

“The development of the Internet is at a critical point in Africa. Web-based services could help accelerate the continent’s economic growth and aid poverty alleviation, but these tools place large demands on an underlying infrastructure that is currently incapable of servicing them.”

Making the Connection: Africa and the Internet

MIKE JENSEN

Amid talk of the growing digital divide between rich and poor countries, Africa has shown encouraging signs that it is rapidly adopting the Internet and making innovative use of the technology. Nevertheless, the continent is still well behind other developing regions of the world in taking advantage of the information and communication revolution. The main reasons for this are the limited and expensive telecommunication infrastructure, small markets, and lack of skills and awareness.

Globally Wired:
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ACCESS TO THE NET

At the end of 1996, just 11 of Africa’s 54 countries had local Internet access, but by February 2000 all of the continent’s countries had access in the capital cities. Excluding South Africa, the number of computers permanently connected to the Internet in Africa exceeded 10,000 early in 1999. By January 2000, the total had increased to about 25,000, which means Africa, with an estimated population of 780 million people, has about as

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¹The proportions for other developing regions are 1 in 125 for Latin America and the Caribbean, 1 in 200 for Southeast Asia and the Pacific, 1 in 250 for East Asia, 1 in 500 for the Arab states, and 1 in 2,500 for South Asia.

many Internet-connected computers (hosts) as Latvia, which only has a population of 2.5 million.

Measuring the actual number of Internet users is difficult, but figures for the number of dial-up accounts supplied by Internet service providers (ISPs) show that Africa has more than 500,000 subscribers. Each computer with an Internet or e-mail connection supports an average of three users, a recent study by the UN Economic Commission for Africa (ECA) has found. This puts current estimates of the number of African Internet users at somewhere around 1.5 million. Most are in South Africa (approximately 1 million), leaving only about 500,000 among the remaining 734 million people on the continent. This works out to about 1 Internet user for every 1,500 people, compared to a global average of about 1 user for every 38 people, and a North American and European average of about 1 in 4. No studies of the number of rural versus urban users have been conducted in Africa, but undoubtedly users in cities and towns vastly outnumber those in rural regions.¹

Africa now has about 26 countries with 1,000 or more dial-up subscribers, but only about 9 countries with 5,000 or more: Egypt, Morocco, Kenya, Ghana, Mozambique, South Africa, Tunisia, Uganda, and Zimbabwe. Clearly countries such as those in North Africa and southern Africa have more highly developed economies and better infrastructures, which would naturally result in larger populations of Internet users. Most of these countries were also among the first on the continent to obtain Internet access, and so have had the most time to develop the market.

The average cost of using a local dial-up Internet account for five hours a month in an African country is about \$60 (usage fees and telephone time included, but not telephone line rental). According

to the Organization for Economic Cooperation and Development, 20 hours of Internet access in the United States costs \$29 a month, including telephone charges. Although monthly European costs are higher (\$74 in Germany, \$52 in France, \$65 in Britain, and \$53 in Italy, for example), these costs are for four times the amount of access, and all these Western countries have per capita incomes at least ten times greater than the African average. Moreover, ISP charges in Africa vary greatly—between \$10 and \$100 a month, largely reflecting the different levels of the markets' maturity, the varying tariff policies of the public telecommunication operators (PTOs), and the different national policies on access to international telecommunications bandwidth.

Most African capitals—which is where Internet access on the continent has been largely confined—now have more than one ISP; by early 1999 over 300 public ISPs had sprung up across the continent. Seven countries had 10 or more ISPs—Egypt, Kenya, Morocco, Nigeria, South Africa, Tanzania, and Zimbabwe—while 20 countries had only one ISP. Although Ethiopia and Mauritius are the only countries in which private companies are barred by the monopoly telecom operator from reselling Internet services, single-ISP service remains the rule in other countries, predominantly in the Sahel subregion, where markets are small.

In some countries the PTOs provide local-call Internet access facilities for ISPs across the entire country by establishing a special area code for Internet access that is charged as a local call. This allows Internet providers to immediately roll out a network with national coverage. Although it massively reduces costs for those in remote areas, only 15 African countries have adopted this strategy (Benin, Burkina Faso, Cape Verde Islands, Chad, Ethiopia, Gabon, Malawi, Mali, Mauritania, Mauritius, Morocco, Senegal, Togo, Tunisia, and Zimbabwe).

In response to the high cost of full Internet-based services and slow access speeds, lower cost e-mail-only services have been launched by many ISPs. Similarly, because of the relatively high cost of local electronic mailbox services from African ISPs, a large proportion of African e-mail users use free web-based services such as Hotmail, Yahoo!, or Excite, most of which are based in the United States. E-mail-only and free web-based services can be more costly and cumbersome than standard e-mail software, however, since extra on-line time is needed to maintain the

connection to the remote site. These services do provide the added advantages of anonymity and greater perceived stability than a local ISP, which may not be operating the following year.

Interest is also growing in using kiosks (small, stand-alone Internet access units found in public places), cybercafés, and other forms of public Internet access, such as adding computers to community phone shops (which provide voice phone services for the public), schools, police stations, and clinics that can share the cost of equipment and access among a larger number of users. Many existing phone shops are now adding Internet access to their services, even in remote towns where a call to the nearest dial-up access point is long distance. In addition, a growing number of hotels and business centers provide a PC with Internet access.

WHO USES THE INTERNET—AND WHAT FOR?

In a recent survey carried out by the UN Economic Commission for Africa (ECA), the greatest number of users belonged to nongovernmental organizations, private companies, and universities. Most users were

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male: 86 percent in Ethiopia, 83 percent in Senegal, and 64 percent in Zambia. The majority of users were well edu-

cated: 87 percent in Zambia and 98 percent in Ethiopia had university degrees. A recent South African survey of the Internet found similar results: the average user was male, 26 to 30 years old, spoke English, was high-school or university educated, and earned between \$24,000 and \$45,000 per year working in the computer industry (all of which indicates that most South African users are white).

Evidence gathered by the ECA suggests that the average level of Internet use in Africa is generally one incoming and one outgoing e-mail daily, averaging 3 to 4 pages, in communications that are most often with people outside the continent. Surveys indicate that about 25 percent of the e-mail has replaced faxes, while 10 percent has replaced phone calls; the other 65 percent are communications that would not have been made in the absence of an e-mail system. Thus, except for e-mail, the web is still a relatively underutilized resource, although 40 percent of Zambian users questioned had conducted literature searches on the web.

Universities were initially at the vanguard of Internet developments in Africa, and most provide e-mail services, yet in early 1999 only about 20 countries had universities with full Internet con-

nectivity. Because of the limited resources and high costs of providing computer facilities and bandwidth, full Internet access at the universities where it exists is usually restricted to staff. Postgraduate students can often obtain access, but the general student population usually cannot.

The African web space is expanding rapidly, and almost all countries have some form of local or internationally hosted web server, unofficially or officially representing the country with varying degrees of comprehensiveness. But generally few institutions of any kind are using the web to deliver significant quantities of information. While progressively more organizations have web sites with basic descriptive and contact information, many are hosted by international development agency sites, and few use the web for their activities. This is partly explained by the small number of local people who have access to the Internet (and thus the relative unimportance of a web presence to the institution), the limited skills available for digitizing and coding pages, and the high costs of local web-hosting services.²

Although a few notable official government web sites exist, such as those of Angola, Egypt, Gabon, Mauritius, Morocco, Mozambique, Senegal, Togo, Tunisia, and Zambia, no discernible government use of the Internet for administrative purposes has been seen. The exception perhaps is in the area of public relations; the Zambian State House, for example, established a press release web site shortly after the local opposition paper, *The Post*, established its own web site. Use of the web by opposition groups is almost nonexistent outside of South Africa, largely due to the lack of penetration of the Internet among their potential constituencies.

Web presence is higher in sectors involved in tourism and foreign investment, which often have

²Africa's French-speaking countries have a far higher profile on the web and greater institutional connectivity than the non-French-speaking countries. This is largely attributable to the strong assistance provided by the various Francophone support agencies, and the Canadian and French governments, which are concerned about the dominance of English on the Internet.

³Radio remains the dominant mass medium in Africa, with ownership of radios far more common than for any other electronic device. In 1995 radio ownership was estimated by UNESCO at close to 18 per 100 inhabitants, compared to 3.5 televisions and 0.31 personal computers per 100. It should be noted, however, that large-scale sharing of information resources is an important feature of the African media landscape. Many people listen to one radio or watch one television at the same time (it is not uncommon to find most of a small village crowded around the only television set, often powered by a car battery or small generator). Similarly, readership of newspapers is often more than 10 people per paper.

HARDWARE AND SOFTWARE

MOST RECENT estimates of the number of PCs in Africa put the average at about 3 per 1,000 people in 1996, although some studies put the average at less than 1 per 1,000. Some of the wealthier countries such as Botswana, Mauritius, and South Africa have significantly higher levels of penetration, with at least 5 per 1,000 and perhaps up to 20 per 1,000 (but as many as 20 people may share a single computer).

Almost all the PC equipment uses Intel or Intel-compatible processors (the exception is the publishing industry, which generally uses Apple Macintosh PCs). Many of these non-Apple PCs are older machines powered by 386 and 486 microprocessors. Microsoft Windows is the dominant operating system, but large numbers of DOS-based systems are still in use. Poor maintenance and insufficient skills to diagnose system problems and to swap parts have led to many out-of-commission machines that could easily be reactivated.

Underutilization of existing computer resources is also common, the result of the preponderance of many standalone PCs in the same office unconnected to local area networks (LANs). Often an office may have many machines, but only one with a modem connecting to the Internet. This usually means competition for the machine and a shared e-mail account. M. J. ■

more mature sites aimed at developing an international market presence. While most ministries and national research centers may have access to electronic mail, few have web sites (reflecting the limited resources of the public sector, the ECA survey found that government employees made up 1 percent of users in Ethiopia and 6 percent in Zambia). Regional intergovernmental agencies have fared better; organizations such as the African Development Bank and the Southern Africa Development Conference (<http://www.sadc.int>) have built web sites providing substantial information on their activities and member states.

The news media are also relatively well represented on the web. The African studies department of Columbia University in New York has identified over 120 African newspapers and news magazines available on the Internet. Those countries best represented are again those with more advanced Internet sectors: Egypt, Ghana, Ivory Coast, Kenya, Senegal, South Africa, Tanzania, Zambia, and Zimbabwe. Also of note are the efforts to host daily newspapers by the ISP AfricaOnline, which has offices in six countries. Two major continentwide African news agencies extensively use electronic media: Inter Press Service and the Panafrican News Agency.³

Business use of the web in Africa has increased rapidly over the last 18 months, although again

mainly in tourism promotion rather than any inward business from the rest of the world. This is likely to change as teleservices draw more attention (in Togo, the world's first Internet-based call center is being set up to provide globally competitive telephone support services for companies with customers in North America). Craft makers around Africa are beginning to sell their wares through the web, usually hosted internationally at sites such as through Buy Afrika (<http://www.buyafrica.com>). In West Africa a women's fishing cooperative has set up a web site that enables its 7,350 members to promote their produce, monitor export markets, and negotiate prices with buyers overseas.

The Internet is also beginning to play a role in health care in Africa. Mozambique and Namibia are part of a growing number of countries where telemedicine is being used to transmit x-ray images and other graphical data through e-mail to experts at major hospitals. In Dakar, medical students are being taught by a team of expert doctors in Brussels using video link-ups. Electronic distance education is growing in other areas also. In 24 university campuses across Africa, students are being linked to classrooms and libraries worldwide through satellite and will soon be able to obtain degrees in computer science, computer engineering, and electrical engineering through the African Virtual University project of the World Bank (<http://www.avu.org>).

BUILDING THE INFRASTRUCTURE

The communications and information infrastructure has improved dramatically in Africa in the past five years. The Internet, satellite television, and cellular phones are widespread. But acquiring this technology is still a dream for the majority of Africans who do not live in the capital cities and are not part of the elite. Access to telephones on the continent is still restricted—only 14 million lines have been installed, fewer than the number of telephones in Manhattan or Tokyo. Most of those lines are concentrated in urban areas, but over 70 percent of Africa's population is rural. Likewise, cellular phone coverage is usually confined to the capitals and secondary cities. And, as was noted, since ISPs are located primarily in the capital cities, an Internet dial-up call for most of the (predominantly rural) public is long distance.

Still, the rate of expansion and modernization of fixed telecommunication networks has increased,

and the number of main lines is growing at about 10 percent annually across Africa. Much of the growth is in the urban areas, where the overall teledensity is still about 1 per 200 inhabitants (continentwide the figure is 0.52 per 100 in 1996, the latest year for which data exists). Between 1990 and 1995, teledensity actually decreased in Liberia, Ghana, Republic of Congo, Sudan, Sierra Leone, and Guinea. Furthermore, 50 percent of the available lines are concentrated in the capital cities. In some countries, notably Eritrea, Guinea-Bissau, Central African Republic, Sierra Leone, Burundi, and Chad, the International Telecommunication Union (ITU) has found that between 80 and 95 percent of the lines are in the main cities.

A considerable degree of variability can be found in the existing telephone networks of various countries. Some governments have made telecommunications a priority and are installing digital switches with fiber optic intercity backbones and the newest cellular and mobile technology. Among the world's

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most sophisticated national networks are Botswana and Rwanda, where 100 percent of the main lines are digital,

compared with 49.5 percent in the United States. At the other end of the scale, large parts of the network in countries such as Madagascar and Uganda are old analog systems with poor national links among urban centers. Surprisingly, the proportion of digital lines in sub-Saharan Africa in 1996 was 69 percent—close to the world average of 79 percent.

Even if telecom infrastructure is beginning to spread, a much smaller proportion of the population can actually afford a private telephone. The cost of renting a connection averaged almost 20 percent of the 1995 GDP per capita. The average world cost is 9 percent; in high-income countries the cost is only 1 percent. Despite this, the number of public telephones is still much lower in Africa than elsewhere—about 1 for every 17,000 people (compared with a world average of 1 for 600 and a high-income-country average of 1 for 200). Because progressively more operators are now passing the maintenance of public telephones to the private sector, a rapid growth of phone shops has occurred in some countries; Senegal, for example, now has more than 10,000 commercially run public phone points. While most of these are in urban areas, a growing number are being established in more remote locations, especially with the PTO Sonatel's aggressive

rollout of backbone infrastructure, which now links 2,000 villages and towns by fiber optic cable.

A large variation exists among countries in the costs of installation, line rental, and call tariffs. In 1996 the average business connection in Africa cost \$112 to install, \$6 a month to rent, and \$0.11 per three-minute local call. But installation charges exceeded \$200 in some countries (Benin, Mauritania, Nigeria, and Togo), line rentals ranged from \$.80 to \$20 a month, and call charges varied by a factor of almost 10—from \$.60 an hour to over \$5 an hour. Local-call tariffs in some countries have increased even further, to more than \$8 an hour (as in Uganda, Gabon, and Chad).

Mobile cellular telephony has experienced rapid growth in Africa, expanding from a presence in only 6 countries 9 years ago to about 78 networks in 42 countries serving over 400,000 customers (excluding the 5 million in South Africa). Operators provide access mainly in the capital cities but also in some secondary towns and along major truck routes. A majority of the systems in use are now based on a digital standard, although international roaming agreements are virtually nonexistent and data communication facilities are often not available except on the older analog systems.

NEW CONNECTIONS

Communications ministers from over 40 African countries have provided high-level endorsement for telecommunications development policies, encapsulated in the African Connection (www.doc.org.za/docs/misc/africon.html), their common vision document published in 1998. Aimed at supporting the development of the underlying infrastructure required by the African Information Society Initiative (AISI), the goal is to lay 50 million telephone lines in Africa over the next 5 years. The project has been officially adopted by the Pan African Telecommunications Union (PATU).

The first concrete project of the African Connection was to hold a promotional and connectivity-awareness-raising car rally in which South African Minister of Telecommunications Jay Naidoo drove from the northernmost tip of the continent in Tunisia to its southernmost point in South Africa. Accompanied by 40 journalists and a support crew, the rally passed through 11 countries and was escorted in each by the local minister of telecommunications (a diary of the trip and other information is available at www.africanconnection.org/rally/index.html).

The recent announcements of many international infrastructure-building initiatives also will substan-

tially change the region's telecommunications with the rest of the world. One of the best-known projects is Columbia Technology's Africa ONE, which aims to put a fiber optic "necklace" around the continent. After some years of dormancy, the \$1.6-billion project, originally led by AT&T, has been given the go-ahead and is expected to be completed in 2002.

Other satellite networks, such as East, Tachyon, SkyBridge, and Celestri promise multimedia voice and data communications, and an "Internet in the sky" using helium-supported stratospheric telecommunications platforms tethered above urban areas has been proposed. While some of these ideas are still some way off and the costs are unlikely to be within reach of the average African citizen until 2010, they will considerably reduce operating costs for ISPs wherever regulations allow. Various worldwide low-earth-orbit satellite networks have also been launched, or shortly will be, such as ICO, Globalstar, and Teledesic, which hold special promise for the subcontinent's widely dispersed population. These satellite networks will derive most of their income when they pass over developed countries, but developing regions of the world, including Africa, hope to take advantage of the satellites' orbit and plan to reduce tariffs to encourage consumer demand in these regions.

With the worldwide recognition of the importance of information and communication technologies (ICTs) in accelerating development, other recent development-assistance initiatives have improved the prospects for wider access to information and communication networks on the continent, especially in rural areas. In addition, to address the growing need for coordination and collaboration, donors and executing agencies involved in ICTs in Africa have agreed to establish an ongoing forum for information exchange on projects called the Partnership for Information and Communication Technologies in Africa (PICTA). Of the general projects identified, among the potentially most important include:

- The United States Agency for International Development Leland Initiative, which is helping develop Internet connectivity in 20 African countries in return for agreements to liberalize the market to third-party ISPs and to adopt policies that allow the unrestricted flow of information. New initiatives for Leland recently announced by Vice President Al Gore include a program for "1 million PCs for Africa, 1,000 schools connected and 100 universities connected." In June 1999, a new initiative to increase Internet access and use in developing countries was

announced. Guatemala, Jamaica, Bulgaria, Egypt, Morocco, Ghana, Guinea, Uganda, South Africa, and Mozambique are the targeted developing countries. The United States is actively encouraging other interested countries to join this initiative, which is part of a broad American effort to foster the information industry worldwide. Through the initiative, these countries will collaborate with the United States government, the private sector, multilateral organizations, and nonprofits to use electronic commerce and the Internet as tools for economic development. Specific aims of the initiative include encouraging the deployment of Internet applications such as micro-commerce (transactions that are generally less than one dollar), telemedicine, distance education, and improved access to government services.

- The World Bank's assistance to telecommunication and ICT development in approximately 25 countries in sub-Saharan Africa. Initiatives include the African Virtual University, Economic Toolkit and Workshops for Internet Connectivity in Africa, and the Global Connectivity for Africa Conference. The World Bank expects to be heavily involved in sector reforms and privatization over the next few years with a view to mobilizing private participation for public objectives, to help remove market imperfections, and, where necessary, to attract private investment. It will focus on the rural sector and on information strategies, building infrastructure, and applications.

- The ITU's program for Africa, which involves various rural, community telecenter, health, and satellite projects emanating from the Buenos Aires Action Plan.

- A number of UN agencies and UN-sponsored programs, such as the UN Special Initiative for Africa's Harnessing Information Technology for Development, a \$11.5-million, five-year program supported by the various UN partners. UNESCO has launched the Creating Learning Networks for African Teachers project to help teacher-training

colleges develop ICT literacy and use it in education and in connecting to the Internet. The UN Development Program's Africa Bureau has agreed to a \$6-million fund to improve Internet connectivity in Africa in the Internet Initiative for Africa project. The Development Program's Sustainable Development Network Program (SDNP) also has 10 operational nodes in Africa: Angola, Benin, Cameroon, Chad, Gabon, Malawi, Morocco, Mozambique, Togo, and Tunisia. National SDNP projects are funded for 2 to 3 years and are expected to provide seed money toward sustainability, either through sale of services or adoption within government budget.

- The Agence de la Francophonie and related international organizations, which are providing support for ICTs in Francophone countries, most of which are in Africa. Recently launched was the AFRiNET project, which provides web servers and related support at a ministerial level to Benin, Burkina Faso, Cameroon, Ivory Coast, Madagascar, Mali, Mauritania, Mauritius, and Senegal. In addition, the Banque internationale d'information sur les États francophones project is establishing web servers in Benin, Tunisia, Mauritius, and Morocco, where databases and information from other countries is hosted.

THE NET'S PROMISE

The development of the Internet is at a critical point in Africa. Web-based services could help accelerate the continent's economic growth and aid poverty alleviation, but these tools place large demands on an underlying infrastructure that is currently incapable of servicing them. The infrastructure is steadily improving, but not fast enough to accommodate the growth in demand for the multitude of services now available. It will require greater commitment by African leadership to open up the telecommunication sector to more competition to ensure that the potential of the Internet is fully exploited. ■