6

THE TECHNOLOGY **REVOLUTION**

The Song-Taaba Yalgré organization in Burkina Faso had a problem. This vibrant group, made up mostly of women living in remote areas where poverty and illiteracy flourish, had begun to earn some welcome additional income by producing shea butter for export. But their efforts were being undermined by difficulties in getting the information they needed about production needs, deliveries, and prices. Communication was difficult, time-consuming, and costly. How could they better connect their 2,000 rural members with headquarters in the capital of Ouagadougou and exchange accurate information on what, where, and when to sell?

The answer came from something most members had never heard of before: the Internet. When Song-Taaba Yalgré established small information centers with Internet access in two key rural areas of shea butter producers, they were able to improve the flow of information rapidly between the central offices and rural producers. The result was improved efficiency, higher production levels, increased profits, and more women joining in to produce shea butter and earn their own incomes. In the three years after the information centers were introduced, shea butter production by Song-Taaba Yalgré increased sharply, and members received basic training in using computers to market their products more efficiently to regional and international buyers.[1] Today, fully 90 percent of the association's sales are via the Internet. Members also use cell phones and GPS technology to track locations, surface area, numbers of trees, and other field data to harvest shea butter fruit more effectively.

Special thanks to Rebecca Schutte, Molly Kinder, and Casey Dunning for their help researching and drafting sections of this chapter.

1 IICD, "Burkina Faso's Shea Butter Producers Go Online," http://www.iicd.org/articles/logon4d/burkina-faso2019s-shea-butter-producers-go-online/.

"My God! Ten years ago, I wouldn't have ever guessed that I would be writing and using a computer" says Awa Sawadogo, a member who never went to school but now writes the association's newspaper. "Now, I can write in Moré, my mother tongue. I know how to create a folder and a file. . . . For us women from rural areas, [technological] tools mean learning and opening up to the world," she says.[2]

Meanwhile, across the continent in the tiny rural village of Bushenyi, Uganda,

> Laban Rutagumirwa charges his mobile phone with a car battery because his dirt-floor home deep in the remote, banana-covered hills of western Uganda does not have electricity. When the battery dies, Mr. Rutagumirwa, a 50-year-old farmer, walks just over four miles to charge it so he can maintain his position as communication hub and banana-disease tracker for his rural neighbors. In an area where electricity is scarce and Internet connections virtually nonexistent, the mobile phone has revolutionized scientists' ability to track this crop disease and communicate the latest scientific advances to remote farmers. With his phone, Mr. Rutagumirwa collects digital photos, establishes global positioning system coordinates and stores completed 50-question surveys from nearby farmers with sick plants. He sends this data, wirelessly and instantly, to scientists in the Ugandan capital, Kampala. "We never had any idea about getting information with the phone," Mr. Rutagumirwa said. "It was a mystery. Now our mind is wide open." [3]

Today, thanks to the rapid expansion of mobile phones, Internet connections, and other forms of information and communications technology (ICT), the opportunities for technology to help lift people out of poverty and change the economic fortune of Africa have never been greater. Across Africa, mobile phones and Internet connections are expanding economic opportunities, creating jobs, reducing business costs, extending financial networks, strengthening health systems, improving information flows, and increasing transparency and accountability. They are affecting nearly every part of the economy in one way or another, including agriculture, manufacturing, customs clearance, banking, and tourism.

In places with bad roads, no landlines, no hope of a train, and unreliable postal services, mobile phones are opening the world to poor villages, creating unprecedented access to information on prices, market conditions, banking services, legal advice, and medical care. They enable farmers and

2 Ramata Soré, "Burkina Faso Shea Butter Producers Go High Tech," IDG News Service, May 15, 2008, http://www.pcworld.com/businesscenter/article/145954/burkina_faso_shea_butter_producers_go_high_tech.html.

3 Sarah Arnquist, "In Rural Africa, a Fertile Market for Mobile Phones," *New York Times,* October 6, 2009, http://www.nytimes.com/2009/10/06/science/06uganda.html.

fishermen to bypass inefficient marketing systems and make higher profits. Innovative text message schemes inform farmers about prices and where and when to sell their crops to maximize their profits. Thousands of poor rural women are using mobile phones and microfinance loans to set up small businesses that charge customers for airtime on the phone. Families are quickly and easily sending remittances by cell phones to relatives in remote villages. Literacy programs dictated over mobile phones are beginning to show promise. Increased Internet connectivity has led to the emergence of data-entry firms that have created thousands of jobs in South Africa, Ghana, and other countries. And, critically, mobile and Internet technologies are strengthening democratic processes and good governance by spreading news bulletins, transmitting voter turnout and ballot information, and encouraging greater transparency of government finances.

These technologies are still very new to Africa. They clearly were not major contributing factors to the economic and political turnaround that swept across the emerging African countries beginning in the early and mid-1990s. But they have had a huge impact in sustaining the progress in recent years. Most important, they are critical for continuing to expand economic opportunities, information flows, and political accountability in the future.

With the spread of mobile phones continuing to grow at rates of 40 percent a year—the highest growth anywhere in the world—Africa's mobile revolution is just starting. Likewise, Internet connectivity, still out of reach for 95 percent of Africans, is poised to expand as new fiber optic cables are brought to the continent and innovative satellite infrastructure deployed. The ICT revolution has unleashed the ingenuity of entrepreneurial Africans to overcome obstacles that have long stymied Africa's economic progress.

The African ICT Explosion

The expansion of mobile technology in Africa has been nothing short of spectacular. Communities that previously had no telecommunications infrastructure have become some of the world's fastest-growing markets for mobile technologies. Many are "leapfrogging" fixed telephones lines entirely. Mobile phones can now be found in far-flung African villages that are beyond the reach of roads, where fixed-line telephone cables are too costly to install.

Africa has become the fastest-growing mobile market in the world. There were already 230 million phone subscriptions in 2007—double the

number from just two years before—and the number has grown substantially since then.[4] In the emerging countries, mobile subscriptions jumped from fewer than 4 per 100 people in 2000 to 28 per 100 in 2007, and in the oil-exporting countries the growth has been even faster (Figure 6.1). Nearly 70 percent of the population in the emerging countries is now covered by a cellular network (Figure 6.2).

Internet access has also grown quickly, especially in the emerging countries (Figure 6.3), although it is much less common compared to the ubiquity of mobile phones. Internet access is reaching 50 million users across the continent, a 10-fold increase over 2000, but still just 5 percent of the population. This low access is in part attributable to the unreliability of electricity, low literacy rates (which is much less of an issue with voice features of mobile phones), and steep prices. Web users pay on average US$366 for a month of service, more than 8 times the cost of similar Internet coverage in India and 20 to 40 times higher than in the United States.[5]

But these high costs are almost certain to drop sharply in the next few years; when they do, Internet access has the potential to expand rapidly. In eastern Africa, the Seacom cable became operational in July 2009 and now provides Internet service that is about 10 times faster than any other service in Africa.[6] In addition, four undersea fiber optic cables are currently under construction on Africa's east coast, including the highly anticipated East African Submarine Cable System, which began operations in mid-2010 and will connect 19 countries between South Africa and Sudan with the rest of the world. West Africa currently has the SAT-3 cable, but it will soon be joined by two more fiber optic cables being built off the West African coast. These cables should significantly increase access and lower costs in capitals and other major coastal cities.

Complementing these efforts is continued rapid expansion of satellite communication, which will provide options for remote areas not immediately hooked to cables. For example, the O3b Network (short for Other Three Billion) is on course to launch a network of 16 low-earth-orbit communications satellites by the end of 2010 with the aim of providing Internet access to 3 billion people in developing countries around the world. The new cables and satellite connections will not solve all the challenges that restrain Internet access, including illiteracy, lack of reliable electricity,

4 Matthew Reed, "Africa, World's Fastest Growing Mobile Market," *Vanguard* 28 (April 2008), available at http://allafrica.com/stories/200804280943.html [subscription].

5 Mohsen Khalil, Philippe Dongier, and Christine Zhen-Wei Qiang, eds., *Information and Communications for Development 2009: Extending Reach and Increasing Impact* (Washington, DC: World Bank, 2009), 51.

6 Cat Contiguglia, "With Cable, Laying a Basis for Growth in Africa," *New York Times*, August 10, 2009, http://www.nytimes.com/2009/08/10/business/global/10cable.htm.

FIGURE 6.1 Mobile Phones Are Now Everywhere . . .
Mobile Subscriptions per 100 People

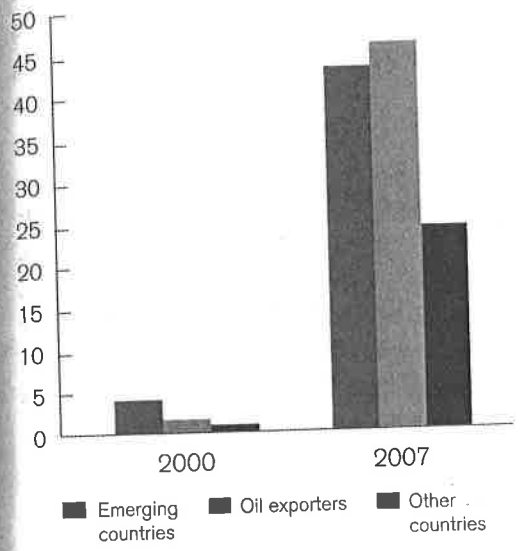


FIGURE 6.2 . . . and Coverage Is Widespread
Population Covered by Cellular Network

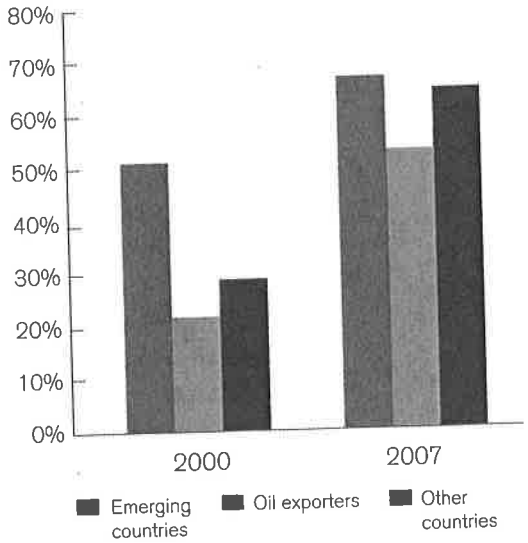


FIGURE 6.3 Internet Subscriptions Are Rising . . .
Internet Subscriptions per 100 People

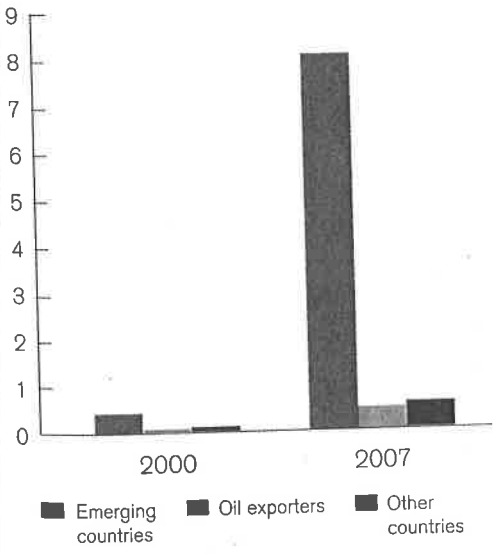
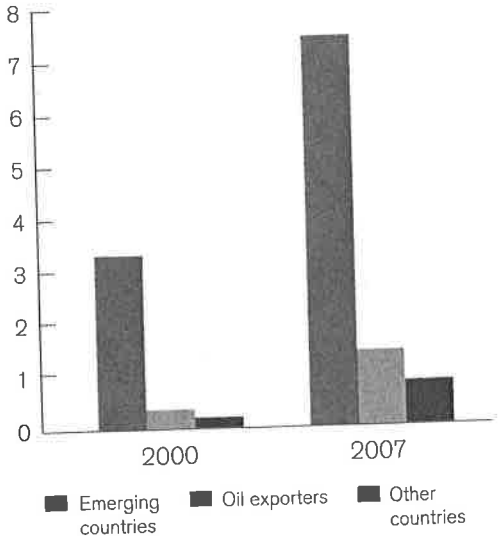


FIGURE 6.4 . . . and Secure Internet Servers Are Increasing
Secure Internet Servers per Million People



Source: World Bank, Information and Communications for Development 2009: Extending Reach and Increasing Impact, http://go.worldbank.org/NATLOH7HV0.

and bringing access "the last mile" from the cables to homes and businesses, but they will be major steps forward. The impact of the Internet is certain to continue to grow rapidly, creating new opportunities for economic growth, business creation, education, transparency, and accountability.

Fueling Entrepreneurship and Commerce

As the mobile revolution puts cell phones in the hands of millions of Africans, the possibilities for economic development, improved livelihoods, and raised living standards are enormous. Here is why: in rich countries, mobile phones are an upgrade from relatively reliable land lines to wider coverage with mobile phones, but in many poor countries, especially in rural areas, they are an enormous leap from isolation to instant access to the world. Moreover, the emerging countries have begun to establish the broader economic environment in which these technologies can have huge influence. Mobile technologies help entrepreneurs find customers, order materials, and reduce idle and wasted time, and otherwise bolster the efficiency and productivity of small-scale enterprises. They help make entirely new businesses viable and allow suppliers and customers to create new markets where none existed before.

As Iqbal Quadir, the founder of Grameen Phone, has observed, connectivity is productivity. There is perhaps no greater testament to the dynamic potential of mobile phones than the myriad innovative ways that African entrepreneurs have used mobile technology to bolster their productivity and expand their businesses. From matatu drivers to bricklayers to small shop owners, entrepreneurs and the self-employed are increasingly using mobile phones to spur their business efforts. Construction workers can order supplies with their mobile phones instead of leaving their sites and traveling long distances to stores. Shop owners can place orders for delivery over the phone, instead of shutting their doors during peak hours to run special errands for customers, bolstering their sales potential and profits and reducing wasted time. Electricians and plumbers don't have to return to the shop to retrieve messages about the next job. And instead of sitting idly for hours waiting for customers to offer them work, contract and day laborers can advertise their mobile phone numbers or simply post their numbers on a fixed site.

A particularly dynamic example is Village Phone Operators (VPOs), which were introduced to Uganda through a joint venture by the Grameen Foundation & MTN Uganda. Grassroots entrepreneurs, the VPOs, borrow money from microfinance institutions to purchase their "business in a box"—a mobile phone, which they rent to villagers who wish to place

calls. The proceeds from these sales allow VPOs to turn a small profit and repay their loans. VPOs, many of whom are women, typically sell five times the average customer's minute usage, illustrating their role in expanding the reach of mobile phones to new markets. Mary Wokhwale, a great-grandmother in the small village of Bukaweak in eastern Uganda, is a typical example:

> "My mobile phone has been my livelihood," she says. In 2003, Ms. Wokhwale was one of the first 15 women in Uganda to become "village phone" operators. Thanks to a microfinance loan, she was able to buy a basic handset and a roof-mounted antenna to ensure a reliable signal. She went into business selling phone calls to other villagers, making a small profit on each call. This enabled her to pay back her loan and buy a second phone. The income from selling phone calls subsequently enabled her to set up a business selling beer, open a music and video shop and help members of her family pay their children's school fees. . . . Ms. Wokhwale's life has been transformed.[7]

Mobile phones are supporting agriculture by providing much more timely and accurate information to farmers and buyers with much lower transaction costs. Farmers face a major disadvantage because of lack of information on weather, pricing, and market conditions, which undermines their bargaining power and leverage. Without the ability to access market information, farmers often have to travel long distances, at great expense and time, to reach a market, without knowing whether this market will offer the farmer the best price.

But mobile technology is helping farmers overcome these constraints by lowering transaction and search costs, improving coordination, and making markets more efficient and transparent. In Kenya, for instance, the Kenya Agricultural Commodity Exchange (KACE), a private firm, has teamed with mobile provider Safaricom to deliver price and market information to Kenyan farmers. KACE installs information kiosks near commodity markets, collects market information at the kiosks, and disseminates this information through SMS messages to farmers, buyers, and exporters.

Ghana-based TradeNet has been called the eBay of agricultural products. TradeNet matches buyers and sellers of crops across a dozen West African countries. It allows sellers to list their products and an asking price and buyers to indicate what they are looking for at what cost. The information is listed on TradeNet's Web site and is sent to subscribers in one of four languages, creating a virtual market for buyers and sellers to find each other and negotiate a deal.

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[7] "Mobile Marvels," Mobile Marvels: A Special Report on Telecoms in Emerging Markets, *The Economist*, September 26, 2009, 1.

Similarly, in Senegal, Xam Marse, which means "know your market" in Wolof, allows farmers to access real-time, location-specific market information about fruit, vegetables, meat, and poultry through free, daily SMS messages and the Internet. One estimate suggests that farmers who have subscribed to the service have earned 15 percent higher net profits. In Uganda, the Women of Uganda Network collects market price information and sends free SMS texts to 400 farmers. In Niger, a study by Tufts University's Jenny Aker found that the introduction of mobile phones was associated with a 20 percent reduction in grain price differences across markets.[8] As a result, consumer prices were lower and profits were higher. The effects were most dramatic for the least accessible markets. And there are many other examples.

These schemes have not been without challenges, one of which is illiteracy. Some of the programs are getting around this by offering alternatives to text messages. The KACE program in Kenya, for instance, offers farmers the option of receiving the information via voice mail. And NGOs such as World Education are piloting literacy programs using mobile phones to help people learn the alphabet and lists of basic vocabulary words. Another challenge is sustainability. Many of the programs offer information to farmers at no cost, and many farmers do not expect to pay. For the longer-term sustainability of the schemes, however, the value of the information must be clear so that customers are willing to pay for the service.

Beyond agriculture, the mobile phone industry itself is an important source of livelihoods and entrepreneurship. A 2008 World Bank study reported that the mobile industry has spawned 3.5 million jobs in Africa.[9] In 2008, the CEO of Kenya's Safaricom reported that the company directly employed 1,600 employees and indirectly supported an additional 400

8 Jenny Aker, "Does Digital Divide or Provide? The Impact of Cell Phones on Grain Providers in Niger," Center for Global Development Working Paper No. 154, http://www.cgdev.org/content/publications/detail/894410/.

9 Asheeta Bhavnani et al.,"The Role of Mobile Phones in Sustainable Poverty Reduction" (Washington, D.C.: World Bank, 2008), http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/The_Role_of_Mobile_Phones_in_Sustainable_Rural_Poverty_Reduction_June_2008.pdf.

airtime dealers and 4,000 money transfer dealers. Each of these dealers in turn worked with subdealers, which have their own subdealers, adding up to an extensive distribution channel employing thousands of people. The mobile industry has spawned a wide range of entrepreneurial activities, from self-employed street vendors, who charge phones for a small fee; phone card vendors; mobile phone repair shops; sellers of second-hand handsets; village phone operators; and even "mobile" mobile entrepreneurs, who affix mobile phones and extra batteries to the front of bikes. These kinds of economic opportunities simply did not exist 10 years ago, and they are just the threshold of an even wider range of opportunities in the years to come.

Meanwhile, Internet connectivity is enabling the launch of new services and connections. It enables producers to connect with buyers in other countries, such as Song-Taaba Yalgré's shea butter producers matching up to export markets. The Internet is making it easier for tourists to find hotels and tour opportunities in many countries. One of the most promising areas is outsourcing for data entry and related activities, including call centers. Outsourcing business services tend to be labor-intensive, create a high percentage of jobs for women, and require less capital investment to start than other sectors. Not surprisingly, South Africa has become the major destination for Internet business services, but it is far from alone. Ghana's Internet services sector has created 37,000 direct jobs and 150,000 indirect jobs, and has generated US$750 million in revenues over 5 years.[10] There are clearly constraints; these activities are heavily dependent on ICT infrastructure, including Internet connectivity, reliable power, and to a lesser degree transport infrastructure, all of which are formidable obstacles in many parts of Africa. Even so, the London-based Datamonitor group has forecast that Africa will soon have the fastest-growing call center industry in the world, citing in particular Botswana, Kenya, and Ghana for promising growth.[11]

Expanding Access to Finance

The vast majority of Africans have never set foot in a bank. For many, there is simply no bank branch in their remote communities. For others, the barrier is their own poverty—their desired transactions are too small or too risky for traditional banks to consider. As a result, millions of peo-

10 World Bank, "ICT Provides Additional Growth for Ghana," March 8, 2007, http://go.worldbank.org/KHCVWNRZX0.

11 Rob Crilly, "World's Next Outsourching Hub: Kenya?" *Christian Science Monitor,* December 21, 2007, http://www.csmonitor.com/2007/1221/p01s02-woaf.html.

ple are left without a bank account and are bypassed altogether by the formal financial sector.

But mobile phones are quickly changing that reality. Entrepreneurs are pioneering a range of mobile banking schemes that provide a growing array of financial services to customers previously without a bank.

Among the most common mobile financial transaction is the innovative use of phone minutes as a tradable commodity—in effect using a virtual currency instead of cash. Mobile subscribers can transfer phone card minutes to another subscriber by sending a text message with a special code. It even has its own language—in Kenya, to send minutes as cash is to "sombassa" someone. The widely popular M-PESA program—M is for mobile, and pesa is Swahili for money—goes further and allows people to deposit money into an account and exchange the deposits for e-money that can be sent to another mobile phone user and redeemed for cash at an M-PESA agent outlet or ATM.

These mobile financial service schemes have many benefits. They bolster the livelihoods of informal workers by allowing them to step beyond cash-denominated transactions. Self-employed entrepreneurs can accept payment on their phones and avoid the security risk of carrying cash. Migrants can send their hard-won income to loved ones hundreds of miles away with a few clicks, saving time and money.

The impact on international remittances is potentially huge. Remittances into Africa exceed a mighty US$8 billion per year, and in some countries like Lesotho and Cape Verde, remittances can reach upwards of 30 percent of GDP.[12] However, traditional remittances have very high transaction costs, often eating up one out of every eight dollars transmitted or more. Operators like Western Union and MoneyGram charge fees as high as US$16 to send US$100.[13] That translates into US$1 billion or more spent just on the transaction costs for remittances to Africa each year. But mobile phones allow people to transfer money for a fraction of the cost. Celtel, one of the largest mobile providers in Africa, now allows customers to transfer money via mobile phones from any bank in the world to banks in Kenya, Tanzania, and Uganda, and to use the phone to manage bank accounts, pay utility bills, transfer cell phone minutes, and use other services, all for a small fraction of the cost of a traditional money transfer.

12 Benno Ndulu, "Challenges of African Growth: Opportunities, Constraints, and Strategic Directions" (Washington, D.C.: World Bank, 2007), http://siteresources.worldbank.org/AFRICAEXT/Resources/AFR_Growth_Advance_Edition.pdf.

13 Ratha Dilip, "Leveraging Remittances for Development," Paper presented at the Second Plenary Meeting of the Leading Group on Solidarity Levies to Fund Development, Oslo, February 6–7, 2007, http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1110315015165/LeveragingRemittancesForDevelopment.pdf.

In the future, of course, an even broader array of financial services beyond payment and money transfers will be offered to mobile subscribers. In particular, banks and microfinance institutions could reach new customers with credit, savings, and insurance products through the launch of new mobile programs. In fact, this is already beginning to occur. MTN MobileMoney began in South Africa in 2005, initially concentrating on providing basic banking services such as money transfers and account monitoring in conjunction with South Africa's Standard Bank. MobileMoney replaced physical banks and only required a phone call and government identification to subscribe, helping to bring in rural users and those without bank accounts. But as MobileMoney has evolved, options have increased from the use of an associated credit card to the addition of two other South African banks and numerous alternate payment points at local shops and stores as well as expanded financial services and security options. The program is now being adopted in Uganda and is being tested in five additional pilot programs across Africa, including one in Liberia.

The wide reach of mobile banking has begun to weaken urban and gender biases that traditional banking structures frequently perpetuate. Mobile phone network coverage opens these services to people in the most remote areas who are often ignored by their capitals. Women gain access to markets and services as they begin to use mobile banking individually to manage funds and transactions apart from husbands or collectives. Moreover, mobile banking enhances security for women and youth because, unlike traditional finance, it does not require travel that wastes time, costs money, and exposes vulnerable populations to physical harm. Economically empowering marginalized groups helps level the financial playing field and acts as a democratizing force for economic growth.

Strengthening Health Services Delivery

ICT is already having a big impact on public health and health services delivery. Mobile technology is supporting both prevention and treatment as it allows health officials and providers to disseminate information more quickly and monitor patients more effectively. Public health officials dispatch SMS texts offering information on HIV/AIDS to a sprawling population, effectively reaching and educating a group of people in minutes as opposed to months. For researchers and technicians, mobile technology is providing a faster way to collect health data and to disseminate information quickly and accurately.

Mobile technology has also revolutionized medical treatment and evaluation. SMS texts can remind patients to get their vaccinations or

take their TB medicine, or even have relatives remind patients to take the correct dosage of antiretroviral drugs each day. The ability to monitor and remind patients has far-reaching effects. Rwanda is now using text messages to track HIV/AIDS patients in 75 percent of the country's health clinics, allowing the health system to follow up with and track patients, even if they change clinics. And a phone-based system called mPedigree in Ghana is being used to tackle the problem of counterfeit drugs: a scratch-off panel on the packaging reveals a special code that can be texted to verify the drugs' authenticity.[14]

Doctors and nurses are now able to improve health services in understaffed or remote health clinics by performing diagnostics virtually. A rural doctor with scant resources can now use a cell phone to send images of blood smears, eye problems, or skin diseases for diagnosis in the nearest urban hospital or at a clinic on a different continent. Public health officials can even monitor medical inventories throughout a country via text messages. South Africa has deployed an innovative pill bottle equipped with mobile technology, called Simpill, to encourage TB patients to adhere to their medication regiment. When a patient opens the pill bottle, an SMS is sent to a server that stores the data. If the Simpill bottle is not opened on schedule, a reminder SMS can be sent to the patient or to family members.

Strengthening Democracy and Governance

The effects of ICT go far beyond economics and finance. The ability to transmit information quickly to wide audiences has potentially major implications for democracy and governance. For example, mobile technology has played an increasingly important role in helping to constitute freer and fairer elections throughout Africa. Citizens have been given a weapon against corruption and rigged elections, and they are more than willing to use it.

In the 2004 presidential elections in Ghana, for example, voters used their mobile phones to call radio shows to report irregularities, obstruction, and intimidation. Likewise, 500 NGO workers with mobile phones directly monitored the 2007 Sierra Leone elections, sending SMS texts immediately to report irregularities and unofficial vote tallies. In the 2008 Zimbabwean election, supporters of different parties sent SMS text messages with local voting results to help build national tallies. These tech-

14 "Beyond Voice: New Uses for Mobile Phones Could Launch Another Wave of Development," Mobile Marvels: A Special Report on Telecoms in Emerging Markets, *The Economist*, September 26, 2009, 10.

nologies are making it much more difficult for those who want to stuff ballot boxes, lose ballots, close polling places, or otherwise thwart the voting process.

Beyond elections, human rights abuses and criminal activity are more easily relayed across a country, and indeed the world, as SMS texts and phone calls pluck an injustice done in a rural area out of obscurity and onto the national stage. Azur Development launched an SMS campaign in the Democratic Republic of the Congo to invite women to report domestic violence. These portrayals were then discussed on a radio show. Mobile technology gives voice to people across great geographic and ideological differences. And it helps deepen public debate on key issues by making it much easier for people to call into radio talk shows. Mo Ibrahim, the Sudanese founder of both Celtel and a foundation to improve governance and transparency, puts it this way: "Mobile phones play a really wonderful role in enabling civil society. As well as empowering people economically and socially, they are a wonderful political tool."[15]

There are, of course, downsides as well. Mobile technology and the Internet can be used to send false information, sometimes on purpose to defame people, or to whip up hostilities against certain groups, as was the case during the 2007 Kenyan elections. These problems are not trivial. They have been an issue for other forms of media and communication over the years, including in newspapers, magazine, radio, television, and landline telephones. In some ways the problems are accelerated by the very speed at which information can flow over ICT channels. But overall the net impact of this greater information and transparency has been positive. And ICT technology can also counter these effects. In Kenya, a website called Ushahidi (which means testimony in Swahili) was established in the aftermath of the elections to map reports of violence. It has since been expanded to several other countries to report human rights violations and provide information for crisis management.

NGO and watchdog groups can post information on government activities, including financial accounts and payments. More governments are posting budget outcomes, audits, and the results of competitive bidding processes online for public scrutiny. The Extractive Industries Transparency Initiative and Publish What You Pay both use information technology to allow for much greater public scrutiny of contracts and payments associated with natural resource industries.

ICT has also enabled some governments to start doing smarter, more efficient business. The ability to enact "e-government" transactions is

15 "Eureka Moments: How a Luxury Tool Became a Tool of Global Development," Mobile Marvels: A Special Report on Telecoms in Emerging Markets, *The Economist*, September 26, 2009, 2.

slicing through bureaucracy by reducing the time and cost of transactions, allowing governments to carry out business at a fraction of the previous cost. For example, to foster trade and increase customs revenues, Ghana introduced the GCNet customs system in 2003. The system acts as a one-stop interface, linking all the main players in the clearing process, enabling quick online processing of customs clearance documentation, and facilitating the clearance of goods through ports. The system allows documents and requests to be submitted at any time and allows for round-the-clock verification and monitoring. GCNet increased customs revenues by 49 percent in its first 18 months of operation and reduced clearance times from three weeks to two days

Looking Ahead

Throughout history, new technologies have unleashed transformative social and economic changes. Railroads revolutionized the United States, the Green Revolution transformed agriculture in Asia, the telegraph and the telephone connected people around the globe, and life-saving vaccine technologies have profoundly improved human welfare. Mobile phones, the Internet, and their successors are on their way to having a similar impact across Africa; they already have brought remarkable change and transformation in just a few years. While their effects will go well beyond the emerging countries, the more open political climate and stronger economic policies in these countries create an environment where the impacts of these new technologies are likely to be particularly significant.

Mobile phones and Internet connections are creating new economic opportunities for big businesses and small entrepreneurs alike. New jobs are sprouting up, and old jobs are increasing their profits and incomes. Farmers, market women, taxi drivers, and street hawkers are all reaping the benefits. Increased cash flows from new jobs and easier remittances have made more money available for individuals and families for food, medicines, and school fees. Information is flowing more quickly and easily, helping improve transparency and accountability and adding new citizen voices to maturing democracies.

The implications for the future are huge. These technologies are helping everyday Africans overcome some of the daunting constraints that have inhibited economic growth and poverty reduction in the past, including geographic isolation, weak infrastructure, poor information, and inefficient markets. To be sure, they are not a silver bullet. They will not overcome all problems, lift everyone out of poverty, or change autocratic governments into liberal democracies. But they are surely helping move

many countries in Africa in a new direction. They are creating completely new opportunities and options that simply did not exist even 10 years ago, much less 20 years ago during the depths of Africa's economic crisis.

The most exciting part is that they have only just begun to have an impact and are nowhere close to reaching their potential. In the years to come, these technologies and their successors will help lower business costs, create new income opportunities that we cannot now conceive, and help citizens hold their leaders more accountable. They will be a powerful force in helping Africa's emerging countries build on their recent success and continue robust growth, improved governance, and poverty reduction in the future.