Harnessing the Transformative Power of Technology to End Poverty
Draft Discussion Paper

Executive Summary

The information and communication technology (ICT) revolution has created enormous wealth for individuals and companies. It is driven by a continuing exponential decline in the cost of communication and information, and it is likely to continue to drive innovation and wealth creation. As the development community seeks to end extreme poverty by 2030 and boost shared prosperity, this paper address the key questions: Can ICT contribute substantially to achieving these goals? Where is the evidence? Can we systematically think about the challenges and opportunities? What is needed to realize ICT’s potential?

We must first appreciate the magnitude of the challenge, and its urgency. The poor lack affordable and reliable access to food, health, education, and other basic services. They lack access to financial services. They are deprived of the key ingredients for productivity and income generation: information and knowledge to improve agricultural practices and small businesses and services. They face extreme vulnerability to economic shocks, natural disasters, ill health, and violence. And they are powerless to influence decisions affecting their lives.

ICT can have a transformative impact on the lives of the poor, but to prove this we need a solid evidence base, and must pursue systematic experimentation and innovation to test the potential and expand the possibilities. The paper proposes a framework for thinking about key poverty dimensions and the role of ICT in addressing them. It illustrates the versatility of ICT role in addressing the challenges facing the poor. It is hoped this framework and examples would help in generating increasing evidence of how ICT has been critical in addressing poverty issues. Perhaps more important, the paper aims to stimulate systematic thinking and innovation in using ICT to support five paths out of poverty: access, opportunity, empowerment, security, and sustainability.

Access

• Accelerating the development of human capital and securing the wellbeing of the poor by transforming education and health services, for instance, via e-learning and mobile health.
• Transforming public services and making them accessible and responsive to the poor, via basic e-services and shared Internet access.

Opportunity

• Making finance inclusive, via mobile money and low-cost delivery of microloans.
• Transforming agricultural extension and business development services, for example, by using mobile to provide timely information to farmers and entrepreneurs.
• Improving the investment climate, by using ICT to simplify government transactions with SMEs and reduce corruption and entry barriers.
• Promoting inclusive innovation and better jobs for the poor, for instance, via online work opportunities.
• Improving opportunities and facilities for poor urban communities, by using ICT to map and monitor their needs and support their community development initiatives.

**Empowerment**
• Opening government and strengthening transparency, accountability, and performance management, for instance, via open government data and local budget tracking.
• Strengthening demand for good governance, for example, via mobile apps to monitor elections and human rights abuses.

**Security and Sustainability**
• Securing cost-effective cash transfer and corruption-proof social protection programs, by providing unique digital identities for the poor.
• Securing last-mile delivery of food, medicine, and disaster relief, via mobile, sensors, and early warning systems.
• Promoting sustainable resource management systems, via smart grids and flood control systems that use real-time data.

As the development community gathers evidence of the transformative power of ICT, we need to recognize that the challenge is not only technological. It demands better understanding of the poor, their resources, the difficulties they face, and the information they lack. It requires building the capacity of local information intermediaries and grassroots innovators. It requires piloting, experimenting, and taking smart risks. And it demands that governments create the enabling environment to bridge the digital divide.

ICT use can become a powerful force in attacking poverty and helping societies shift to sustainable and consumption patterns. To realize this potential, governments and their development partners, including aid agencies, local business and civil society, must make ICT a key part of broader and smarter strategies to eradicate poverty and promote equitable and sustainable development.
Introduction

This paper outlines a few of the many ways in which information and communication technologies (ICTs) can be a powerful force for eradicating extreme poverty, promoting shared prosperity and realizing the Post-2015 Development Agenda. It poses the global challenge of poverty eradication, and the opportunities presented by the digital revolution to address this challenge. It suggests a framework for thinking about broad areas and contexts where ICTs can be applied for poverty eradication. Finally, it poses key issues for governments and development partners to prioritize and integrate ICT into their development agenda.

The Problem

The poor lack affordable and reliable access to food, health, education, and other basic services. They bear the brunt of ill treatment and high cost transactions in accessing public services, or do not enjoy affordable access to such services. They lack access to financial services and credit. They are deprived of the key ingredients for productivity and income generation: for instance, information and knowledge to improve agricultural practices and small businesses and services. They are powerless to influence decisions affecting their lives. They are vulnerable to economic shocks, natural disasters, ill health, and violence. In sum, they suffer from “information and communication poverty”, lack access to timely information and essential knowledge, and lack channels to get responsive services and have their voice heard—such information and communication divides create barriers for the poor as producers, consumers, and citizens.

The World Bank Group, the UN system, and political leaders have set the challenge of eradicating extreme poverty by 2030 (the key post-2015 development goal). Unlike the pre-2015 Millennium Development Goal (MDG) goal of halving the number of people in extreme poverty (with less than US$1.25 a day), it will be harder to reach the remaining one billion people living in extreme poverty as they will be increasingly concentrated in fragile, failed, or poorly-governed states. They are in isolated communities and countries with high inequality. Most are working poor, engaged in vulnerable and low-productivity jobs, landless, self-employed or in microenterprises. They lack income and assets to attain basic necessities, lack access to health and education, and live on marginal lands and vulnerable areas. They lack social networks and political influence over resources.

Reaching the extremely poor requires transforming public services to work for the poor. It demands better jobs and incomes that would come from ICT-enabled modernized agriculture and competitive small enterprises. It requires building open, effective, and accountable institutions, and strengthening the demand for good governance. It calls for refined data of the needs and resources of poor communities, to target social transfer programs more effectively, and to empower the beneficiaries and their intermediaries with information on progress towards the MDGs. It calls for harnessing the ICT revolution to end information poverty and economic isolation, which are at the root of all other dimensions of poverty.
The Opportunity

The digital revolution is driven by a continuing exponential decline in the cost of capturing, storing, processing, mapping, transacting, analyzing and sharing information. This technological revolution is enabled by a growing array of tools and platforms: Internet, broadband, search engines, mobile phone and devices, smart mobile and apps, cloud computing, digitization visualization, open source and open data, social media, crowdsourcing, interactive mapping, big data and analytics, to name but a few. The diffusion of some of these platforms and tools in developing countries has been unmatched in the history of technology: mobile phones, in particular, have spread from negligible numbers in 2000 to an almost universal platform.

New growth theorists and economic historians have characterized ICTs, especially mobile phones and broadband internet, as general-purpose technologies (GPTs), having a broad range of uses in a wide variety of products and processes. GPTs are the engines of long-term growth and the source for economic transformation and sustainable increase in national productivity. They play the role of “enabling technologies”, opening up major platforms for transformational change, and managerial and business innovations. They act as catalysts, inducing complementary innovations in other sectors. While the steam engine is widely accepted as the GPT of the first industrial revolution, and electricity is viewed as the GPT for the second industrial revolution, ICT is the defining GPT of today’s information revolution. Its growth has been almost exponential. As a result, it has been diffusing much faster than earlier GPTs.

The ongoing ICT technological revolution is so profound and pervasive that it challenges traditional incremental thinking. This revolution is still at an early stage of maturation, and its potential impact on economy-wide productivity and poverty reduction is yet to be fully realized. As in earlier GPTs and major technological revolutions, the short-term impact of ICT (reflected in economy-wide transformation and productivity surge) may be uncertain due to the process of “creative destruction” and resistance to change, but the long-term impact will be profound. Typically, this long-term impact has been underestimated in earlier revolutions.

Increasing evidence from developing countries shows that ICT--particularly mobile and electronic government/mobile government--is playing a growing role in attacking the mutually reinforcing dimensions of poverty, smartly and effectively. Yet, the potential of ICT for poverty reduction is far from being exploited since the mobile and data

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1 Following Moore’s law, the processing power per chip has increased a million times over the last 40 years. Today, a smart phone has more computing power than all of NASA did when it put a man on the moon in 1969.

2 It took more than 80 years for fixed line phones to reach 100 million subscribers, but just over 20 years for mobile phones to attain 6 billion subscriptions by 2012. Internet subscribers similarly increased from 35 million to more than two billion in the first decade of the 21st century.

4 The global stock of digital data is doubling every 20 months, 95% of the world’s data in digitized, and amount of data coming out of optical fibre cables doubles every nine months.
revolutions are right at the start of their growth curve, and aid agencies and developing country institutions are also at their early stages of adjustment and institutional learning. The technical analytic capacity to mine, visualize and make use of big data in various sectors and research are also being built up. The recent advances promise that ICT tools will become drastically cheaper, more inclusive and affordable. Thus, ICT use can become a powerful force in attacking poverty and helping societies shift to sustainable production and consumption patterns. To realize this potential, ICT must become a key part of broader and smarter strategies to eradicate poverty and promote equitable and sustainable development.

**How can ICT contribute to eradicating various poverty challenges?**

The following examples illustrates the versatility of ICT as a GPT and cross-cutting enabler to overcome key manifestations and causes of poverty. ICT application can provide access to basic public and financial services, expand opportunities for jobs and income generation, increase human capital and productivity of the poor, empower poor communities and their social intermediaries, enhance their security, and reduce their vulnerabilities.

**Access**

*Accelerating the development of human capital and securing the wellbeing of the poor by transforming education and health services.*

ICT can expand access and quality of education via distance education, digital learning material, lifelong learning for workers, and for supporting communities of practice for teachers. In many African countries simple mobile apps are used for monitoring schools, teachers, and student performance, including attendance. In India, cloud schools (without teachers) are being piloted to offer a new education channel for the poor in the remotest areas. ICT-enabled functional literacy programs are piloted for disadvantaged women in West Bengal. Smart schools networks are being built to integrate IT literacy and IT-aided learning into primary schools and their surrounding communities in Egypt. In Rwanda, educational information is captured directly from schools into databases and used to improve educational administration and policy making.

ICT uses in the health sector are expanding rapidly, and the potential seems only limited by institutional and policy constraints. The potential for telemedicine and m-health for

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7 The Economist, TEDGlobal: Cloud schools offer new education, 2013
8 Thutong: SA's education portal, 2012
9 The Economist, TEDGlobal: Cloud schools offer new education, 2013
10 ITU, ICT Success Stories, 2013
11 UNDP, Egypt: Smart Schools Network, 2007
12 TheWorld Bank, Transformation-Ready: The strategic application of ICT in Africa (Education), 2011
service delivery is huge—for remote diagnosis for patients in India’s rural areas, surveillance and alerts for HIV patients in South Africa and the elderly in Chile, tracking drug supply and demand at rural health clinics in Kenya and Malawi, and modernizing rural hospital management information systems and electronic records in Sri Lanka. In Peru, a mobile application uses SMS messages to deliver information on health and nutrition during pregnancy. In Kenya, e-learning has been used for training to upgrade nurses, who otherwise have no access to advanced training. ICT is also used for timely monitoring of spread of disease and analysis of causes and sources for preventing strategies, as in the spread of Malaria in Kenya. In Uganda, maternal mortality dropped by 50% when rural extended care were provided under the Ultimate Emergency Relief During Pregnancy and Childbirth, using a mix of technologies.

**Transforming public services and making them accessible and responsive to the poor.**

A vast ICT application area is reengineering government processes and developing online delivery channels to provide client-centered public services—making them work transparently, efficiently, and responsively, particularly for the poor. E-government (including m-government) applications offer an expanding array of services ranging from permits, land titles, certificates (birth, marriage, death), to many basic government services. It offers “one stop shops” for service delivery and promises to overcome “last mile” barriers to delivery. Time to get certificates in Maharashtra (India) was reduced by 50-60%. Corruption was dramatically reduced in registering and accessing land records in Karnataka (India).

E-government also opens up public services to public-private partnerships, enabling participation by diverse providers and partners, thus facilitating competition and expanding citizen choice. E-government facilitates beneficiary feedback via online facilities and user monitoring, thus creating a virtuous cycle for improving e-services. Equipped with mobile apps, front-line field workers like nurses and extension officers can serve local communities in more timely and effective ways.

**Opportunity**

**Making finance inclusive**

M-PESA, Kenya’s world-leading mobile-money system, was launched in 2007. It is currently (2012) used by over 17m Kenyans, about two-thirds of the adult population, and 25% of the country’s gross national product flows through it. M-PESA lets people transfer cash using their mobile phones. M-PESA has since been extended to offer loans and savings products, and can also be used to disburse salaries or pay bills, which saves

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15 Accenture, *African Medical and Research Foundation: E-Learning*, 2005

16 Eldis, *ICTs for Poverty Alleviation*, 2005


users further time and money. One study found that in rural Kenyan households that adopted M-PESA, incomes increased by 5-30%. In addition, the availability of a reliable mobile-payments platform has spawned a host of start-ups in Nairobi, whose business models build on M-PESA’s foundations. More recently, M-PESA has been diffused to 45% of Tanzania. Going global, it has been adopted in 72 countries, with the potential to cover 2 billion people with cell phones but no bank account.

Financial and insurance services are being built on the M-PESA platform. For example, the Kilimo Salama scheme (Swahili for “safe farming”, launched in 2010) is a mobile micro-insurance that grants weather-indexed insurance to small-scale farmers. This product was developed from the partnership between several enterprises, a public agribusiness company, a mobile phone operator, an insurance company, and the Kenyan Meteorological Department. Every time a farmer buys seeds, fertilizer or other agro-chemicals, he or she can also buy insurance against weather unfavorable to their crops. In case of crop failure due to drought or excessive rain, insured farmers are entitled to compensatory payments made effective through M-PESA. Within one month from its launch, 9,500 farmers had subscribed to the weather index insurance scheme.

In India, ICT is providing low-cost platforms that extend branchless banking and microfinance, and enable instant financial transactions. Eko, an Indian company, leverages existing retail shops, mobile networks, and banks to extend branchless banking services and offer payment, cash collection, and disbursement services. Users employ handheld devices to open accounts and send money to people and places around the country. Smart cards have been piloted in Andhra Pradesh, to improve access to microfinance via low-cost smart cards. Smart Cards with an embedded microchip containing information on clients’ credit histories are helping SKS, a microfinance institution, to reduce transaction costs. Smart Cards have been identified as a solution to the high cost of delivery, because they can lead to gains in efficiency, eliminating paperwork, reducing errors, fraud and meeting time. Potential savings in operations are estimated to be around 18 percent.

**Transforming agricultural extension and business development services**

A very broad area of ICT application is in agricultural extension and marketing—providing information on agricultural inputs and market prices, communicating advice on cultivation practices, tailoring extension services via public-private networks, and facilitating and coordinating transactions across the supply chain. Knowledge and information constitute a necessary ingredient to increase agricultural productivity and incomes in rural areas. ICT, and particularly mobile apps promise to shift knowledge and

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19 Morawczynski (2010), *Examining the Adoption, Usage and Outcomes of Mobile Money Services. The Case of M-PESA in Kenya*
20 The Economist, *Why does Kenya lead the world in mobile money*, 2013
22 Cecchini and Scott (2003), *Can ICT Applications Contribute to Poverty Reduction? Lessons from Rural India*
information (extension) system from top-down, supply-driven to just-in-time, interactive, personalized, demand-driven, context-sensitive, multiplayer system.

e-Choupal, an early application in India, uses networked kiosks in 40000 villages to serve more than 4 million farmers, with planned expansion to 100,000 villages. Each kiosk serves as a commerce hub, equipped with computer connected to Internet, and services 600 farmers in surrounding villages. Farmers obtain information on daily crop prices in local markets, procure seeds, fertilizer, and other products, and sell their crops at better prices than they would receive from traditional intermediaries. The system has increased user farmers’ by 20%, mainly due to improvements in yields, productivity, and price.

Nokia Life Tools on low-cost phones are being piloted to deliver context-tailored extension services in China, India, and Indonesia. In Macedonia, SMS is used to advice farmers on timely application of pesticide, reducing its use by 30%, with beneficial impact on incomes and environment. In Pune, India, an Internet-based discussion portal that provides an open forum where users (farmers, experts) have created more than 90% of the content. In Indonesia, Ghana, Uganda, and Malaysia, mobile apps are also deployed to build communities of practice among farmers, and obtain market information and agricultural expertise.23

In Africa, SMS via mobile is used to provide extension services for animal husbandry (iCow in Kenya). In Bhutan, mobile phones, combined with milk processing units, helped induce production and increased income of milk producers by 40% within a year.24 In Gujarat, India, networked and computerized milk collection centers ensured quality standards, fair prices, faster processing, and immediate payment to farmers. In Sri Lanka and India, satellite technology and mobile are used to forecast fishing grounds—increasing yield and incomes by as much as 100%.25 In Trinidad and Tobago 95% of those in the fishing industry use cell phone for market information.26

ICT also promises to connect and improve the productivity of SMEs via the adoption of e-business applications—ranging from procurement and financial management, to sales and marketing. Given the huge potential for productivity and competitiveness, many developed and developing countries have promoted e-business diffusion programs—providing information, training, and consultancy services, as well as matching grants and cluster support, for e-business adoption among SMEs. Singapore, Korea, Chile, and Canada provide examples.27 Mexico has also leveraged the use ICT to strengthen business development services for SMEs.

24 UNCTAD, Information Economy Report 2010 (page 68)
25 Sri-Lanka National Aquatic Resources Research and development Agency, Research and Development activities in fishery sector, 2013
26 Brookings Institute, How Mobile Technology is Driving Global Entrepreneurship, 2012
Improving the investment climate

E-government applications can play a major role in improving the investment climate and reducing costs of doing business, particularly for SMEs who otherwise face entry barriers, high transactions and corruption costs, and unfair competition in government procurement. Some municipalities in Latin America have taken the lead in simplifying their government-to-business (G2B) transactions (such as e-registration. E-licensing, e-reporting. e-tax, e-procurement) and created interactive, web-enabled, one-stop portal for all these transactions. These municipalities scored the highest on IFC’s Doing Business.

Introducing G2B applications can provide opportunities to drastically simplify transactions and regulations for SMEs and at the same time, secure fair competition for small business to participate via transparent e-government procurement. In Georgia, ICT-enabled one-stop shops reduced the time to register (start) a business from a month to three days, and the cost, from “unofficial” fee of $150 to a clear fee of $29, and to register a property, from 39 days to 2.28. Trade Nets can also simplify trade documentation and dramatically reduce the time needed to prepare and process customs declarations. In Tunisia, customs declaration processing was reduces from 3 days to 15 minutes, with major impact on small traders.

Promoting inclusive innovation and better jobs for the poor

Business process outsourcing (BPO) offers a huge potential for employment in many developing countries. India’s exports in ICT services currently exceed $70 billion annually. BPO offers the potential of much diffusion in jobs beyond few countries and cities—reaching small town, rural areas, and the marginalized by outsourcing simple tasks using micro-work and impact sourcing tools. China, India, Latin America, Southeast Asia have also created jobs for local data sourcing, market research, and BPO by connecting workers through mobile phones or the internet, providing them with local knowledge sourcing or basic BPO tasks in return for payment in the form of airtime credit or mobile money. These tasks range from market research, local data collection and opinion research to data processing. Going forward, the company is focusing primarily on market research and local data collection, i.e. work that can only be done in a specific location.29

Similarly, Impact Sourcing has provided jobs for disadvantaged youth (poor, in high employment areas) in data entry and digitization in Cambodia, Laos, and Kenya. It services for-profit businesses, including publishers and content hosts, and nongovernmental organizations such as development agencies and universities and government agencies such as national libraries. 30

Communication services are generating significant expansion in jobs to serve local markets throughout Africa, Asia and Latin America and most of these jobs are distributed in small town and rural areas. These include telecenter operators: mostly women operators in West Africa, and rural call centers: mostly women workers in India. The

29 Rockefeller Foundation, Job Creation Through Building the Field of Impact Sourcing, 2011
30 Rockefeller Foundation, Job Creation Through Building the Field of Impact Sourcing, 2011
Bangladesh’s Village Phone Program created jobs for poor women while expanding mobile coverage for remote rural areas. The Village Phone Program, started in 1997, provides a good income-earning opportunity to more than 210,000 mostly women Village Phone operators living in rural areas. ³¹ It is also likely that open government data initiatives, spreading across developing countries, will create jobs to mine and customize data, for businesses, and to build apps for pro-poor NGOs.

As countries transform into knowledge economies and information societies, ICT will drive much of social and business innovation. Open platforms and social networks will help connect, inform, and mobilize partnerships for ICT-enabled innovation. Mobile apps are being created and diffused throughout Africa, enabling inclusive social innovation. Sri Lanka used e-society mini-grants to form partnerships among NGOs, small software developers, and local governments to create ICT applications aimed at solving development problems for poor communities. Pioneering countries and states are embedding ICT-enabled innovation into government, business, and civil society organizations—to make their services work for the poor.

**Mapping resources and opportunities of poor communities for better planning and support of local initiatives.**

An example of using ICT to map and monitor the needs and resources of poor communities is Kibera, outside Nairobi, Kenya, known as Africa largest slum. It remained a blank spot on the map. Without basic knowledge of geography and resources of poor communities, it is impossible to target interventions, create jobs, and have informed decisions about how to improve the lives of the poor. In 2009, young Kiberans created a digital map of their community, and began to run a Wiki, discussion forums, and a community media, and a tracking of development funds for the region. ³²

Mobile and geo-mapping offer fast data collection for community development, as in the Bank’s funded community forestry development in Nepal, and poverty assessment in Nigeria. Crowdsourcing offers many opportunities to mobilize, capture, and share local knowledge and local assets. It is also used to seek ideas for local initiatives and engage in distributed problem solving.

**Empowerment**

**Opening government and strengthening transparency, accountability, and performance management**

Open government data initiatives aim to improve citizen feedback, performance monitoring, and trust in government. Sixty countries so far have joined the open government partnership, including Brazil, Kenya, the Philippines, Malawi, Moldova, and India. Brazil created a transparency portal on government spending, and used media and activist groups to amplify its impact on accountability. Brazil also shares information on civil salaries, and awarded public contracts.³³ Open data on public expenditure help

³¹ Grameenphone, Village phone social initiative, 2013
³² Map Kibera, Kenya, 2013
monitor, track and detect leakages. Kenya developed a budget-tracking tool for grassroots organizations and communities to actively engage in public resource management, tracking both disbursement and utilization of development funds, and holding their officials accountable for projects—just by sending a simple SMS.\textsuperscript{34} The system gets about 4500 SMS monthly, and has exposed corruption cases at local and national levels. Kenya’s government estimates that its open data portal could save the country $1 billion annually in procurement costs, while increasing beneficiary feedback, and participation in development.\textsuperscript{35}

Open government data is also facilitating decentralization and accountability at the local government levels. Many Brazilian municipalities practice open and participatory budgeting. Turkey created local government portal through which local officials and academics build knowledge and share data on themselves, bids and tenders, and local projects, among others. Open government data and local budget tracking has also enabled community monitoring and citizen feedback on aided and local projects expenditure and results. Dashboards, results-based monitoring, and knowledge management systems are used to strengthen performance management of targeted programs for the poor: Similarly, predictive analytics, big data, and digital IDs for beneficiaries are used to improve targeting, and facilitate policy and program experimentation—developing a science of delivery.

**Strengthening demand for good governance**

Recent trends in ICT—including mobile connectivity, collaborative tools, interactive mapping, crowdsourcing, and social media—allow citizens to adopt new strategies to communicate, coordinate, mobilize, and have their voices heard. These new tools offer a platform for empowerment and participation, for mobilizing and coordinating at low cost, in real time, on massive scale. They enable more effective, customized feedback in real-time. Digital networks have acted as a massive supply shock to the spread and cost of information, including information on government programs and performance. They have also empowered citizens to make their voices heard, by increasing their reach and access to various media, and by connecting and informing local and global NGOs. In the process, they have magnified the speed and scale of group coordination and helped to synchronize the behavior of groups quickly, cheaply, and publicly in ways that were unavailable as recently as five years ago.\textsuperscript{36} One outcome is the rise of networked social movements, the Arab uprisings, the “occupy” movement in the US and Europe, and the increasing demand for good governance (DFGG) in Brazil, Turkey, Russia, Africa and Asia.

An interesting example of mobile apps for strengthening demand for good governance is Ushahidi—meaning “testimony”—first launched in Kenya by young Africans, and now a global phenomenon. This open-source and publicly accessible platform enables users around the world to submit various kinds of information, digital images, and video recordings through SMS-enabled mobile phones, smart phones, and a Web site.

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Originally created to report on, monitor, and respond to post-election events in Kenya in 2008, Ushahidi has grown to enable users across regions to track the global swine flu outbreak, and observe earthquake relief in Chile and Haiti. It is also used to monitor human rights abuses, help enforce environmental regulation, and strengthen social accountability across many development activities.

Governance, social accountability, citizen empowerment, and institutional reform are central to development assistance and poverty eradication. This recognition has raised the profile of engaging civil society and catalyzing DFGG. However, all governments, and particularly authoritarian regimes and lumbering administrative machineries, are hard-pressed to absorb the challenge presented by a newly empowered citizenry and the explosion of political activism. There is the tendency to rely on accountability tools—and particularly ICT tools—to do the work, without building the informational capabilities of the social intermediaries necessary to make the technical tools work. Civil servants and public agencies also need to be equipped with the ICT tools and reforms to respond.

ICT can also play a critical role in strengthening oversight institutions through collaborative oversight by citizens, and through e-Parliament, e-Justice, and e-Media applications. Some applications also enable citizens to hold these oversight institutions to account. The Kenya’s “keep an eye on parliament” helps track votes vs. promises of parliamentarians. Similar applications are spreading in Brazil and India.

Security and Sustainability

Enhancing security via more cost-effective cash transfer and social protection programs

ICT offers more cost effective and targeted delivery of social protection programs. India is building a national biometric database that gives a unique ID to every citizen. Currently, hundreds of millions of the 1.2 billion Indians are barely visible to the state, and less than half of them have a birth certificate. This massive experiment in digital and secure platform will be open to use for the reliable delivery of financial and government services. It will be first used for targeted social cash transfer programs; the National Rural Employment Guarantee Act guaranteed every household in rural India a hundred days a year of unskilled labor in public works, at annual cost of US$ 9 billion. So while holding the potential to improve the efficiency of all kinds of government services, this platform will give all citizens access to what they deserve, including access to vital social protection schemes. It will provide scale, speed, quality, transparency, cost-effectiveness, and innovation platform. The Bank’s President has called this platform “the killer app for poverty eradication”—with the potential for universal applicability.

Other developing countries are introducing similar applications to secure cash transfer to the poor and other targeted groups. ICT is enabling multi-level tracking, and the use analytic targeting and experimentation with alternative incentive schemes such as cash transfer for girls’ education. The administrative costs of Brazil’s Bolsa Familia dropped from 12.5% to 2.5% with the use of digital ID card. The Philippines’ government is using

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37 Mzalendo project (‘Patriot’ in Swahili), 2013
digitized assessment forms and digital ID to identify who and where are the poor and target them for social protection via the National Household Targeting System for Poverty Reduction.\textsuperscript{38} M-PESA is used in Afghanistan for police officers to access their salaries via their mobile, cutting out the middleman.

Biometric IDs are also used to shed ghost workers—a huge problem of waste and abuse in Africa. In Zimbabwe, a recent review revealed 75,273 ghost workers out of 188,019 employees, costing more than $200 million. In Nigeria, digital IDs introduced in 2011, eliminated an astonishing 43,000 ghost workers from the public payroll, for a savings of more than $75 million dollars.\textsuperscript{39}

\textbf{Securing last mile delivery of food, medicine, and disaster relief:}

ICT is playing an increasing role in monitoring the delivery of essentials, to avert stock outs in food and medicine, among other essentials, thus overcoming common “last mile” problems. Coordination via mobile can also improve food security and timely food distribution via information sharing, partnerships, real-time feedback and adjustment and demand-driven supply chain management. NGOs and pro-poor social intermediaries also leverage ICT to map vulnerabilities, manage risks, enable distributed problem-solving, and help the poor cope with external shocks.

Our world has become increasingly volatile, due to climatic changes, financial shocks, and increasing interconnectivity. Growing volatility and shocks have major and long-term impact on poor communities, who are typically the most vulnerable and fragile. This situation calls for more macro-level contextual information as well as more timely and granular information that distinguish which groups are affected, where, when, and how badly. The digital data revolution presents great opportunities to gain richer, deeper insights into human behavior to manage and respond to these vulnerabilities.

ICT tools are used to provide early warnings, and improve emergency response and disaster management via sensor systems, big data, analytics, crowdsourcing, geo-mapping, and satellites, and mobile. Currently, the UN system alone has 39 early warning systems in operations—covering global and regional levels. Sensors and analytics are also applied in cities, as in Rio after the flood and mudslide of the favelas in 2011. In Kruger Park in South Africa, a fire information system detects fires from space within 15 minutes, instead of hours or days.\textsuperscript{40} A desert locust information system has revolutionized locust early warning and control by means of integrating Satellite imagery, GIS and advanced field data collection. This system does not only mitigate food security but also environmental issues since it can drastically reduce the amount of pesticides used in the desert locust campaigns.\textsuperscript{41}

\textsuperscript{38} Asia Pacific Futuregov, \textit{The Philippines improve poverty database}, 2012
\textsuperscript{39} Slate, \textit{I’ve Got My Eye on You}, 2011
\textsuperscript{40} Advancing ICT for Disaster risk management in Africa, 2010
\textsuperscript{41} Advancing ICT for Disaster risk management in Africa, 2010
With the diffusion of mobile, geo-mapping analytics, and visualization tools, civil society organizations are adopting more agile approaches to data collection, to capture and share real-time data. They deploy crowdsourcing, crisis-mapping, and other participatory sensing apps. They involve multiple partners, like-minded individuals, and communities of practice. They provide field-based early warning systems, finely-grained real-time awareness, and real-time feedback from the affected population. A celebrated example is *Ushahidi*, which has been deployed in various crisis situations, from Haiti to Japan.42

**Promoting sustainable resource management systems:**

Smart city initiatives are spreading in developed and developing countries, but they are at very early plot stages, with promising results. Cities are key to climate change and sustainability. They are major users of resources. Most urban growth will be in developing countries. So, the battle for sustainability and shared prosperity will be won or lost in cities. The urban poor are the most vulnerable to climatic changes, fragile urban systems, and urban service and infrastructure failures. Smart city initiatives enhance the resilience and sustainability of urban systems by combining digital and physical infrastructures via sensors, and using big data analytics to model complex systems, monitor their operations, and optimize the use and recycling of resources. They cover smart grids, energy, transport, logistics, water supply, sanitation systems, and urban services. In many cities, a command and control operation center is equipped with the necessary communication, monitoring, and analytic capabilities to enhance resilience and the city’s sustainability of systems and infrastructures.

In Rio, the operations control center improve sense and response capabilities to flooding by providing: real-time data from river systems, sensors and weather combined with historical data to give a unified view of the physical infrastructure; advanced weather modeling to monitor and predict water flows and pinpoint potential flood; improved alert and communication systems with citizens; improved information sharing across agencies and coordination of emergency and disaster response; and improved investment decisions by identifying weak points and where infrastructure is needed.

ICT is also applicable to promoting sustainable livelihood, production and consumption patterns for the rural poor via sustainable agricultural practices such as in the use of water, fertilizers, and pesticides. Kenya built an information network on sustainable practices for pastoralists and farmers. The Arid Lands Information Network (ALIN) provides farmers and pastoralists in drought prone areas with information for sustainable livelihoods. Through a network of community development workers, ALIN encourages people in the dry lands to share experiences and ideas on good and bad development practices in agriculture or pastoralism and the use of ICTs. ALIN also publishes newsletters that are distributed to community workers and partner organizations.

**Issues and Challenges**

The development community should address the following issues and challenges:

42 *Ushahidi*, 2013
• What sectors and poverty dimensions should be prioritized for ICT to be harnessed as a force multiplier for eradicating poverty?
• How can the best practices of successful countries in integrating ICT into their economic transformation and poverty reduction strategies be shared and leveraged via Bank partnerships?
• What have development partners (aid agencies) learned so far about harnessing ICT for development and supporting clients to leverage ICT for their poverty reduction strategies? How can these practices be replicated and scaled up to have substantial and sustainable impact on poverty eradication?
• What are the challenges of integrating ICT into development partnerships and practice? How should these challenges be addressed (in terms of skills, incentives, organization, keeping up-to-date with fast technological change, dynamic selectivity)?
• What roles and strategies would development partners (UN, World Bank, MDBs, foundations, NGOs, ICT industry leaders) should consider to meet the challenges of ICT for poverty eradication?

As the development community gathers evidence of the transformative power of ICT, we need to recognize that the challenge is not only technological. It demands better understanding of the poor, their resources, the difficulties they face, and the information they lack. It requires building the capacity of local information intermediaries and grassroots innovators. It requires piloting, experimenting, and taking smart risks. And it demands that governments create the enabling environment to bridge the digital divide.

ICT use can become a powerful force in attacking poverty and helping societies shift to sustainable and consumption patterns. To realize this potential, governments and their development partners, including aid agencies, local business and civil society, must make ICT a key part of broader and smarter strategies to eradicate poverty and promote equitable and sustainable development.

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