locally, and in the diaspora.

- The level of development of the transport networks. Where this is poor, barriers to the increased movement of people and physical goods affect the cost of communications network implementation and support, as well as the level of demand for communications services.

Strategies also need to take into consideration the large-scale sharing of information resources that is a dominant feature of the African communications landscape. Often there are more than ten readers per newspaper. As indicated above. estimates are that there are usually 3-5 users per dialup Internet account. It is not uncommon to find much of a small village's inhabitants crowded around the only TV set, often powered by a car-battery or small generator.

Clearly, one of the most important strategies for improving ICT use is the accelerated liberalization of the telecom sector, to improve the delivery of the services on the continent through competitive forces. Expanding universal service goals is also important because currently these are focussed on the provision of basic voice telephone services. Today, universal service goals should also include access to the Internet and other more advanced value-added services.

An important and often neglected part of the strategy is to improve support

to the regulatory agencies that are now emerging on the continent and to support public participation in the development of policy, rather than formulating it behind closed doors in regulators' and ministers' offices.

The question often asked in relation to telecom liberalization is: is the Internet a threat or an opportunity for the public telecommunication operators? It is clearly a threat for those operators who are not able to respond to these rapid technological changes and to regulatory and institutional fluidity. Concerns are expressed that government revenues will be reduced in the short term, and that the number of licenses should be limited to make sure that the telecom operators are not threatened by the introduction of competition and new technology. But these concerns come from an approach which generally speaking is outmoded. There are positive spin-offs to the economy and society as a whole from having a much improved telecommunications infrastructure. These gains are not worth sacrificing for the sake of protecting monopoly operators who currently only provide one or two percent of the potential connectivity really required on the continent.

It should also be noted that broadcast radio, the most widespread medium on the continent, is still relatively unexploited and could be better used as an intermediary tool in many respects for the provision of Internet information services. For example, in Sri Lanka, a local community radio station spends about two hours a day responding to questions from listeners, and then the producers research the answers on the Internet and try to provide useful Internet information, which is rebroadcast to people who don't have a computer or any other form of Internet device.

The use of the Internet by broadcasters is also providing new opportunities for cutting programming costs and obtaining audio clips or video clips for rebroadcast locally. This medium is already being used by the Panos Institute (http://www.panos.org) to provide a database of audio material for francophone radio stations in West Africa accessible through the web. NGO network SangoNet (http://www.sn.apc.org) has a similar facility for South African radio stations.

In a different area, the broadcast networks, with their much wider reach than the fixed-line telecommunication networks, are also being used purely for the low-cost transmission of data. A number of initiatives in this area have already been established to transmit web pages, e-mail and graphics such as weather maps, for example Siyanda (http://www.siyanda.co.za) and WorldSpace's data channels (http://www.worldspace.com).

One of the most immediately rapidly growing ICT developments in Africa is mobile cellular telephony using the GSM standard (Global System for Mobile), which is also predominantly used in Europe and Asia. An increasing number of countries have built cellular networks which are

equal in subscriber base to the fixed-line network. Cellular operators have expanded from a presence in only 6 countries nine years ago to about 80 networks in 42 countries. The number of cellular subscribers now surpasses the number of fixed lines in Africa, largely because the fixed-line operators are often unable to provide service and so mobile phones often substitute for their fixed-line equivalent.

In addition, a rapidly growing number of added services are provided by cellular operators, such as data transmission, short message sending, and Internet access, and even financial transactions using Wireless Access Protocol (WAP) for small mobile-phone screens. Data transmission is limited to 9.6Kb at the moment, but speeds will rise to 384 Kbps when the new GSM data protocol, General Packet Radio (GPRS) is widely available next year; trials are already taking place in South Africa. GPRS radically advances the utility of the GSM network, especially when combined with the sophisticated GSM handsets that are essentially becoming a multifunction personal computing and communication device.

These trends in the GSM sector suggest that once competition and technical advances have forced the price of hand sets and usage down sufficiently, the fixed-line operators may end up passing on most of their end-user customer services to the mobile operators and concentrating on the provision of broadband national and international connectivity.

The growth of the mobile networks has also meant that many rural areas where fixed-line infrastructure is not available are now serviced. In particular, because major roads linking cities are usually covered for mobile service, communities up to 30 kilometers on either side of these roads are now able to avail themselves of voice and limited data communication services.

Due to the relatively small number of people who can afford a phone line, let alone a computer, public access services are very much in demand. Smart-card and PIN-based public and cellular phones have been widely adopted across the continent, creating a new revenue stream in the sale of telephone air-time by small shops and telecentres. This infrastructure can also form the basis for more advanced value added telephone-based services, including e-commerce, especially where universal smart-card systems are adopted.

The demand for public phone shops and telecenters is an important opportunity for small businesses, equipment providers and franchisers. An increasing number of operators are now passing the responsibility for maintaining public telephones over to the private sector. This has already led to a rapid growth of private phone shops in many countries. The most well-known success story of this strategy is in Senegal; as mentioned above, it now has over 10,000 commercially run public phone bureaus, employing over 15,000 people and generating over 30 per cent of the entire network's revenues. While most of the phone shops are in urban areas, a growing number are

being established in more remote locations, especially with the Senegal telecom operator's aggressive rollout of backbone infrastructure which has linked 2,000 villages and towns by digital microwave and fibre-optic cable.

"Virtual phone" and calling card alternatives for those unable to afford their own phone are also an option being adopted by telecom operators in some countries such as Botswana and South Africa. Subscribers are issued their own unique phone number and pay a small rental for a voice mailbox, from which they can retrieve their messages from any telephone. A pager can also be tied to the system to immediately inform the subscriber that a message is waiting.

The high cost of computers relative to income levels in Africa has resulted in a number of innovative approaches to the provision of low cost PCs and other Internet access devices. The two main areas here are:

- The provision of 'remanufactured' or recycled PCs such as the recent initiative by the manufacturers of the Freeplay wind-up radio. They have set up a new computer recycling division called AfriBox aiming to supply Internet ready PCs for Africa costing $300. A number of international NGOs and foundations such as WorldComputerExchange.org are shipping to Africa containers of similar computers obtained as donations from large companies.

- The provision of set-top boxes and other low-cost network computers which can be plugged into a television set. These devices typically cost about $200, substantially reducing the cost of gaining access to the Internet. ISPs in South Africa and Tanzania have already begun providing such equipment.

Universal smart card and e-commerce policies are also gaining attention in a number of countries. Mauritius and South Africa are looking at a single smart card that will hold the carrier's driving licence, small amounts of funds, and health and other social security information.

Harmonization of e-commerce policies is also on the agenda in a number of countries, so that, for example electronic evidence is upheld in court and can be used in many ways for ensuring that e-commerce is correctly carried out.

It is also considered important to develop a phased approach which gives priority to such activities as the connectivity of key decision makers in business and government. In addition, policy makers need to develop an understanding of the importance of the linkages between ICTs and other basic infrastructures—in particular improvements to the transport and power supply networks, without which the potential impact of ICTs will be limited.

It is clear that the availability of sufficient human resources will continue to be an overriding issue in many areas. Awareness raising is also a human

resource issue which will continue to be important, as will be the more general need to develop the capacity to deal with the rapid changes being brought on by the use of new technologies.

The major problem in the area of human resource development is that the pool of expertise in ICTs in the region is relatively small (at all levels, from policy making down to the end-user), which contributes to the limited deployment of infrastructure and the high price of access. Rural areas in particular suffer from very scarce expertise in computer maintenance and software troubleshooting. Given the very low pay scales in the African civil service, this problem is virtually unsurmountable for government infrastructure operators who are continually losing their brightest and most experienced to the private sector and even to much higher paying jobs in Europe and North America. This situation is not unique to Africa or developing countries, but is also being faced by the developed world where infrastructure demands have also outpaced the supply of experienced staff. The only effective response to this problem is to ensure that ongoing training and capacity building is high on the agenda of every organization.

Currently the availability of specialist training in infrastructure operation and installation is extremely limited on the continent. In Africa there are only two major regional centres for training in telecommunications—in Senegal for francophone countries and Kenya for Anglophone countries. Through an ITU support programme they are expected to be transformed into Centres of Excellence in Telecommunications Administration (CETA). CETAs are intended to provide senior-level, advanced training and professional development in the areas of telecom policies, regulatory matters and the management of telecommunications networks and services.

A number of telecommunication operators maintain their own training schools, but these usually suffer from the same lack of financial resources being experienced by the operators themselves. The German international technical training assistance agency, Carl Duisberg Gesellschaft (CDG), has sent a large number of telecom trainees from Africa to Germany over the last 20 years, and many other development agencies have similar, if small such programmes. More recently, UNDP and Cisco have created a joint venture to assist in the establishment of nonprofit Cisco network training academies in all the LDCs. International volunteers are also being seen as an important vehicle for technology transfer, which will be boosted by the recently announced United Nations Information Technology Service (UNITeS) of the UN Volunteers (http://www.unv.org) and other similar NGO initiatives such as NetCorps Canada.

In general the international community has already played a strong role in training and capacity building in Africa and it is expected that this will continue

to be an important activity for developed country assistance agencies. Other examples of the wide range of projects in this area that have been instituted include:

- The Establishment of a Global Telecommunications Academy by the ITU. This will operate as a brokerage service for distance learning courses. Once established, the Academy is to be self-financed through a fee payable by every course participant. The Academy aims to create a cooperative network of partners by pooling existing resources in universities, training institutes, financing bodies, governments, regional organizations and telecommunications operators, and has as its goal the promotion of training and human resources development in developing countries.

- In the Internet area, the Internet Society (ISOC) runs an annual developing countries training workshop where in-depth training is given to participants financed by ISOC fund-raising from the private sector. Over 100 Africans were trained at each of the last two workshops. The UNDP's Sustainable Development Network Programme (SDNP) and USAID's Leland initiative have also trained significant numbers of network technicians.

- In six Francophone countries of sub-Saharan Africa, there is a plan to create training centers and

courses for technical capacity building. The plan comes from a joint project by the United Nations Institute for Training and Research (UNITAR) and France's Organization for Scientific and Technical Research Overseas (ORSTOM is its French acronym). The Cameroon center has financial support from the World Bank's InfoDev fund, ORSTOM, ACCT and others. Funds are being sought for similar centers in Côte d'Ivoire, Sénégal, Burkina-Faso, Benin, and Mali. At the Cameroon center a network engineering course is now being run regularly.

- An Internet training programme has been established for institutes, schools and other agencies of higher learning in Francophone and Lusophone sub-Saharan African countries. It is called Internet pour les Ecoles Inter-Etat d'Afrique de l'Ouest et du Centre.

- The Commonwealth Secretariat has established COMNET-IT in Malta to support ICTs in Commonwealth developing countries and provide scholarships for postgraduate degrees in computer science.

Proposed ICT human resources development activities that have attracted attention include:

- Creating awareness-raising programmes to improve public understanding of the application of IT, with cooperation from the public

and private media, and publicize government use of IT.

- Ensuring that all educational institutions have full Internet access, particularly for University students who are often barred from using the campus Internet service due to lack of facilities.

- Developing training programmes in rural areas to teach basic infrastructure maintenance skills.

- Establishing 'centres of excellence or specialization' to train policy makers, network operators and users in government and the private sector; providing opportunities for advanced training at existing regional centres of excellence; and conducting seasonal outreach and distance-learning programmes to strengthen national centres. This can help to overcome the problems that centres of excellence are expensive to maintain, the perception that high-quality training can only be obtained outside the region, and the difficulty in some countries to attract good students in sufficient numbers to justify expenditures. ■

References

- Africa's Information Society Initiative (AISI) Documents, supported by the UN Economic Commission for Africa http://www.bellanet.org/partners/aisi/more/index.html

- Bridging the Gaps in Internet Development in Africa—Report from the International Development Research Center (IDRC). http://www.idrc.ca/acacia/studies/ir-gaps.htm

- CTA Observatory on ICTs http://www.agricta.org/afagrict-l

- Centre international pour le développement de l'inforoute en francais (CIDIF) http://inforoutes.cidif.org

- Continental Connectivity Indicators. Mike Jensen, 2001. http://www3.sn.apc.org/africa/partial.html

- World Telecommunication Development Report. International Telecommunication Union, Geneva, 1999.

- Global Connectivity for Africa Conference Report, 2-4 June 1998, Addis Ababa, Ethiopia. World Bank and ECA.

- International Institute for Communications in Development (IICD) http://www.iicd.org

- ITU Rural Connectivity & Telecentres http://www.itu.int/ITU-D-Rural

- World Bank Internet Economic Toolkit for African Policy Makers. http://www.world-bank.org/infodev/projects/finafcon.htm

- Partnership for ICTs in Africa (PICTA) http://www.bellanet.org/partners/picta

- SADC In the Next Millenium—Theme Document, 1999 http://www.sadc.int/theme.htm

- Telecommunications and Universal Service—International Experience in the Context of South African Policy Reform. Sean O'Siuchru. IDRC. 1996.

- Telematics for Development in Africa—Symposium position paper (ITU/UNESCO/IDRC/UNECA), 1995. http://www.sas.upenn.edu/African_Studies/Padis/telmatics_Jensen.html