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Africa's Evolving Infosystems: A Pathway to Security and Stability

by Steven Livingston

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“Africa doesn’t need strongmen, it needs strong institutions.”

—President Barack Obama

Address to Ghanaian Parliament, July 11, 2009

Executive Summary

Political instability and violence in Africa are often the products of rumor and misinformation. Narrow interests have used politically biased newspapers and radio programming to spread disinformation and champion politically divisive causes. Meanwhile, reasonable opposition voices have been kept silent and shuttered from public life, often by repressive, even violent means. This remains a serious concern across Africa.

Against this backdrop, the emergence of new information and communication technologies in Africa, advancing in tandem with emerging democratic institutions, is noteworthy. Over the past 5 years the annual growth rate for mobile telephony in Africa has been 65 percent, more than twice the global average.

Linked by mobile telephony and supported by geographical information systems, civil society networks now have unprecedented opportunities to develop security-monitoring programs, provide information needed for effective health care, create banking services, and provide farmers with market information. Remarkably innovative uses of mobile communications, often paired with radio broadcasting, have created entirely new types of institutions that promote transparency, accountability, and security. These evolving institutions are often organic to Africa and pegged to the immediate needs of the communities they serve. Technology innovation centers, created and staffed by African engineers and technicians, are leading the way in developing solutions to longstanding problems. Mobile phones are now irrevocable features of African life, and high-speed Internet connectivity soon will be too.

While the new information technologies can, at times, be used for less positive purposes, including crime and politically motivated violence, on the whole they are enhancing human security and sustainable economic development across the continent. As with all technology, on their own they are politically neutral. The key to realizing the positive potential in new technologies in Africa is found in focusing on the human motivations behind them. Policy initiatives, therefore, should focus on encouraging the development of applications that aim to improve human security, accountability, and transparency.

Initiatives include supporting Africa-based innovation centers where hardware and software applications are developed specifically suited to local needs. Other initiatives should be directed toward basic research concerning the political, economic, and security implications of local networks created by mobile telephony and related technologies. What are the measurable effects of mobile telephony on the lives and well-being of people across Africa, whether living in cities or remote villages? What are the effects of leaping from isolation in remote locations to being integrated in a global information network, within the lifetime of a young adult? There are many unanswered questions. Future policies and best practices must be informed by scientifically grounded answers. These and other policy recommendations center on leveraging the emerging technologies for positive purposes.

Misinformation and Violence

Rumors and misinformation fuel political tensions and violence in Africa. This is because many African communities have lived in information-constrained environments with few opportunities to corroborate news. As a result, inaccurate stories spread widely before being countered. Even then, these false perceptions may never be fully erased. In the meantime, individual and collective responses to the distortions, especially those that are threatening in nature, may set off a cycle of violence. Exploiting the weakness of these information systems, opportunistic politicians and media owners have often trumpeted feigned grievances and imaginary enemies to mobilize popular support behind self-interested positions—with predictably polarizing effects on the affected societies. Citizens are left without the information they need to properly assess the causes of social, political, and economic problems they face—or to assist in formulating and monitoring effective responses.

In Kenya, an independent review commission established to investigate the 2007 post-election violence found that the live broadcasts of some vernacular language radio stations were inflammatory. Listeners were told to “arm themselves against their enemies,” drawing uncomfortable parallels with Radio Télévision Libre des Mille Collines’ infamous role in fanning passions during Rwanda’s 1994 genocide.¹

Unsubstantiated information also exacerbated social tensions in Egypt during the swine flu outbreak of 2009. Although the spread of the H1N1 influenza virus had nothing to do with pigs, roughly 300,000 were slaughtered—the country’s entire stock—as a way of controlling the spread of the disease. At the time, there had not been a reported case of H1N1 in Egypt. Christian farmers accused the government of religious intolerance.² Reports of this sort worsened already strained Muslim-Christian relations and may have indirectly contributed to the rioting of thousands of protesters and clashes with police following the murder of six Coptic Christians in January 2010.³

In the Nigerian state of Plateau, more than 2,000 people have been killed in communal violence since 2001, including more than 500 in attacks in early 2010.⁴ Media have played a role in deepening these tensions. Indeed, an analysis of the attacks by Chatham House concluded that the Nigerian government needed to “take steps to curb hate-speech and control rumors.”⁵

Tensions were exacerbated by the uncertainty created by President Umaru Yar’Adua’s unexpected departure from Nigeria in November 2009 for medical treatment. Contradictory accounts of his health in the Nigerian press added to confusion in Abuja. Since the president left Nigeria without properly transferring power to the vice president and without communicating with the Nigerian people, it wasn’t clear who was in control. Rumors and uncertainty of this sort fuel instability and violence.

The effects of rumor and misinformation are not limited to dramatic episodes of violence. They also affect the long-term health of African societies. After years of effort, in 2004 the World Health Organization (WHO) was aiming to finally eradicate polio as part of a global campaign to vaccinate communities where the disease persisted. Nigeria was one of the six remaining countries that hosted the polio virus.⁶ However, misinformed Muslim leaders in the northern Nigerian states of Kano, Kaduna, and Zamfara claimed the vaccine program was a Western plot designed to sterilize Muslims and called for a boycott. Another unfounded rumor had it that the vaccine was, in reality, the HIV/AIDS virus and that it was being administered to reduce the size of the Muslim population. Consequently, many parents tragically stopped allowing their children to be vaccinated. WHO spent the next several years combating the rumor. Nonetheless, by then the Nigerian virus had spread to other African nations and in 2009 there were polio outbreaks in 19 previously unaffected countries. Today, Nigeria continues to host the largest number of polio cases in the world.⁷

Political instability, personal insecurity, disease, and persistent poverty—these are just a few of the concrete damaging outcomes of rumors, misinformation, and an unprofessional and underdeveloped African media. Weak information and communications networks leave people vulnerable and political systems unstable. Conversely, as noted by the International Federation of Red Cross and Red Crescent Societies, “Giving vulnerable people the right information at the right time is a form of empowerment. It enables people to make the decisions most appropriate for themselves and their families and can mean the difference between being a victim or a survivor.”⁸

The objective of an effective communication system in a functioning democracy is to fill the public sphere with factually grounded information that assists government officials, civil society, and the general public in their efforts to find appropriate solutions to mutually recognized problems. Where powerful institutions are closed, secretive, and remote from citizen's lives, media, in turn, will remain underdeveloped, unprofessional, and regarded as a threat to political stability and human security. Where the press is allowed to operate responsibly and freely, citizens benefit from an open and honest public dialogue about the problems they face. Research also points to a strong relationship among democratic institutions (including a free and functioning press), economic development, and the avoidance of conflict.⁹

Viewed in this way, a country's political stability is only as good as its systems for communicating timely and reliable information. Security and economic development are strengthened by information systems that promote accountability and transparency. A clear path to increased stability and improved human security, therefore, is found in initiatives that strengthen media, intrasocietal communication, and access to information.

Challenges to Press Freedom in Africa

Following South Africa's successful hosting of the 2010 World Cup, African National Congress (ANC) party leaders proposed a restrictive

press law that threatened to tarnish the country's newly burnished image. Party leaders were angered by news accounts of corruption by ANC officials. The Protection of Information Bill would obligate heads of government agencies to withhold broad categories of information. Prison sentences of up to 15 years for publishing secret material would serve as a "deterrent to unauthorised disclosure."¹⁰ Nobel Laureate Nadine Gordimer joined other South African writers in saying, "This is the threat of a return to the censorship under apartheid."¹¹

According to Freedom House's 2010 annual survey, the average level of press freedom across the continent declined significantly in the previous year, representing the largest overall drop of any region in the global analysis.¹² A total of 5 sub-Saharan African countries were rated Free, 19 were rated Partly Free, and 24 remained Not Free. As a consequence of Namibia and South Africa declining in the rankings to Partly Free, no countries in southern Africa were rated as Free in the survey.

Other surveys have produced similar results. In a survey of 178 nations, Reporters Without Borders found that 7 African countries ranked in the top 50 of the most open media environments, while 14 ranked in the bottom 50 (see table).

In Rwanda, the government has intimidated journalists and closed newspapers. In June 2010 an opposition journalist was shot to death after he published an article linking the government with the attempted assassination of an exiled Rwanda general.¹³ Other journalists have been jailed and threatened. A 2008 law banned criticism of the president and requires journalists to reveal their sources in court. The Rwandan government has also made it difficult for foreign journalists to work inside the country. Belgian, Ugandan, British, and French journalists have been denied entry or expelled from the country. A number of other journalists have been imprisoned, harassed, or forced into hiding.

Resources are another pressing problem. Basic resources for news operations are lacking across the continent.¹⁴ Printing presses, newspaper stock, distribution vehicles, and many of the other necessities of printing

2010 World Press Freedom Index			
Bottom 50		Top 50	
Country	Rank	Country	Rank
Cameroon	129	Namibia	22
Algeria	133	Cape Verde	26
Morocco	135	Ghana	27
Ethiopia	139	Mali	28
Nigeria	146	South Africa	38
DR Congo	148	Tanzania	41
Swaziland	155	Burkina Faso	49
Libya	160		
Somalia	161		
Tunisia	164		
Equatorial Guinea	167		
Rwanda	169		
Sudan	172		
Eritrea	178		

Source: Reporters Without Borders.

and distributing a newspaper are in short supply. Sometimes even something as indispensable as electricity is unreliable, making it difficult to use computers and run printing presses. Even where the economy is relatively strong, such as South Africa, Nigeria, and Kenya, journalists are hampered by inadequate resources and lack of professional training, and stymied by political pressure and harassment. These factors contribute directly to undermining access to timely and accurate information.

How to Respond?

For some, the recent trends in press freedom suggest that Africa is not ready for democracy. According to this view, the more appropriate course of action is to lower expectations and focus instead on creating stable hierarchical administrative structures that have greater capacity to manage basic improvements in infrastructure and

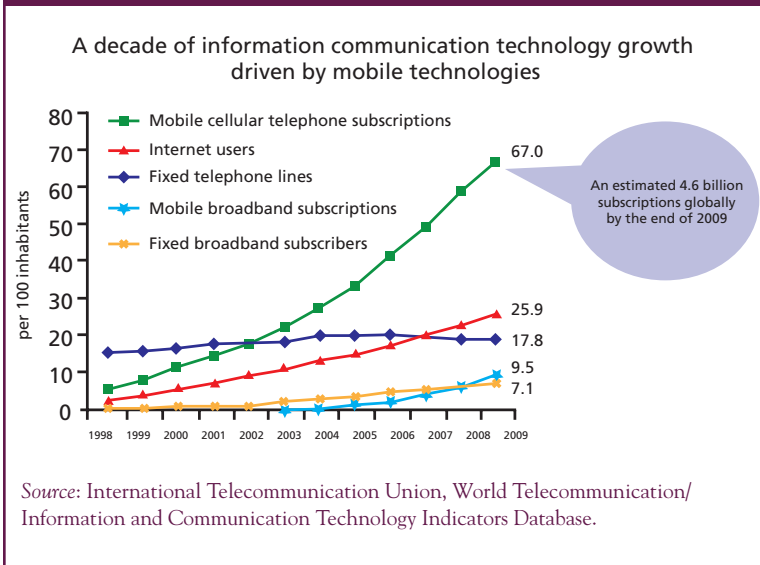
promote economic development. Indeed, throughout the Cold War and beyond, standard development theory assumed the best path to the achievement of rapid economic development was through the support of authoritarian regimes.¹⁵ Although they strongly disagree with it, Morton H. Halperin and his colleagues articulate the basic rationale for this development orthodoxy.

Because of the superior organizational abilities inherent in their hierarchical structures, *only authoritarian governments can match resources to urgent strategic tasks such as increasing savings and investing in public works like highways and dams, building up a disciplined military, enforcing the rule of law, and creating a functional education system. Authoritarian governments can undertake all of these things more efficiently than can lumbering democracies.*¹⁶

Hierarchy is regarded as necessary because of the complexities and the *transaction costs* associated with developing a national economy. Transaction costs are the costs associated with organizing and managing human activities. Hierarchies are, in the main, an information distribution system established where the scale of operations makes face-to-face interaction impossible. CEOs and generals do not tell each subordinate what to do; instead, he or she uses an information distribution system, a chain of command, to distribute directives and monitor compliance. This has long been considered the most logical and efficient organizational structure to meet pressing development and security needs.

Information technology changes this dynamic. Rather than requiring a hierarchical command structure, information is distributed from everyone in a network to everyone else in the network. The rapid and deepening penetration of mobile telephony across Africa has made this alternative possible.

Figure 1. Mobile Telephony Growth Relative to Other Technologies



The Ascendancy of Cellular Telephony

Novelist William Gibson once remarked, “The future is already here—it’s just not evenly distributed yet.” Yet we *are* getting closer. Cellular telephony has been the most rapidly adopted technology in history.¹⁷ By mid-2010 there were five billion mobile phone subscribers or more than 7 of every 10 persons on the planet, a 25 percent increase over just the previous year.¹⁸ One recent estimate claimed that by 2020 there would be 50 billion wireless devices performing an array of functions.¹⁹ Figure 1 illustrates the rapid growth of cellular telephony between 1998 and 2009, far outpacing the adoption rates of other technologies, including the Internet.

Most of the growth in recent years has occurred in the developing world. Mobile penetration in Africa soared from 2 percent at the turn of the century to 28 percent by the end of 2009.²⁰ Growth rates in some countries have been nothing less than astonishing. With a total national

population of 38.5 million people, Kenya saw mobile phone subscribers jump from just 200,000 in 2000 to 17.5 million in 2009. In 2010, about half of all Kenyans subscribed to a mobile telephone service, with many more using phones made available by friends and family.²¹ Ghana recorded a mobile penetration rate that exceeded 60 percent by the end of 2009, after having stood at just 22 percent 3 years before.²² In the Middle East, sub-Saharan Africa, and South and Southeast Asia, mobiles are not replacing existing landline telephones, as in the industrialized world, but are instead giving people the means to communicate over distance for the first time.

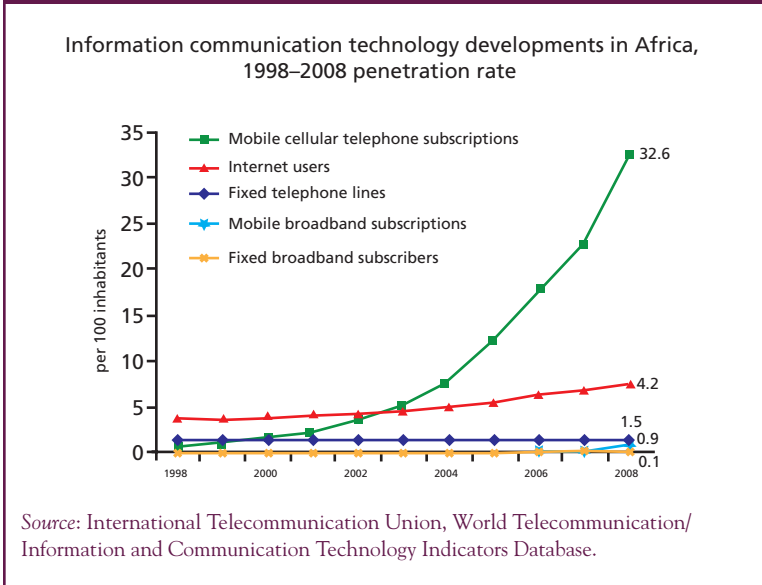
Figure 2 illustrates the impressive rate of growth of mobile telephony in Africa. Eager businesses have responded to this expanded market. In many African towns, it is common to see most buildings and, at times, it seems, almost every surface painted in the varying bright colors of competing mobile phone companies. In Goma, located more than one thousand miles from the capital at the far eastern edge of the Democratic Republic of the Congo (DRC), even the traffic circle in the center of town is painted in the deep purple hues of a major cellular provider.

Expanding Access to Information and Networks

Clearly, the expansion of cellular service in Africa has been motivated by a desire for profits, not politics. Yet significant political effects have resulted from the growth of mobile telephony. Sudanese-born billionaire Mo Ibrahim, a leading entrepreneur in the mobile telephony industry in Africa, has noted this unintended effect.

The mobile industry changed Africa. I must admit we were not smart enough to foresee that. What we saw was a real need for telecommunication in Africa, and that need had not been fulfilled. For me that was a business project.²³

Information technology has changed who can gain access to and deliver information. Now, everyone in a network can simultaneously

Figure 2. Mobile Telephony Growth in Africa

share information. As a result, the organizational structure involved in nearly every human endeavor, from selling books to fighting wars, is being transformed. Coordinated activities that were once prohibitively expensive (measured according to time, money, and manpower) are now practicable because of information networks.

This is happening because mobile phones and other information technologies have dramatically reduced the cost of information. This in turn allows motivated persons to pursue solutions to endemic political, economic, and social ills that would have been, in the absence of the lower costs, too difficult to sustain. As technology writer Clay Shirky notes, “Loosely coordinated groups can now achieve things that were previously out of reach for any other organizational structure.”²⁴ More than other technologies, mobile phones create resilient and adaptable networks suited to the needs of disparate populations. They also lead to a serious reassessment of the orthodoxy that says hierarchical regimes are best suited to further

rapid development. Transparency and accountability structures inherent in democratic systems—including responsible media, civil society empowered by new technologies, and international organizations—help specify problems and priorities, articulate solutions, and monitor progress in their implementation.

Mobile telephony allows nongovernmental organizations (NGOs) and other groups to organize disparate and often marginalized populations into new kinds of organizations and types of group activity. This includes financial services, health care, collective security, and human rights monitoring. The importance of this phenomenon can scarcely be overstated. Data transmissions (texting, short message service—SMS, digital maps, etc.) are perhaps the most important aspect of communicating via mobile phones in Africa.²⁵ A survey commissioned by the United Nations Foundation and the Vodafone Foundation found that the key benefits of mobile technology for all NGOs include:

- ◆ time savings (cited by 95 percent of the 560 NGOs polled)
- ◆ ability to quickly mobilize or organize individuals (91 percent)
- ◆ ability to reach audiences that were previously difficult or impossible to reach (74 percent)
- ◆ ability to transmit data more quickly and accurately (67 percent)
- ◆ ability to gather data more quickly and accurately (59 percent).²⁶

This rapid expansion in data transmissions is dramatically improving the capacity for oversight in Africa. There are scores of accountability-enhancing programs based on mobile phones emerging across Africa. Only a few can be highlighted here. FrontlineSMS, for example, distributes a free software program that enables users, usually civil society organizations, to send and receive text messages with large groups of people. In Nigeria, a local Nigerian NGO known as the Network of Mobile Election Monitors (NMEM) used FrontlineSMS to monitor the 2007 presidential elections. In total, over 11,000 messages

were received into the SMS hub. They provided a richer picture of how the voting went, even in rural polling stations with fewer official observers. A sense of transparency lent greater credibility to the overall election process.²⁷ Such technologies can dramatically supplement traditional election-monitoring systems in a vast country with poor roads and little in the way of support services.

During the 2010 constitutional reform referendum in Kenya, an SMS-based monitoring mechanism called Uchaguzi strengthened Kenyans' confidence in the balloting. As one observer noted: "Kenyans got a chance to track election results minute by minute. I had both the TV and my laptop on and I could easily compare results across broad platforms and channels and they were consistent!"²⁸ The strength of programs like FrontlineSMS and Uchaguzi is found in their ability to create loosely knit organizations that enhance transparency. One might speak of regulation by revelation. Corruption is abated "because people knew that if they try to rig the election there could be someone behind them that may send a text message reporting the incident."²⁹

Textuality, another mobile telephony initiative, runs several programs intended to improve health care. Stop Stock-outs is an organization that tracks medicine inventories at the local level. A similar program is called Pill Check. It enables members of a local community to visit public hospitals to check the availability of drugs. This is an enormous benefit in keeping local dispensaries supplied. Another initiative, Text Messages Across Nigeria, tracks the distribution of some 63 million mosquito nets.³⁰

Movirtu, a for-profit initiative, is expanding the use of mobile telephony by poor rural communities in sub-Saharan Africa and South Asia with an innovative business model. One of Movirtu's services is called MXPAY. Movirtu installs a server in a mobile operator's switching center that provides access to basic mobile banking for those who do not own a mobile handset or a subscriber identity module (SIM) card, or have a bank account. Users are assigned a number and a password

that enables them to “log in” to the system with any available handset. Those who lend their phones for this purpose receive an airtime top-up credit, which is calculated as a percentage of the transaction.

Expanding financial services to the rural poor redresses a long-held, major obstacle to development. With access to financial institutions, households can create a reliable savings plan that helps smooth out the uneven revenue flows typical of rural economies. It also reduces the need for rural households to store virtually all of their assets as livestock, which are inevitably vulnerable to drought, disease, or limited grazing areas. The system can also be used to distribute funds to recipients by aid agencies. What these examples share is the use of inexpensive, highly mobile, and adaptable mobile networks. Through distributed problem-solving, networks identify problems, monitor conditions, and implement solutions.

There are other examples. PlanUSA is a well-regarded American NGO that specializes in child protection and well-being programs. One project under development in Benin uses SMS and mapping to help bolster existing child protection networks.³¹

*SMS allows for anonymous and low cost reporting. It's hoped that this will encourage more reporting. More reporting will allow for more information, and for patterns and degrees of violence to be mapped. This in turn can be used to raise awareness around the severity of the problem, advocate for the necessary resources to prevent it, and develop better and more targeted response and follow-up mechanisms.*³²

Another use of the emerging ubiquity of mobile telephony is in commercial transactions and market exchange. For example, mCollect is a Trade-in-Hand initiative started in 2006 with the intention of enhancing export opportunities and trade throughout West Africa. Trade-in-Hand is a program run by the International

Trade Center based in Geneva, Switzerland. It began in 2006 as a program in Burkina Faso and Mali to provide farmers with daily commodity price quotes using SMS messaging. One of the Trade-in-Hand initiatives is called Mobile Marketplace. It offers a virtual marketplace to small-scale producers who have access to a mobile phone by enabling them to advertise their products to exporters and other big buyers. This greatly expands opportunities to connect buyers and sellers beyond a farmer's or trader's immediate locale. Better awareness of prices also reduces low-income farmers' risk when deciding whether to plant a particular crop.

Trade-in-Hand is not alone. There are similar initiatives found around Africa, including TradeNet/Esoko and Resimao. Both of these programs make market data available on the Web and via mobile phones. The Grameen Foundation Technology Center has implemented a similar program in Uganda under the name Community Knowledge Worker (CKW). CKW collects and relays agricultural information from farmers by mobile phone to provide a vital link between farmers and buyers. All of these initiatives use mobile networks to create and share information that enhances market efficiency.

In addition to providing market information, medical supply inventories, and election monitoring, mobile telephony is having an effect on corruption. Nigerian 419 scams are legendary among email users around the world, but they have their greatest adverse effect on Nigerian society. The "419" reference is to the article of the Nigerian Criminal Code dealing with fraud. These scams have led to widespread cynicism within Nigeria about the ulterior motives of seemingly well-intentioned initiatives, with almost anyone and anything being a potential target of a scam. With so little social capital, energy is wasted on efforts to detect scams, rather than getting things done.

Using aggregate data analysis, Catie Snow Bailard found that perceptions of corruption declined in reverse proportion to the increase in mobile telephony. The greater the access to mobile phones, the less

likely was the perception that society was irredeemably corrupt. This is a product of networked information systems that increase access to a much broader array of information, thus facilitating relatively simple fact-checking. As Bailard notes:

With mobile phones, aid agencies can directly contact schools and villagers to ensure that aid is appropriately disbursed. In addition, mobile phones make it easier for villagers to learn that they are entitled to receive a certain amount of aid, increasing their capacity to demand that aid. Mobile phones also diminish the power of local officials to extract bribes by better connecting individuals with alternative officials or with villagers who can provide information regarding alternative channels, reducing a given official's sole discretion over the supply of services, permits, or licenses.³³

Mobile Telephony and Security

International peacekeeping organizations use cellular telephony to extend their reach into otherwise inaccessible areas. In 2009, United Nations Security Council Resolution 1906 instructed the United Nations Mission DR Congo (MONUC)³⁴ to “build on best practices and extend successful protection measures piloted in North Kivu, in particular the establishment of Joint Protection Teams, Early Warning Centers, communications liaisons with local villages and other measures,” in the provinces of North Kivu, South Kivu, and Orientale. “MONUC’s intent is to increase the Force’s information collection capacity and interaction with local populations in the field through private mobile phone operators, in order to enhance the protection of civilians.”³⁵

To this end, MONUC’s Civil Affairs Section (CAS) has developed joint strategy and contingency plans aimed at “improving

protection of civilians, mitigating the humanitarian consequences of military operations, and strengthening the interactions between MONUC military and civilian components.”³⁶ As a part of its information-gathering initiative, private telecommunications operators in the DRC were contacted by MONUC to help create a “surveillance center” concept of operations. The Surveillance Center is a 24-hour-a-day call center staffed by an interpreter and MONUC soldiers responding to unfolding incidents. It allows civilians in the area to call in reports of security incidents as they happen. Critically, it has also improved communication between MONUC patrols—which are staffed overwhelmingly by soldiers who do not speak a local language—and local people, who can speak directly to the interpreter via telephone or radio while the patrols are still present. Relations between local populations and MONUC before the creation of the Surveillance Centers were tense, in part owing to a perceived lack of UN responsiveness. “Today significant improvements in the speed and frequency with which MONUC soldiers in North Kivu are responding to security incidents have renewed trust in the mission.”³⁷

Information technology is also improving real-time responsiveness to civilians at risk in conflict zones. In March 2009, the Congolese army and MONUC joined forces in Operation *Kimia II*. The objective was to forcibly disarm the Democratic Forces for the Liberation of Rwanda (FDLR), a Rwandan Hutu militia group, some of whose leaders participated in the genocide in Rwanda in 1994. Yet the Congolese army was itself accused of human rights abuses during the operation. Human Rights Watch documented the deliberate killing by Congolese soldiers of at least 270 civilians in a remote part of North Kivu province.

In response, MONUC’s Rapid Response and Early Warning Cell (RREWC) was created in May 2009 to help harness information in support of security and civilian protection efforts. The RREWC collects and assesses information from all monitoring sections on incidents occurring in the context of a joint operation and quickly

transmits reports and recommendations to senior MONUC officials. The system aims to provide operational information relevant to civilian protection to military commanders on the ground. At the heart of all of these initiatives are mobile phones. Access to such tactical level real-time information is of vital importance in many African security environments where threats are posed by highly mobile irregular forces that are often intermingled with civilian communities.

There are also examples of community-based civilian security initiatives using mobile phones. Oxfam–Great Britain (GB), a development, emergency relief, and advocacy organization, funded an initiative in Kenya called PeaceNet, an umbrella organization made up of Kenyan organizations and individuals dedicated to human security and political accountability.³⁸ Oxfam–GB contributed approximately 40,000 British pounds to the development of an information nerve center that would serve as a central reporting station where data from the field could be assimilated and used to take steps to avert bloodshed. In December 2007, as tensions rose after the disputed presidential election, information texted into the nerve center was then passed along to relevant authorities and police. The thinking was that putting a few policemen or elders in place could prevent something unfortunate from happening.³⁹ Using this approach, the nerve center was able to mobilize local religious leaders, NGOs, and authorities in the Rift Valley city of Eldoret to take effective measures as reports were called in about impending violence. Violence in that instance was avoided. Similarly, following the murder of a member of parliament, a vigilante group planned a reprisal attack on residents of a rival ethnic identity. Once the nerve center learned of this it mobilized a “peace committee” who persuaded the young members of the vigilante group to disband and go home.⁴⁰

Although they are helping to improve the lives and well-being of many people across Africa, mobile phones are not panaceas for all that troubles Africa, nor are they always put to positive ends. In Mozambique in 2010, for example, serious food riots were probably exacerbated by the

use of mobile phones and the panic and misinformation they facilitated.⁴¹ Although Mozambique officials denied it, the BBC reported that at the height of the violence the country's two mobile phone companies were forced by government authorities to suspend SMS services.⁴² Technology is politically neutral. Human motivations vary and, when matched with tools, they make possible an endless variety of outcomes. An airplane can reunite families, deliver relief supplies, or be turned into an instrument of destruction and misery. Likewise, mobile phones can be used to coordinate violence and crime. The key is to find ways to emphasize the use of the technology toward the creation of positive outcomes. The expansion of information technologies and civil society organizations in Africa is providing unprecedented opportunities to do just that.

Remote Sensing Satellites and Event Mapping

Better organizational capacity through communication technology is not the product of a single system, but rather multiple, overlapping, and reinforcing systems. Another key component of the modern information system in Africa today, accordingly, is high-resolution, commercial, remote sensing satellites.

In 1999, a company called Space Imaging launched the world's first privately owned and operated high-resolution remote sensing satellite. It offered customers 1-meter resolution panchromatic satellite images and other value-added products such as a variety of detailed maps and three-dimensional perspectives. With the fleet of remote sensing satellites that have been launched since 1999, private organizations, news media, and even individuals have access to satellite imaging that is well under 1-meter resolution. This has dramatically expanded what can be known and by whom. For example, it was an NGO that revealed the Iranian nuclear program in December 2003, not the United States or another state.⁴³ Whether such a capability is in the best interest of international security is still a point of debate. Yet what is clear is that high-resolution commercial

satellite imagery—now down to about 30-centimeters resolution—can make life more difficult for dictators. A recent example from Zimbabwe is instructive.

In 2006, as the government of Robert Mugabe prevented foreign reporters from entering the country and intimidated local journalists into silence, remote sensing satellite images helped fill the information void by capturing evidence that the community of Porta Farm was destroyed by police and military forces and that thousands of residents were forcibly relocated as part of a campaign against political opponents. The American Association for the Advancement of Science (AAAS) commissioned the images and Amnesty International in London and Zimbabwe Lawyers for Human Rights (ZLHR), based in Harare, disseminated the findings.⁴⁴

Geographic information systems (GIS), the geospatial data management software used to process the data collected by remote sensing satellites, have also advanced in sophistication. Google Earth is probably the most commonly seen example. GIS and remote sensing have been paired with cellular telephony and geographical positioning satellites to create crowdsourcing solutions to pressing social needs, such as human rights monitoring and disaster response. Crowdsourcing refers to the distribution of problem-solving to “crowds,” to members of the general public who are tied together in a network.⁴⁵ Rather than relying solely on institutionally based expert analysis, problems are addressed using social networks created by Internet or cellular telephony. A “crowd” is the source of solutions.

Those who build crowdsourcing solutions and use mobiles and GIS software are referred to as *event* or *crisis mappers*. Event mappers use GIS and reports sent by SMS, calls, or email messages to plot events. This creates a database of incidents that can be analyzed for patterns, evidence profiles, and other analytic tools. Ushahidi.com is one such organization—though one without a specific physical presence. Rather, it is a Web site supported by a network of mostly Kenya-based developers as well as contributors from around the world who use and adapt its open-

source software to specific event mapping purposes. Its origins are found in the realization that GIS and mobile phones could be paired to monitor the violence that followed the flawed 2007 elections in Kenya.⁴⁶ Using reports submitted via the Web and mobile phones—45,000 in all—GIS maps were created to visualize patterns of violence. The maps helped track claims about what happened to whom at what point and where. It created transparency and a means of accountability.

The service since has grown to a worldwide movement of volunteers and users. For example, it was used in South Africa to track xenophobic violence against immigrants.⁴⁷ A more advanced version of the software was deployed to monitor violence in the Eastern Congo in 2009.⁴⁸ Al Jazeera-International used it during the Israeli invasion of Gaza in 2009.⁴⁹ Furthermore, the Ushahidi platform has been used to coordinate relief efforts following the devastating earthquake in Haiti and the wildfires in Russia. This constitutes a next step in the development of the technology, moving beyond its original function of aggregating knowledge of widely dispersed events to now being used to coordinate responses, especially where governments are weak and ineffectual. Resources are matched with needs, all by use of voluntary participation networks.⁵⁰

Voix des Kivus (Voice of the Kivus) offers another example of event mapping. In 2009, it distributed mobile phones to three persons in each of four villages in the eastern Congo. These twelve people were trained to use the phones to provide data on behalf of their communities. This includes reports of violence and other security concerns, as well as reports regarding development initiatives, food production, and key social events. In the summer of 2010, the program expanded to additional villages throughout the region.⁵¹ The point of the effort is to link these remote population settlements in a support and security network. Alerting villagers to potential dangers, or allowing villages to alert security forces of developing concerns, extends a layer of security and safety to rural populations currently left largely to their own devices.

Unlike the unplanned engagement of mobile phone users found in crowdsourcing, the Voix des Kivus initiative uses “crowdseeding”—the strategically planned placement of mobiles with selected individuals and the establishment of long-term relationships with each user. There are trade-offs to this approach. On the one hand, the information collected from seeded phone users is probably more reliable because of the training that accompanies recruitment to the program. On the other hand, crowdseeding may create greater security risks for those with the phones. As witnesses to criminal behaviors—and carrying the means to report it—phone holders are at greater risk of becoming targets of violence themselves. To mitigate this potential risk, project leaders have established a system that allows the mobile users to opt out of message distributions and to specify recipients.

Radio

Mobile phones are not only paired with high-tech surveillance satellites, they also complement radio, a deeply rooted communication system in Africa. With relatively low literacy and low penetration rates for television (especially in rural areas), Africa is a radio continent. For example, 92 percent of the approximately 800,000 persons in Swaziland have one or more radio sets in their household, with 86.5 percent of the population reported to listen to radio one or more times a week. In Malawi, there is only 1 television station but 16 radio stations and 2,600,000 radio receivers—250 radios per 1,000 residents. In Chad on the border with the Sudan, Radio Sila is a community and humanitarian radio station broadcasting in Massalit, Dadjo, Arabic, and French. It reaches almost a million refugees and internally displaced Chadians.⁵²

As Ethan Zuckerman of Harvard University’s Berkman Center has observed, the only technology that “compares to the mobile phone in terms of pervasiveness and accessibility in the developing world is the radio. Indeed, considered together, radios and mobile phones can serve as

a broad-distribution, participatory media network with some of the same citizen-media dynamics of the Internet, but accessible to a much wider, and non-literate audience.”⁵³ As an example, Zuckerman cites Interactive Radio for Justice, a participatory radio show in the conflict-affected Ituri region of the Democratic Republic of the Congo that uses short message service to enable listeners to ask questions about justice and human rights to a panel of Congolese and UN officials. Similar examples can be found elsewhere in the DRC and in other countries. Leaders of a network of 17 community radio stations in the volatile eastern region of the DRC estimate that, together, five million people listen to their programming.

There are at least three identifiable effects associated with mobile phones and radio. First, listening to radio programming creates a deeper sense of community. According to Jacques Vagheni, the director of Radio Tayna, one of the 17 community stations in the region, listening to radio in villages is a community activity.⁵⁴ Several members of a village gather to listen to a single radio and then talk about the programming they’ve heard. Radio clubs are commonly formed among listeners and serve as a forum for discussing programming content and, most interestingly, formulating ideas for future programming. Club members use mobile phones to call in programming suggestions.

Second, community radio serves as a political forum and as a link between authorities and the public. Moreover, community radio is generally allowed greater latitude in terms of freedom of expression than other media. As Vagheni observes, “Community radio brings news to the people that they want to hear. It brings information they need. Government media (on the other hand) is all about ‘The president did this and the minister did that.’” Also, community radio brings information from the people to the political decisionmakers, as well as the decisions of the authorities to the people.

Third, community radio contributes to the security of the community. As Vagheni explains, “If there is an event happening in their area they (listeners) call the station,” much in the way commuters in the West call

a radio station to report a traffic mishap that is likely to affect the larger community of listeners. Radio and mobile telephony knit the community together. Radio and mobile phones also provide communities tools that empower them to build connections with external organizations that can help meet pressing safety, health, and economic concerns.

Radio Okapi, the MONUC/Hirondelle Foundation radio network in the DRC, contributes to community-building, security, and the provision of public service information.⁵⁵ Since its founding in 1995, the Hirondelle Foundation has created several other radio stations in crisis areas, including Star Radio in Liberia; Radio Ndeke Luka in Bangui in the Central African Republic; Moris Hamutuk, a radio program for refugees in Timor; Miraya FM, in Sudan; and Cotton Tree News, in Sierra Leone.

UN peacekeeping missions have also established radio stations that have become the de facto national broadcasters, providing citizens with trusted local news programs and nonpartisan public affairs forums. In the Sudan, DRC, Somalia, Liberia, and Côte d'Ivoire, UN-backed radio services offer essential national sources of local news. In relying on national announcers, producers, and reporters, these stations have given local broadcast journalists on-the-job training. As William Orme, a media development advisor with UNDP, notes:

By almost any measure—political impact, infrastructural improvement, giving voice to dissent and minorities, raising local journalism standards—the peacekeeping radio stations contributed more to media development in these postconflict countries than any other concurrent media aid programs, including the many journalism-targeted projects of UNESCO [United Nations Educational, Scientific, and Cultural Organization] and UNDP [United Nations Development Programme].⁵⁶

Despite its many powerful attributes, radio cannot, by itself, in most instances, provide the information required to address the more intractable problems facing rural African populations. Phillips, Hossain, and Arends-Kuenning find that mass communication campaigns are most effective when combined with personal communication and outreach. "Outreach has proved to be an effective means of providing service but an inefficient scheme for communication and exchange. Communication schemes involving groups are effective mechanisms for introducing ideational change but lack the elements of privacy and personal rapport that are essential elements of effective service delivery. Combining communication strategies with outreach produces synergistic effects that build upon the advantages of group and individual encounters."⁵⁷ Such strategies "demonstrate that outreach has a continuing impact on program effectiveness, even after a decade of household visitation."⁵⁸

In other words, combining mass media with interpersonal communication is the most effective way of transferring effective messages—and generating behavioral change. While only a fraction of a target population may hear the original message, if the content is relevant, waves of others will subsequently hear the message via personal networks.

The importance of the combination of a communications medium and community outreach in Africa can be seen when considering certain development initiatives. For example, in many parts of Africa, HIV/AIDS infection is a major health concern. In some countries infection rates are now well above 25 percent of the total adult population and climbing. Funded by the U.S. Agency for International Development (USAID), MTV's "Staying Alive" campaign for radio in Senegal helped stations organize an AIDS awareness campaign. For 6 months in 2005, 32 radio stations in Senegal talked about HIV several times a week—something that had never happened before. Besides broadcasting, a Dakar community station, Ndef Leng FM, which reaches nearly two million people in 14 languages, sponsored skits at festivities where young people played roles of ordinary Senegalese

facing the epidemic. The initiative stimulated a dramatic upsurge in the level of discussion and awareness on the subject. The campaign was successful since it drew on Senegalese culture and values and had the consent and active participation of community, civil, and religious authorities, both Christian and Muslim.⁵⁹

Unfortunately, it is impossible to reach all affected communities through person-to-person outreach. Some are simply too remote. In those instances, radio, listener communities, and mobile phones may help create a sense of community and ownership of initiatives that would otherwise not exist. For individuals living in remote, dispersed, and dangerous regions in eastern Congo and elsewhere in Africa, this makes it possible to at least approximate the intimacy of personal outreach.

Whether it is community radio in DRC or Darfur, or Radio Okapi, or national radio in Senegal, what seems clear is that radio taps into local culture and language and has a reach and intimacy that are unmatched as a mass medium. Mobile phones deepen that sense of community and connectedness by making what is by nature a passive, one-way communication system into an interactive, participatory medium.

Still, the tremendous potential found in community radio and cellular telephony is not fully realized because of the challenges associated with working in areas of extreme poverty and insecurity. Practically all journalists working for community radio stations in the DRC lack adequate pay and functioning equipment. Even relatively insignificant items, such as voice recorders, are in short supply. The stations themselves are simple cinder block or mud-block buildings with makeshift equipment. Rebels often attack and loot the more remote stations, or occupy and use them for their own purposes—until driven out by government or UN forces.

African Information and Communication Technology (ICT) Innovation Centers

Many of the information technology innovations making a difference in Africa have been—and are now—developed on the

continent. Kenyan information technology (IT) developers created Ushahidi in response to the instability and violence following the 2007 national elections. Since then the Ushahidi platform has been adapted to various purposes around the world. Uchaguzi, the elections monitoring system, was developed by many of the same key players involved in the creation of Ushahidi. Many of these social entrepreneurs were also involved in the creation of iHub, a gathering space in Nairobi for technology enthusiasts and bloggers drawn together for the high-bandwidth connectivity, mutual inspiration, and technical support. The iHub center is an example of the sort of innovation centers that urban studies research and sociological studies point to as agents for further economic development and innovation.⁶⁰

Inspired by iHub, Hive Colab in Kampala, Uganda, offers another example of an Africa-based innovation center. It is an open, collaborative, community-owned, work environment for young tech entrepreneurs to focus on projects, access the Internet, and have a quiet professional environment in which to develop their ideas, hold events, and generally collaborate. It is associated with another Kampala-based initiative called Appfrica, which facilitates, mentors, and incubates software entrepreneurs in East Africa.

In Cape Town, South Africa, business leaders founded the Cape Town Information Technology Initiative (CITI) in 1998. One of CITI's key initiatives is the Bandwidth Barn (BWB). Similar to iHub and Hive Colab, the BWB, has been in operation since 2000 and is a leading ICT business incubator. In 2010, CITI proposed Cape Town as the site for a Google incubator, an innovation center funded by the global search giant, and an InfoDev incubator. InfoDev is a World Bank "ICT4D" initiative that looks for ways to leverage IT for development and economic growth. As hubs in a global network of innovation sites, the Hive Colab, BWB, and iHub are physically located in Africa but integrated into a global flow of scientific and technical information.⁶¹

In 2010, the U.S. Department of State teamed up with iHub, Hive Colab, and Social Development Network (Sodnet)—a Kenya-based organization that promotes civil society—in sponsoring the “Apps4Africa” contest. Building on the foundation established by Secretary of State Hillary Clinton’s Civil Society 2.0 initiative, Apps4Africa competition encouraged the production of software applications suited to Africa’s development needs. The competition attracted more than twenty entries from participants in Kenya, Rwanda, Uganda, and Tanzania. First Place went to a Kenyan developer’s mobile application that helps farmers track the fertility cycles of cows. Second Place went to Kleptocracy Fighters, Inc., a mobile application that allows citizens to record and report real time information concerning possible government corruption. Reports can be audio, video, or text. Mamakiba, the Third-Place winner, is an SMS savings calculator and prepayment tracking tool designed to help low-income women save and prepay for their maternal healthcare needs.⁶²

In another impressive example of IT innovation, participants at iHub joined teams from around the world in a “Random Hacks of Kindness” competition in June 2010. The “hackers” came together in real time for a marathon weekend of coding around problems relating to natural disaster risk and response. The problems tackled included the development of landslide prediction software for risk reduction in developing countries. Rainfall-triggered landslides are a common occurrence in poor communities around the world, and large events can cause loss of life, require community relocation, and cost millions of dollars. The Nairobi team’s submission received the grand prize.⁶³ Another problem involved the development of a missing persons identification system to be deployed in the aftermath of a hurricane or other disaster resulting in mass dislocations of populations.

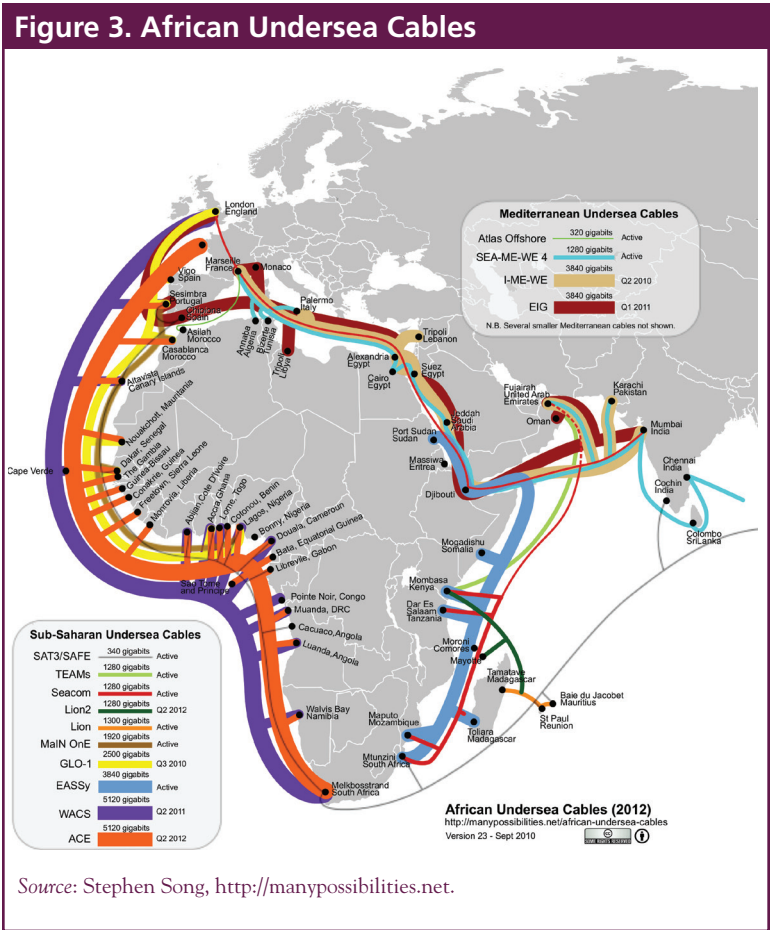
There are several other initiatives that one could point to in illustrating the growth and impact of the IT sector in Africa, all in just the last few years. For example, Geekcorps-Mali promotes stability and prosperity in the developing world through information

and communication technology. It pursues an evolving array of ICT initiatives in West Africa. Kiwanja.net, an offshoot of FrontlineSMS, provides advice and support for African and international NGOs on the use of ICT for development and related objectives. In fact, there has been such a proliferation of technological initiatives emerging out of Africa that keeping track of them all requires the assistance of a monitoring technology. AfriGadget is a site dedicated to tracking and highlighting sustainable technologies developed for Africa, usually by Africans. In 2008, it was named by *Time* magazine as one of the top-fifty Web sites in the world.⁶⁴

Besides homegrown innovation centers such as iHub, CITI, and SmartExchange, African locations have been selected by several major global IT companies for placement of IT innovation centers.

- ◆ Ericsson Innovation Center (EIC) has three application development hubs: Nigeria, South Africa, and Kenya. EIC concentrates on mobile applications. It is modeled after the Gramjyoti project in India and the Alokito Bangladesh project, both of which centered on the linkages between mobile telephony and economic development.
- ◆ Nokia Research Center–Nairobi focuses on the needs of the African mobile phone user.
- ◆ Microsoft announced that it would build four innovation centers in Africa, including two in South Africa.
- ◆ IBM launched its Africa Innovation Center in Johannesburg in September 2009—part of a US\$120-million, 2-year investment in the African IT sector.

Africa can expect bigger changes in the near term. Figure 3 illustrates the undersea high-bandwidth cables servicing Africa by 2011. About 80 percent of global data transmission uses undersea cables. As of mid-2009, 40 percent of continental Africa's nations were without a direct high-bandwidth cable connection. Satellite uplinks were used instead but at rates that were twenty times more expensive than bandwidth prices in



Source: Stephen Song, <http://manypossibilities.net>.

the United States. The new cable systems will alter that pricing structure, opening up new opportunities for the growth of high-speed Internet and better cellular telephony.⁶⁵ Once all 12 undersea cables are fully operational in 2011, Africa’s total international bandwidth will increase from about 6 terabytes per second (tbps) in 2009 to as much as 34 tbps.⁶⁶

Organizations, Institutions, and Security

Because security is the product of sound institutions and organizations, we are led to ask questions about their origins.

Institutions that contribute to transparency and accountability, such as a free and responsible press, are often a part of the answer. Nobel Laureate Amartya Sen's oft-quoted observation summarizes the proposition: "There has never been a famine in any country that has been a democracy with a relatively free press. I know of no exception."⁶⁷ In his analysis, Sen demonstrates that famines have less to do with deficiencies in the overall availability of food than they do with the distributional effects associated with government decisionmaking. Famines are typically the result of bad decisions, the lack of timely information, and the lack of means for putting political pressure on government leaders to take appropriate and timely action. A free press and other democratic institutions offer the best protection against these disconnects. Timely, accurate information is an obvious prerequisite to holding government decisionmaking accountable. "Newspaper reports and public protests," notes Sen, "carry not only information that authorities can use, but also elements of pressure that may make it politically compelling to respond to these danger signals."⁶⁸ Timely, accurate information helps create predictability, and predictability and security are closely related.

What kind of organizations and institutions are best suited to creating these conditions? While there may not be a single answer to this question, a few general tenets emerge. In this study, two stand out: a free press and civil society empowered by new technology.

Clearly, a free press has an essential role to play in fostering access to information. Unfortunately, according to Freedom House and Reporters Without Borders, press freedom in Africa seems, on the whole, to be slipping backwards. This is why continued efforts to improve the professionalism of journalists in Africa are so essential, as are the equally important efforts to encourage governments to be aware of the long-term positive benefits of press freedom. This is not an easy task, particularly when press freedom is often seen as threatening to insecure and weak governments.

In semi-authoritarian countries, challenges to press freedom are daunting. “On paper, Rwanda has more private newspapers and radio stations than at any point in its history. In practice, independent news coverage is minimal due to business woes and government intimidation.”⁶⁹ Autocratic governments will instinctively try to shut down or intimidate those who try to use information technology to further freedom’s reach.⁷⁰ In other instances, insurgent groups force mobile phone operators to turn off towers so as to thwart efforts to improve security with alert systems that rely on mobile phones.⁷¹ Yet, as ICT becomes more widely adopted, those governments that restrict the flow of information will increasingly stand out. They must also be forced to absorb the deleterious effects these restrictive policies will have on their economies.

The larger point is that organizational dynamics, economics, and political pressures both shape and are shaped by information access. And given the role of a free press in security, stability, and development, it is important that we give careful consideration to how information is accessed and its effects on the nature of organizations and institutions.

Not all information is the same. One common distinguishing property of information is cost. It costs more in time and energy, for example, to physically transport information on paper than it does to send it electronically. This is having a major effect on the nature of journalism throughout the world. Costs take the form of news-stock, ink, binders, distribution systems, etc. They are met by large organizational structures, such as *The New York Times*, or *Le Monde*. These costs also offer opportunities to those who wish to interrupt the flow of physically constructed and distributed information. Interference in the system (such as seizing the printers and disrupting the availability of ink or paper) impedes the process.

There are other examples of the relationship between the cost of information and the nature of organizations. Information in printed books gives rise to an organization called a library. Yet it costs more

in time and space to use a card catalogue to manage information in a library than it does to store it electronically. Furthermore, it costs more to store a physical book than it does to store the same information on a website. It is also more costly to check a book out of a library than it is to download it from a Web site. One must go to a library, check the catalogue, and find the correct shelf—only to discover that the book is not there. This takes time, energy, and resources. When stored electronically, the same information is available to a “library patron” without leaving home—assuming the required communication technology is in place. These are opportunity costs—the cost of what one could be doing rather than what one is doing, in this case, going to retrieve a book that isn’t there. Nor can an electronic book be checked out and made unavailable to other readers. There are as many copies as there are readers. The actual cost of the book, its storage costs, and the opportunity and transaction costs associated with its use are all affected by the nature of the information that creates a “book.”

Likewise, these sorts of costs affect group activities oriented to common goals. Information costs can be thought of as an aspect of what economists call transaction costs. This refers to the effort required in time and energy to conduct business, or to organize any human endeavor. *Low-cost, abundant, easily distributed information lowers transaction costs, which affects the nature of institutions and organizations.* This explains the emergence of the security, health, and financial initiatives in Africa described earlier that are enabled by mobile networks.

Writing a century ago, sociologist Max Weber noted the relationship between the chief characteristics of information and the nature of organizational structure. In his era, that meant a large, hierarchically structured bureaucracy. Bureaucracy is established according to the needs of rational administration and organized according to areas of expertise in a high-cost information environment. Resting on a belief in the rationality of rules and the demonstrated capacities of those elevated to authority to issue directives, bureaucracy was understood as a kind of

meritocracy. It emphasized the importance of knowledge and expertise over personality and identity. Weber refers to “the rational specialization of functions and the rule of expert knowledge” in describing the organization of hierarchical administrative systems.⁷²

In *Wirtschaft und Gesellschaft* (*Economy and Society*), Weber also argues that the administration of business depended on the tempo of operations. This in turn is determined by the “peculiar nature of the modern means of communication, including, among other things, the news service of the press.”⁷³ The tempo of administration must match the flow of information coursing through society. Accordingly, hierarchy and command and control systems are inherently about the efficient flow of information across a large number of people based on the differentiation of skill, knowledge, and responsibility. This is the premise of hierarchical organizations: that information is scarce, costly, and difficult to assimilate and manage.

Political scientist Bruce Bimber picks up on Weber’s link between information and the nature of organizational structures in society. For an example he points to the nature of information systems in North America in the 18th and early 19th century. Its chief characteristic was the “absence of an effective system for the national-scale flow of political information.” Although he is describing a particular time and place, his point applies equally well to information and organizations across history and location. Bimber writes:

Before the 1820s, communication and the exchange of information were constrained by the limits of face-to-face contact and slow human travel. No electronic or electrical communication medium would operate until the telegraph at mid-century, and no true system of national news existed to assemble and distribute information. Postal service was rudimentary, with the distribution of mail unreliable and often unavailable

*in many places. The number of roads or rivers used for conveyance of messages was insufficient to move information around the country in a functional way.*⁷⁴

He is describing an underdeveloped region, regardless of the timeframe. This was important for, as must be kept in mind, information technology includes more than electronic devices. Roads, railroads, the pony express, and (now) air travel are also elements of information technology. They convey information. The consequences of the inability to communicate politically germane information in such an environment are profound. Because public officials are without a systematic way of gauging citizen preferences, representation rests on conjecture and rumor—or worse, manipulation and exploitation. At the same time, with so little information available to those living far from administrative centers, citizens have little guidance in assigning responsibility for political outcomes to appropriate officials. Accountability is all but impossible.

What is more, citizens are unable to communicate with one another. As Bimber observed in his example of an underdeveloped North America, the limited flow of information “obstructed the formation of coalitions and coordinated political action.”⁷⁵ *The capacity for democratic governance, political accountability, and the nature of political organization are deeply affected by the characteristics of information and communication.*

Organizations are—or at least can be—less hierarchical, more adaptable to changing circumstances, and networked. For example, rather than brick and mortar buildings, modern political advocacy organizations and interest groups have virtual presences, meaning they occupy an information space more than they do a physical one. Ushahidi and Voix des Kivus don't exist in the same way other more established organizations with similar purposes do. Yet established organizations have patterns of doing things that are not easily changed, sometimes for very good reasons. Rather than use crowdsourcing, some NGOs rely on country experts—often a lone individual posted to a region—who is responsible

for offering assessments of the stability and security of his or her region in periodical reports. This approach mirrors the system used by nation-states for decades. Its strength is found in the expertise and credibility of the area expert. The weakness is in the time delays, excessive demands, and vulnerabilities resulting from relying on a lone individual.

“Post-bureaucratic” organizational structures reflect an information-rich society, one characterized by cheap, plentiful, and easily managed and distributed information. Various collective action initiatives do not require organization at all, at least not in the traditional sense. This constitutes “the opening of formerly closed organizational boundaries.”⁷⁶ Within and among organizations, the segregation of information according to official roles is weakened. They become more open and inclusive—and less hierarchical. In this sense, horizontal organization is more democratic. “Structurally, democracies’ ‘horizontal networking’—that is, the flow of ideas back and forth between the public, private, and civic sectors—allows for greater versatility, timeliness, and capacity for adjustment in the adoption and implementation of a policy than the hierarchical structures typical of authoritarian systems.”⁷⁷

Scarce and restricted information encourages the development of undemocratic, opaque, and unaccountable institutions of governance. Information abundance encourages greater transparency and accountability. The trends in mobile telephony, the expanded availability of broadband cable, and the use of radio in community services in Africa describe an emerging environment of information abundance. As obstacles to information flow continue to fall, unprecedented new opportunities for improving governance and security in Africa will continue to emerge.

Policy Recommendations

Development in Africa not only improves the lives and well-being of Africans, it also contributes to global peace and security. While speaking at an event marking the announcement of a new economic

development initiative of the United States, Secretary of Defense Robert Gates put the point this way: “Development contributes to stability. It contributes to better governance. And if you are able to do those things and you’re able to do them in a focused and sustainable way, then it may be unnecessary for us to send soldiers.”⁷⁸ The growth in the number of mobile phones available to economically disadvantaged people, the availability of remote sensing data to nongovernmental organizations, and the complementary availability of radio are contributing to democratic governance and security in Africa through greater transparency and accountability. New kinds of institutions and organizations have emerged—Ushahidi, iHub, FrontlineSMS, Voix des Kivus, MobileActive—that knit communities together, protect civilians, and help them get a fair price for the fruits of their labor, while helping ensure greater accountability. New information technologies and applications such as mobile phones and community radio listener clubs have deepened the impact of established media.

The central policy recommendation emerging from this analysis is to strengthen and expand these trends—with the aim of supporting responsive African information initiatives. These, in turn, will augment ongoing progress toward security, development, and democratic governance on the continent.

Support IT Innovation Centers. The catalysts for so many of the key changes in African information systems described in this study have come from Africa itself. CITI, SmartXchange, the Johannesburg Centre for Software Engineering, Geekcorps-Mali, Kiwanja.net, Hive Colab, and iHub are African initiatives in response to African needs. The full effect of this is subtle and therefore might be missed. When one visits iHub in Nairobi, or attends a CITI event in Cape Town, or speaks with those who keep the community radio station running in Goma, one immediately senses a well-deserved pride. There is ownership and commitment and a palpable sense of ambition in these places. There is a sense that, “We did this.” The fact that international

analysts and academics come to these groups to learn about their ongoing accomplishments is itself a significant indicator of the depth of the changes at hand. In the past, these international experts came to offer advice and lecture, not learn about the latest innovation in the application of technology for positive social change.

Innovation centers should be supported by grants, technical exchanges, and infrastructure support. Yet African initiatives must remain African. To strike the needed balance between appreciated support and an unwarranted tendency toward co-optation, international assistance should be collaborative. Civil society organizations today are, by the nature of the electronic networks described in this study, global in reach. Supporting these local information technology initiatives through grants, technical advice, or exchange programs helps create a stronger capacity on the global scale. Technology supplies the tools required for local initiatives to overcome the transaction costs associated with collective action. The international focus should, for the most part, remain on the development of the technological capacity to form organizations needed to address the economic and security priorities of African communities. These communities are then best suited to developing the initiatives that will be effective for them.

Similarly, strengthening exchange programs with African students and community leaders involved in the development of technologies addressing human needs in Africa will help build indigenous capacity. Encouraging further exchange programs with leading technology firms, such as Google, Microsoft, IBM, Ericsson, Yahoo!, and others will also deepen the technical know-how of African entrepreneurs. With the expanding technical facilities and greater bandwidth, workshops with these technology companies can be virtual.

Strengthening exchange programs should not be limited to technical fields but targeted to governance more generally. Ory Okolloh, the Kenyan lawyer whose vision led to the creation of Ushahidi, and who now serves as its executive director, obtained an undergraduate degree in political

science from the University of Pittsburgh and a law degree in 2005 from Harvard University. In 2006, she cofounded the parliamentary watchdog site Mzalendo—the Kenyan equivalent of the Congressional Record and C-Span in the United States.⁷⁹ Innovations in the social application of technology are just as important as technological innovation.

Assist Women Empowerment Initiatives. Statistical evidence points to a gender gap in the ownership of mobile phones, with fewer women in the developing world owning and using mobile phones. According to statistics provided by the GSMA Development Fund and the Cherie Blair Foundation for Women, women overall are 21 percent less likely than men to own a mobile phone. In Africa, the figure is 23 percent. Women represent nearly two-thirds of the untapped market for mobile phones.⁸⁰ In an effort to close the mobile phone gender gap, Secretary of State Hillary Clinton has backed an initiative called mWoman. Closing the gap empowers women in the marketplace and improves safety.⁸¹ Assistance efforts should give special priority to the empowerment of women and to helping close the mobile gender gap.

An example of such a program is Tostan's Jokko Initiative: Mobile Technology Amplifying Social Change. Tostan is a development NGO with operations in eight African nations. The Jokko Initiative aims to provide women with access to mobile phones and training in applications for community engagement and social change. Among its priorities is connecting women with one another and with their communities, helping to build consensus on local development priorities.

Support Liberalization of the Telecommunication Sector. Governments should limit their direct involvement in the mobile telephony business. Since the liberalization of Nigeria's telecommunication sector in 2000, the industry has become a source of approximately 5,500 jobs, with another 450,000 jobs associated indirectly with the industry.⁸² Yet the penchant for government control continues to constrain these opportunities in many African

countries. Ethiopia has maintained a monopoly on mobile telephony, resulting in a penetration rate of just over 1 percent in 2007. In neighboring, war-ravaged Somalia, three competing mobile service providers had a 6 percent penetration rate.

Yet liberalization must come with effective regulation. Governments should be encouraged to regulate the mobile market in ways that support competition. Without regulation, mobile service providers are less likely to provide affordable rates for connections between operators and for international service, even within Africa. Interconnection tariffs limit effective competition as dominant providers drive competition out of the market by, essentially, excluding them from the local network. Also, government intervention may be needed to create incentives for the provision of services in rural areas. Regulators can require carriers to provide coverage in rural areas as a part of a licensing agreement.

Another approach is to create a Universal Access Fund (UAF). Financing expansion of mobile services to high-cost and low-income regions, historically, has been provided by either higher tariffs for some services (such as domestic long-distance or international calling) or by state subsidies. Increased international competition has, in most cases, made high tariffs untenable. To avoid reliance on state subsidies, UAFs have been set up to channel a portion of revenue from all the carriers into a fund for redistribution as subsidies to expand universal service or access. Colombia and Peru established such funds in 1994, followed by Chile and Mexico in 1995 and Guatemala in 1996.⁸³ Each operator can bid for a subsidy from this fund to help develop additional services in underserved regions.

UAFs can be used to extend mobile telephony coverage to the market margins. According to research conducted in 24 sub-Saharan African nations by the World Bank, 57 percent of the population is already within range of a mobile signal. Globally, \$3 billion of market-led investment would leave only 3 percent of the global population without access to a mobile signal by 2015.⁸⁴

Expand and Sustain Radio's Reach. Radio broadcasting continues to be a central source of news and information across Africa. Its significance to the daily lives and well-being of people in rural communities is strengthened by the communities' ability to "talk back" to the radio stations with mobile phones. Listener clubs help develop programming, provide stations with information about community events, or call stations during crises to warn others of evolving threats. Aid agencies and government offices use radio to provide citizens information about health, safety, and other sorts of practical and valuable information.

Recognizing the importance of radio, in 2010 the UN Food and Agriculture Organization's Extension, Education and Communication Service provided equipment for producing and receiving radio programming to partner radio stations and members of the Association of Community Radios in the Democratic Republic of the Congo.⁸⁵ Initiatives such as this are needed in communities across Africa. A more ambitious program for expanding community radio stations would strengthen their ability to knit communities together with much needed information about agriculture, health, security, and other community needs.

A related priority is to give more attention to sustaining radio systems established by the UN during peacekeeping operations. The information vacuum that is created when UN peacekeepers depart can be only partially filled by less professional and more localized community radio stations. With this in mind, the UN should establish partnerships with credible and capable local media outlets, such as nonpartisan public broadcasters or community radio networks, if such institutions exist. Where they do not exist, development efforts should include the incubation of sustainable radio systems that will remain even after the UN has departed. Current peacekeeping radio services should begin planning now for their eventual closure, and help build local broadcasters that could provide similarly professional and nonpartisan programming.⁸⁶

Share Geospatial Data. The changes described in this study are tied to the fundamental global expansion of the availability of information.

A key instance of this is geospatial information, one of the central components of event mapping. Remote sensing data and GIS maps give organizations the ability to see into spaces that were once beyond the reach of even large organizations. Accordingly, steps should be taken to expand the availability of geospatial data.

The United States National Geospatial-Intelligence Agency (NGA) supports geospatial data analysis for the United States Government. This includes supporting humanitarian assistance programs, disaster relief, resource development, and construction projects. NGA's imaginative use of unclassified geospatial data in Mongolia offers an example of what can be done in Africa. NGA first entered into an exchange and cooperative agreement with the government of Mongolia in 2004. Since then, detailed gravity and elevation data of Mongolia are helping produce highly accurate digital terrain models, important to the safe operation of flight navigation systems.⁸⁷ In Africa, unclassified high-resolution geospatial imagery obtained from the commercial satellite image providers can be shared with African health and human welfare agencies, or with nonstate actors, to monitor environmental concerns or human rights issues, or help plan development projects.

Develop Journalism Training Programs. The central premise of this analysis is that *secure and stable societies are associated with open and responsive information systems*. New information technologies are dramatically enhancing the capacity of such systems. Yet it would be a mistake to lose sight of the positive effects of "old-fashion" information technologies such as newspapers and radio stations. A free press is essential to development, stability, and security from violence and hunger. A clear path to increased stability and improved human security, therefore, is found in initiatives that strengthen existing media, as well as those that develop new media and civil society initiatives.

Except for South Africa, qualified institutions dedicated to training journalists in the region are either underdeveloped or missing

altogether.⁸⁸ International lending agencies should support initiatives that raise the standards of journalism education in Africa.

Representatives of the international community with a presence in Africa should also lead by example and proactively engage African journalists. Regular press conferences, press releases, background interviews, and other “press availabilities” can help set norms for engagement between government officials and journalists. They also represent potential experiential learning opportunities for local journalists. Spokespersons should encourage best practices, including regular clarifications of what it means to speak of “ground rules,” specifying background from on-the-record interviews. Individual follow-up with those who show professional promise should also be encouraged.⁸⁹

There are several noteworthy examples of Africa-based independent initiatives aimed at strengthening journalism capacity in Africa. For example:

- ◆ The Mohamed Amin Foundation runs the MoFORCE Training for Television and Film program in Nairobi. It attracts aspiring broadcast journalists from all over Africa who want to learn technical aspects of television and film production.
- ◆ Canada's Carleton University launched its Rwanda Initiative in 2006. It consisted of four journalism professors, all veteran journalists, who took up residence at the National University of Rwanda in Butare. Since then the initiative has sent more than seventy Canadians to Rwanda to teach journalism, work as media interns, or conduct training sessions with working journalists.⁹⁰

Research ICT-Security Initiatives. What is the impact and effectiveness of some of the innovative MONUC and community-based ICT civilian protection initiatives reviewed in this study? Aside from the encouraging anecdotal evidence, little is known about the long-term effectiveness and viability of security and human welfare initiatives created by mobile telephony and related technologies.⁹¹ Though serious ethics considerations must be met first,

there are viable research designs involving cross-sectional analysis comparing the security of communities with mobile telephony versus communities without access to these technologies. Detailed longitudinal research on the introduction of mobile telephony and the security impact of these initiatives should also be supported. The Voix des Kivus program is doing some of this sort of work now, but much more needs to be done. Once completed, the research should inform efforts by the African security sector and international peacekeeping forces (particularly the African Union, United Nations, European Union, and U.S. Africa Command). The community-based findings should have a training component attached so conflict resolution and early warning groups can most effectively build the technology components into their networks.

Africa has realized impressive progress in its information and communications environment over the past decade. This has opened up unfathomable new opportunities for information-sharing, education, and accountability on the continent. While there are no quick fixes or easy solutions to Africa's many challenges, the development and safeguarding of reliable and innovative communication institutions are indispensable paths to greater security, democratic stability, and development.

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