

The **Transformational Use**
of Information and
Communication Technologies
in Africa



eTransform AFRICA



The [eTransform Africa](http://www.eTransformAfrica.org) report was prepared jointly by the World Bank and the African Development Bank in cooperation with the African Union. Six sector reports, two thematic reports and an overall report are available online at www.eTransformAfrica.org, including more than 20 detailed case studies of ICT transformation in action in Africa. This report covers an executive summary, and overview and the main findings from each of the sector and thematic reports.

The **Transformational Use** *of Information and* **Communication Technologies** *in Africa*

The World Bank
and the **African Development Bank**,
with the support of the **African Union**

Edited by Enock Yonazi, Tim Kelly,
Naomi Halewood and Colin Blackman

eTransform AFRICA



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FOREWORD

While the world's economy is struggling to recover from the global financial crisis, the African economy is in the midst of a long boom. Over the past decade GDP has been increasing on average at 5% a year, and over the next five years, Africa's economy will grow faster than any other continent. One contributory factor has been the take-up of information and communications technologies (ICTs) and, in particular, the spectacular growth in mobile communications. The number of mobile subscriptions in use in Africa increased from fewer than 25 million in 2001 to almost 650 million by 2012. Two-thirds of African adults now have access to ICTs. The power of ICTs is more than just putting mobile phones in the hands of poor people. By allowing people to access health information, agricultural price data or educational games, ICTs can strengthen other sectors, and possibly the whole economy.

ICTs are now helping Africa to overcome its traditional market failures – such as communicable diseases, the public-goods aspects of having a literate and numerate population, and clean water and sanitation – as well as government failures – absentee teachers and doctors, patronage-ridden water and electric utilities, etc. Avoiding the excesses of the past, most African governments intervened by providing the regulatory framework and public goods such as the backbone for broadband services. The rest is being provided by the private sector, which has every interest to capture the profits from this private good. In short, they balanced the interventions to correct market failures with the avoidance of government failure.

7% ICT's contribution to Africa's GDP

US\$56 billion from the private sector in telecom

+ 615,000 km of national backbone networks

eTransform Africa: The Transformational Use of Information and Communication Technologies in Africa captures the existing use of ICT in six sectors (agriculture, climate change, education, health, financial services, government) and two cross-cutting themes (regional trade and integration, ICT competitiveness). It further examines the immediate potential that could be realized with further attention by both the private and public sectors and makes recommendations for policy makers and development practitioners. The detailed studies carried out for this report (available at www.eTransformAfrica.org) include twenty country case studies spanning the continent and an ICT data table that showcases country data for mobile and broadband indicators. The case studies show how ICTs can help overcome government failures in different sectors.

This publication is the result of a collaboration between the African Development Bank, the World Bank, the African Union, and various authoring teams and their interactions with African entrepreneurs, farmers, health workers, and civil servants – all using ICT to make better decisions in their economic and social lives. This publication not only sheds light on the path Africa is already on, but also encourages continued creative thinking in how to utilize ICTs to benefit more Africans.

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648.4 million of mobile
subscriptions in **2011**

US\$150 billion Projected ICT
market by **2016**

x20 Growth of internet
bandwidth in **2008–2012**

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The eTransform Africa study grew out of the African Union Summit of ICT Ministers, held in Addis Ababa in January 2010. The eight sectoral and cross-cutting reports were commissioned following an international tendering process that attracted some of the best firms and individuals. The work programme kicked off with a launch meeting in Nairobi, in February 2011, and continued with a review meeting in Johannesburg in June 2011. As the reports and case studies have been elaborated, they have been subjected to expert scrutiny both by the project team and by the wider public, through the www.eTransformAfrica.org website and other blogs. This philosophy of “early exposure” of results has undoubtedly strengthened the final outputs through a rigorous process of review and ground-truthing.

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ABBREVIATIONS

	3G	Third Generation mobile
A	ADEA	Association for Education Development in Africa
	AfDB	African Development Bank
	ATM	Automated teller machine
	AUC	African Union Commission
B	BPO	Business process outsourcing
C	CCS	Cargo Community System
	CDMA	Code division multiple access
	CFIS	Community Flood Information System
	CGAP	Consultative Group to Assist the Poor
	CHF	Community-based health financing
	CIC	Community Information Centre
	CIQS	Customs, Immigration, Quarantine and Security
	CKW	Community Knowledge Worker
D	DFID	UK Department for International Development
E	EMIS	Education Management Information Systems
F	FARA	Forum for Agricultural Research in Africa
	FDI	Foreign direct investment
G	GDP	Gross domestic product
	GOe	Global Observatory for eHealth
	GPRS	General Packet Radio Service
	GSM	Global System for Mobile Communications
	GSMA	GSM Association
	Gbps	Gigabits per second
H	HEP	Health extension programme
	HIS	Health Information System
	HMIS	Health Management Information System
I	ICT	Information and communication technologies
	ICT4D	ICT for Development
	ID	Identification
	IFC	International Finance Corporation, member of the World Bank Group
	IFF	Illicit financial flow
	IFI	International financial institutions
	IP	Intellectual property
	IT	Information technology
	ITES	Information Technology Enabled Service
	ITN	Insecticide treated net
	ITU	International Telecommunication Union

	IXP	Internet eXchange Point
L	LID	Local ICT development cluster
M	Mbps	Megabits per second
	MDG	Millennium Development Goal
	MFI	Microfinance institution
	MNC	Multinational corporation
	MNO	Mobile network operator
N	NAPAs	National Adaptation Programmes of Action
	NEPAD	New Partnership for Africa's Development
	NESIS	National Education Statistical Information System
	NGO	Non-governmental organization
	NRA	National regulatory authority
	NREN	National Research and Education Network
O	OECD	Organisation for Economic Cooperation and Development
	OER	Open education resources
P	PCS	Port Community System
	PDA	Personal digital assistant
	PPP	Public-private partnership
R	R&D	Research and development
	REC	Regional Economic Communities
	RFID	Radio frequency identification
	RHEW	Rural Health Extension Worker
S	SaaS	Software as a Service
	SARS	South African Revenue Service
	SEACOM	South East Asian Commonwealth (submarine cable)
	SEND	Social Enterprise Foundation of West Africa
	SIM	Subscriber Identity Module
	SMEs	Small and medium enterprises
	SMS	Short Message Service
T	TCO	Total cost of ownership
	TEAMS	The East African Marine System (submarine cable)
U	UK	United Kingdom
	UNDP	United Nation Development Program
	UNESCO	United Nations Educational, Scientific and Cultural Organization
	UNFCCC	United Nations Framework Convention on Climate Change
	US	United States
	USA	United States of America
	USAID	United States Agency for International Development
	USSD	Unstructured Supplementary Service Data
W	WB	World Bank
	WHO	World Health Organization
	WiMAX	Worldwide Interoperability for Microwave Access
	WTO	World Trade Organization

EXECUTIVE SUMMARY



Context

Information and communication technologies (ICTs) have the potential to transform business and government in Africa, driving entrepreneurship, innovation and economic growth. This new flagship report – **eTransform Africa** – produced by The World Bank and the African Development Bank, with the support of the African Union, identifies best practice in the use of ICTs in key sectors of the African economy. Under the theme “Transformation-Ready”, the growing contribution of ICTs to Agriculture, Climate Change Adaptation, Education, Financial Services, Government Services and Health is explored. In addition, the report highlights the role of

ICTs in enhancing African regional trade and integration as well as the need to build a competitive ICT industry to promote innovation, job creation and the export potential of African companies.

eTransform Africa was formally launched on 28th May 2012 at the Open Innovation Africa Summit in Nairobi, Kenya. Six sector and two thematic reports are available online at www.eTransformAfrica.org, including more than 20 detailed case studies of ICT transformation in action in Africa. This overview presents the main messages arising from this body of research.

The transformational power of ICTs

ICTs, especially mobile phones, have revolutionized communications in Africa.

The explosive growth of mobile phones in Africa over the past decade demonstrates the appetite for change across the continent. In the year 2000, there were fewer than 20 million fixed-line phones across Africa, a number that had accumulated slowly over a century, and a waiting list of a further 3.5 million. With a penetration rate of just over 2 per cent, phones were to be found only in offices and the richest households. But the coming of the mobile phone has transformed communications access. By 2012, there were almost 650 million mobile subscriptions in Africa, more than in the US or the European Union, making Africa the fastest growing region in the world. Few imagined that such demand existed, let alone that it could be afforded. In some African countries, more people have access to a mobile phone than to clean water, a bank account or even electricity. Mobile phones are now being used as a platform to provide access to the internet, to applications, and to government services.

Africa's "mobile decade" has driven its economic growth.

Foreign Direct Investment is booming and Africa is now a much easier place to do business, thanks to its much-improved connectivity. ICTs directly contribute around 7 per cent of Africa's GDP, which is higher than the global average. That's because, in Africa, mobile phones are also substitutes for many other types of service, such as financial credit, newspapers, games and entertainment. So the value of a mobile phone is higher in Africa than elsewhere. We are now seeing the rapid development of mobile broadband with smartphones and affordable tablets across Africa. This will bring even greater social and economic impacts over the next decade.

ICTs can empower the lives of Africans and are driving entrepreneurship, innovation and income growth.

The effect of ICTs on the African economy is impressive, but it is the way they are changing the everyday lives of Africans that is genuinely transformational.

The eTransform Africa report explains how mobile phones are being used to provide financial services in Kenya (M-PESA) and agricultural market information services in Ghana (Esoko). It shows how electronic filing of taxes in South Africa or sensor-based irrigation systems in Egypt are revolutionizing traditional practices. And it describes how ICT tools are helping Africans face up to new challenges, like climate change, or tackle ongoing issues, such as HIV/AIDS. Furthermore, the wider use of ICTs in government is bringing more transparency and openness, for instance through Kenya's Open Data initiative or the use of Twitter and Facebook to coordinate protests and inform international opinion as part of the Arab Spring. This growing social and economic dependence on ICTs brings new challenges, not least the need for infrastructure to become more robust and resilient, and for services to become more reliable. Issues of cybersecurity and data protection will also come to the fore as security and trust become increasingly important.

It's not about the phone or the computer; it's about the applications and the information they deliver.

ICTs now offer major opportunities to advance human development – from providing basic access to education or health information to making cash payments and stimulating citizen involvement in the democratic process. Phones, computers and websites are powerful tools but it is individuals, communities and firms that are driving change. Mobile phones and the internet are helping to release the dynamism of African society. State-owned monopoly telephone companies were, for too long, a barrier to African ingenuity – due to waiting lists, high prices and unreliable services – but now a thriving local ICT sector is part of the solution, not the problem. In many of Africa's largest cities, smartphones can now be obtained for under US\$100. They have the equivalent computer power of a PC that would have cost over US\$3,000 a decade earlier. With cheap data packages and free Wi-Fi, smartphones can be used to start a business, or to find a job.

ICTs can ease cross-border communications, financial transactions, and sharing of data and information and are having a catalytic impact upon regional integration and trade facilitation.

Until recently it was cheaper to call America or Europe from Africa than a neighbouring country. And Africa's entire internet connectivity was less than that of the tiny country of Luxembourg. Such disparities hindered cross-border regional trade. But this has changed with some 68,000 km of submarine cable and over 615,000 km of national backbone networks laid in the past few years. The internet bandwidth available to Africa's one billion citizens grew 20-fold between 2008 and 2012. These electronic highways will provide the trading routes of the future supporting Africa to improve its trade performance both within the continent and between the continent and other world regions.

The deployment of ICTs and the development of applications must be rooted in the realities of local circumstance and diversity.

Despite the optimism caused by Africa's ICT revolution, there is no one-size-fits-all model, and services that prove popular in one country may fail elsewhere. National ICT strategies must be developed locally, building upon consultative stakeholder processes and adapted to local circumstances. The private sector will drive the investment, and provided more than US\$56 billion in telecom infrastructure investment in the decade to 2008. But this may not be enough to ensure competitive markets, or to reach rural areas. Public-private partnerships (PPPs), such as the Burundi Backbone System consortium, can help. But there are still whole countries, such as the newly independent South Sudan, that are connected to the outside world only through slow and expensive satellite links.

Governments have an important part to play, in creating an enabling environment and in acting as a role model and lead client in adopting new innovations and technologies.

Governments may participate directly in infrastructure investment, as the government of Botswana did when creating an alternative fibre route to the coast via Namibia. But their larger role lies in creating an enabling environment – issuing licences, making available rights of way, auctioning spectrum, mandating infrastructure sharing and

interconnection and so on – that allows a liberalized market to thrive. Beyond that, governments can serve as a leading customer for faster networks, and can migrate their own services and data online. When the Kenyan government put services online such as public service jobs, tax returns, exam results and candidate selection for schools, it provided a major demand driver for mobile broadband, and stimulated further investment in that country's networks. Similarly, in Ethiopia, government and donor sponsorship of eHealth initiatives is helping to finance network investment.

Effective use of ICTs will require cross-sectoral collaboration and a multi-stakeholder approach, based on open data and open innovation.

Valuable and sustainable ICT applications are most likely to develop within an environment that encourages experimentation and collaboration between technologists, entrepreneurs and development practitioners. Often, stakeholders may combine their interests in communal projects, such as the creation of the Cape Town Internet exchange. The recent flowering of local ICT development clusters (LIDs) – such as iHub and NaiLab in Kenya, Hive CoLab and AppLab in Uganda, Activspaces in Cameroon, BantaLabs in Senegal, Kinu in Tanzania or *infoDev's* mLabs in Kenya and South Africa – is helping to create new spaces for collaboration, training, applications and content development, and for pre-incubation of firms.

Africa is still at the beginning of its growth curve and, to date, most ICT applications have been pilot programmes. Now is the time for rigorous evaluation, replication and scaling up of best practice.

The research carried out for this study has highlighted a number of success stories and has shown examples of programmes that could be scaled up and replicated elsewhere. But there is a lack of systematic monitoring of outcomes, and cost-benefit analyses of investments are rare. Nevertheless, the evidence that has been marshalled in these studies, the most comprehensive carried out to date, does point to the potential for effective rollout and a period of rapid growth ahead. Africa was once an ICT laggard, but is now becoming an ICT leader. Innovations that began in Africa – like dual SIM card mobile phones, or using mobile phones for remittance payments – are now spreading across the continent and beyond.

Lessons from the sectoral studies

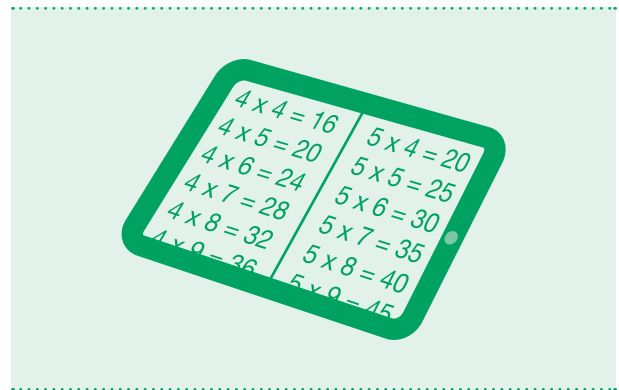


A study on the **Agriculture** sector was carried out by Deloitte and contains case study analysis of the use of Radio Frequency Identification (RFID) tags for tracking livestock in Namibia, and ICT sensor networks used in water management for irrigation in Egypt. These examples show how ICT can help address some of the challenges facing agriculture and food security in Africa, such as inadequate access to markets and unfavourable market conditions, weak infrastructure, high production and transport costs, natural disasters, environmental degradation and loss of biodiversity. When a common information system/platform is available for stakeholders, such as DrumNet in Kenya, it has been shown to improve efficiency by minimizing the duplication, ensuring the consistency and improving the integrity of data.



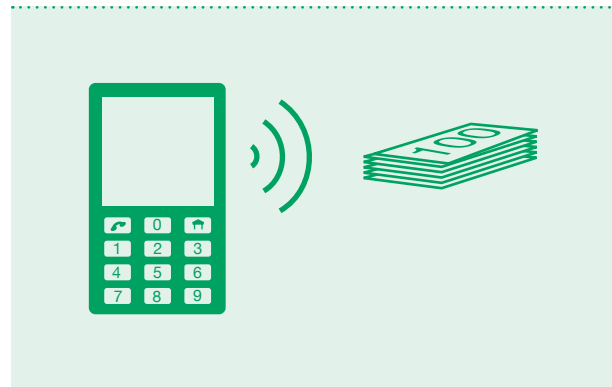
The use of ICTs in adapting to **Climate Change** was studied by the International Institute for Sustainable Development (IISD), with country case studies of Malawi,

Senegal and Uganda. Africa is especially vulnerable to the impacts of climate change because its major economic sectors are more sensitive to climate change and because it has lower levels of general economic development. African countries are preparing for the potential consequences of climate change by building their understanding of climate science, identifying priorities and planning for adaptation, and implementing targeted adaptation measures. Such measures can range from addressing the drivers behind vulnerability and building response capacity, to managing climate risk and addressing impacts directly. ICTs will play an important role in helping the African continent to reduce and manage vulnerability and impacts. Large-scale deployment of ICTs such as satellites, meteorological stations, sensor networks, GPS and GIS applications can be used to monitor and measure climate impacts. National and regional policies for open data and communications will be important components. Equally important, however, will be smaller scale applications – ICT enabled information services combined with mobile phone applications that will support knowledge sharing among people and communities to diversify livelihoods, reduce vulnerability and build the capacity to respond quickly to changing circumstances.



The **Education** sector was examined by *ict* Development Associates, whose report includes country case studies from South Africa, Uganda and Senegal. It focuses on five critical aspects: teacher professional development, digital learning resources, affordable technologies, education management information systems and National Research and Education Networks. Education and innovation are interrelated drivers of development, which can be facilitated

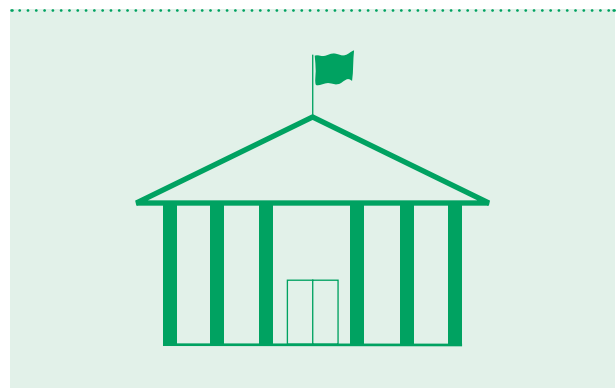
by ICTs. The means by which educators and students access learning materials and collaboration platforms are increasingly affordable as more functional, low-cost mobile devices become available. Connectivity is also crucial for accessing resources, and requires continued focus on competitive broadband access using suitable technologies (wired and wireless), and national and regional collaborative networks. Access to content is improved by open educational resources, which can be copied and adapted without licence fees. However, effectively integrating technology into teaching and learning requires well-qualified educators, a clear focus on equipping teachers with ICT literacy skills and support for teachers to use skills and technology in teaching and learning.



Vital Wave Consulting analysed the **Financial Services** sector, including country case studies of Gabon and Kenya. They conclude that mobile banking has reached a tipping point in Africa and now is the time for policy makers to act boldly. ICTs combined with innovative business models have helped widen financial inclusion, most visibly case in Kenya, where active bank accounts have grown fourfold since 2007 aided by some 17 million M-PESA mobile money accounts. Governments have a key role to play in encouraging investment and in enabling effective regulation, in consultation with Central Banks and the private sector, including commercial banks and mobile money service providers. Governments need to coordinate with the Regional Economic Communities (RECs) in support of regional integration by introducing favourable regulations to allow mobile operators and other non-bank third parties to offer cross border mobile financial services.



The **Health** sector study, carried out by Vital Wave Consulting, includes country case studies of Ethiopia and Mali. Health trends in Africa are generally positive but there is need for significant improvements. The pre-emptive use of ICT could act as a “game-changer” in helping to achieve the Millennium Development Goals (MDGs). With the impact that mobile-based ICTs are already having for consumer communication and transactions, they could be further used to enable and simplify consumer and institutional healthcare service delivery funded by out-of-pocket and insurance transactions. Supply chain issues that also impede procurement and delivery of equipment and medical supplies could be addressed by a mobile supply chain management and equipment tracking system in which mobile devices (phones, PDAs, tablets, laptops) are used for data collection and monitoring. ICTs can also help in outreach to rural areas, and by providing communication between rural healthcare extension workers and trained nurses and doctors in peri-urban facilities as exemplified by the IKON tele-radiology programme in Mali.



The issue of **Modernizing Government** through ICT was tackled by Deloitte, with case studies of integrated financial management systems in Malawi and electronic tax filing in

South Africa. Clearly ICTs are fundamentally changing the way in which citizens and businesses interact with government representatives and other agents of the state. The associated high expectations, particularly regarding the speed and flexibility with which public service providers can respond to individual requests, provide feedback on programmes and expenditure and handle national crises, are extremely challenging. Attention to how governments communicate should not overshadow the importance of the accuracy, completeness and relevance of what they communicate. A balance is needed between the citizen-facing aspects as well as the underlying efficiency and effectiveness of back-office systems. Hence, the delivery tiers of e- and m-Government are key but depend on the design, development and implementation of underlying ICT systems. Governments should recognize the power of social media and exploit it to their advantage, in particular to reinforce democratic processes, drive efficiency, foster innovation, empower public sector workers and expose corruption. Establishment of accurate, effective and efficient national identification systems, incorporating technology that reduces fraud and identity theft, was found to be one of the key building blocks for an effective government service delivery.



The cross-cutting study of **Regional Trade and Integration** was carried out by *ict* Development Associates, and includes case studies of Botswana, Kenya and Senegal. Africa's trade performance is weak compared with other world regions, particularly in trade within the continent, and is undermined by inefficiencies and poor coordination between national agencies along the supply chain. The study describes experience and opportunities for using ICTs in trade facilitation – especially in improving the efficiency and coordination of trade and transport logistics; port, customs and border management; and the availability to trading businesses of information about markets and trade requirements. Data sharing through national and regional “single windows” can reduce costs and delays, improve reliability and enhance the

profitability of trade. ICTs should, however, form part of a broad approach to trade promotion, and implementation needs careful planning and resources. Regional integration through Regional Economic Communities (RECs) can play a crucial role. The RECs and International Financial Institutions (IFIs) should work with other stakeholders to advance ICT-enabled trade facilitation.



Finally, a second cross-cutting study on **ICT Competitiveness** was carried out by Excelsior with TNO, with country case studies of Kenya, Morocco and Nigeria. These countries are embracing the use of ICTs in novel ways to improve the social and economic opportunities available to firms and citizens. Provided the African ICT market continues its impressive double-digit growth, the market could be worth more than US\$150 billion by 2016. The study highlights the need to build a competitive ICT industry to promote innovation, job creation and the export potential of African companies.

Of course, challenges remain. The continent largely lags behind the rest of the world in terms of ICT readiness and Africa has made slower progress in the past two years when compared to other regions. The Arab Spring has caused a short-term decline in inward FDI in the north of the continent. Pricing of ICT services, especially broadband, continues to be higher than other regions. Furthermore, the growing trend towards taxing incoming international calls suggests a worrying reversion to the former view of the ICT sector as a cash cow. The challenge for the next decade is to build on the mobile success story and complete the transformation. This will require reducing the cost of access for mobile broadband, supporting government private-sector collaboration, improving the e-commerce environment, enhancing ICT labour market skills, encouraging innovative business models that drive employment, such as microwork and business process outsourcing, and creating spaces that support ICT entrepreneurship, such as ICT incubators, and local ICT development clusters.

Part I

OVERVIEW



chapter

1

*The Transformational Use
of Information and
Communication Technologies
in Africa*

HOW ICTS ARE TRANSFORMING AFRICA

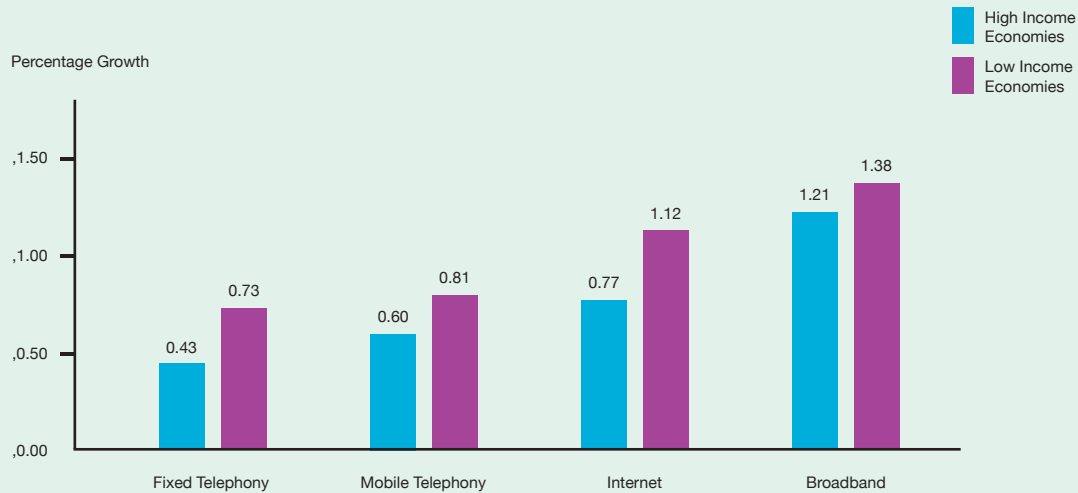
1.1 Context

Information and communication technologies (ICTs) have the potential to transform business and government in Africa, driving entrepreneurship, innovation and economic growth. This new flagship report – eTransform Africa – produced by The World Bank and the African Development Bank, with the support of the African Union, identifies best practice in the use of ICTs in key sectors of the African economy. Under the theme “Transformation-Ready”, the growing contribution of ICTs to Agriculture, Climate Change Adaptation, Education, Financial Services, Government Services and Health is explored. In addition, the report highlights the role of ICTs in enhancing African regional trade and integration as well as the need to build a competitive ICT industry to boost innovation, job creation and the export potential of African companies.

The eTransform Africa study grew out of the African Union Summit of ICT Ministers, held in Addis Ababa in

January 2010. At that meeting, Ministers expressed their belief in the transformational power of ICTs and their view that Africa was poised for a new era of growth that would take advantage of the platform laid by investment in new networks over the previous decade. In the 2000s, the focus had been on connectivity, bringing more and more of Africa’s citizens into the information society and building ever-faster connections to the rest of the world. Analytical research had indicated the boost to economic and social development that could come from network investment. Over the previous 25 years, a 10 per cent increase in the penetration rate of mobile phones had been associated with a 0.8 per cent boost in GDP per capita in developing countries, while the same increase in broadband networks could add a further 1.4 per cent to general economic growth (World Bank, 2009) (see Figure 1.1). In the 2010s, the focus should logically shift to transformation as the penetration of ICTs deepens in the core sectors of the African economy (World Bank, 2012).

Figure 1.1 Growth effects of various ICTs on GDP, worldwide



Source: Adapted from Qiang and Rossotto, 2009, p 45.

While Ministers were hopeful of transformational change, they also expressed their frustration at the lack of hard evidence of the links between investment in ICTs and sectoral development. There were plenty of pilot programmes but few of these had reached scale or shown wide-reaching impact. There was a need to prioritize investment in using ICTs for sectoral development, but which sectors should be first in the queue? Which business models were proving successful and which pilot programmes represented best practice that could be replicated and scaled up?

This report attempts to answer some of those questions. For the first time, detailed and systematic studies have been commissioned to show how ICTs are changing the landscape in different sectors, both in terms of worldwide best practice and in specific experience of African economies¹. The eight sectoral and cross-cutting reports were commissioned following an international tendering process that attracted some of the best firms and individuals globally. The study was directed by a project team headed jointly by the African Development Bank and the World Bank. The work programme kicked off with a launch meeting in Nairobi, in February 2011, and continued with a review meeting in Johannesburg in June 2011. As the reports and case studies have been elaborated,

they have been subjected to expert scrutiny both by the project team and by the wider public, through the www.eTransformAfrica.org website and other blogs. This philosophy of “early exposure” of results has undoubtedly strengthened the final outputs through a rigorous process of review and ground-truthing.

The involvement in this study of the two major investors in the African ICT Sector – the African Development Bank and the World Bank Group – together with the African Union is significant because it sets out a new strategy for future investment, in close coordination with client governments, the private sector and other stakeholders. Although ICT infrastructure investment will continue to be important (Independent Evaluation Group, 2011), increasingly future investment programmes will be geared to the transformational use of ICTs. The outcomes will be measured not in higher penetration rates but rather in outcomes such as poverty reduction, creation of jobs and enterprises, increase in agricultural productivity, better access to healthcare, clean water, education and so on. Thus this report marks not so much the end of a study but rather the start of a new phase of growth. The ICT investment programmes that arise from this new growth phase will be evidence-based, demand driven and stakeholder-led.

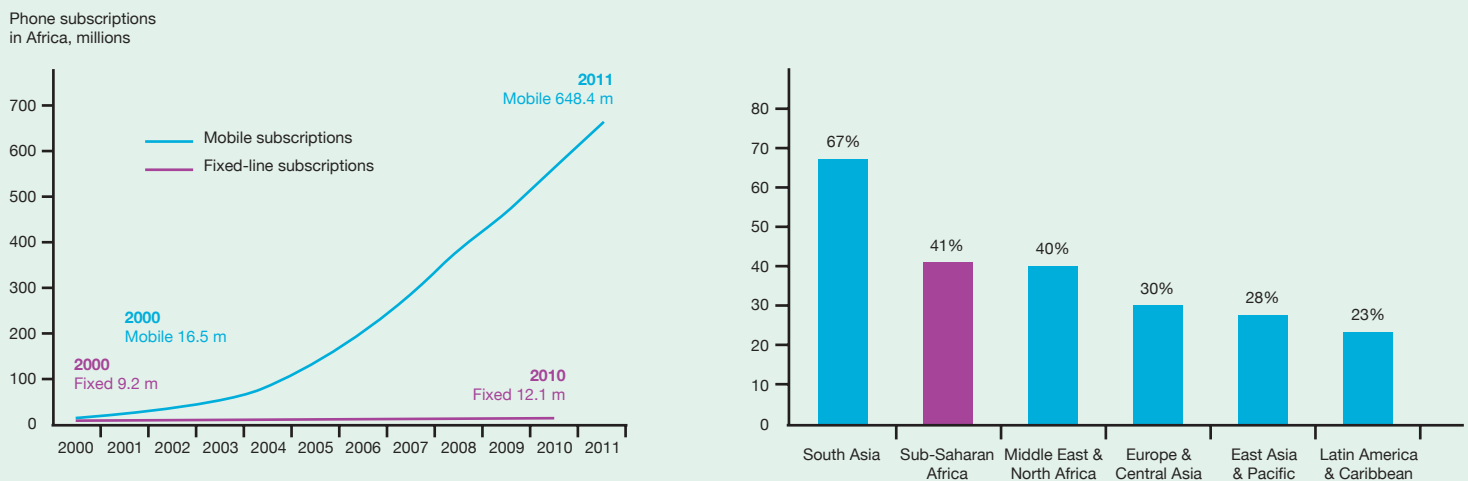
1.2 The transformational power of ICTs

ICTs, especially mobile phones, have revolutionized communications in Africa. The explosive growth of mobile phones in Africa over the past decade demonstrates the appetite for change across the continent. In the year 2000 there were fewer than 10 million fixed-line phones across Africa, a number that had accumulated slowly over a century, and a waiting list of a further 3.5 million. With a penetration rate of just over 1 per cent, phones were to be found only in offices and the richest households. But the coming of the mobile phone has transformed communications access. By the start of 2012,

there were almost 650 million mobile subscriptions in Africa (A. T. Kearney, 2011), more than in the United States or the European Union², making Africa the second fastest growing region in the world, after South Asia (Figure 1.2). At the start of the decade, few imagined that such demand existed, let alone that it could be afforded. In some African countries, more people have access to a mobile phone than to clean water, a bank account or even electricity. Mobile phones are now being used as a platform to provide access to the internet, to applications and to government services³.

Figure 1.2 Africa's mobile revolution

Mobile phone and fixed line subscriptions in Africa, 2000–2011 (left chart) and average mobile growth rates by region (right chart).



Source: World Bank, Wireless Intelligence and ITU.
Note: Regions in the right chart include developing countries only.

The direct contribution of ICTs to Africa's economy and its growth is impressive. In 2011, the mobile phone ecosystem provided more than five million jobs and contributed around US\$15 billion directly to government revenues in sales and import taxes and regulatory fees (AT Kearney, 2011, p 21). Unlike the traditional fixed-line telecommunications sector, the mobile industry in Africa

has always been competitive in most African economies, with Nigeria having as many as nine licensees, and most countries having three or more operators⁴. Even South Sudan, which has one of the lowest levels of cellular penetration in the world at about 12 per 100 inhabitants, supports five separate operators, soon to be six (Kelly and Minges, 2011). The industry has gone through several

waves of expansion and consolidation, and some of the largest African-based groups have recently been sold to foreign owners⁵. Nevertheless, African-owned mobile phone operators, like MTN Group, have grown to become major players on the world stage. But the significance of the direct contribution of ICTs to the African economy is secondary to their indirect contribution, in driving growth in other sectors.

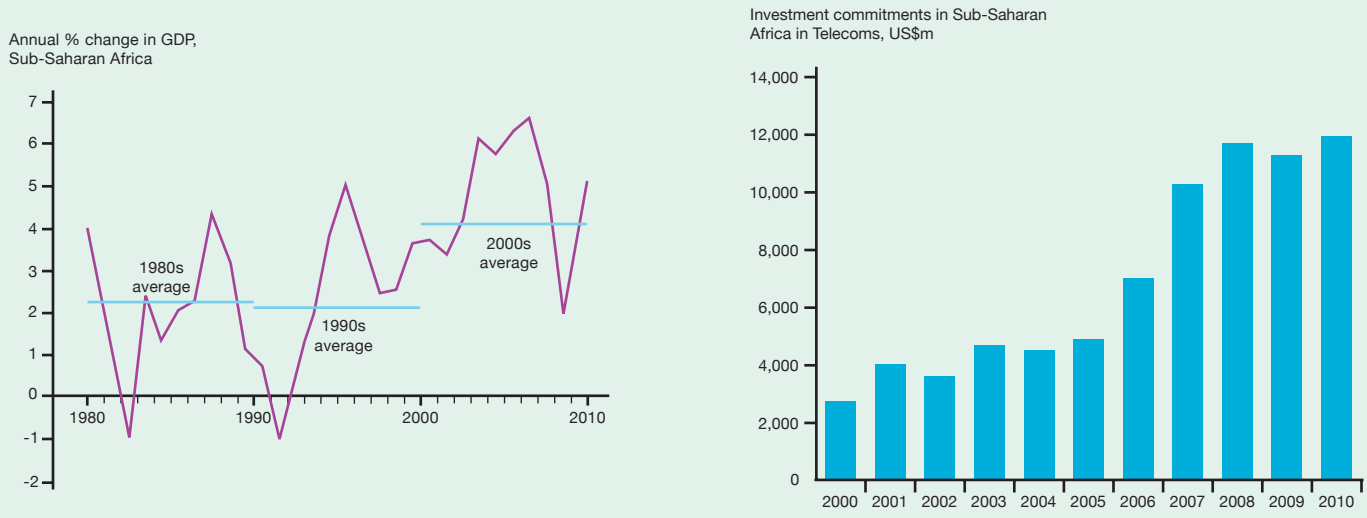
Africa’s “mobile decade” has driven its economic growth. World Bank research has indicated that, between 2000 and 2008, Africa’s early reformers enjoyed an extra 1.2 percentage point boost to GDP compared to those that only liberalized their telecom sectors later (Williams *et al*, 2011, p 111). Africa’s economy has enjoyed a renaissance in the 2000s (OECD *et al*, 2011) with the average rate of economic growth of almost 5 per cent, which is higher than anything achieved since the 1970s (Figure 1.3, left chart). Many factors have contributed to this, including increasing political stability, higher commodity prices and reforms in other sectors of the economy. But it is not too fanciful to believe that the wider

availability of ICTs has also contributed greatly to this African renaissance.

Foreign Direct Investment is also booming, increasing almost fivefold between 2000 (US\$27 billion) and 2010 (US\$122 billion), though it has declined in the north of the continent recently owing to the fall-out from the Arab Spring (OECD *et al*, 2011). In the telecommunication sector, private investment, much of it from foreign sources, is growing and contributed some US\$77m between 2000 and 2010 for Sub-Saharan Africa (Figure 1.3, right chart). Africa is now a much easier place to do business, thanks to its much-improved connectivity. ICTs directly contribute around 7 per cent of Africa’s GDP, which is higher than the global average. That’s because, in Africa, mobile phones are also substitutes for many other types of service, such as financial credit, newspapers, games and entertainment so the value of a mobile phone may be higher in Africa than elsewhere. We are now seeing the rapid development of mobile broadband with smartphones and affordable tablets across Africa. This will bring even greater social and economic impacts over the next decade.

Figure 1.3 ICT driving Africa’s renaissance

Africa’s economic growth, by decade, 1990–2010 (left chart) and private investment in telecoms, 2000–2010 (right chart).



Source: World Bank, World Development Indicators, PPI Database.

ICTs can empower the lives of Africans and are driving entrepreneurship, innovation and income growth. The effect of ICTs on the African economy is impressive, but it is the way they are changing the everyday lives of Africans that is genuinely transformational. The eTransform Africa report contains more than 20 detailed case studies of ICTs in action (see Figure 1.4 right page). The case studies show, for instance, how mobile phones are being used to provide financial services in Kenya (M-PESA) and agricultural market information services in Ghana (Esoko, see Box 1.1), how electronic filing of taxes in South Africa or sensor-based irrigation systems in Egypt are revolutionizing traditional practices, and how ICT tools are helping Africans face up to new

challenges, like climate change, or tackle ongoing issues, such as HIV/AIDS.

Furthermore, the wider use of ICTs in government is bringing more transparency and openness, for instance through Kenya's Open Data initiative (Rahemtulla *et al*, 2012) or the use of Twitter and Facebook to coordinate protests and inform international opinion as part of the Arab Spring (Dubai School of Government, 2011). This growing social and economic dependence on ICTs brings new challenges, not least the need for infrastructure to become more robust and resilient, and for services to become more reliable. Issues of cybersecurity and data protection will also come to the fore as security and trust become increasingly important.

Box 1.1

Esoko, a mobile platform to support farmers

Esoko is a pioneering mobile tool, developed first in Ghana and now being used in some 15 different countries in West and East Africa. The application provides users with agricultural market information service (AMIS) such as up to date prices and their recent trends, weather forecasts and alerts, and crop production levels in order to help farmers to improve their productivity and sell their products at the right price, the right place and the right time.

Esoko has proved to have a significant impact on farmer's businesses. For example in Ghana, a randomized trial survey of farmers using the system compared with those not using it has shown 10 percent increases in revenues for maize, nuts and cassava. It also shows that only 14 per cent of Esoko users report not having access to credit compared to 47 per cent for non users. Esoko also reached its sustainability threshold of 10,000 subscribers overall or 2,000 subscribers in any country in most of the markets it serves, sometimes in as little as one year.

But the market for AMIS is becoming crowded with mFarm (in Kenya) and Manobi (primarily in francophone West Africa among Esoko's African competitors (Kelly and Pehu, 2011). Currently Esoko has an edge over other entrants due to its early start, its wider coverage and its user-friendly interface. Because it uses standard mobile services that are available on even the cheapest handset, like Short Message Service (SMS) and Unstructured Supplementary Service Data (USSD) rather than mobile applications, that are specific to particular operating systems and devices, it currently has a wider reach. But this may prove a limiting factor as more smartphones enter the market and users demand visual applications that work on touch screen devices.

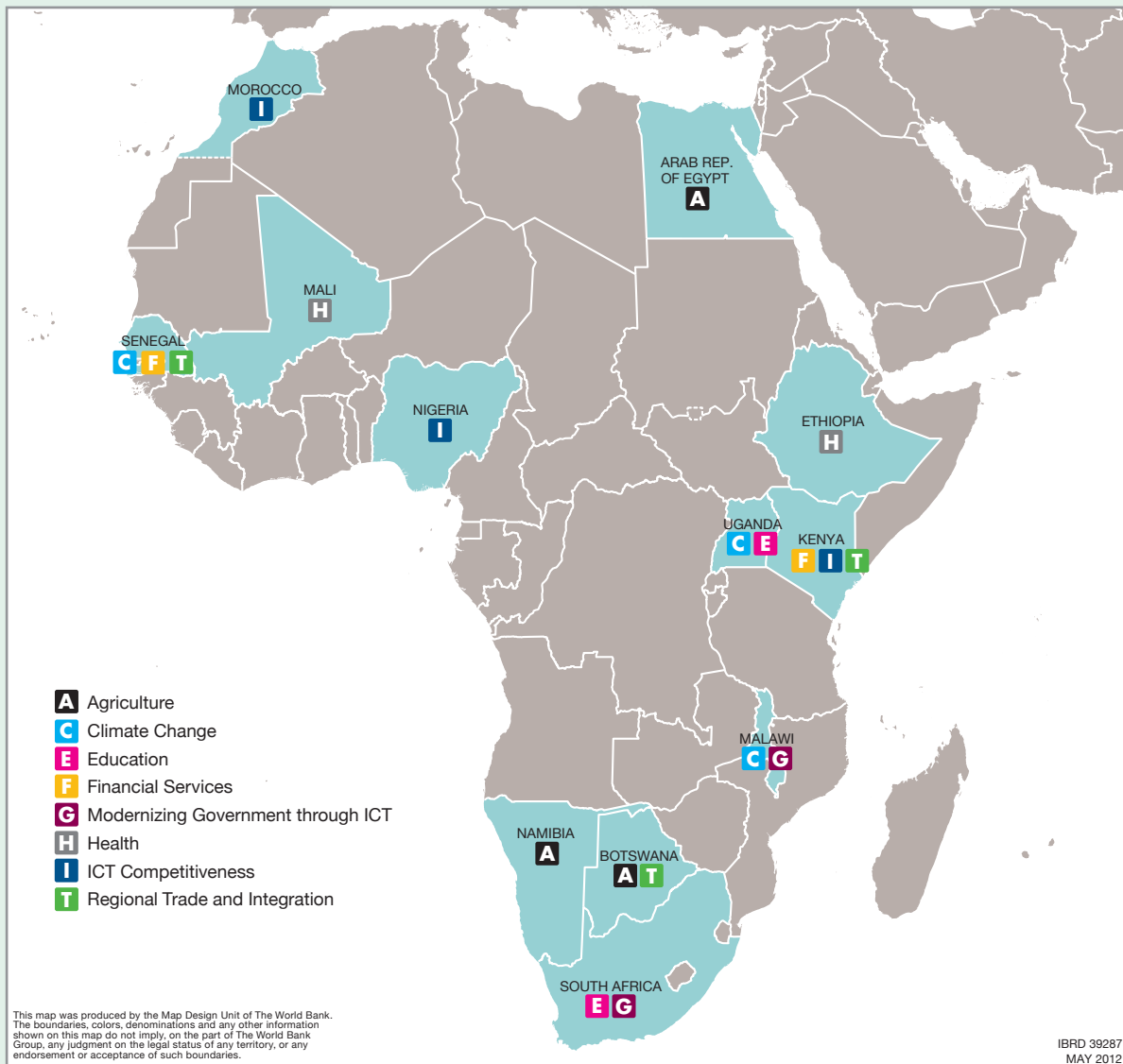
Source: Esoko (www.esoko.com) and Subervie, 2011.

1.3 From access to apps

It's not about the phone or the computer; it's about the applications and the information they deliver. ICTs now offer major opportunities to advance human development – from providing basic access to education or health information to making cash payments and

stimulating citizen involvement in the democratic process. Phones, computers and websites are powerful tools but it is individuals, communities and firms that are driving change. Mobile phones and the internet are helping to release the dynamism of African society. State-owned

Figure 1.4 ICT putting Africa on the map
Map of the case studies covered in the eTransform Africa studies.



Source: Author compilation based on country case studies at www.eTransformAfrica.org.

monopoly telephone companies were, for too long, a barrier to African ingenuity – owing to waiting lists, high prices and unreliable services – but now a thriving local ICT sector is part of the solution, not the problem. In many of Africa’s largest cities, smartphones can now be obtained for under US\$100, and fake phones, sold under-the-counter, are even cheaper. Today’s smartphones have the equivalent computer power of a PC that would

have cost over US\$3,000 a decade ago. With cheap data packages and free Wi-Fi, smartphones can be used to start a business, or to find a job.

Africa’s mobile phone subscriptions will grow to over a billion well before the end of this decade, and the actual phones themselves will be replaced and upgraded. Few phones are thrown away and there is a thriving

second-hand market, which partly explains why mobile phone subscriptions (i.e. SIM cards) outnumber actual users. But the phones in use in Africa are becoming more powerful and the uses to which they are put are becoming more sophisticated (Rao, 2012). One indication of this is the wide range of mobile applications now being developed locally (see Box 1.2). What's more, innovations that begin in Africa are now spreading elsewhere. M-PESA is being used in at least six countries outside Kenya and the Etisalat Mobile Baby service, pioneered in Tanzania,

is now being rolled out in nine other countries during 2012. Ideas that originate in Africa are also spreading. For instance, several African operators, including Safaricom in Kenya have made the informal practice of "flashing" (i.e. making an outgoing call but hanging up before it is answered, as a way of triggering a return call) into a service by making free "call me back" SMS messages available to subscribers. As the spread of mobile phones begins to exceed the scope of electrification, paid recharging services are also becoming more widely available.

Box 1.2

It's not just M-PESA: A selection of award-winning Africa-developed ICT applications

Although Safaricom's M-PESA mobile money application continues to gain a lot of international press attention, there are a number of other locally developed ICT applications that have been winning awards recently. Those shown below are just a sample.

Application (country / website)	Short description	Awards / recognition
AkiraChix (Kenya) www.akirachix.com	AkiraChix is an association that inspires and develops women in technology through networking, training and mentoring. Among the applications it has developed is Magme, an open source project for visual accessibility, developed for Computer Aid International.	<ul style="list-style-type: none"> • Unsung Heroes' award • Women Deliver Top 50
mFARM (Kenya) www.mFarm.co.ke	An agribusiness company and mobile agricultural information service, incubated by infoDev's m:Lab East Africa. M-Farm provides price information over SMS and provides a bulk buying service for farmers.	<ul style="list-style-type: none"> • infoDev Top 20 SMEs • IPO48
Etisalat Mobile Baby (Tanzania) www.etisalat.ae	First launched in Tanzania, and now in the process of being rolled out more widely, the Mobile Baby application helps to combat maternal mortality by creating an ecosystem of medical healthcare professionals, NGOs, pharmaceutical and insurance companies, and government agencies to support pregnant mothers.	<ul style="list-style-type: none"> • GSMA Nest Mobile Health Innovation, 2012
MafutaGo (Uganda) http://mafutago.appspot.com	A mobile application that displays the locations, prices, and special offers or nearby gas stations.	<ul style="list-style-type: none"> • Mobile Premier Award, 2012
MedAfrica (Kenya) http://m.medafrica.org	A mobile health platform that provides symptom checkers, first-aid information, doctor and hospital directories together with relevant alert services.	<ul style="list-style-type: none"> • Pivot 25 East Africa 2011, overall winner
Horticultural Remote Irrigation system (Niger) www.tele-irrigation.net	Remote control of irrigation system from mobile handset.	<ul style="list-style-type: none"> • Orange Social Venture Prize 2011

Source: Author compilation based on country case studies at www.eTransformAfrica.org.

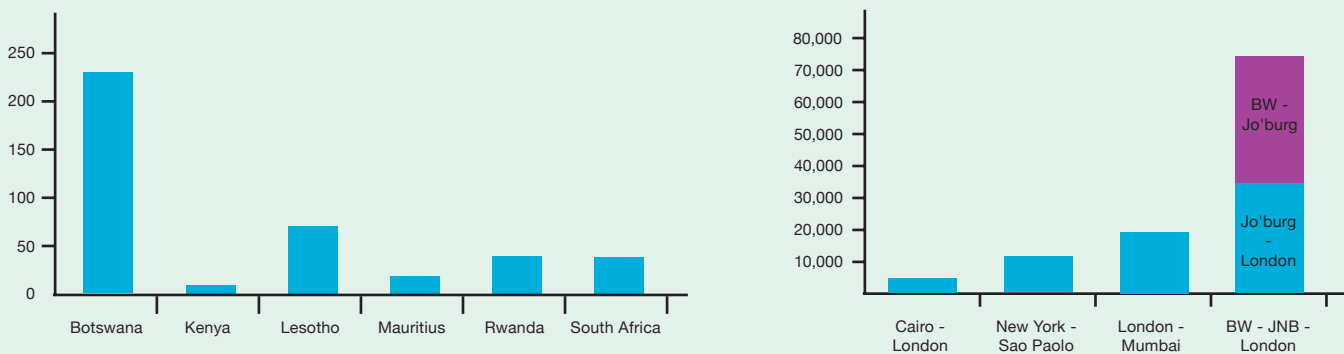
The growing popularity of mobile phones in Africa is driving demand for bandwidth. At the start of the new millennium, the entire continent of Africa had less international internet bandwidth than the tiny country of Luxembourg (ITU, 2000). As recently as five years ago,

the situation did not look promising, but a new generation of international cable projects has transformed the situation, at least for international connectivity, as more than a dozen submarine cable projects have connected Africa to the other rest of the world. Some 68,000 km of

submarine cables had been rolled out by, and a further 92,000 km are planned (Figure 1.5). The World Bank is involved in a number of these investments through its US\$0.5 billion Regional Communication Infrastructure Program (RCIP). The available capacity has increased rapidly from 80 Gbps in 2008 to about 15.7 Tbps projected by 2012 in Sub-Saharan Africa alone (ITU, 2010).

This infrastructure represents the beginning of a new era of connectivity for the continent, promising greater international bandwidth and more reliable connectivity, as seen in Mauritius where the second connection to a submarine cable in 2009 led to an 83 percent increase in international bandwidth capacity in just one year (Mauritius National Computer Board, 2011).

Figure 1.5 Unequal broadband
Cost for 1 GB/Month in USD (October 2011), and a dedicated 155 Mbps connection for selected destinations (July 2011).



Source: World Bank, TeleGeography.
 Note: In the right chart, the data applies to a circuit from London to Johannesburg (JNB) with backhaul to Gaborone, Botswana (BW).

Getting the cables to the shoreline helps, but more investment is required to bring connectivity to users. Some 676,739 km of backbone infrastructure had been rolled out by September 2011, with new fibre being laid at a rate of 138 km per day⁶, using fibre to establish national backbones and to connect landlocked countries with the submarine cables as well. Numerous African countries are now seeing rapid development of their national backbone networks through private sector investment, public finance or a mixture of both. For example, Rwanda is connected to two cable landing stations through Tanzania to Dar es Salaam and also to Mombasa in Kenya. East African states are to spend US\$400m on an optical fibre backbone to link Tanzania, Uganda, Kenya, Rwanda and Burundi with more than 15,000km of cable⁷. But not everywhere is benefitting. The world's newest state, South Sudan still has no fibre access to international cables and must rely upon very small apertures terminals (VSATs) for satellite access to the rest of the world. Plans to lay cable are hindered by the slow pace of demining, the lack of paved roads and an uncertain regulatory situation.

Even when both international and national connectivity is in place, the impact on users is only noticeable if there are improvements in broadband speed and reliability and a reduction in the price paid per MB. Kenya is a striking example: the connection to the TEAMS, EASSy and SEACOM cables in 2009-10 led to a wholesale price decrease of almost 70 percent in one year (ITU, 2010). Lower retail prices for consumers are also filtering through as seen with the announcements of tariffs reduction for broadband by Airtel and MTN (Rao, 2012) and, with help from the regulator, in South Africa⁸. Broadband speeds are improving too. Ghana ranks as Africa's broadband speed star with an average household download speed of 5.29 Mbps in April 2012. Although this ranks only 70th among global economies, and is only slightly over half the global average of 10.17 Mbps, it is still a noticeable improvement on recent years. Behind Ghana, Libya, ranks 75th with 5.13 Mbps, while Angola, Kenya, Zimbabwe and Madagascar also make the global top 100⁹.

ICTs can ease cross-border communications, financial transactions, and sharing of data and information and are having a catalytic impact upon regional integration and trade facilitation. Until recently it was cheaper to call America or Europe from Africa than to call a neighbouring country. Such disparities hindered cross-border regional trade. But, as noted above, the internet bandwidth available to Africa's one billion citizens grew 20-fold between 2008 and 2012. These electronic highways will provide the trading routes of the future supporting Africa to improve its trade performance both within the continent and between the continent and other world regions. One consequence of this is that an increasing share of Africa's international traffic is shifting onto IP-based (Internet Protocol) networks. This is happening both as individual subscribers use popular voice over IP (VoIP) services such as Skype, even where it is not legal to do so, and as operators themselves take advantage of the low-cost transit arrangements for their international traffic.

As an increasing share of traffic travels over IP networks and terminates on mobile phones, thus bypassing the bilateral accounting rate system, the price of terminating a call will tend to be the same, irrespective of origin. This is reducing the disparities that used to exist between inter-regional and international traffic. But in this new world of globalized pricing, geography and policies still matter. For instance, the Union of the Comoros is disadvantaged by geography, as its population of fewer than one million means that it is bypassed by international submarine cable systems. Thus to terminate a Skype call there costs 66 US cents per minute, almost ten times higher than in more populous South Africa. By contrast, Djibouti is advantaged by geography, because of its situation at the entrance to the Red Sea, through which many international submarine cables pass. But it is disadvantaged by market liberalization. Djibouti Telecom's monopoly over incoming international traffic means that to terminate a Skype call there costs 39 US cents per minute, or three times the rate of more liberal Egypt, at the other end of the Red Sea¹⁰.

Such price differences matter because there is increasing competition among countries to compete for internationally footloose investment and to be the "next India" in the global market for ICT-based services, estimated at over US\$500 billion (Sudan *et al*, 2010). Kenya, in particular, through the Kenya ICT Board, has set itself the goal of becoming "Africa's most globally-respected knowledge economy" by 2017, the end-point of its 2012-2017 National ICT Masterplan (Kenya ICT Board, 2012). It plans to create 50,000 jobs in ICT industries, development and innovation in 500 new organizations. In particular, through a business process outsourcing (BPO) operation

at Konza City, it hopes to attract increased foreign direct investment in this field. Mauritius has similarly ambitious plans. In its national ICT Strategic Plan, 2011-2012 (Gilwald and Islam, 2011), the government sets out its vision to make ICT the "fifth pillar" of the national economy, with offshore ICT services to contribute some 7 per cent of national GDP.

The report on the competitiveness of the ICT sector carried out for this study (Excelsior and TNO, 2012, p2) argues that reducing the cost of access for mobile and broadband is the most important single step a country can take for enhancing ICT competitiveness. Mauritius and Kenya are better placed than most African economies to achieve this. Kenya has the lowest price and Mauritius the fifth lowest price for mobile service in Africa according to one recent survey (Research ICT Africa, 2012), with the cost of the OECD low-user mobile basket being just US\$1.90 in Kenya and US\$2.39 in Mauritius for a basket of 30 calls and 100 SMS per month. In the case of Kenya, this is a result of regulatory intervention to set a mobile termination rate which is the lowest in Africa at 1.44 shillings (1.68 US cents) per minute (Communications Commission of Kenya, 2010).

The deployment of ICTs and the development of applications must be rooted in the realities of local circumstance and diversity. Despite the optimism caused by Africa's ICT revolution, there is no one-size-fits-all model, and services that prove popular in one country may fail elsewhere. National ICT strategies must be developed locally, building upon consultative stakeholder processes and adapted to local circumstances. The private sector will drive the investment, and the influx of capital has been boosted recently, in particular by significant investments from Chinese equipment manufacturers. But this may not be enough to ensure competitive markets, or to reach rural areas. Furthermore, there are still whole countries, such as the newly independent South Sudan, that are connected to the outside world only through slow and expensive satellite links.

One recent approach to the problem of market failure is via public private partnerships (PPPs), i.e. agreements between the government and private organizations to develop, operate, maintain and market a network by sharing risks and rewards. The advantages to the private sector include reducing capital risk while for the government there is reduced operational risk. PPPs in Africa's ICT sector can take several forms:

- A cooperative model, such as the Burundi Backbone System (BBS), where a World Bank loan, made via the government, has been used to finance the

construction of a national fibre backbone network jointly operated by 17 private operators and ISPs, operating under a self-regulation model. This scheme addresses the shortage of fixed infrastructure in Burundi which, like many African countries, is dominated by wireless operators.

- A special purpose vehicle (SPV) share ownership model, as applied in Sao Tome e Principe, Liberia, Sierra Leone and elsewhere, in which the government as well as private investors are stakeholders.
- A bulk purchase model, applied in Rwanda and Malawi, where World Bank investment has been used as an anchor tenant and to aggregate demand, without any government ownership.

An older approach to market failure in the telecommunication sector involves using universal service funds (USF), usually run by the regulator or a special body, as a way of recycling the profits of the incumbent operator or from spectrum auctions and licence fees to subsidize

network roll-out and to reach rural and remote areas. Following a push in the late 1990s and early 2000s, most African countries now have a USF or, like Botswana, are planning to create one. But while USFs in Africa have proved efficient at accumulating cash, through levies on operators, they are less good at disbursing it, with as much as three-quarters remaining unspent according to one recent study (GSMA, 2006). In part, this is because mobile network roll-out has largely occurred without a need for subsidy (Williams *et al*, 2011). Universal Service obligations placed on private operators, when added to other taxes, such as spectrum fees, sales taxes, profits taxes, equipment import taxes and increasingly taxes on incoming international calls (A. T. Kearney, 2011), can place a high burden on the local industry. And when funds accumulate without being spent, it can sometimes prove a temptation for fraud. An opportunity now exists to revise the mandates of these USFs so that they can be used for broadband network roll-out, both mobile and fixed, not just voice, and for encouraging the development and deployment of applications.

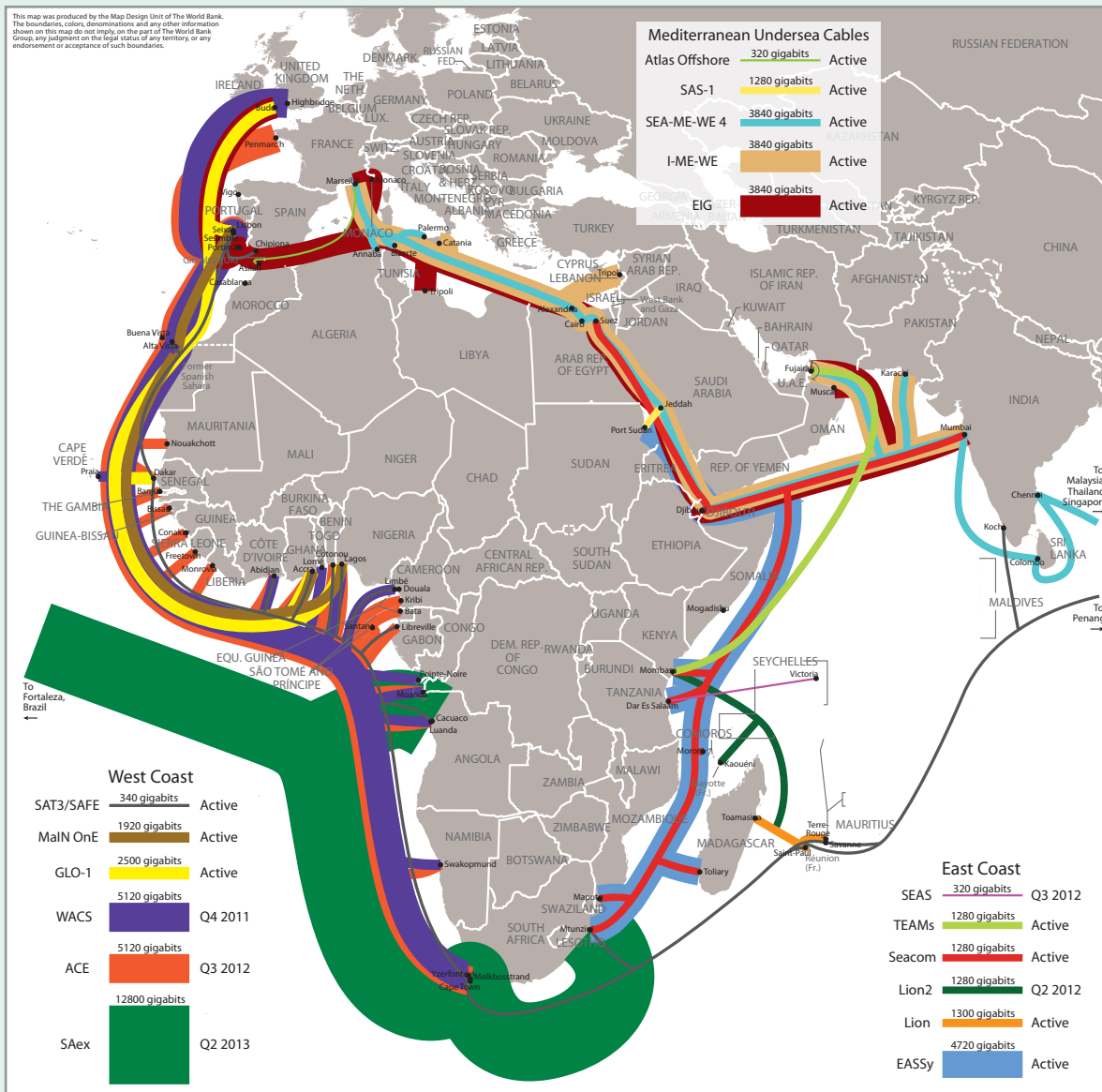
1.4 The role of governments

Governments have an important role to play, in creating an enabling environment and in acting as a role model in adopting new innovations and technologies. Creating a vibrant environment where useful information is readily available to help entrepreneurs, farmers, health workers and environmentalists, for example, make better decisions in their daily activities requires a holistic approach and several supporting inputs or pillars. The key supporting pillars for such an environment includes adequate information and communications infrastructure, digital literacy and nurturing an ICT-skilled workforce that would propel emerging efforts to leverage ICTs to the next level to achieve sustainability and replicability. Taking a holistic view on a sector is a significant challenge for any government, regardless to how developed a country may be. Yet, as shown in the following chapters, African governments have made significant steps in building these pillars.

In terms of infrastructure, much of Africa's investments, private and public, have been in increasing network capacity or bandwidth so that the quality of internet or broadband service is available to more countries on the African continent. Infrastructure providing international connectivity (see Figure 1.6) requires large upfront investments which the private

sector cannot shoulder. In these instances, public and donor funding are being leveraged. For example, in 2010 Eastern and Southern Africa was the only major region in the world not connected to the global broadband infrastructure by fibre optic cables. Twenty countries were reliant on expensive satellite connectivity to link with each other and the rest of the world. African governments and development financial institutions came together with the private sector to deploy the Eastern Africa Submarine Cable System (EASSy), a submarine fibre-optic cable running 10,000 km along the east coast of Africa, connecting South Africa, Mozambique, Madagascar, Tanzania, Kenya, Somalia, Djibouti, Sudan, Comoros and Mayotte. Governments also participate directly in infrastructure investment, as the government of Botswana did when creating an alternative fibre route to the coast via Namibia. Hence, most of the international connectivity issues are being addressed. However, in order for ICT services to be accessible to more Africans, connectivity within the continent needs to be further improved. And the government's larger role lies in creating an enabling environment – issuing licences, making available rights of way, managing spectrum, mandating infrastructure sharing and interconnection and so on – that allows a liberalized market to thrive and bring down price of service for the African consumer.

Figure 1.6 Reconnecting Africa
Undersea cable systems serving Africa, actual and projected, April 2012.



Source: <http://manypossibilities.net/african-undersea-cables>.

Beyond that, governments can serve as an anchor user for faster networks and migrate their own services and data online. When the Kenyan government opened up its databases and put public data online, including exam results, poverty and census data, it provided a major demand driver for mobile broadband, and stimulated further investment in that country's networks (Rahemtulla, 2011).

Similarly, in Ethiopia, government and donor sponsorship of eHealth initiatives is helping to finance network investment (Vital Wave Consulting, 2012a).

In order for people to fully leverage and benefit the new ICT capacity that is increasingly becoming accessible in Africa, attention on improving digital literacy rates and

ICT skills will become more and more important. ICT can be an engine of growth when it is embedded into the daily activities of people – whether in agriculture, education, financial services, health or delivery of public services. The challenge to raise digital or ICT literacy is likely to be a greater challenge than deploying infrastructure and creating robust and innovative markets for private operators to thrive in. Increasing ICT skills requires a number of factors. Throughout this report Kenya is highlighted as having many of the drivers in place including improved access to broad-based primary through to graduate level institutions, a large diaspora who return to the country pursuing opportunities in entrepreneurship, and high exposure to international institutions owing in part to its role as the African base for many multinational companies and international organizations.

Creating an enabling environment in which the ICT sector can thrive and stimulating demand for services are important roles but, in the context of transformation, governments need to do more. In many of the sectors covered in this report – such as climate change adaptation, education, health or directly modernizing the operations of government – government is the leading investor and provider of services. It is essential, therefore, that there is policy coherence between the government's objectives for the ICT sector and its objectives for the user sector (OECD and infoDev, 2009). This is also true in other areas where the government provides regulation, such as financial services. Rules governing access to the SIM card are important in opening up and harmonizing mobile money (Makin, 2009) while financial regulations, such as those relating to money laundering, provision of interest or lending, may also need to be reviewed.

1.5 Stakeholder collaboration

Effective use of ICTs will require cross-sectoral collaboration and a multi-stakeholder approach, based on open data and open innovation. Valuable and sustainable ICT applications are most likely to develop within an environment that encourages experimentation and collaboration between technologists, entrepreneurs and development practitioners. Often, stakeholders may combine their interests in communal projects, such as the creation of

the Cape Town Internet Exchange. The recent flowering of local ICT development clusters (LIDs) – such as iHub and NaiLab in Kenya, Hive CoLab and AppLab in Uganda, Activspaces in Cameroon, BantaLabs in Senegal Kinu in Tanzania or *infoDev's* mLabs in Kenya and South Africa – is helping to create new spaces for collaboration, training, applications and content development, and for pre-incubation of firms (Box 1.3).

Box 1.3

Local ICT Development Clusters

Located on the 4th floor of a modern office building in Nairobi, where a sunny balcony gives views over the bustling city, Kenya's *iHub provides a space where young entrepreneurs can network, while joining focus groups discussions, receiving mentorship, and chatting to venture capital investors. Apart from having the best coffee shop in town, its other big attraction to the nation's digerati is that it offers a fast broadband connection, which is the quickest way to set up a business in Kenya. Established in March 2010 by Erik Hersman, a renowned blogger, TED fellow and entrepreneur, it now has over 2,000 members benefitting from the co-working space. It's not quite a business incubator, though there are two of those in the same building, with Nailab next door and infoDev's m:Lab East

Africa one floor below. Rather, it might be described as a "pre-incubator" where good ideas come to take shape and be turned into commercial prospects. The young technologists who crowd into the place are able to get the necessary support to develop their ideas into marketable products.

*iHub is part of a much larger technology movement in Kenya and in Africa. Two important predecessor organizations that helped shape *iHub are Skunkworks, an informal grouping of mobile applications developers, and Ushahidi, a non-profit software company co-founded by Erik Hersman, that develops free and open source software for information collection, visualization and crisis mapping. Ushahidi was born in the aftermath of

the disputed elections in early 2008 and has subsequently been used in over ten countries, primarily to map critical information to aid disaster recovery efforts such as in the Haiti earthquake in 2010 and the Japan earthquake in 2011. *iHub is now, in turn, giving birth to other spin-offs, such as *iHub research, and Akirachix, both female-run start-ups.

*iHub's success has been widely followed elsewhere. Africa continues to see the emergence of technology labs in Kampala (Hive CoLab), Dar es Salaam (Kinu), Dakar (Bantalabs), Thswane (mLab Southern Africa) and Douala (ActiveSpaces) as well as new initiatives that are coming online in Accra and Lagos. The labs serve as an accessible platform for bringing together technologists, investors, tech companies and hackers in the area. Each lab shares a focus on young entrepreneurs, web and mobile-phone programmers and designers.

The technology movement in Africa is being driven by the youth who, through these labs, have the means and foresight to apply new and accessible technologies to solve immediate problems and find useful solutions for common problems. Many of the youth are in tune with the problems and challenges that are faced in the communities in which they live. The labs conduct workshops among themselves to share experiences and brainstorm ideas, and use digital technology

to create tech communities that have no borders. This approach to nurturing technology is quite different to the top-down approach that had been tried in the early 2000s of building science parks, or government run initiatives to promote business process outsourcing. The difference this time is that these initiatives are generally bottom-up and community driven. They may receive the blessing of government but are not dependent upon it for providing opportunities for training and capacity building.

Source: Authors, and adapted from <http://ihub.co.ke/pages/about.php> and <http://afrilabs.com/about> (both accessed 20/4/2012) and White, 2011.

**iHub in Nairobi, Kenya.*



Stakeholder cooperation is vital also for providing initial fund for pilot programmes and trials. For instance, among some 92 mobile applications around the world identified in a recent World Bank study (Qiang *et al*, 2012), only 15 per cent had commercial or private funding as their primary source of income. Donors provided the primary funding source for over half the programmes, and governments and corporate social responsibility programmes provided the rest. M-PESA, the mobile money application in Kenya, is perhaps Africa's best known mobile application, and now a huge commercial success. But even M-PESA required an initial boost of donor cash, from UKaid. It is now supported by a large ecosystem including the mobile operator (Safaricom), conventional banks (including Equity Bank) and a network of 27,000 agents across the country. In the specific case of mobile money (Vital Wave, 2012b), the study carried out for this report makes the following recommendations to donors:

- Reduce private sector risks by underwriting the risks of "first movers";
- Reduce shared costs by underwriting supporting systems that are common all financial service players; and

- Leverage limited donor resources to drive private and consumer action towards desired financial service sector goals.

Effective cooperation will require a spirit of openness and transparency on the part of all stakeholders. This is exemplified in the case of agriculture, also profiled for this report (Deloitte, 2012), where the value chain that links consumer and producer is extensive, and often crosses continents. This sector report makes the following recommendations to donors:

- Develop self-sustaining funding solutions;
- Focus on community ownership;
- Make eAgriculture technology robust and accessible;
- Focus on capacity-building; and
- Develop country-specific agriculture strategy maps.

This latter recommendation, in particular, will require transparency and data exchange between many different organizations, including those holding satellite imagery, agricultural production statistics, soil and terrain maps, agricultural market information systems and so on.

Promoting a culture of open data requires a framework, such as that provided by Kenya's Open Data Initiative, which makes available a centralized website where government departments can post data and users can easily find it (Rahemtulla, 2011). Another useful data framework is provided by a national spatial data infrastructure (SDI) which provides the basic set of digital coordinates for geographical information on which specific datasets and geographical information systems (GIS) can be overlain. Many GIS have considerable financial value, for instance for navigation or for mining. Others have great social value, for instance, data visualizations showing the impact of climate change or land use. But without the backbone of a national SDI, the cost of constructing such overlays rises considerably and their usefulness, for the interchange of data, is diminished. A national SDI is therefore a classic example of a public good which is best created through collaboration between public and private stakeholders. The costs are often quite modest – a feasibility

study for creating a national SDI in Uganda, for instance, puts the cost at about US\$3.5m, which is relatively small in comparison to government departmental budgets (Geo-Information Communication and ESRI Canada, 2011) – and the benefits can be long lasting. But the problems of coordination can be huge as an effective SDI requires the participation of so many different stakeholders.

Africa is still at the beginning of its growth curve and, so far, most ICT applications have been pilot programmes. Now is the time for rigorous evaluation, replication and scaling up of best practice. The research carried out for this study has highlighted a number of success stories and has shown examples of programmes that could be scaled up and replicated elsewhere. But there is a lack of systematic monitoring of outcomes, and cost-benefit analyses of investments are rare (Box 1.4). Indeed, one of the surprises coming out of this study is how little systematic impact evaluation has been carried out and published. Nevertheless, the evidence that has been marshalled in these studies, the most comprehensive carried out to date, does point to the potential for effective roll-out and a period of rapid growth ahead.

Box 1.4

African Virtual University

Founded in 1997, the African Virtual University (AVU) is a Pan African Intergovernmental Organization whose aim is to significantly increase access to quality higher education and training through the innovative use of Information and Communication Technologies. It has its headquarters in Nairobi, Kenya with a regional office in Dakar, Senegal. The AVU has graduated 43,000 students across Africa and established a wide-ranging network of Open Distance and eLearning institutions in over 30 countries in Sub-Saharan Africa. Since its inception, the AVU has benefited from donor resources and, in January 2012, AVU received US\$15.6 million from the African Development Fund for the second phase of the AVU Multinational Project. This grant is intended

to enable participating African countries and institutions to improve their infrastructure and programmes, and provide technical assistance on their ICT in education policies and strategies. The grant will also support research and development, open educational resources, and gender mainstreaming through the award of scholarships to women enrolled in science programmes. The AVU would benefit from a more rigorous evaluation to identify success stories and what programmes might be scaled up or reformed.

Source: Authors and <http://www.avu.org/News/the-african-virtual-university-receives-a-grant-of-usd156-million-from-the-african-development-bank-group-to-help-increase-ict-in-education-support-to-african-countries.html>.

Africa was once an ICT laggard, but is now becoming an ICT leader. In virtually every area of ICT – mobile, broadband, international bandwidth, PC penetration – Africa is closing the gap with the rest of the world and in some areas, like mobile financial services, it is setting

the pace. The studies in this report document a huge amount of local-level innovation, both in adapting applications developed in the rest of the world to African circumstances and in developing new home-grown applications. But there is insufficient south-south

learning. It remains the case that African leaders are more likely to look outside their continent for role models than to look at the successes happening next door.

Ironically, south–south learning is already happening in Africa, but not so much among its leaders as among its young people. Social networks, like Twitter, Facebook and Africa’s home-grown MXit (see Box 1.5) provide a

platform for informal learning to take place in an environment of fun and experimentation. It is a commonplace to say that Africa’s greatest strength is its youth, but in this case it is really true. As the generation of Africans that have grown up with mobile phones and social media enter the labour market and government, they will bring with them the habits of information sharing that they have grown up with. That will be a real eTransformation.

Box 1.5

MXit, home-grown African social networking

MXit, a South African social network, has become the premier social network in its home country and has expanded to reach more than 30 million users across Africa and beyond with 40,000 new users joining every day. Overall, MXit has 50 million users registered in more than 120 countries.

In the first half of 2011, MXit registered 24 million users just in Sub-Saharan Africa compared to less

than 19 million for Facebook, making MXit the biggest social media network in Sub-Saharan Africa. Success has been enhanced by the high level of activity of its users compared to other social networks, with an average MXit user spending 45 hours per month on the site.

Source: www.mxit.com and newspaper reports.

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1. In this project, “Africa” is taken to be the continent as a whole, covering both North Africa and Sub-Saharan Africa.
 2. GSMA, “Africa now the world’s second largest mobile market, reports GSMA”, November 2011, <http://www.gsma.com/publicpolicy/wp-content/uploads/2012/04/africamobileobservatory2011-1.pdf>.
 3. “Digital Africa”, Intelligent Life, <http://www.economist.com/node/18529875>.
 4. Wireless Intelligence (2012), <https://www.wirelessintelligence.com>.
 5. For instance, Orascom Telecom of Egypt, which has holdings in seven African countries was acquired by VimpelCom of Russia, via Wind Telecom, in 2005. The African company MSI Cellular Investments, which later became known as Celtel was acquired by Zain and later by Bharti Airtel of India in 2010. MTN, with headquarters in South Africa and operations in 17 African economies, remains the largest African-based operator.
 6. Hamilton Research, “Africa’s fibre roll-out”, <http://www.africabandwidthmaps.com/?p=2572>.
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 8. “What Telkom’s price cut means for you”, My Broadband, 14 April 2012, <http://mybroadband.co.za/news/adsl/47484-what-telkoms-price-cut-means-for-you.html>.
 9. <http://www.netindex.com/download/allcountries/>, speeds retrieved on 14 April 2012, with average speeds being a rolling mean over the previous 30 days.
 10. Skype Out tariffs are available at: <http://www.skype.com/intl/en-us/prices/payg-rates/>. Skype is used in this comparison because it publishes rates for all countries on its public website.
 11. In the case of mobile, the gap has arguably already been closed: Africa’s share of the world’s mobile phones, for instance, is more than twice as high, at about 10 percent, compared with its share of the world’s GDP, at just over 4 per cent.

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Part II

**SECTOR
STUDIES**



chapter

2

The **Transformational Use**
of Information and
Communication Technologies
in Africa

AGRICULTURE



1. Introduction

2. Landscape analysis

Common platforms for agriculture stakeholders
Multi-stakeholder eAgriculture knowledge sharing in Africa
The role of mobile technology in eAgriculture
Traceability
Agricultural insurance
ICT in rural development

3. Africa scan

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ICT as a potential tool for increased traceability of livestock
Intensified utilization of ICT for increased irrigation efficiency

5. Recommendations

Recommendations for policy makers and regulators
Recommendations for donors

Further reading

2.1

INTRODUCTION

The strategic application of ICT to the agricultural industry, the largest economic sector in most African countries, offers the best opportunity for economic growth and poverty alleviation on the continent. Food security is paramount for the survival of individuals, families and ultimately nations, yet Africa's agriculture sector has been in decline over the past 40 years. Poor farmers have largely remained poor with 73 per cent of the people living in rural areas subsisting on less than a dollar a day.

Like other sectors, African agriculture is disadvantaged owing to factors that include:

- under-investment in rural areas,
- inadequate access to markets and unfair market conditions,
- inadequate access to advanced technologies,
- weak infrastructure,
- high production and transport costs,
- gender asymmetry in access to assets and services,
- conflicts,
- HIV/AIDS,
- natural disasters,
- deforestation, environmental degradation and loss of biodiversity, and
- dependency on foreign aid.

African agriculture is largely traditional and practised by smallholders and pastoralists. This type of agriculture is predominantly rain-fed, has low-yielding production,

and lacks access to critical information, market facilitation, and financial intermediation services.

The role that ICT can play in addressing these challenges is increasing as personal ICT devices – such as mobile phones or tablet PCs – are becoming more widely available. ICT, when embedded in broader stakeholder systems, can bring economic development and growth as it can help bridge critical knowledge gaps. Mobile technology, on the other hand, is increasingly being adopted as the technology of choice for delivery of ICT services and solutions.

The wider adoption of ICT in agriculture is of strategic importance to five main stakeholder groups:

- **Businesses:** businesses, associations, other organizations
- **Farmers:** individuals; organized and informal associations
- **Researchers:** researchers; educators and trainers
- **Government:** ministries of agriculture, and other relevant departments and agencies
- **Citizens,** both as consumers and as custodians of the environment, for instance through civil society organizations.

In identifying the ways in which ICT can help agriculture, it is useful to view the farming life cycle as a three-stage process (see Figure 2.1):

- **Pre-cultivation:** including crop selection, land selection, calendar definition, access to credit, etc.
- **Crop cultivation and harvesting:** including land preparation and sowing, input management, water management and fertilization, pest management, etc.

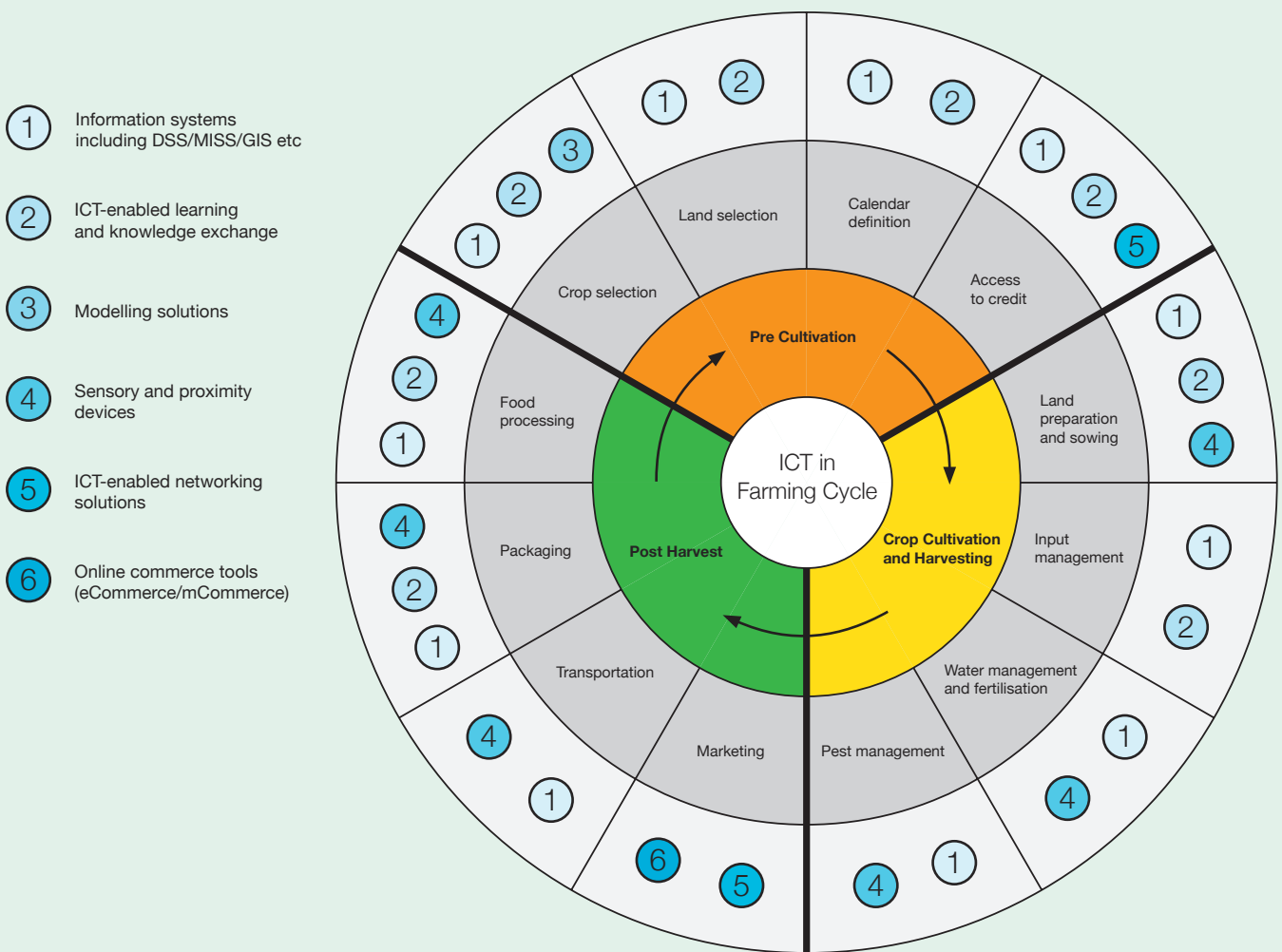


- Post-harvest: including marketing, transportation, packaging, food processing, etc.

Of course, some aspects of how ICTs can assist with agriculture are cross-cutting, like the use of geographical

information systems (GIS) for land-use planning, while others are broader than agriculture, such as their use in climate change adaptation. Nevertheless, this framework provides a useful basis for analysis.

Figure 2.1 Information and service needs differ through the crop lifecycle



Source: Deloitte.

2.2

LANDSCAPE ANALYSIS

Scanning the global landscape highlights many examples of the successful use of ICT in agriculture enabling the identification of trends relevant to Africa. These include:

Common platforms for agriculture stakeholders

An integrated information system for agriculture stakeholders minimizes the duplication of data and ensures consistency, improves integrity of the data and can address a wide variety of information needs. Although often complex, systems can be customized to ensure that the user experience is relatively simple. Cost and time spent

on maintenance is relatively low and the amount of user training required can be reduced. A good example of such a system is DrumNet, a network of support centres in Kenya that provides hands-on assistance through the delivery of financial, marketing and other information products and services.

Multi-stakeholder eAgriculture knowledge sharing in Africa

Multi-stakeholder research partnerships, including farmers, extension professionals, educators and scientists, have many benefits. They focus research on the most relevant topics, reduce the time needed to complete research, and improve the efficiency and effectiveness of the research process. Examples of applications of ICT in agricultural knowledge sharing include:

- ICTs for spatial analysis and targeting of programmes
- ICTs for better risk management
- ICTs and financial services for the farmer
- eEducation
- Virtual aggregation of small stakeholders

The role of mobile technology in eAgriculture

Mobile phones, GPS systems, barcode scanners, RFID readers and smart card readers are all examples of

technologies that can be used to capture, read and store data. However, further components, such as the internet,



communication networks and regulatory systems (to provide data security and standard systems for codes) are essential to complement the input and output devices. One example of the role of mobile technology is the GSMA's mAgri Programme, which aims to identify and fund opportunities for mobile communications in the agricultural value chain. For instance, the mFarmer Initiative Fund, launched in 2011 in partnership with the Bill & Melinda Gates Foundation and USAID, is designed to:

- Stimulate the development of mobile phone-enabled agriculture information and advisory services that are commercially sustainable;
- Build services that impact farmers' income and productivity;
- Reduce the barriers for operators to launch and improve mFarmer Services;
- Test and prove models for delivering agricultural information services via mobile phones; and

- Promote a culture of knowledge sharing in the mFarmer ecosystem.

The mFarmer Initiative Fund will support projects in Sub-Saharan Africa (Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia).

Another example of mobile technology in agriculture is a well-established service that has been operating in Ghana since 2005. The Esoko Ghana Commodity Index (EGCI) is a rural communication platform that publishes a cash market price index composed of data on physical commodities. The index is published weekly and tracks wholesale and retail prices and aims to improve farmers' incomes by building healthy markets. Currently Esoko is active in ten countries in Africa and has a variety of partnership agreements which include public sector agricultural projects, Esoko country franchises and licensed partners.

Traceability

Consumer demand for quality and food safety is placing increased emphasis on the traceability of agricultural production, particularly in the markets of the developed world. Traceability in the agriculture sector involves the recording of information on animals and food so that an item moving through a global supply chain can be tracked from its origin along the entire value chain. For instance, remote tracking among the coffee growers of Costa Rica and Mexico are examples of a successful implementation in developing nations.

The Coopetarrazú's processing plant uses leading-edge technologies for coffee drying, hulling, sorting and shipping. It also tracks hundreds of thousands of coffee purchases, worth US\$16 million annually from its 2,600 members, during the harvest and ensures that purchases meet certification criteria to ensure premium prices.

Traceability in livestock farming is also the focus of one of the detailed case studies, so these two cases provide two different views of traceability.

Agricultural insurance

Agricultural insurance is becoming increasingly important as extreme weather patterns generated by climate change are exacerbating volatility in food production and food prices. Crop insurance has long been used in developed countries to deal with weather uncertainties, but its availability in Africa, particularly to smallholder farmers, has been extremely limited. Agricultural insurance also applies to livestock, bloodstock, forestry, aquaculture and

greenhouses. ICTs can play an important role in the agricultural insurance process by:

- facilitating access to information and services to stakeholders;
- providing advance information about weather and market price situations;

- providing better services and facilitate speedy claims servicing;
- monitoring and tracking premium repayments;
- ensuring a better interface between the insurer and the insured, particularly for field-based transactions;
- developing specialized and affordable rural insurance products; and
- improving complaints procedures.

ICT in rural development

Multi-purpose community centres can be used to provide remote populations with information and communication options. In Bhutan, for example, Community Information Centres (CIC) were established to provide services to a scattered population, who live in mountainous, forested terrain that has made wired internet and telephone connectivity prohibitively expensive. Their objective was to provide sustainable, commercially viable ICT services in rural areas. The state provides the equipment, and an individual from the local

community is employed to promote and maintain those services. Services available at the CICs include basic and advanced computer training, internet access, telephone facilities, government information and forms, and lamination and scanning facilities.

Broadband connectivity brings high-end services closer to the rural population and helps reduce poverty. As a result, the travelling time and cost for villagers and farmers is reduced while employment opportunities are generated.

2.3

AFRICA SCAN

While the landscape analysis highlighted global best practices and sample cases, the Africa Scan provides a closer look at recognized eAgriculture successes in Africa.

The Africa Scan provides an overview of ICT solutions in the agricultural sector in Africa, identifying reasons for their success and the potential for them to be scaled up. These success factors emerged from studying examples of ICT use that are described in more detail in the full report, such as:

- Using ICT to bring together multiple stakeholders in the Kenyan agriculture sector – DrumNet
- SMS-based services developed by Zambia’s National Farmers’ Union
- Sissili Vala Kori – farmers’ use ICT to share new production, processing and marketing skills in Burkina Faso
- A mango traceability system linking Malian small-holders and exporters to global consumers
- Index-based agriculture insurance on agricultural inputs in Kenya – Kilimo Salama
- Using ICT to improve forest governance in Liberia – LiberFor



- Mobile technology as a “Game Changer” in South Africa – MXit
- Mobile technologies used by GSMA as an initiative to alleviate food security related problems – mAgri
- Seeing is believing – unlocking precision agriculture in West African smallholder communities with very high-resolution imagery
- A government-recognized body used to implement a project provides the initiative with added credibility.
- Where mobile phone reception and signal coverage issues were problematic, local alternative media uses emerged to circumvent the problem.
- Additional faith and trust in the system are created when a solution is developed locally.

The reasons for success identified in these examples are:

- Real economic value was added either because of savings resulting from the use of ICT or an increase in revenue or profitability.
- The language and medium used to communicate with the farmers were important contributing factors in the farmers’ response to the programme.
- Good conceptualization and execution was achieved by including multiple stakeholders in win-win partnerships.
- Trust was built with stockists, support centre operators and the government by using local champions as facilitators. This is an essential element for success in any project.
- Projects were often augmented by bundling many services together with the basic or original facilities to make them truly comprehensive.
- Community members find it particularly useful if farmers are directly involved in training and can demonstrate a solution.
- By increasing the scale at which knowledge and new techniques can be applied, and by reducing transaction costs, ICTs help to create sustainable business models, based on the private sector.
- In instances where farmers were able to identify personally with a technology solution they were more inclined to adopt it and continue to use it.
- In areas of low literacy and low ICT penetration rates, use of an appropriate medium was important to the success of the venture.
- It is important to establish a long-term interest and commitment amongst all those involved.
- In the precision farming case study, the adoption of satellite technology resulted in lower operational costs and increased yield.

CASE STUDIES

2.4

ICTs for
AGRICULTURE
in Africa

Here we focus in depth on two major opportunities for increased use of ICT identified as key areas for a rapid increase in agricultural production. These are, first,

the improved traceability of livestock and products and, second, the increased efficiency of irrigation of crops.

ICT as a potential tool for increased traceability of livestock

Livestock production is the most widespread and generally practised agricultural activity on the African continent. If, as a result of intensified use of ICT in improving the efficiency of livestock and meat production in selected African countries, significant increases in production are possible at affordable cost and these methods are relatively easy to duplicate in areas with diverse natural landscapes, the potential for general increased wealth creation in all parts of the continent could be enormous.

The Namibian Livestock Identification and Traceability System (NamLITS), was studied in depth (see Box 2.1).

In this system official identification is done by means of animal identification devices as required by international standards. Both radio frequency identification (RFID) for automated data input and a visual plastic ear tag that supports remote pastoral production where there is limited or no technological support, are used. As a backup system, branding of animals will continue. Eligible cattle are tagged as part of a specific campaign and further tagging takes place during annual vaccination campaigns or community visit-based surveillance activities. In cases where handling facilities are in disrepair, mobile crush pens are used.

Box 2.1

Namibia: Livestock traceability systems unlock wealth along the value chain

The results of the in-depth investigation in Namibia revealed that:

- The traceability systems employed by the commercial farming community and its downstream role players have unlocked wealth along the entire value chain;
- The experience gained by the commercial livestock sector can serve as a valuable platform to roll out traceability systems in under-developed rural areas where livestock production is heavily relied on to sustain the people;
- New, streamlined traceability systems which have recently been developed allow a wider spectrum of functions to be included so that many additional services can be rendered;
- The co-ordinated extension of comprehensive systems of traceability can improve the lives of multitudes of poor people and the long-term sustainability of the entire livestock industry. This has the potential to positively affect the economy of the country at large;
- The capital and operational costs involved in the roll-out of such a comprehensive traceability programme are relatively low compared to the benefits which can accrue to the livestock industry, the respective role players in the value chain as well as the government of the country;
- An enabling environment should be created by the government and all other interested parties to ensure maximum efficiency of an advanced traceability system;
- Should international organizations involved in the provision of aid funding wish to make a contribution of note to Namibia, consideration should be given to concentrating their funding efforts on the provision and maintenance of a comprehensive traceability system;
- Traceability systems can be rolled out in many other African countries where they can be expected to bring about similar wealth creation, but an enabling environment must be created first;
- Investment in the intensified use of ICT can offer more advantages than investment in possibly any other interventions that may be considered.



Intensified utilization of ICT for increased irrigation efficiency

It has been demonstrated in many areas of the globe that using good irrigation techniques can increase the efficiency and profitability of crop production as much as a hundredfold. Efficient irrigation practices provide a consistent moisture supply to crops, water deficiencies can be overcome during periods of drought, more than one crop cycle per year can be achieved and the effective use of all production resources can be improved dramatically. The pressure on the diminishing water resources can also be alleviated and, as a result, more land can be put under irrigation. The increased utilization of ICT could have a positive effect on irrigation efficiency.

Egypt depends almost exclusively on the Nile River for its water supply. Of this, 85 per cent is used for irrigation. Two separate aspects of the use of ICT in managing irrigation are highlighted through the case of Egypt. The first of these is an Integrated Water Resource Management Action Plan which the Ministry of Water Resources and Irrigation in Egypt has been implementing in response to the increasing demand for water while the options for increasing supply are limited. It is being implemented on more than 2,000 km² in the Nile Delta, covering the command of two main canals, Mahmoudia and Mit Yazid. The project aims at improving the management of irrigation and drainage and increasing the efficiency of irrigated agriculture water use and services.

The plan aims to improve irrigation and drainage systems and the water management institutional structure. The first phase of the project has resulted in crop yield increases of 20 per cent, with drainage estimated to account for 15-25 per cent of this increase. A further benefit is the re-use of drainage water.

A second type of intervention is illustrated by the Magrabi Farms area which was a green-fields operation and has been developed from actual desert to the 8,500 acres that are now fully irrigated and underpin an export-oriented agribusiness. Magrabi exports produce to 38 countries. Magrabi is an ideal example of the development of a full-scale, economically sustainable unit that has used technology in order to reach its current status. They are completely independent in terms of being able to conduct all the functionalities required for good soil, water and multi-cropping management. There are fully equipped laboratories on the farm that form part of an integrated quality control programme and the whole complex has a fully-integrated, reticulated irrigation system which is managed by an irrigation engineer. All water passes through filters and all bypass water is tested for purity as fertigation, i.e. application of fertilizers, is a normal practice. Efficiency of water usage is continuously monitored. An on-site weather station, for temperature monitoring and evaporation pans to determine moisture loss, is used to facilitate the correct irrigation scheduling.

Box 2.2

Egypt: ICT use increases irrigation efficiency

In-depth investigation in Egypt shows that:

- Existing ICT systems employed by some of the commercial farming community in large-scale irrigated farming operations have increased the efficiency of water use and generated larger profits;
- The experience gained by the large and small-scale commercial irrigation sector can serve as a valuable platform for even more comprehensive ICT systems. Many more agrarian communities in Egypt can be reached and this will contribute towards the improvement of living standards;
- The intensified use of ICT can offer government organizations opportunities to diversify their services to all communities involved with irrigation farming;
- The capital and operational costs involved in the roll-out of a range of ICT-based functions are relatively low compared to the large benefits expected;
- The enabling environment which the government and all other interested parties create to ensure efficient use of irrigation water, can serve as an example to other countries;
- International aid organizations could make a serious contribution to Egypt by focusing funding efforts on the intensification of ICT-based irrigation systems;

- The systems can also be rolled out in many other African countries and can be expected to bring about a similar magnitude of wealth creation, provided that an enabling environment can be created;
- Investment in the intensification of the use of ICT for the improvement of crop production under irrigation, can offer more advantages than investment in most other areas.



RECOMMENDATIONS

The following recommendations aim to assist policy makers, regulators and the donor community to:

- Gain insight into the benefits of ICT led interventions in their respective countries or regions;
- Implement interventions that would have a tangible outcome;
- Develop multi-country cooperation and best practices; and to
- Prioritize interventions that would be most beneficial

Recommendations for policy makers and regulators

RECOMMENDATION 2.1

Create partnerships with the relevant stakeholders

In many African countries, synergies between the different parties in the agricultural value chain are not exploited optimally. Hence, forums need to be set up to encourage dialogue, interaction and promote knowledge related to use of ICT in agriculture, such as the World Bank's ICT in Agriculture eSourcebook. Specific partnerships should be identified and be built between stakeholders for identified eAgriculture projects with targeted outcomes, working with established partners, such as NEPAD or CAADP. These partnerships can play an invaluable role in the research, planning, problem solving, review of operations and in training relevant government officials and staff in the use of ICT in agriculture.



RECOMMENDATION 2.2

Establish an agricultural hub

Leadership, communication and creative thinking are required to initiate and sustain eAgriculture projects that will have a significant impact. A purpose-built management and support structure would enable communication between private sector and government and drive the strategic agenda of the state. Designed to be non-bureaucratic and nimble, an agricultural hub would drive agricultural diversification, mega projects including eAgriculture projects, and initiate and coordinate opportunities in the agricultural sector. These eAgriculture projects would in turn stimulate commercialization, diversification and job creation.

RECOMMENDATION 2.3

Implement legislation and regulations to govern specific opportunities

Legislation and regulations relating to ICTs must be revisited, to ensure that, amongst other concerns, information security is protected, the cost of communications infrastructure (e.g. broadband) is reduced and ICT infrastructure is accessible even from remote rural areas. Some programmes, such as national irrigation schemes and traceability programmes, may require new, strong legislation and regulation. National legislative bodies together with Ministries of Agriculture and Ministries of Communications need to coordinate to ensure timely enactment of laws and regulations.

RECOMMENDATION 2.4

Consider adoption of traceability systems at a national level

Traceability systems have the potential to bring about an observable improvement in the well-being of large numbers of people on the African continent as export markets can be created when traceability systems are implemented correctly. Systems should address full traceability, from first contact to market destination, since systems that do not cover the whole lifecycle create gaps in traceability, which may be detrimental to the industry and the consumer. It is essential that legislation and regulations are enforced and will also apply to other agricultural products.

RECOMMENDATION 2.5

Empower women in agriculture

In Africa, women perform 65 per cent of all activities within the agricultural sector. Not only do these women often have little access to finance, but also they have little free time to devote to their own interests or to rest and are physically at a disadvantage. Women in rural communities, and particularly those moving from subsistence farming to small-scale farming, can benefit greatly from ICT as these can save time and physical effort and equal access can be monitored. Governments need to provide incentives to telecommunications service providers to expand money transfer services to rural communities as these enable rural woman to have more autonomy over their finances. Content providers need to provide health, nutrition and educational advice on eAgriculture web pages. Active monitoring of eAgriculture programmes by government is necessary to assess the degree to which these programmes take the interests of women into account.

RECOMMENDATION 2.6

Implement irrigation solutions in Africa

ICT can be used to reduce water consumption significantly using modern irrigation techniques and as a result enhance the quality and productivity of land and eventually increase farmers' incomes. Since technology that has been used for a number of years in Egypt with great success may still be deemed as "new" in many other African countries, consulting with and learning from experts and those with extensive experience in ICT is recommended.

RECOMMENDATION 2.7

Implement integrated eAgriculture plans

Implementation of a comprehensive, integrated, long-term eAgriculture Plan for each country should involve all stakeholders and hence increase stakeholder ownership, bring about economies of scale, and ensure that there is political and executive commitment to eAgriculture with the necessary budgetary allocation. The plans facilitate the design of single technology frameworks for each country into which new hardware and software components, addressing different functionality and features, could slot. Single-window services and one-stop-shops naturally result from such plans. There is also a need to strengthen African research and training institutes in the agricultural and environmental field, including those that play a role in monitoring climate change.

Recommendations for donors

RECOMMENDATION 2.8

Develop self-sustaining funding solutions

Since eAgriculture ventures, particularly those taken up by communities, must be sustainable beyond their initial funding periods, it is necessary that strong business models exist and that the community members can benefit directly. Some jobs related to eAgriculture can be filled by local people and creating these jobs would address the rural brain drain to some small extent. Donors should publish the fact that a description of viable plans for ultimately making a project self-funding is one of their funding application's evaluation criteria.

RECOMMENDATION 2.9

Focus on community ownership

Well-established community ownership assists projects to survive after donors move on and reduces long-term dependency on an external champion. Thus, programme designers and implementers of community-based projects should include community members in decision making early in the project and progressively hand over leadership and operation of the project to them. As community owned projects are often resource-scarce, it is best to adopt approaches that make adequate use of the existing infrastructure.



RECOMMENDATION 2.10

Make eAgriculture technology robust and accessible

Systems are only valuable if they are used, but this can only occur in eAgriculture projects if the end users find the systems easy to use and the technology is cheap, available, reliable and can be run off-line when necessary. Backup and disaster recovery plans, as well as alternative work processes that can easily be linked into the primary system, need to be implemented so that systems are useable even if there is some failure of the technology. Systems designers and developers need to design system access through commonly available technology devices, such as mobile devices, and include alternative communication options in order to include the largest possible number of end users. Voice is often a better option than text because users are often not fully literate. Multi-purpose telecentres not only allow internet and ICT access but are important centres for learning, listening and stimulating ideas. Initial donor financial support is needed until the number of users reaches a critical mass.

RECOMMENDATION 2.11

Build human capacity in rural communities

Rural communities urgently need basic education opportunities, including basic farming skills and business management skills. Complete reliance on eEducation is not recommended in communities made up primarily of smallholders or subsistence farmers but the internet can be a very valuable resource for the teachers who provide classroom tuition. Donors and funders are urged to ask for an educational use component to be made a funding eligibility requirement for all projects. A good model here is the African Leadership in ICT (ALICT) component of the Global eSchools and Communities Initiative (GeSCI), based in Nairobi, Kenya.

RECOMMENDATION 2.12

Encourage environmental responsibility through country agriculture strategy maps

Country specific agriculture strategy maps, using a variety of ICT tools but primarily imaging tools such as GIS and satellite technologies, can be used to encourage environmentally responsible farming as well as commercially astute practices. Donors are urged to assist in developing the eAgriculture plan recommended to policy makers and regulators in Recommendation 2.7 above by providing access to the necessary technology and international experts required for developing country specific agriculture strategy maps.



FURTHER READING

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(2011) *ICT in Agriculture sSourcebook - Connecting Smallholders to Knowledge, Networks, and Institutions*

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<http://www.ictinagriculture.org>

For a more detailed presentation on the role of ICT in agriculture in Africa, see the full eTransform Africa sector report:

<http://www.etransformafrica.org>



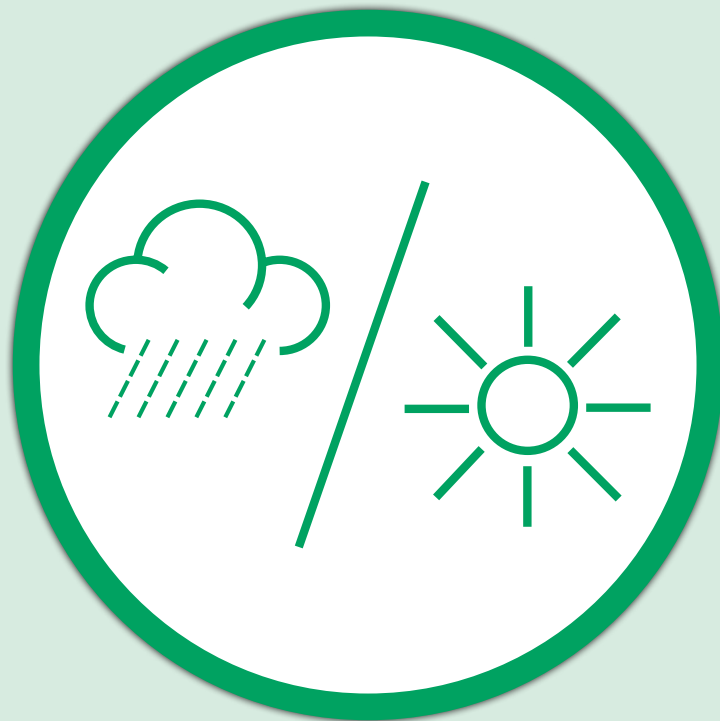


chapter

3

The **Transformational Use
of Information and
Communication Technologies
in Africa**

CLIMATE CHANGE ADAPTATION



1. Introduction

Understanding climate change mitigation and adaptation
ICTs and climate change

2. Landscape analysis

3. Opportunities and challenges

4. Case studies

5. Recommendations

Recommendations for government and development partners
Recommendations for governments and donors

Further reading

3.1

INTRODUCTION

Like other regions of the world, Africa is beginning to experience the impacts of human-induced climate change. Temperature increases of 0.1 to 0.3°C per decade have been observed in South Africa, for example, with indications that Africa is warming faster than the global average. Rainfall patterns are becoming more variable across the continent, reflecting in part the influence of traditional factors such as the El Niño/La Niña-Southern Oscillation (ENSO). Warming in the south Atlantic and Indian Oceans may have led to a weakening of monsoons, depriving the Sahel region of rainfall in recent years.

These observed changes in climate parameters have not occurred uniformly across Africa:

- In East Africa temperatures have risen by an average of 1.3°C since 1960. Rain patterns have altered and droughts and floods are becoming more frequent. Since 1912, Mt Kilimanjaro’s ice fields have decreased in total area by about 80 per cent.
- In North Africa significant warming has occurred during the summer while winters are becoming drier. Sahelian Sudan experienced a 25 per cent decrease in rainfall during the last quarter of 20th century.
- In Southern Africa decadal warming of 0.1 to 0.3°C occurred between 1961 and 2000, while the duration of the dry season lengthened between 1961 and 2005.
- West Africa saw substantial reductions in rainfall during the latter half of the 20th century, including prolonged droughts in the 1970s and 1980s, and greater rainfall variability.

The current trends of rising temperatures and altered rainfall patterns are set to continue during the remainder of this century. At a continental level, mean annual temperatures are projected to rise by between 3.2°C and 3.6°C by the period 2080 to 2099. Precipitation patterns will also continue to change – very likely decreasing along

the Mediterranean coast, Northern Sahara and west coast to 15°N, while increasing in tropical and eastern Africa. An increase in the number of extreme climate events experienced within the continent is likely to accompany these changes in climatic averages. Rising sea levels are also projected to affect Africa’s coastline, particularly the eastern coastline, as well as island states.

African countries are especially vulnerable to the impacts of climate change for three interrelated, mutually reinforcing reasons:

1. Africa’s climate is likely to be more severely affected by climate change than other regions, as recent data suggest that it is warming faster than the global average.
2. Its major economic sectors, such as agriculture, are climate-sensitive.
3. Low levels of human development (income, education, health) and the greater presence of other stress factors (such as conflict and disease) constrain adaptive capacity.

The 2008 *Human Development Report* identifies five major “transmission mechanisms” through which climate change will affect human development:

- Losses in agricultural production and food security: Africa could experience the largest losses in agricultural output potential.
- Increased water stress and water insecurity: The number of people experiencing water stress is likely to increase in northern and southern Africa, while the opposite is likely to happen in eastern and western Africa.
- Rising sea levels and exposure to climate disasters: More frequent and intense extreme events, such as cyclones and droughts, will increase disaster-related losses.



- Transforming ecosystems and biodiversity: Coral bleaching, ocean acidification, warmer inland lakes and shifts in species ranges are pushing many ecosystems beyond their capacity to adapt to changing climate conditions.
- Increased human health risks: The likelihood of malaria epidemics may increase since previously unaffected populations will not have the genetic modifications to protect against infection.

While these impacts will present themselves in different ways and with varying degrees of severity in different regions and countries, they are likely to translate into significant development losses, particularly in Sub-Saharan Africa. Many will be irreversible and efforts to achieve the Millennium Development Goals (MDGs) or sustain progress made are likely to be compromised.

Understanding climate change mitigation and adaptation

International responses to climate change are coordinated through the United Nations, and focus in particular on the UN Framework Convention on Climate Change (UNFCCC) and its subsequent Kyoto Protocol. These responses fall into two main categories. Mitigation is concerned with reducing the level of greenhouse gas emissions in the Earth's atmosphere that are the principal causes of climate change. Adaptation is concerned not with prevention but, in the words of the Intergovernmental Panel on Climate Change, with "adjustments in human and/or natural systems... to reduce [its] adverse impacts or take advantage of opportunities" that may arise from it.

Adaptation takes place at all levels in society, from large-scale interventions that are driven by governments and regional organizations to the autonomous actions taken by threatened communities and individuals. Appropriate adaptation requires:

- access to current understanding of the potential physical and socio-economic changes which are or could occur as a result of climate change;
- design and implementation of effective responses to the challenges and opportunities arising from climate change;
- coordinated action by all stakeholders, including those at the local level; and
- reliable information and guidance on actions that may be taken to increase the resilience of vulnerable communities and individuals.

Over the past decade, understanding has grown regarding how to enable adaptation around the world. Four principal lessons can be derived from that experience to guide future interventions:

1. There is an intimate connection between adaptation and sustainable development. Measures that tackle the underlying economic, social and environmental challenges of low-income countries and communities also help them to address the outcomes of climate change. Healthier and better educated populations living in robust ecosystems are better equipped to adapt.
2. The impacts of climate change and the requirements for adaptation are highly contextual. The impacts of climate change will vary markedly from country to country and location to location. Interventions must be carefully tailored to the circumstances in which they are being applied.
3. Adaptation must be integral to national development strategies and institutions. Addressing adaptation needs is not an option within development policy; climate change is occurring and will affect countries' development priorities. All development planners and managers need to be aware of its implications and mainstream climate change considerations into development thinking.
4. As in many areas of human activity, adaptation involves trade-offs. Actions which will protect some vulnerable communities may have adverse impacts on other groups. Development planners need to model likely impacts while remembering that climate change itself renders the status quo in many contexts unsustainable.

ICTs and climate change

Information and communication technologies have had an increasing impact on economic and social development over the past two decades, resulting from their capacity to generate and disseminate information, to facilitate the coordination of different actors in and beyond government, and to make government, business and development processes more efficient. These three capacities are as relevant to climate change adaptation as they are to other fields. However, the extent of experience in deploying ICTs for adapting to climate change is currently less than in other development fields, such as health and education.

ICTs also have a complex relationship with sustainability and with the underlying cause of climate change. This relationship can be described in terms of the effects of ICTs:

- First order (direct) effects concern the impacts which ICTs themselves have on climate change, in particular the CO₂ emissions from the production, use and disposal of communications equipment and services, accounting for between 2 and 2.5 per cent of global emissions.
- Second order (indirect) effects concern the role ICTs can play in reducing emissions resulting from other industrial sectors, by having them adopt ICTs to improve efficiency and production. A complication arises from rebound effects which may eliminate the gains resulting from apparent reductions, such as increased power consumption resulting from lower energy prices achieved through greater energy efficiency.
- Third order (societal) effects result from large-scale changes in social and economic behaviour resulting from widespread use of ICTs, including changing patterns of trade, production and consumption, and global to local engagement of citizens in decision-making.

There are a growing number of perspectives on how to approach the intersection of ICTs and adaptation. IISD has built on several analytical approaches to create a new framework to guide future policy and programming interventions. This framework categorizes interventions at four points along a continuum of adaptation, which are as follows:

1. Addressing the drivers of vulnerability – interventions which are concerned with the underlying factors that make people and communities vulnerable to the impacts of climate change, rather than being concerned with those impacts themselves.
2. Building the response capacity of local and regional systems and communities – interventions which help communities to acquire the resources they need to respond to the impacts of climate change.
3. Reducing and managing risks related to climate variability and climate change – interventions which provide information and facilities to help communities change lifestyle and economic behaviours in ways that make them more sustainable in new climate conditions.
4. Confronting climate change – interventions which directly address the physical impacts of climate change such as rising sea levels and the spread of malarial mosquitoes into newly favourable regions.

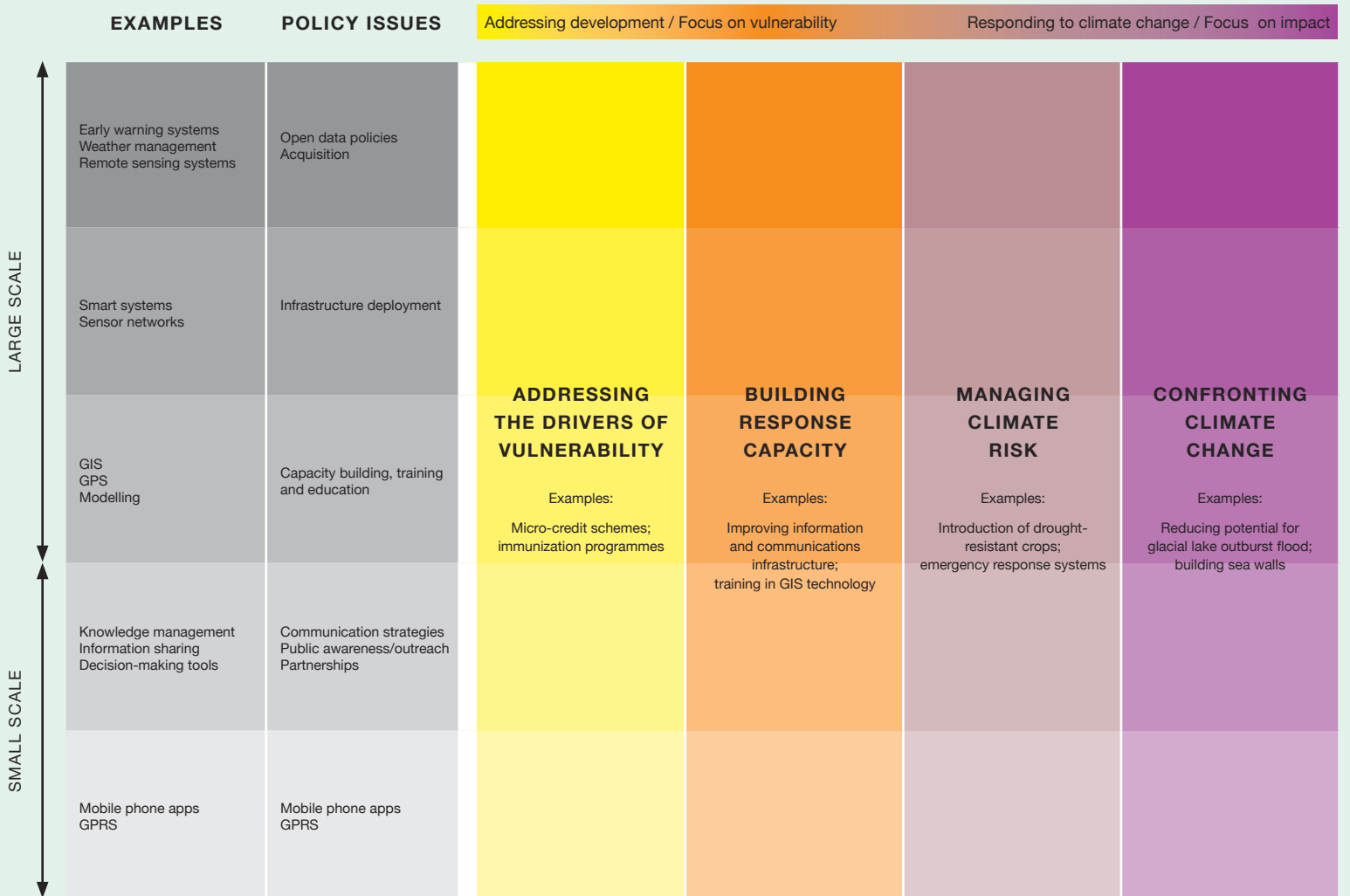
Within this framework, it is possible to categorize interventions more precisely in a number of ways:

- By sector: A number of development sectors are particularly susceptible to the impacts of climate change, notably agriculture and water resources, forestry and fisheries, health and livelihoods.
- By geographic scale: Climate change is a large-scale phenomenon but will also have impacts that vary greatly between individual locations. Interventions therefore range from those at regional or national level down to specific actions to meet the needs of individual communities.
- By technology: ICTs are highly diverse and can be implemented on different scales. At one end of the scale they include expensive one-off applications such as sensor networks, satellite earth stations and meteorological systems. At the other, they include the mobile phones that individuals can use to access information, report problems or share experiences.

This analytical framework is illustrated graphically in Figure 3.1.



Figure 3.1 **A framework to assess ICT tools for climate change adaptation**



3.2

LANDSCAPE ANALYSIS

The UNFCCC lies at the heart of much of the work which addresses adaptation in Africa today. Strategic instruments arising from this work include countries' National Communications on their climate response activities, and the National Adaptation Programmes of Action (NAPAs) which have been developed by Least Developed Countries (LDCs). The African Union, NEPAD and some Regional Economic Communities (RECs) in Africa have sought to achieve coordinated action by governments at the continental or regional levels, and to stimulate national policy development for adaptation.

A number of projects and programmes are currently being implemented in Africa to support adaptation to climate change. Major continental programmes focusing on climate change adaptation with a budget above US\$50 million include: the Climate Change Adaptation Support Programme for Action-Research and Capacity Development in Africa; the Africa Adaptation Programme; and the Climate for Development in Africa (ClimDev-Africa) Programme and its component, the African Early Warning and Advisory Climate Services.

In conjunction with these multi-country, multi-sector projects are others that focus on capacity-building (including policy linkages) and research activities in specific sectors such as:

- Agriculture: "Strategies for Adapting to Climate Change in Rural Sub-Saharan Africa: Targeting the Most Vulnerable" (FANFRAN) and "Developing rice and sorghum crop adaptation strategies for climate change in vulnerable environments in Africa" (RISOCAS).
- Water and energy: "The Water, Climate and Development Programme in Africa" and the "Climate Proofing Energy Systems: Vulnerability-Adaptation-Resilience" (HELIO).

- Forestry: "Adapting the Framework of Forestry Policy to meet the needs of climate change in the MENA region" (GIZ).
- Health: "Transferring the Malaria Epidemic Prediction Model to Users in West Africa" (CCAA).
- Meteorology: "The Regional Science Service Centre for Adaptation Climate Change and Sustainable Land Management in Southern Africa".

Two critical challenges arise from this work:

- the extent to which adaptation is integrated with wider development planning; and
- the extent to which strategic planning leads to practical implementation on the ground.

Both of these are challenges in many development sectors, not just for climate change adaptation. Where the use of ICTs is concerned, they are supplemented by two more specific issues:

- the extent to which ICTs are integral to adaptation planning; and
- the extent to which they can be deployed in practical implementations, given current infrastructure, financial and human resource limitations.

Governments have made some references to ICTs in National Communications, NAPAs and other documents which establish these sectoral priorities, though these references are rather few and limited. The use of ICTs is suggested for tasks such as the collection and dissemination of agro-meteorological information, monitoring for flood projection, and planning for and tracking of changes in the distribution of diseases such as malaria and meningitis, early warning systems and disaster preparedness. Many countries in West, East and Southern Africa have



identified a desire to improve their meteorological and forecasting capacity and to strengthen their early warning and disaster risk reduction systems.

In general, current uses of ICTs in the context of climate change tend to achieve the objectives of:

- generating, organizing and communicating information about the risks resulting from climate change, climate variability and extreme climate events, as well as preparing for their effects on food security and water supply;
- developing information systems within the food sector that are better able to reflect household access to food and food consumption;
- developing early warning and hazard risk information systems to deal with the additional fire hazards associated with climate change and to enable integrated fire management; and
- developing ICT mapping tools to map vulnerable areas and provide spatial representations of climate change impacts.

OPPORTUNITIES AND CHALLENGES

3.3

ICTs for
CLIMATE CHANGE
ADAPTATION
in Africa

Programmes and projects across Africa confirm the importance of interventions in several areas of activity. These include:

- monitoring and measurement of climate impacts, including weather systems, the impact of weather/climate on natural resources such as water (sea levels, rainfall) and weather-dependent economic sectors (agriculture, forestry, fisheries), and the potential impact of climate change on health;
- early-warning systems concerned particularly with acute events resulting from climate variability and climate change;
- knowledge-sharing between intergovernmental and national government agencies, businesses and academic institutions that have the capacity and/or the responsibility for designing or coordinating responses to climate change;
- implementation of small-scale activities to protect lives and livelihoods in vulnerable communities and to support the lifestyle and behavioural changes needed to enable survival and prosperity in contexts that are

changing as a result of climate variability or climate change; and

- transmission of information and advice to and between local communities on impacts that they may experience, actions that they could take to protect themselves against sudden (weather-induced) crises, and potential lifestyle and behavioural changes that could help to secure their lives and livelihoods in the longer term.

These practical applications use a wide variety of technologies which are interconnected using existing communications networks and services, including:

- high-value remote monitoring equipment such as satellites;
- networks of remote sensors;
- global positioning and GIS applications;
- communications services such as the internet, mobile networks and SMS; and
- handheld devices such as mobile phones and PDAs.

It is clear that there are important shortfalls in current adaptation policy and practice and in the application of ICTs to adaptation.

- While nearly all African countries have ratified the UNFCCC and so committed themselves to taking action to reduce their vulnerability to climate change, there is a big gap at present between strategy development and implementation activity. Adaptation has not yet become effectively mainstreamed into development planning in many countries, and remains absent from many comprehensive national development strategies.
- ICTs, likewise, have not yet become effectively integrated into adaptation planning. The potential of ICT-related interventions is insufficiently explored in NAPAs and other adaptation strategies and rarely integrated into comprehensive thinking about how adaptation can best be achieved. This leads to under-use of ICTs in programmes and projects which are associated with these strategies.
- Most ICT-related interventions which are currently taking place are either at a macro or a micro level – intergovernmental dialogue, national strategies, large-scale projects such as weather monitoring by satellite and large-scale sensor networks; or projects aimed at increasing awareness and information for vulnerable communities and individuals which will help them identify and manage their own adaptation needs. There is a shortage of the meso level activity which is essential in bridging the gap between grand strategies and local circumstances.
- Use of ICTs to support adaptation to climate change is concentrated in a small number of development domains, notably agriculture, water and coastal zone management. The degree to which these actions, and adaptation efforts more broadly, are coordinated with the broader development objectives of African countries varies from country to country, and generally could be strengthened. As ICTs can have a pervasive impact across the spectrum of development, their use at the community level also could be expanded to more holistically encompass the diversity of adaptation needs in different sectors at the local level.

The evidence that emerges nevertheless confirms that ICTs do have significant potential value in adaptation and that this potential should be exploited more effectively. More attention, in particular, should be paid to:

- high-level meteorological and other climate monitoring, using satellites, sensors and other ICTs, and associated early warning systems;
- knowledge-sharing among climate change and development professionals; and
- using locally available communications media (broadcast services and mobile phones, and internet as it becomes more readily available) to support local communities' adaptation efforts with information and advice, and to integrate local information and knowledge more effectively into large-scale planning.

A number of factors will be critical to enabling governments and development partners to maximize the value of ICTs' potential. These include:

- improvements in the availability and quality of communications networks, including rapid progress toward ubiquity in the availability of mobile networks, rapid growth in broadband networks, and lower prices for end-users in communications markets;
- commitment on the part of political leaders and development policy-makers to integrate adaptation effectively in development planning and to integrate ICTs effectively in adaptation;
- awareness-raising and capacity-building at all levels, from decision-makers to residents in vulnerable communities, concerning the importance of adaptation to climate change, the ways in which adaptation can be achieved, and the potential role of ICTs in this regard;
- improved governance that is capable of taking advantage of better information resources and translating strategy more effectively into implementation on the ground; and
- the financial resources required to achieve these goals.



CASE STUDIES

3.4

In reviewing the evidence on the use of ICTs in climate change adaptation in Africa, three country case studies were conducted. These studies paid particular attention to:

- adaptation and agriculture: the needs of farmers in Uganda and the role that community knowledge workers play as local information brokers for sharing knowledge that can aid in adaptation (see Box 3.1).

Box 3.1

Climate change adaptation in agriculture – the role of Community Knowledge Workers in Uganda

Established by the Grameen Foundation, Community Knowledge Workers (CKWs) in Uganda are a network of locally-based “trusted intermediaries” who interface between content producers and smallholder farmer groups. They conduct mobile based surveys of their communities, and act as the conduit for dissemination of centralized information to community farmers. The objectives of the CKWs include improvements in farm productivity, increases in revenue and the collection of information that can help farmers to meet their needs. Specific types of information that the CKWs transmit which are relevant to climate change adaptation include:

- advice on land preparation based on available weather forecasts, especially expected rainfall;
- information on pests (farmers can send pictures of an infested crop and seek diagnostic advice);
- information about value-chains, market prices and opportunities; and

- Information about available storage facilities.

CKWs are themselves farmers and are elected by fellow members of local cooperative farmer groups. They must speak English, must be judged innovative in their farming practices, must be willing to serve their communities, and must aspire to meet target objectives which are regularly checked and monitored through an online dashboard. They are incentivized with a rented smartphone kit which is preloaded with applications concerned with crop production such as land preparation and weather projections; a solar or bicycle operated battery recharge system to power community cell phones; and a shirt, hat and vest to indicate their role.

By July 2011, over 20,000 farmers and households had registered to receive information by a total of 463 CKWs. The initiative aimed to achieve a total of 800 CKWs by the end of 2011.

- adaptation knowledge sharing among policy makers and practitioners: the use of knowledge-sharing platforms in Senegal such as AfricaAdapt (see Box 3.2).

Box 3.2

Adaptation and knowledge sharing for decision making

Senegal: AfricaAdapt - knowledge sharing for adaptation:

AfricaAdapt aims to facilitate the flow of climate change adaptation knowledge for sustainable livelihoods between researchers, policy-makers, civil society organizations and communities that are vulnerable to climate variability and climate change across the continent. This distributed community of practice (CoP) is supported by a website that lists face-to-face events and allows members to upload their profiles and showcase their work. AfricaAdapt is animated by four network conveners (called Knowledge Sharing Officers), one from each of the main partners.

Other applications with potential for adaptation, information gathering, knowledge sharing and decision support:

- Satellite and remote sensing – The number and range of remote sensing (RS) infrastructure and applications has continued to grow in Africa, though this is primarily located in a few countries (South

Africa, Nigeria and Algeria). Limited financial resources and the challenge of establishing strong academic and research bases have contributed to the slow uptake of remote sensing on the continent. African remote sensing data, information and applications have been used in many different sectors, including agriculture and rural development, climate and weather analysis, exploitation of natural resources, forestry, natural disaster and water resources management.

- The South African Risk and Vulnerability Atlas (SARVA). This electronic spatial database directly supports access to and visualization of data about the impact of global change (including climate change) on human and natural environments. The Atlas initiative provides access to a large collection of scientific data and knowledge, including climate and weather related datasets including forecasts of rainfall, wind and temperature, seasonal forecasts, and climate change projections for rainfall, temperature and circulation.

- adaptation and water: the management of water in Malawi through community based participatory geographic information systems (see Box 3.3).

Box 3.3

Adaptation and water management: Participatory Geographic Information Systems (PGIS) in Malawi

Mangochi is an old town set on the west bank of the Shire River, which flows between Lakes Malawi and Malombe, and is close to important forest reserves and nature parks. Using Participatory Geographic Information Systems (PGIS) and problem tree analysis, deforestation has been identified as a major environmental problem that has left much of the area's customary land bare, leading to soil erosion, loss of soil fertility, siltation of rivers and water holes, loss of biodiversity and flooding in low lying areas around the Malombe and Shire Valley.

The PGIS project established to address the problem of deforestation was conducted in a study area of nine village communities that are within 500 metres of a water body (as stipulated by the National Water Policy), and 2000 metres of a source of fuel for food supply. Its objective was to engage government officials and local communities in the process of participatory decision making for environmental and natural resource management. Through this process, it aimed to establish a baseline assessment and to investigate



climate change adaptation strategies concerned with access to forest resources, food security and the availability of water for irrigated agriculture and domestic consumption.

As part of the programme's work, communities were trained and required to map their villages using GPS devices, to generate maps of their own communities, and to create a centrally located model that can be used to determine current and future water needs. The outcome of the project suggested that men produced less detailed maps than women, who more

precisely located fuel, water, forestry and areas prone to floods and droughts. The exercise illustrated the extensive knowledge of the immediate local community as well as its susceptibility to the impacts of climate change or variability. Communities were empowered by the initiative which improved their understanding of the presence or lack of resources in their immediate surroundings, of climatic variations and of approaches to developing communal adaptation strategies, including long-term strategies. It also improved communities' capacity to negotiate with government agencies over issues such as the location of water points.

While the case studies have been presented through the sector lenses of agriculture and livelihoods, knowledge management and water management, it is important also

to consider the various applications aligned according to the ICTs and adaptation framework, as shown in Table 3.1.

Table 3.1 ICTs and climate change adaptation framework

TOOL & APPLICATION CATEGORIES		CONTINUUM OF ADAPTATION ACTIVITIES				
			Addressing Drivers of Vulnerability	Building Response Capacity	Managing Climate Risk	Confronting Climate Change
Scale	Examples	Policy Considerations	Examples: Micro-credit schemes; immunization programmes	Examples: Improving information and communications infrastructure; training in GIS technology	Examples: Introduction of drought-resistant crops; emergency response systems	Examples: Reducing potential for glacial lake outburst flood; building sea walls
Large scale implementations of ICTs	<ul style="list-style-type: none"> • Early warning Systems • Weather Management • MET Systems • Satellite and Remote Sensing Systems 	<ul style="list-style-type: none"> • Open Data Policies • Acquisition 	<ul style="list-style-type: none"> • Increasing the number of weather stations (METs) • Satellite and remote sensing systems 		<ul style="list-style-type: none"> • Distance early warning system • Community flood information system 	
	<ul style="list-style-type: none"> • Smart Systems • Sensor Networks 	<ul style="list-style-type: none"> • Infrastructure deployment 	<ul style="list-style-type: none"> • Hartebeespoort Dam programme 		<ul style="list-style-type: none"> • Himalayas glacial lakes sensors 	
	<ul style="list-style-type: none"> • Geographic Information Systems • Global Positioning Systems • Modelling 	<ul style="list-style-type: none"> • Capacity building, training, and education 	<ul style="list-style-type: none"> • Malawi Participatory GIS • Water-related information system, Mekong Delta (WISDOM) 		<ul style="list-style-type: none"> • South Africa Risk and Vulnerability Atlas • PRECIS regional climate modelling system 	
Small scale implementations of ICTs	<ul style="list-style-type: none"> • Knowledge Management Systems • Information Sharing Systems • Planning and decision tools 	<ul style="list-style-type: none"> • Communication strategies • Public information, outreach and awareness • Partnerships 	<ul style="list-style-type: none"> • Uganda Community Knowledge workers • AfricaAdapt • Ushahidi 		<ul style="list-style-type: none"> • Open Risk Data Initiative • Climate Change Explorer Tool • AfricaAdapt • Ushahidi 	
	<ul style="list-style-type: none"> • Mobile Phone Applications • General Packet Radio Systems (GPRS) 	<ul style="list-style-type: none"> • Access and Affordability of Access 	<ul style="list-style-type: none"> • MPESA • TextToChange 		<ul style="list-style-type: none"> • Kilimo Salama 	

Vulnerability Focus

Impact Focus



RECOMMENDATIONS

Three broad observations should pervade the thinking of governments and development partners in this field of ICTs and climate change adaptation:

1. Understanding local circumstances – the ecosystem itself and its social and cultural environment – is essential if adaptation interventions are to be successful. In this field, as in others, large-scale programmes will only work if they respond to the granularity of local contexts.
2. Reliable, high quality communications infrastructure is essential for the effective use of ICTs. Technology can only deliver services and applications if that underlying infrastructure is available. It needs strengthening across the continent.
3. Human skills are just as essential to the application of ICTs for adaptation as infrastructure, equipment and applications. ICTs can play a crucial role in supporting public outreach and building awareness of the impact of climate change and adaptation, as well as offering opportunities to address those challenges.

Recommendations for government and development partners

RECOMMENDATION 3.1

Use a systematic framework to structure thinking

A systematic framework, such as that illustrated in Figure 3.1, is fundamental to structuring the approach to the role of ICTs in adapting to climate change. Such a framework should focus on:

- reducing vulnerability, such as on ICTs that contribute to improvements in health, food, nutrition and other social drivers of vulnerability; and
- building adaptive capacity, such as on ICT-enabled interventions in the water and agriculture sectors, on weather prospects and water hazards, land management and adaptive capacity of farmers and pastoralists.

In addressing direct impacts of climate change, the framework should focus on:

- developing climate change projections at national, regional and sectoral levels; and
- programme and project interventions in urban planning; coastal and water resources management, the establishment and management of early warning systems, and the delivery of disaster and emergency relief.



RECOMMENDATION 3.2

Build capacity for integrating ICTs into national strategic adaptation plans

Building the capacity for integrating ICTs into adaptation policy development will have significant benefits. Particular attention should be paid to including more detailed application of ICTs in National Adaptation Plans in LDCs and adaptation planning efforts in other countries. Traditional bureaucratic “silos” separate environment, climate change and adaptation policy makers and planners from those working on ICTs and telecommunications. Planned interventions should be undertaken to bring those responsible for adaptation policy and planning (particularly National Adaptation Plans) together with ICT/telecommunications government staff to work together for more effective planning and implementation.

RECOMMENDATION 3.3

Involve the private sector more extensively in planning and implementation

Engagement of the ICT private sector in climate change adaptation is less substantial and widespread than it is in mitigation, where the private sector is directly involved in developing clean technologies, energy efficiency, dematerialization to reduce carbon footprints and other areas of innovation. More work is needed to engage strategically with the private ICT sector, to review where privately motivated interests in applications could directly or serendipitously enhance adaptation while also delivering commercial value.

Recommendations for governments and donors

RECOMMENDATION 3.4

Embed ICT planning in the adaptation planning process

Use of ICTs should be embedded in the adaptation planning processes that are already underway in most African countries. In particular, for the LDCs, the preparation of second generation National Adaptation Plans should be seen as a window of opportunity for the inclusion of ICT-relevant interventions. Preparation for these should include a capacity building programme to review where and how investments in ICTs might be best integrated within these plans.

RECOMMENDATION 3.5

Develop open data policies across Africa

Access to data is a fundamental requirement for adaptation planning. Model policy frameworks and guidance could be developed for countries across Africa, with a view to making environmental and meteorological data open to all interests (public, academic, and private).

RECOMMENDATION 3.6

Invest in tools and infrastructure

There is considerable scope to invest in tools and infrastructure that will have a direct impact on knowledge of current and projected climate change impacts. These include:

- early warning systems, weather management, meteorological systems, satellite and remote sensing systems;
- smart systems and sensor networks;
- geographic information systems/modelling/planning and decision-making tools;
- knowledge management systems, information sharing systems, planning and decision-making tools; and
- mobile phone applications and GPRS.

RECOMMENDATION 3.7

Support for the sharing of knowledge and action for adaptation

Adaptation policy makers and planners need to be able to connect with and learn from one another about what is working and what is not – and this knowledge exchange needs to be informed by real experience on the ground. Two major gaps need to be addressed:

- mechanisms for sharing information between platforms, and for meta-level search-and-retrieval access across all platforms; and
- mechanisms for managing, sharing and developing flows of communication with vulnerable communities.

The potential for using crowd-sourcing techniques to address these gaps should be explored, particularly those that are enabled by mobile phones, to generate real-time data on both acute and chronic impacts of climate change.

FURTHER READING



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SOUTER, D., MACLEAN, D., AKOH, B., and CREECH, H.

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For a more detailed presentation on the role of ICT in climate change adaptation in Africa, see the full eTransform Africa sector report:
<http://www.etransformafrica.org>

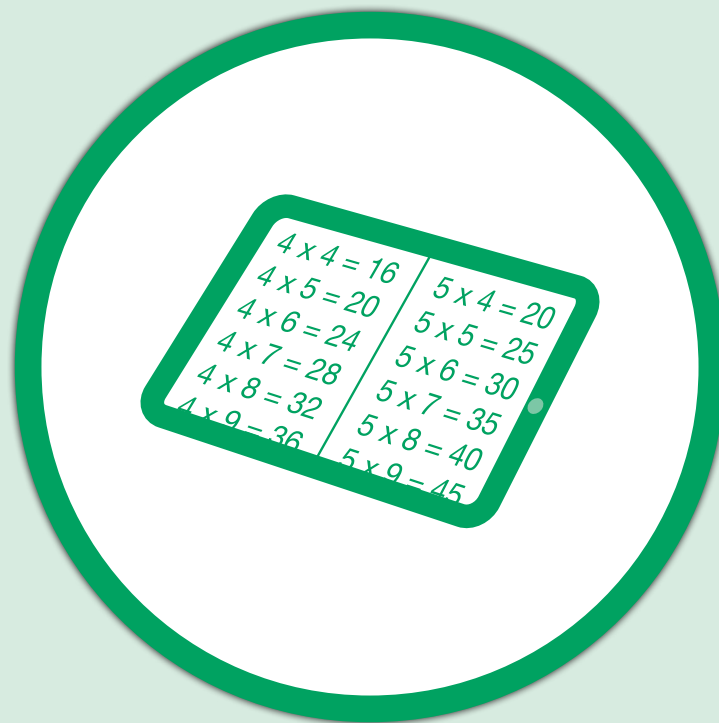


chapter

4

*The Transformational Use
of Information and
Communication Technologies
in Africa*

EDUCATION



1. Introduction

2. Landscape analysis

3. Opportunities and challenges

Establishing an enabling policy environment
Widening access to ICT infrastructure and connectivity
Providing increased connectivity to support education and learning
Harnessing ICT to improve management and administration
Harnessing Open Educational Resources

Building human capacity
Challenges

4. Case studies

5. Recommendations

For policy makers and regulators
For development partners

Further reading

4.1

INTRODUCTION

The future development of Africa and its participation in the knowledge society will be greatly influenced by how Africa manages to deliver quality education to its citizens. The African Union specifically acknowledges this in its Second Decade of Education for Africa (2006–2015) Plan of Action:

Education forms the basis for developing innovation, science and technology, in order to harness our resources, industrialise, and participate in the global knowledge economy and for Africa to take its rightful place in the global community. It is also the means by which Africa will entrench a culture of peace, gender equality and positive African values.

While ICT has been used in many parts of the world to improve the quality and increase access to education, most African countries still face the challenge that increased expenditure on education is not necessarily achieving the

expected benefits. This chapter examines the potential for the use of ICT to support improvement and transformation of the education sector in Africa, including brief case studies of South Africa, Uganda and Senegal. It identifies specific opportunities and challenges, and recommends areas of intervention for governments, development partners and other stakeholders. It looks in particular at the following five areas:

- teacher professional development;
- digital learning resources;
- affordable technologies;
- education management information systems (EMIS); and
- National Research and Education Networks (NRENs).

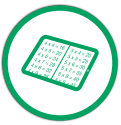
4.2

LANDSCAPE ANALYSIS

In Africa, many governments have focused on developing national ICT policies and National Information and Communication Infrastructure Plans to support their socio-economic development efforts and policies for ICT in education. Several African governments are prioritizing the use of

ICT in education, in order to achieve critical strategic developmental objectives – or at least agreeing policies to do this.

Developing countries, however, have experienced difficulties in adapting policies and regulations to rapid



changes in technology and market structure. In some instances, policies concerned with ICT and education are not complemented by policies in other relevant areas, such as telecommunications, that support such development. Furthermore, ICT policies are not always accompanied by detailed implementation plans or commitment from government to implement them.

Increasingly, investment in ICT is being seen by education institutions as a necessary part of establishing their competitive advantage, because it is attractive to students and is also deemed essential by governments, parents, employers and funders of higher education. Despite this, there is no direct correlation between increased spending on ICT and improved education performance.

Benefit and impact, to the extent that they can be reliably measured, are more functions of how ICT is deployed than of what technologies are used.

The growth of knowledge societies has placed increasing emphasis on the need to ensure that people are information-literate. However, it is important to consider expanded definitions of information literacy that are based on mastering underlying concepts rather than on specialized skill sets. Education systems need to develop and establish methods for teaching and evaluating these critical literacies at all levels of education.

ICT can facilitate a transition of the role of the teacher in the classroom into that of an instructional manager helping to guide students through individualized learning pathways, identifying relevant learning resources,

creating collaborative learning opportunities, and providing insight and support both during formal class time and outside of contact time. Unfortunately, however, most professional development programmes tend to concentrate on teaching educators how to use the technology itself. Professional development needs to focus on how to mentor and guide learners in this environment.

At the same time, the emergence of the concept of Open Education Resources (OER) has led to growth in the collective generation and sharing of content by networked groups of people, and in the proliferation of technologies that enable cheap information-sharing and collaboration. The digitization of information in all media has also, meanwhile, introduced significant challenges concerning intellectual property.

ICT is reducing barriers to entry for potential competitors to traditional education institutions by reducing the importance of geographical distance, enabling potential new efficiencies in overheads and the logistical requirements of running education programmes and research agencies, and expanding cheap access to information resources. As a result, there has been significant growth in the number of distance education programmes in which teachers and students are physically separated, and in which teaching and learning take place by means of individual technologies or combinations of technologies.

Mobile and personal technology platforms are increasingly seen as appropriate for services of all kinds. The capabilities of mobile and personal devices have grown, driven partly by the increasing availability of digital materials and applications.

OPPORTUNITIES AND CHALLENGES

4.3

ICTs for
EDUCATION
in Africa

Planning for new interventions which aim to harness ICT to improve education must begin with contextualized needs analysis and careful preparation which takes account of the realities within which implementation will

take place. There is no single right approach which suits all educational environments but there are a number of general opportunities which are worth noting:

Establishing an enabling policy environment

Establishing an enabling policy environment, or reviewing what is in place to ensure sufficiency, is a major opportunity for many countries (see Box 4.1). South Africa and Egypt are examples of countries that have achieved significant progress in the integration of ICT in education through enabling policy environments, supported by appropriate institutional and regulatory structures. They illustrate that, where there has been significant scaling up of ICT integration into teaching and learning, implementation has been carried out through cross-sectoral collaboration between ministries of education and other sectors. An enabling policy environment includes policies and

initiatives that help to drive the national ICT agenda, and includes policy on ICTs in education, bandwidth and connectivity. Existing education policies in most African countries need thorough review and updating to ensure that the policy for ICT in education supports and is supported by complementary policies for education as a whole. Additionally, all education legislation should be reviewed and updated to safeguard against legal and conceptual contradictions created by ICT in education policies. Most important is the need to align resource allocations and budgets with priorities defined in these new policy positions.

Box 4.1

Establishing an enabling policy environment

While responsibility for the management of schools is shared between national and provincial government in South Africa, all priorities and programmes are in line with national policy determined by the national government. South Africa has a number of cross-sectoral and mutually supportive policies. Successful implementation of policy requires enabling institutional arrangements. South Africa has several public entities and agencies concerned with ICT, as well as a national commission to advise on ICT development in the country. These support ICT in education in various ways as part of their mandates.

Uganda first developed a National ICT Policy framework in 2003. While there is a draft education

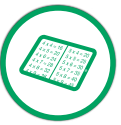
sector-specific ICT policy, this draft, at the time of this study, was still with Cabinet for ratification. The absence of an approved policy and strategy for ICT in education is the most likely cause of a lack of common focus and direction among many, largely donor-driven, initiatives for ICT in education.

Senegal, on the other hand has the necessary policy environment for ICT in education, but has seen limited real progress. Adopted in 2009, the policy has yet to have any significant impact on the state of ICT in education. This suggests that Senegal still has to put in place a more comprehensive range of related policies in order to achieve success.

Widening access to ICT infrastructure and connectivity

Widening access to ICT infrastructure and connectivity is another priority. It is important first to harness devices that teachers and learners already own. The proliferation of mobile phones has meant that more learners have access to ICT devices than ever before, offering opportunities in terms of sustainability and scalability. A number of pilot projects are testing the use of mobile phones to support educational activities and some, such as the Yoza and Math for Mobile projects in South Africa, are seeking to

exploit this high level of access to learning on an increasingly large scale (see Box 4.2). However, mobile phones may not be the most appropriate platform to address a particular educational need, and may present challenges of access, cost and usability. As technology costs decline further, other devices (such as laptops and tablets) are likely to become more affordable and accessible platforms for both teachers and learners.



Box 4.2

Widening access to ICT infrastructure and connectivity

Alongside a vibrant private sector, the government of South Africa has invested substantially to develop the country's telecommunications sector. It has made considerable strides in the electrification of schools, with more than 85 per cent of public schools covered by 2009. South Africa also has initiatives in place to provide computer laboratories in schools and connect them to the internet.

Because of the high penetration of mobile technology in the country, especially among the young, South Africa is piloting projects that make use of mobile technology for learning. South African universities are also making use of mobile technologies to support academic administration and community work.

In the absence of an enabling policy environment in Uganda, it is not surprising that – apart from

donor-driven projects supplemented by initiatives of the communications regulator, the Uganda Communications Commission – there has been no coordinated effort yet to address access and connectivity for schools. The overwhelming majority of schools in Uganda – primary and secondary – lack access to both the internet and power.

In Senegal, telecommunications operators are the main players in the extension of internet connectivity to schools. There are, in addition, a number of externally funded projects aimed at providing access to schools, the largest to date being the USAID Basic Education project (USAID/EDB). All of these were initiated before the adoption of an ICT in education policy. The impact of this policy in directing donor-funded projects remains to be seen.

Models of shared access to mobile devices, as well as those focused on teacher access, are more realistic from the perspectives of cost and support than one-to-one computer access. These devices can be moved around within schools, and can therefore be more easily integrated into classroom teaching.

One-to-one computing strategies may be suitable for providing access to teachers. If they have laptops or netbooks, they can use these to engage in informal learning at their own pace, to source and develop materials, and to design and project lessons. This approach is being explored in countries including South Africa (Teacher Laptop Initiative) and Kenya (Laptops for Teachers Programme).

Providing increased connectivity to support education and learning

The increasing *rollout of competitive fibre to Africa and within African countries* and greater *penetration of wireless and mobile platforms* have expanded opportunities for connectivity and broadband access. Wi-Fi and WiMAX especially create the opportunity for wide scale deployment of wireless access devices.

The *emergence of National Research and Education Networks (NRENs)* in Africa over the past ten years has

created an important opportunity to extend affordable non-commercial broadband to education institutions. South Africa and Kenya stand out as examples where a combination of sector liberalization and government investment in connectivity to education, working with NRENs, has led to prices falling to less than 10 per cent of what they were three years ago.

Harnessing ICT to improve management and administration

There is also value in *harnessing ICT to improve educational management and administration* (see Box 4.3). One major problem with current management information systems is the lack of adequate and well-designed policies and strategies for the collection and use of educational information by both governments and individual institutions. There is a need to support African governments so that they can formulate cost-effective and sustainable strategies for educational data collection and use, and for the development of indicators that enable

the monitoring of national and regional education performance. There is also a need to upgrade current Educational Management Information Systems (EMIS) through the adoption of web-enabled tools, and for the sharing of knowledge on requirements, challenges and opportunities. The National Education Statistical Information System (NESIS) programme, which has been promoted by the Association for Education Development in Africa (ADEA) provides a platform to promote policy and other capacity support for EMIS development in Africa.

Box 4.3

Harnessing ICT to improve management and administration

South Africa has established a comprehensive range of EMIS platforms that cover the acquisition, processing, dissemination and reporting of education data at the national level, and within different education strata.

In Uganda, several development partners – including the World Bank, USAID and DFID – have at different times supported EMIS, including decentralization to districts and the incorporation of GIS capability into the system. EMIS in Uganda has, nevertheless, faced several challenges, including unreliability of data, challenges in decentralization resulting from a lack of human capacity in EMIS and equipment maintenance,

and challenges in sustainability resulting especially from connectivity costs. In addition, the data collected are only used at the centre: they are not yet used to support decision-making by schools or districts.

In Senegal, there are centrally managed systems for collecting educational statistics at all levels of education. There are also systems for managing examinations, finance, and human resources. Most of these are internally developed, pointing to the fact that Senegal has made significant progress both in capacity development and in implementing EMIS.

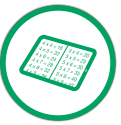
Open source platforms provide another opportunity for African countries, though they require expert human capacity. One example is OpenEMIS, which was sponsored by UNESCO. OpenEMIS allows database administrators

to adapt a generic tool to the specific characteristics of their national education system and to customize the components of the information system appropriately.

Harnessing Open Educational Resources

The growth of Open Educational Resources (OER) and the communities around them provides a significant opportunity to improve access to and use of high quality educational materials (see Box 4.4), of which African governments and educators can take advantage.

Developments include those, such as OER Africa and the Teacher Education for Sub-Saharan Africa (TESSA) Initiative, which are involved in promoting and supporting the creation and use of OER in Africa.



Box 4.4

Harnessing digital learning resources

Several initiatives provide free educational resources in South Africa. The Thutong portal, run by the Department of Basic Education, has resources on curriculum and examinations, teacher development, school administration and management. Mindset Network, an NGO, has been distributing high-quality materials for the schooling and health sectors openly and freely. The Siyavula project, founded in 2008, works with teachers to develop teaching and learning materials in collaboration and then share them through an open licence agreement.

Uganda does not have any significant initiative to produce OER, either in the public or private domains. Senegal, on the other hand, has made considerable progress in developing digital learning resources. At the national level, the Ministry of Education has collaborated in the development of an education portal through which teachers can download learning resources and adapt them to local needs. The portal also provides a training space that allows teachers to take courses, participate in collaborative work and engage with peers and experts.

The transformative educational potential of OER revolves around increased availability of relevant high-quality learning materials that can contribute to more productive work by students and educators. The principle of allowing adaptation of materials also provides a mechanism to develop roles for students as active participants in educational processes. OER has the potential to build capacity by providing institutions and educators, at little or no cost, with access to the means to develop their competence in producing educational materials and to carry the necessary instructional design to integrate such materials into high quality programmes of learning. NGOs and the private sector are active in the generation of OER, offering opportunities for collaboration with governments and educational institutions.

Important challenges to OER development include: the need to ensure that the resulting products are educationally effective and of a high standard; provision of adequate ICT infrastructure and connectivity; buy-in from those academics and educators who are not yet aware of the benefits and possibilities; adjustments to staff workload to enable participation in content creation and adaptation processes; capacity to develop and adapt OER resources; and hidden costs associated with search and adaptation. There is also a need to develop enabling policies for intellectual property rights, human resource benefits, and quality assurance.

Building human capacity

Building sufficient and competent human capacity remains a challenge for most African countries. Countries that have developed a national strategy for professional development find it easier to achieve scale in the training of their teachers and in resourcing their professional

development. For example, Namibia's TECH/NA! strategy maps out training of the entire education workforce from ministry to school level, with training of teachers focused on pre-service and in-service training by teacher training colleges.

Box 4.5

Building human capacity

One of the important features of teacher education in South Africa is the National Framework for Professional Teacher Education and Development (NFPTED),

which specifies how ICT can be used to widen access to teacher education, improve teacher-learners' motivation, speed up communication, and provide an

enriched environment for learning. ICT professional development has been integrated into pre-service teacher education by some universities, and there are also many opportunities for in-service teacher professional development in ICT. The training by universities in ICT teacher professional development has been complemented by the efforts of SchoolNet South Africa, which manages three large teacher development programmes: Intel Teach, Microsoft PiL, and the Commonwealth Certificate for ICT Integration.

While both Uganda and Senegal have initiatives aimed at building the capacity of teachers, both countries appear to focus on computer literacy among teachers rather than pedagogical issues around ICT in learning. Uganda has remained at the small-scale pilot level, without any visible plan or strategy for national level expansion. Senegal, in addition to participating in international programmes like Microsoft PiL and iEARN, has some national level initiatives that address both pre-service and in-service training.

There are parameters for good practice which inform the strategy for professional development for ICT integration that can be taken on board in African countries. Those developed within the NEPAD e-Schools Initiative advocate a holistic multi-stakeholder, multi-modal delivery approach to professional development, specifying that all educational role-players should “possess the skills and competence required to use ICT effectively in their daily lives”. In addition, “ongoing educational opportunities – formal, non-formal, and informal – [should be] made available to, and...used by, all of these groups of people to further develop their educational ICT competence”. Opportunities

for teacher competence development include worldwide and regional programmes such as iEARN, which is available in 29 countries on the African continent.

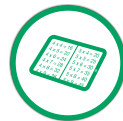
Because of their reliance on teachers themselves to contribute and sustain them, communities of practice offer a cost-effective model of professional development. Teachers that engage in communities of practice are more confident of their work and less afraid to display it for scrutiny and critique by others. Examples include the Partners in Learning Network (PILN), Siyavula, and the Teacher Education in Sub-Saharan Africa (TESSA) Forum.

Challenges

The opportunities for ICTs in education must be understood within a context of challenges and difficulties. These include:

- the absence of comprehensive policies which enable and support interventions and which are supported by clearly defined and resourced strategies for implementation at national level as well as at the level of educational institutions;
- lack of financing and prioritization of ICT investments;
- limited infrastructure of the kind required to support the use of ICT in education;
- lack of capacity at all levels to integrate and support the use of ICT in education effectively;
- lack of necessary ICT skills among teachers, and of the specific training needed to be able to use ICT appropriately in the classroom;
- lack of appropriate content;
- lack of accurate, comprehensive, up-to-date data on education; and
- the tendency of ICT to accentuate social, cultural and economic disparities.

It is generally believed that ICT can empower teachers and learners, promote change, and foster the development of 21st century skills, but data to support these perceived benefits from ICT are limited and evidence of effective impact remains elusive.



CASE STUDIES

4.4

ICTs for
EDUCATION
in Africa

Three country case studies, of South Africa, Uganda and Senegal, were conducted to enable a deeper examination of success factors and challenges.

South Africa provides an example of a country which is at a comparatively advanced stage of implementing ICT in education. Uganda offers lessons for countries where there has been some effort to introduce ICT in education, and where the education sector appears vibrant, but where there is no coordinated framework. Senegal, like South Africa, was one of the early pioneers of ICT in education, has a reasonably well-developed framework and, according to all indications in the literature, has a vibrant education sector. However, the UNDP Human Development Report 2010 education indicators point to educational outcomes well behind those in South Africa and Uganda.

The progress of South Africa, Uganda and Senegal against the challenges identified above is briefly outlined in Boxes 4.1–4.5. The case study countries, through their achievements and challenges, suggest the following lessons:

1. A robust policy environment that supports the ICT in education policy is an enabling, but not sufficient, condition for ICT roll-out.
2. Policy requires supportive institutional arrangements that may necessitate central-level coordination.
3. ICT integration in education requires national budget support as well as nationally driven partnerships with the private sector. Total reliance on donor-funded projects that are necessarily driven by differing donor agendas will lead to standalone projects that are not sustainable.
4. National ownership and sustainability planning are critical in all initiatives if they are to go beyond the novelty pilot level to nationwide projects that have real impact.
5. Success of integration of ICT in education requires a change of focus from computer literacy for teachers to understanding ICT integration in education from the pedagogic perspective.



RECOMMENDATIONS

For policy makers and regulators

RECOMMENDATION 4.1

Establish an enabling policy environment

Ensure that all investments in ICT in education (including those made by governments, development partners, individual educational institutions and NGOs) are directed by a single, integrated ICT-in-education strategy so that they are working towards common national strategic objectives. To be effective, strategies should be developed through appropriate processes of consultation within countries, in order to ensure that there is strong consensus on the proposed approaches by all major stakeholders, combined with buy-in to the strategic objectives that have been defined.

RECOMMENDATION 4.2

Widen access to ICT infrastructure and connectivity

Implement programmes that enable students, teachers, and administrators to gain access to, or own suitable computing devices, and that support the development of NRENs as a means to enable resource-sharing and collaboration.

RECOMMENDATION 4.3

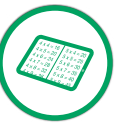
Harness ICT to improve management and administration

Promote data-driven decision-making at all levels. The focus on data usage at all levels implies that investment in future EMIS development should focus on schools, colleges and universities that provide the data.

RECOMMENDATION 4.4

Harness digital learning resources

Consider judicious investments in content creation and aggregation to ensure compliance with African curricula and/or local language demands, motivating usage by educators and students. In the first instance, priority content could be derived from open content sources. If suitable content is not available, it will be useful to identify and invest in priority content development focus areas.

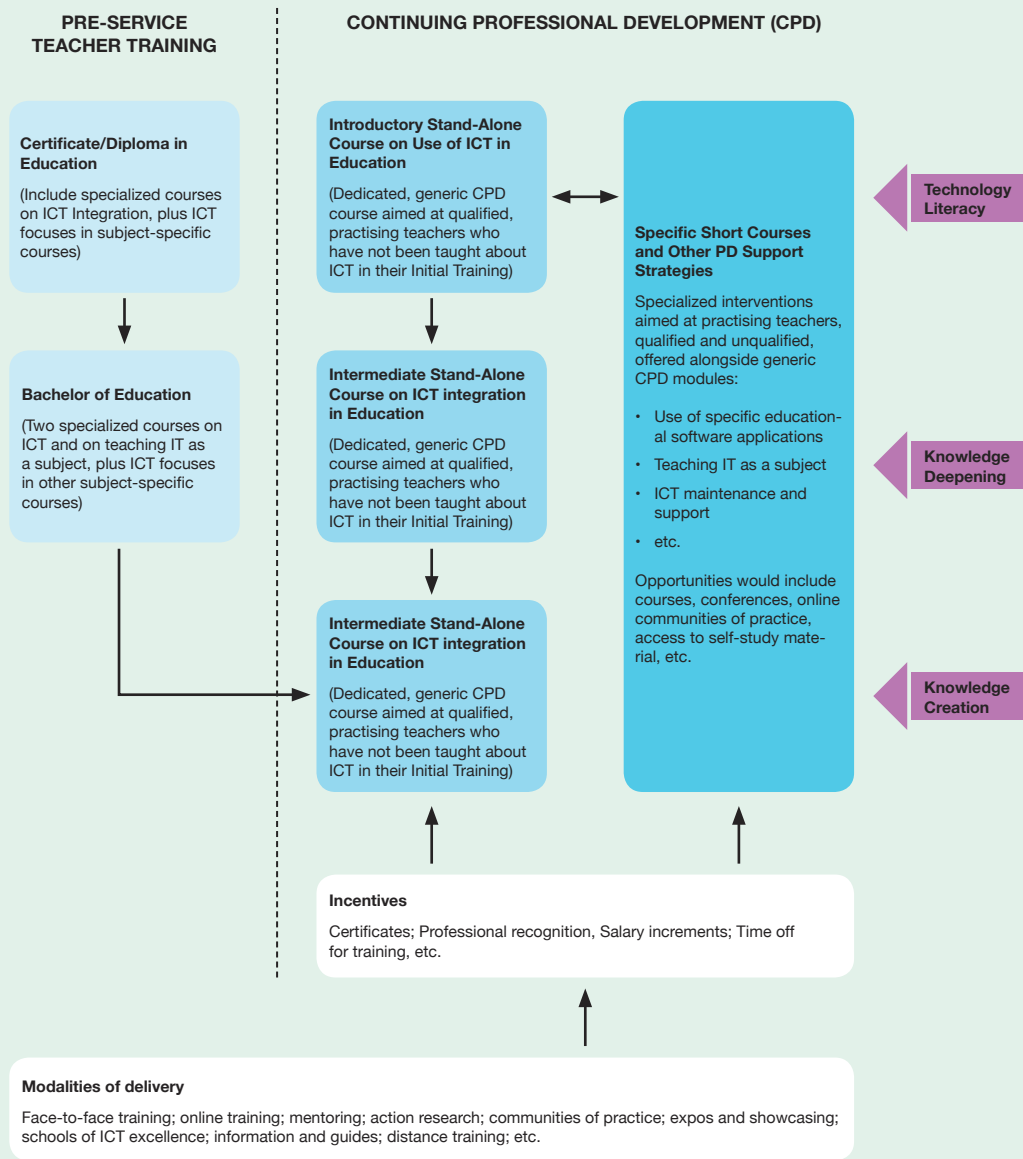


RECOMMENDATION 4.5

Build human capacity

Adopt a suitable global professional development framework to guide national implementation of ICT in education professional development. The UNESCO ICT Competence Standards for Teachers and Teacher Training (CFT) is a good starting point for planning professional development strategies at national level. Figure 4.1 presents a model for such a framework, based on the approach that Guyana has used to develop a professional development for ICT integration strategy using the UNESCO ICT Competency Framework.

Figure 4.1 **Illustrative model of national framework for ICT professional development**



For development partners

Development partners are potential sources of funding for initiatives which cannot be readily financed from national budgets, as well as potential sources of policy

guidance and expertise. They are especially well positioned to stimulate and support initiatives that are based on cross-border collaboration:

RECOMMENDATION 4.6

Ensure funded projects contribute to national policies and objectives

Often, ICT in education projects initiated by development partners have not been clearly aligned to broader national policies and objectives. Where this has been the case, such projects tend to be unsustainable and may even impede progress in effective roll-out of ICT in education by creating conflicts of interest and unnecessary fragmentation.

RECOMMENDATION 4.7

Consider investment in the enabling policy environment

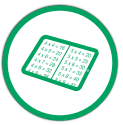
Should national strategy be unclear, development partners should consider support for governments to develop the policy environment, including expert support, financing and capacity building at both national and regional levels.

RECOMMENDATION 4.8

Consider investments to build capacity at a regional or continental level

Regional or continental initiatives can contribute to building capacity that would support policy makers in implementing the kinds of initiatives outlined in this chapter. These might include:

1. development of common, openly licensed course and programme materials;
2. support for the aggregation and release under open licences of digital learning resources produced in African countries, possibly by supporting regional consortia of providers;
3. establishment of platforms for capacity building and knowledge exchange on EMIS deployment;
4. support for the development of NRENs and deployment of associated data networks and applications (e.g. grid-computing, video-conferencing, e-learning, etc); and
5. development of the capacity of policy makers and regulators to enable them to establish more effective ICT in education policies, strategies and regulatory frameworks.



RECOMMENDATION 4.9

Continue to fund pilot projects to test innovative technologies

Technology is still developing rapidly bringing with it new educational opportunities. Experimentation is important, therefore, to test the potential educational applicability of these new technologies and approaches, examine their total cost of ownership and establish their strengths and weaknesses. Often, it is difficult for governments to fund such experimentation, but it remains an essential part of building a knowledge base of best practice. Development partners have a critical role to play in supporting such activities, not least in ensuring pilot projects are well evaluated and the results widely shared.

RECOMMENDATION 4.10

Ensure that intellectual capital generated by funded projects is shared

Adopting policies that lead to release of intellectual capital under open licences (unless there are valid reasons not to do so) and ensuring that this is stored in a sustainable online repository would help significantly to reduce wastage and duplication of investment.

RECOMMENDATION 4.11

Undertake an evaluation and impact assessment of regional initiatives

Investments by donors, and national governments, in this crucial field will be much more productive if they are rooted in independent critical evaluation of regional initiatives at different stages of development and implementation. This will provide better understanding of which initiatives to support and how these can be best supported, reinforced or expanded where appropriate, including support for collaboration between regional initiatives so that they reinforce one another.



FURTHER READING

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(2006) *Second Decade of Education for Africa (2006–2015)*

Plan of Action, Revised August 2006

<http://www.nepad.org/system/files/Second%20Decade%20of%20Education%202006-2015.pdf>

BUTCHER, N.

(2011) *A Basic Guide to Open Educational Resources (OER)*

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<http://www.col.org/resources/publications/Pages/detail.aspx?PID=357>

Educational Technology Debate: Exploring ICT and Learning in Developing Countries

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EduTech: A World Bank Blog on ICT use in Education

<http://blogs.worldbank.org/edutech/>

FARRELL, G. and ISAACS, S.

(2007) *Survey of ICT and Education in Africa: A Summary Report Based on 53 Country Surveys*

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IEG (INDEPENDENT EVALUATION GROUP)

(2011) *Capturing Technology for Development: An Evaluation of World Bank Group Activities in Information and Communication Technologies*

The World Bank Group

http://ieg.worldbankgroup.org/content/dam/ieg/ict/ict_evaluation.pdf

NEIL BUTCHER and ASSOCIATES

(2010) *ICT, Education, Development, and the Knowledge Society*

Thematic paper prepared for GeSCI African Leadership in ICT: Building Leadership Capacities for ICT and Knowledge Societies in Africa

UNESCO

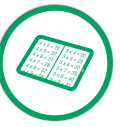
(2011) *UNESCO ICT Competency Framework for Teachers*

UNESCO

<http://unesdoc.unesco.org/images/0021/002134/213475e.pdf>

For a more detailed presentation on the role of ICT in education in Africa, see the full eTransform Africa sector report:

<http://www.etransformafrica.org>





chapter

5

*The Transformational Use
of Information and
Communication Technologies
in Africa*

FINANCIAL SERVICES



1. Introduction

2. Landscape analysis

Opportunities and challenges

3. Case studies

Senegal
Kenya

4. Recommendations

Recommendations for policy makers
Recommendations for donors

Further reading

5.1

INTRODUCTION

The second most populous continent in the world and with abundant natural resources, Africa continues to grow as the world's economy currently stands on shaky ground. However, steady GDP gains are sometimes obscured by the continent's economic, political and social problems. As Africa grows and becomes more tightly integrated with the global economy, its citizens and businesses increasingly need access to financial services tools that will allow them to compete. ICT is one avenue for increasing that access as ICT and financial services complement each other. ICTs allow for greater financial inclusion, and the financial services sector is a primary driver of communications and network technology.

However, the financial services sector has distinct developmental challenges. Issues of trust, consumer protection, and network systemic risks that can slow the pace of progress require clear and strong regulations. The need for policy and regulatory development is made more difficult by the speed of technological change. Nevertheless, strategic intervention through policy or public investment can play a critical role in addressing the challenges faced by the financial services sector. And the rapid pace of technological change can motivate leaders to accelerate policy deliberations, providing this does not lead to regulatory over-reach.

5.2

LANDSCAPE ANALYSIS

It is striking to see the role that ICT and innovative business models have played in the explosive growth of financial inclusion. In Africa, the most visible case is Kenya, where active bank accounts have grown more than four-fold between 2007 and 2012. This process has been aided by M-PESA which had created some 17 million mobile money accounts by early 2012. Transactions through mobile banking service M-PESA exceed US\$375 million each month and account for up to 20 per cent of the nation's GDP.

But Kenya only provides the introduction to a longer story. It took bold thinking and several years for M-PESA to build internal support to get it started. With M-PESA and others now as proof points to reduce risk, new players are entering the market in Kenya and elsewhere, and the time-to-market is reduced. While the pace of adoption may be different from nation to nation, the opportunity is no longer debated; it is just a matter of making it happen.

Summarizing the state of the financial services sector for an entire continent is a daunting task, compounded by



rapid advancements that are underway, many made possible by ICT. Literature on this subject is abundant and useful thanks to concerted efforts at national and international levels to bring attention to both the challenges and opportunities in Africa's financial services sector. Here we focus on the prime objectives of improving financial inclusion and nurturing the growth of micro and small businesses. Attention is also given to those operational and supporting systems necessary for improved service provision for these markets.

According to *Making Finance Work for Africa*:

In Africa, on average, less than 20 percent of households have access to formal financial services, with low population

densities, poor transport and limited communications infrastructure contributing to a lack of supply in extensive regions of the continent.

There are several methods to monitor national progress on improving financial inclusion. Among these, one can assess to what extent financial services are available to a population by quantifying points of access, generally defined as the density of financial institution branches within a country. Alternatively, analysis examines the percentage of the adult population that has deposit or credit accounts. The data indicate that compared to countries in other regions, African nations and their citizens have less access to formal financial services and tools.

Opportunities and challenges

Advances in ICT present unique opportunities for financial services sector development in Africa. These advances touch all facets of the financial services sector ecosystem, from innovations and cost reductions for user access to devices and transmission technology (including the revolution in mobile communications and the growth of broadband internet access), data storage and sharing, security, and analytical processing. All of these will be critical enablers to a thriving financial services sector in Africa. These developments can accelerate the drive towards development goals and allow African nations, historically in the lower ranks of financial sector indices, a way to leapfrog challenges that have afflicted other nations.

Challenges to greater use of ICT in financial services can be broadly grouped into three major categories: consumer challenges, governing and regulatory challenges, and market maturity challenges. These categories, and the major issues that comprise them, are illustrated in Figure 5.1:

Consumer challenges: Many of the efforts to address consumer challenges in financial services have focused on expanding access to the most fundamental services – transactional capabilities and simple market information services that can utilize the growing penetration of mobile phones. As these core capabilities are rolled out, innovators are trying to:

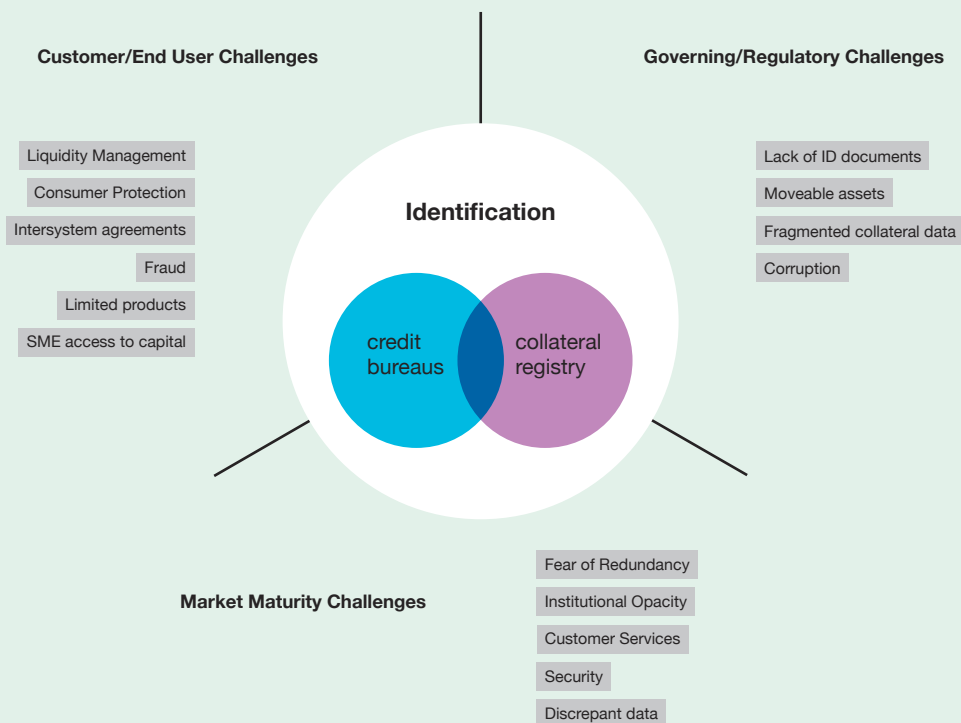
1. build upon consumer acceptance of these new models, and
2. leverage the transactional capabilities to introduce a more diverse portfolio of financial services.

Governing and regulatory challenges: Governance and regulatory demands for developing Africa's financial services sector are in many respects the starting point for advances in the sector. Without transparent roles and responsibilities, commercial interests may decide the unknown risks are too high to make the sizable investments needed for building out networks. In the innovative models of mobile financial services, lack of clarity regarding the roles for financial institutions and mobile operators can cause market fracture or lead to redundant investments that are transferred as costs to the consumer.

Market maturity challenges: Financial inclusion may be limited by a poor competitive environment or a lack of supporting infrastructure. Low levels of interest or understanding by financial institutions in serving low-income populations, the unsuitability of conventional practices (such as brick-and-mortar locations), the relatively weak voice of financial inclusion advocates, and the weakness of credit bureaus and collateral registries all contribute to the relative paucity of financial services products for unbanked populations.

Figure 5.1 next page →

Figure 5.1 **Challenges to greater ICT use in financial services**



Fortunately, there are initiatives underway that seek to address these fundamental challenges. Seven major initiative areas are identified in Table 5.1. Some of these

initiatives and their applicability to African countries are further analysed in the case studies on Senegal and Kenya.

Table 5.1 **Major initiatives to address challenges in financial services**

Challenge area	Key initiatives
Consumer challenges	<ul style="list-style-type: none"> • Transactional friction and retail payments: Methods for making regular payments or deposits in ways that can reduce complexities such as physical proximity to financial institution branches or the identification requirements, such as mobile payment systems • New product development: New products such as savings, lending, and eBanking that appeal to underserved consumers • SME access to capital: Easing access to capital for small businesses through tools like electronic cash registers
Governing and regulatory challenges	<ul style="list-style-type: none"> • Identification: Initiatives to allow registration and identification through mobile or other electronic means • Collateral registry: Integrated collateral registry databases that allow for verification of property and other assets
Market maturity challenges	<ul style="list-style-type: none"> • SaaS for MFIs: Cloud-based IT services that reduce the need for physical financial services infrastructure • Credit bureaus: Use of mobile or other transaction data to establish creditworthiness



CASE STUDIES

5.3

Senegal

Senegal's economy is strengthened by a relatively good infrastructure, openness, the nation's ability to attract investment and ambitious development projects. For a mobile society with a large migrant population, the importance of telecommunication and financial services cannot be overstated. Senegal's ICT sector, in particular, enjoys a steady growth in the area of mobile telephony with

over 68 per cent coverage in 2010. The figure for financial services, although improving, is much lower (16%). However, the barriers to increased financial inclusion in Senegal are quickly disappearing as technology innovations and mobile payment services spread across Africa (see Table 5.2).

Table 5.2 **Senegal's challenges and opportunities for ICT and financial services**

Drivers of growth	Readiness (regulations, infrastructure, demand)	Challenges	Opportunities
ICTs	High	<ul style="list-style-type: none"> • Multiple regulators • Bureaucracy • Slow mobile money services 	<ul style="list-style-type: none"> • Diversification of products/services offered on existing platforms (mobile) • Linking to financial and non-financial services
Financial services	Low-Medium	<ul style="list-style-type: none"> • Up-market focus • Inefficient MFIs • Lack of credit to SMEs and the informal sector • Technology limitations 	<ul style="list-style-type: none"> • Low-cost, down-market banking • Leveraging excessive technological capacity • Diversification of products and delivery platforms
Market players	Medium	<ul style="list-style-type: none"> • Limited knowledge of market • Competition not aggressive enough • Bureaucracy 	<ul style="list-style-type: none"> • Demand-driven product offering • More competition

Some of the factors that have delayed the expansion of financial services in Senegal are limited products, low-risk behaviour, and the lack of interest by banks to serve SMEs and the informal economy. Although there are more than 200 microfinance institutions (MFIs), they suffer from

inadequate capital, a narrow menu of products, a lack of professionalism, and limited technological resources.

Telcos in Senegal could make financial services accessible without the geographic and time limitations that

characterize branch banking. A more aggressive drive to deliver new services, such as the recently launched Orange Money, could transform the landscape if matched by trusted, demand-driven products and flexible customer identification requirements.

Most of the necessary pieces are present in Senegal for significant expansion of financial inclusion. A solid infrastructure, steady economic growth, favourable regulations, and a robust private sector together with high-level government backing of ICT access would help Senegal leverage mobile technology for financial services. In a country where remittances play a significant role, matching the penetration of mobile phones with financial services capable of capturing small transactions is technically possible, but operationally challenging.

Senegal's public sector has not yet offered strong incentives for telcos and banks to form partnerships that profitably serve lower-income markets using mobile platforms. Relatively simple incentives include reducing the layers of bureaucracy. Although MFIs would be natural choices for financial inclusion because of their footprint

in underserved areas, they are not attractive to risk-averse lenders. In order to meet its financial inclusion hopes, Senegal would have to transform the financial landscape by aligning policy and regulatory frameworks. The country should remove barriers to scale by reducing duplicate efforts by MFIs, donors, and the private sector players that offer different mobile financial services.

Significant opportunities exist in Senegal for mobile network operators (MNOs) to expand financial services. Recently launched mobile money transfer services, notably by Orange, are steps in the right direction. Speed to scale, however, remains an issue that challenges mobile payment services, mainly caused by a gap between demand and the types of products offered. With a well-coordinated strategy and policies that favour the poor, Senegal has the potential to become an exemplary performer in financial inclusion. Overall, Senegal is at the tipping point to become one of the top performers in financial services in Africa. Success in Senegal is likely to create a model that can be transferred to the rest of Francophone Africa.

Kenya

Despite the political and ethnic turmoil that it has experienced in the past few years, Kenya's economy is still the largest and most diversified in the East African Community (EAC) and the wider East Africa/Horn of Africa region. Compared to its neighbours, aid only plays a limited role, and Kenya's private sector is known for its resilience. The country serves as a communications hub for the region, and Kenyan firms increasingly aim for a regional footprint. Kenya's labour force is better educated than that of its neighbours, and Kenyan professionals are often hired throughout the region.

Kenya's ICT sector has benefited from these conditions and a relatively advanced telecommunications sector, strengthened by three undersea fibre optic cables. The ICT sector was also identified as one of the key sectors to promote by the government in its Vision 2030 development plan. On the other hand, Kenya still had a large unbanked population, dependent on remittances, which made it ripe for mobile money solutions, unlike, say, South Africa where bank accounts and credit card ownership were already well entrenched.

The focus of extensive media coverage, Safaricom's mobile money service M-PESA ('pesa' is Kiswahili for money)

has been hugely successful for several reasons. First, the company already had a widespread agent network, which meant that the service was easily accessible throughout the country. In addition, Safaricom's management have devoted a lot of effort and commitment to the basic issues of the business, in particular on agent training, branding, marketing and security of the system.

Since its launch, a range of payment services have been added: subscribers can now pay at retail outlets, purchase airline tickets, make school fee payments and pay utility bills with their mobile money account. In addition, the service has become increasingly integrated with the banking sector: subscribers can pick up cash from PesaPoint ATMs, and Equity Bank was the first commercial bank to offer a link between M-PESA mobile money accounts and traditional bank accounts.

Agency banking allows commercial banks to use retail outlets and other agents to conduct a limited range of banking services through them. Agents may therefore need to be given some limited access to core banking functions. Given the infrastructural challenges, the banks currently rolling out this service use GSM technology as well.



The example of Kenya offers lessons to policy makers on both the conditions and policies that have allowed an innovative ICT-based financial service to scale, with positive effects on the rest of the financial services system. Kenya's market-oriented business environment and its innovative telecommunications sector have enabled competition to respond to the new entry, and ICT remains a government priority. These conditions and policies support the development of other services that use mobile money (e.g. micro-insurance), giving an additional boost to mobile money providers. Policy makers have also been relatively flexible in their approach to experimentation. The Central Bank of Kenya (CBK) was willing to support a mobile money pilot and find a balance between regulations, oversight, and flexibility for the mobile operator to experiment. Finally, due to M-PESA, the banking sector has recognized that there is money to be made by offering services to lower-income consumers. There is both competition and co-operation between mobile money and the banking industry, but banks have recognized that it is useful for clients to connect their mobile money account to their bank account, and the potential to increase their revenues has helped to reduce their opposition to mobile money as an immediate competitor, while increasing the offerings available to consumers.

The competitive impact of Safaricom's market dominance may not make for an ideal market structure but,

in the case of mobile money, it gave clients the reassurance that they would find a Safaricom outlet everywhere in the country where they could retrieve their cash. In some ways, Safaricom's current dominance has actually been strengthened by its early success with mobile money, which increases customer loyalty as it has important lock-in effects for users. In addition, consumers are so familiar with the ubiquitous brand that they feel safe entrusting it with their funds; an important factor given the political turmoil in Kenya following the 2007/08 election. Safaricom also treated mobile money as a profitable service, not a CSR project, and therefore invested the necessary resources to develop it. This is something that policy makers in other countries should consider when studying ways to allow room for innovation. The company also invested heavily in branding, marketing, a simple user interface, and system safety and security, while also constantly expanding its offerings (e.g. merchant and bill payments, receipt of remittances, and introduction of a prepaid Visa card). Finally, the company has engaged in regular, proactive conversation with regulators like the CBK. That has allowed Safaricom, and others, to expand their service offerings to customers while reassuring regulators that appropriate safeguards are in place. Thus, the Kenyan example offers guidance to both public and private-sector actors, and illustrates the importance of a multi-sector approach.

Table 5.3 Kenya's challenges and opportunities for ICT and financial services

Drivers of growth	Readiness (regulations, infrastructure, demand)	Challenges	Opportunities
ICTs	High	<ul style="list-style-type: none"> Address interoperability challenges to allow operator-independent platforms to compete 	<ul style="list-style-type: none"> Build on mobile money success by allowing greater functionality for other savings, payment and insurance products
Financial services	Medium	<ul style="list-style-type: none"> Overcome relatively high transaction costs by addressing market competition issues Address international payments issues (such as remittances) 	<ul style="list-style-type: none"> Create competitive environment for additional mobile or ICT-based savings and payments services to thrive Improve and clarify regulatory structure to encourage cross-sector participation by telcos and banks/MFIs Diversification of products and delivery platforms
Market players	Medium	<ul style="list-style-type: none"> Mitigate dominant market position of one carrier 	<ul style="list-style-type: none"> Encourage greater competition

5.4

RECOMMENDATIONS

For both national policy makers (including regulators) and international donors, recommendations address consumer, public sector and market issues, taking into account the different stage of maturity in African countries. No two countries in Africa start from the same point when it comes to financial services. Those beginning to pursue the opportunity are at a formative stage while others are in a better position to scale endeavours already underway. All are working towards a desired state.

The financial services sector is a complex ecosystem. No single part of the sector can easily be addressed in isolation, and there is no “one size fits all” solution for all countries. From that point of view, each nation will view the recommendations offered here through their own lens when determining their priorities. Some areas justify greater attention owing to the degree of maturity of the existing financial services sector and the existing policy/regulatory environment.

Recommendations for policy makers

RECOMMENDATION 5.1

Commit to financial inclusion through mobile banking

Commitment to poverty reduction and development on a national level form the basis of a commitment to financial inclusion. Policies and regulations should encourage market entry (e.g. permit mobile operators to accept deposits on behalf of licensed financial institutions where depositors could earn interest) and prevent monopolies (e.g. disallow exclusive agreements for cash in/out points). Experimentation should be encouraged by easing procedures for testing new approaches. Interoperability should be encouraged by developing data and process standards specific to new areas of financial services, such as mobile financial services. Scaling states should coordinate awareness-raising with third-party organizations with target markets (e.g. agribusiness, healthcare). The more advanced states should consider introducing a real-time mobile transaction clearing/settlement switch in order to remove the bottleneck when shifting to an open network.

RECOMMENDATION 5.2

Support diversification in mobile financial services

Generic single products or constricted services leave latent and explicit demands unmet or even discourage uptake and participation. Socio-economic conditions specific to a country’s environment should be taken into account in the kinds of products offered (e.g. Islamic finance), rather than regulations determining the choices offered to consumers. Cash-in/cash-out, bill payments, deposits, savings, remittances, insurance, provident funds, and loans are examples of products that can be offered, and national policies should provide incentives to institutions and agents to offer these and other diversified services.



RECOMMENDATION 5.3

Encourage access to capital for SMEs

Promoting growth and fostering SME success requires transformative policies that pay particular attention to the ripple effects that SME capital access has on the overall economy. These effects include increased employment, asset building and more tax revenue. Governments should help to lower the fear of risk among bankers by providing measured loan guarantees, similar to the Small Business Administration in the United States. Such programmes can also be complemented by making training available to SMEs in financial management, innovation and marketing.

RECOMMENDATION 5.4

Promote appropriate and flexible identification policies

Absence of, or limited proximity to, financial institutions is not the only barrier that keeps poor customers from accessing financial services. Identification flexibility for small transactions is a crucial policy component that should be seriously considered. Incentives aimed at making services widely available should come before mandates to obtain identity documents such as a national ID, driving licence, proof of residence, or passport. National identification initiatives should be undertaken that use low-cost services to register and identify users, with feasibility studies of biometric options. Citizen participation in identification enrolment should be encouraged through a mix of incentives and requirements, e.g. by pairing with useful services (G2P payments and advertising), or by requiring linking to activation of SIMs. Risk-based methods of identification should be used for establishing new financial accounts so that risks may be mitigated by limiting balance and transfer amounts and providing increasing capabilities with greater evidence of identity.

RECOMMENDATION 5.5

Provide guidance for streamlining back-end systems

Detailed guidelines rather than mandatory rules would be most helpful to streamline the back-end systems that should be installed and managed across institutions. A banking technology coordinating group within central banks, ministries of finance/development, or independently operating offices could assess and audit technologies that enable financial inclusion. Such a body could monitor and outline the latest and most strategically relevant back-end systems, including mobile banking components, and interface with technologies used by different institutions.

RECOMMENDATION 5.6

Develop data standards and practices for credit data

Policies should aim to address the problems presented by fragmented, standalone or non-existent credit bureaus that complicate lending for institutions as well as beneficiaries. A database system should be established to provide transparency for both lenders and borrowers. Data standards and practices should be developed for generating and aggregating credit data. Alternative forms of data for discerning credit-worthiness should be examined. An obligation should be considered for national utilities to make payment data available to credit bureau services.

Recommendations for donors

RECOMMENDATION 5.7

Reduce private sector risks by underwriting “first movers”

Donors have an important role to play in underwriting the risks of first movers thereby encouraging private sector involvement and innovation. For instance, private sector involvement could be induced through goal-oriented awards for early and successful efforts to address inclusion goals through the availability of mobile banking (Gates Foundation incentive fund for Haiti is an example). Incubator efforts for product designs and concepts tailored to consumer needs should be supported.

RECOMMENDATION 5.8

Reduce shared costs by underwriting common supporting systems

The selection of back-end systems log-ically falls to the private sector, since it affects competitive positioning and costs considerations. However, donors might consider underwriting a “minimum-feature” service available via the cloud so that even the smallest MFIs and banks would be able to manage accounts. Donors would also make a positive impact by supporting the systems necessary for interconnection (real-time switches for mobile payment interoperability) and systems that pre-condition infrastructure for service delivery (identification registries). Such investments work with rather than against the private sector, enabling more market participation.

RECOMMENDATION 5.9

Leverage limited resources to drive private and consumer action

Donors have an essential role in reducing the risks of lending to small, unknown businesses. Loan guarantee programmes are an important part of small business support efforts and donor funds could be leveraged for this purpose. In areas where traditional credit bureaus are failing to serve SMEs (or do not exist), donors could also support alternative methods for assessing and sharing risks. Such scenarios might include leveraging crowd-based voting mechanics combined with donor-to-peer (Kiva.org) and peer-to-peer (Prosper.com) lending models to determine donor allocation of funds. Donors should support efforts to raise consumer awareness, and back solution incubators and heavy experimentation to translate needs into products.

FURTHER READING



ICTs for
FINANCIAL
SERVICES
in Africa

ALLIANCE FOR FINANCIAL INCLUSION

(2010) *The AFI Survey on Financial Inclusion Policy in Developing Countries: Preliminary Findings*

<http://www.g24.org/Workshops/afisur.pdf>

DELOITTE

(2011) *Mobile Value Added Services (MVAS): A Vehicle to Usher in Inclusive Growth and Bridge the Digital Divide*

Deloitte Touche Tohmatsu

https://www.deloitte.com/assets/Dcom-India/Local%20Assets/Documents/Deloitte_ASSOCHAM_MVAS_Study.pdf

KENDALL, J., MYLENKO, N. and PONCE, A.

(2010) *Measuring Financial Access around the World*

Policy Research Working Paper No 5253, The World Bank, *Finance and Private Sector Development*

http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2010/03/30/000158349_20100330164126/Rendered/PDF/WPS5253.pdf

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(2010) *Financial Access 2010: The State of Financial Inclusion through the Crisis*

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http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/07/19/000356161_20110719015018/Rendered/PDF/633320WP0Finan00Box0361513B0PUBLIC0.pdf

STEIN, P., GOLAND, T. and SCHIFF, R.

(2010) *Two Trillion and Counting. Assessing the Credit Gap for Micro, Small, and Medium Sized Enterprises in the Developing World*

IFC and McKinsey Consulting

http://www.mckinseysociety.com/downloads/reports/Economic-Development/Two_trillion_and_counting.pdf

STORK, CHRISTOPH

(2011) *mBanking the Unbanked*

http://www.mobileactive.org/files/file_uploads/mBankingTheUnbanked.pdf

WORLD ECONOMIC FORUM

(2011) *The Mobile Financial Services Development Report 2011*

http://www3.weforum.org/docs/WEF_MFSD_Report_2011.pdf

For a more detailed presentation on the role of ICT in financial services in Africa, see the full eTransform Africa sector report:

<http://www.etransformafrica.org>



chapter

6

*The Transformational Use
of Information and
Communication Technologies
in Africa*

HEALTH



1. Introduction

Trends and challenges
ICT as a game changer in health

2. Landscape analysis

eLearning and telemedicine
Data exchange and analysis
Supply chain management
Public health promotion
Health financing

3. Case studies

4. Recommendations

Recommendations for policy makers, regulators, administrators
and project managers
Recommendations for donors

Further reading

6.1

INTRODUCTION

Countries in Africa spend significant amounts of their GDP on delivering health services through systems that are often inefficient, costly and lacking in transparency. Information and communication technologies (ICTs) have the potential to transform the delivery of health services across the continent in ways that not only increase efficiency but also improve accountability (World Bank, 2004).

The availability and quality of ICT services are growing rapidly across Africa, with mobile network coverage rising from 16% in the late 1990s to over 90% of its population in 2011. Growth in this sector has led to increased investments, decreased costs and rapid growth in technology-enabled services.

However, these gains in ICT infrastructure have not as yet benefitted the health sector in a systematic way.

Although there are many ongoing projects across Africa that attempt to improve the health sector through the use of ICTs, most remain pilots, few are evaluated and even fewer are designed or assessed for scalability. While a recent World Bank survey of nearly 150 active health projects revealed that a third had a specifically financed eHealth component, few were systemic fixes, and a gap remains in strategy, communication, capacity and available investment regarding ICTs for health system strengthening.

ICTs present a large, unexploited potential for transforming governance and transparency in the health sector in Africa to achieve “more health for money spent” and thereby improve the efficiency of health spending, both domestic- and donor-financed.

Trends and challenges

The overall trend in healthcare across Africa reflects the optimism arising from the general improvement in social welfare, as shown by the 10 percentage-point reduction of people living on less than \$1.25 per day between 1999 and 2009. While few African countries are en route to achieving the health-related Millennium Development Goals (MDGs), many are making significant progress. For instance, sub-Saharan Africa (SSA) has experienced a reduction in child mortality from 180 to 129 deaths per 1,000 live births, and while there is still regional progress to be made to reach the MDG goal of 60 by 2015, certain countries with high under-five mortality, like Madagascar, Malawi, Eritrea, Liberia, Niger, and Tanzania, have already more than halved their rates of child mortality between 1990 and 2010. Similarly, while the entire region requires more progress to reducing maternal mortality by three-quarters by 2015, Equatorial Guinea, Eritrea, Cape Verde,

Ethiopia, Rwanda, and Mauritius have already more than halved their rates since 1990. Progress on MDG 6 is also visible in countries like Botswana, Rwanda, Namibia, and Zambia, where over 55% of people living with advanced HIV have access to antiretroviral therapy.

Although immense progress has been made, a majority of Africa countries are falling behind on their MDG commitments and existing strategies will not be sufficient. New approaches are needed.

The main opportunities for ICTs to positively impact the health sector reflect the remaining core challenges countries face in pursuit of MDG targets, and implementation of ICTs to assist in resolving micro-level challenges will only be successful if macro-challenges do not obstruct ICT capabilities. The systemic



challenges faced are substantial and complex, and include:

- **Insufficient skilled healthcare workers:** It is estimated that Africa, which has 11% of the world's population, carries 22% of the global disease burden and more than 1.5 million additional health workers are needed to resolve the human resource shortage. Yet in resource-constrained health systems, existing workers are often inefficiently allocated, leaving service gaps in rural areas, or insufficiently monitored and motivated, leading to attrition and potentially poor quality of care delivered in the absence of training and knowledge support in the field.
- **Lack of health information systems:** Many low- and middle-income health systems lack sufficient technology to enable communication between households, care providers, and eventually, policy makers. The absence of these infrastructure elements increases the possibility of morbidity and mortality owing to the “third delay”, i.e. the delay in receiving adequate service after reaching a healthcare facility. The impact is felt most by people in rural areas, where delays are more extreme.
- **Shortages of drugs, equipment and supplies:** Without medical equipment and supplies it is difficult for health workers to provide the care they have been trained to provide. Sometimes, supply shortages even lead to health centre shutdowns. In 2010 in Uganda, for example, eight rural health centres closed because of lack of supplies, leaving people in the Amuru district without healthcare, and an additional twelve recently-built health centres have not opened for the same reason.
- **Inadequate public information about preventable diseases:** The simplest preventive solutions can lead to lives saved. For example, while HIV testing services may be highly available, without encouragement and clear communication about the details of the service they may go underutilized. Or alternatively, if the general public was able to receive information about contaminated water sources – in the form of alerts about diarrhoea or malaria outbreaks – households could protect themselves from disease.
- **Financing constraints:** Often, care is not accessed because patients are unable to pay out of pocket. Also, governments remain challenged to provide adequate financial resources for seeding health systems infrastructure, research and innovations.

ICT as a game changer in health

eHealth may be defined as the use of information and communication technology (ICT) – including computers, mobile phones, satellites, software, information systems and digital platforms, etc – to enable, support and deliver health services to patients and populations. eHealth can make use of tools like mobile phone-based health (mHealth) applications, telemedicine systems, or eLearning programmes, and includes the digitization of a country's Health Management Information System (HMIS) or Health Information System (HIS). It is assumed that use of ICTs will lead to greater efficiencies in use of resources and greater efficiency in service delivery, a significant matter when the 2010 WHO World Health Report revealed that 20 to 40 per cent of all health spending was wasted due to inefficiencies. Investment in ICT has the potential to reform health systems, extend services to underserved areas, and reduce waste and redundancy.

Data from the 2011 Global Observatory for eHealth (GOe) survey showed that some 83 per cent of 112 surveyed countries identified at least one ongoing mHealth programme, and 33 per cent identified at least one telemedicine programme within their country. Of the 31 African countries who responded to the survey, SSA nations were least likely to have established, institutionalized eHealth programmes in mHealth, telemedicine or eLearning. When these programmes exist, they are in either the pilot or informal stages of development. Yet the fact that over 67 per cent of the African WHO members responded to the survey is encouraging, indicating willingness to “mainstream” eHealth as a component of their health strategies.

6.2

LANDSCAPE ANALYSIS

Though limited in quantity and rigour, there is evidence emerging that ICTs can address challenges of maternal and child health and infectious diseases in rural Africa. Hundreds of mHealth interventions to date have been piloted across the continent, for a variety of purposes including remote consultation, patient data management, referrals, supply chain management and health worker training. Some countries, like Rwanda, have implemented a comprehensive national eHealth System, including

programmes for tracking patient records, monitoring infectious diseases, managing drug and supply chains, telemedicine communications with health professionals in distant areas and eLearning and training for health-care workers. With the proper telecommunications infrastructure and committed leadership, such strategies could facilitate new business and service models. For this reason, countries are experimenting with different types of applications, as outlined below.

eLearning and telemedicine

eLearning and telemedicine programmes have the capacity to improve human resources for health by enabling workers with the training and information, needed to respond to emergencies and crises. Several Francophone African countries, such as Mali, Cote d'Ivoire, Senegal and Burkina-Faso, have implemented an online platform (RAFT) that allows for web-based seminars, training, discussions and sharing of best practices between health-care professionals in each of the ten participating Francophone countries. The Tunisian Society of Telemedicine and eHealth – an NGO composed of doctors, telecom engineers, and communications specialists – sponsors and promotes videoconferencing between health professionals in emergency cases. It allows for tele-diagnosis by professionals in hospitals at a distance, and between the country's thirteen tele-radiology centres, three tele-pathology, two tele-optomology, six regional hospitals, general hospitals and six specialized centres, up to twenty remote sites can utilize the videoconference at any given time.

Other programmes targeting community health workers include Botswana's eLearning programme for community

health workers at the KITSO AIDS Training Program, a public-private partnership between the Ministry of Health and Harvard Medical School. Other innovative forms of support for frontline health workers are applications like CommCare, from mHealth company Dimagi, which programmes various health worker protocols for different types of patient interactions into a mobile phone, complete with picture and voice prompts for not fully literate users. Other creative ICT solutions for the human resource crisis include Switchboard's MDNet programme, a free closed calling network between all doctors' mobile phones in Ghana, which removes the cost and connectivity barriers to doctors seeking advice or assistance from their peers.

Such simple interventions could make a significant difference in attracting, retaining and improving the performance of limited health workers, like using mobile phone communication to improve referral systems, or creating an interactive voice response menu on a phone that contains knowledge reminders and remote training for health workers in rural locations.



Data exchange and analysis

In traditional paper-based reporting systems, collecting and exchanging quality and timely health data remains a challenge, as the process can consume the time and attention of health workers who are meant to be providing services instead, and can result in inaccurate or incomplete data. Electronic Health Information Systems (HIS) can help minimize time spent recording data, such as the HIS shared across Southern African countries Botswana, South Africa, Mozambique, Ethiopia, Malawi and Tanzania. The BEANISH programme – Building Europe-Africa Collaborative Network for Applying ICT in Healthcare Sector – is an open-source Java-based program that allows healthcare professionals to gather data and enter it into a digital healthcare system, which can be used for data analysis and management. Similarly, OpenMRS, developed by the Regienstrief Institute and Partners in Health, provides a lightweight, user-friendly option for an electronic medical records system.

A unique feature of ICT-enabled data collection is that data can be viewed and analysed in real time so that care providers and policy makers can make lifesaving decisions based on evidence. Such tools can save health workers time and costs of paper-based data entry and transportation, as in a project in Guatemala when the World Bank reported a 71% decrease in data collection

costs when using the programme Episurveyor on a mobile phone for data collection compared to paper. When the NGO Partners in Health employed a personal digital assistant (PDA) for tuberculosis results collection, the processing time of 6.2 days was significantly lower than baseline and control days with date entry errors reducing from 10.1% to 2.8%.

When designed appropriately, free and customizable software like Episurveyor, OpenXData and Open Data Kit enable remote fast, accurate and inexpensive data collection eliminating a large amount of burdensome work that distracts workers from their core duties. The Mobile Technology for Community Health (MoTeCH) Midwife initiative, for example, conceived by the Grameen Foundation and funded by the Bill & Melinda Gates Foundation, uses mobile phone technologies to help Ghana achieve those goals. Using General Packet Radio Service (GPRS), Short Message Service (SMS) and Interactive Voice Response (IVR) technologies, MoTeCH surveys midwives, allows them to dial-in toll-free and record and update critical data about pregnant mothers. Another example, Child Count, is an SMS-based application that allows community health workers to upload patient metrics to an external database which is then monitored for irregularities.

Supply chain management

Weak supply chain systems across low-income countries – caused by poor road infrastructure that delays delivery, and poor electrification that eliminates the possibility of a cold chain – can result in remote health posts being under-stocked or stocked-out of essential commodities, such as contraceptives for reproductive-aged women and vaccinations for children. Further, the World Health Organization's estimate that 10-30% of drugs in the developing world are counterfeit could put millions of lives on the African continent at risk of unnecessary death and disease if those medicines make it into the system unnoticed. In Ghana, mPedigree employs Sproxil, a technology that uses barcodes and unique identification mechanisms to track counterfeit drugs in developing countries.

The World Bank is currently conducting an evaluation in Zambia of the use of mobile phones to improve supply chain management. Other ongoing efforts include StopStockouts, in Kenya, which allows field-level health workers to report stock-outs by SMS on their mobile phones to a central database which then converts, via GPS data, to a geographic visualization of the problem in order to alert administrators and supervisors of the issue. In Tanzania, the SMS for Health project uses ICTs for supply chain management of malaria drugs.

Public health promotion

An AED-SATELLIFE project, the Uganda Health Information Network (UHIN) uses PDAs to provide early warning information about the spread of communicable diseases to citizens. The data collection element is four times as efficient and 25 per cent more cost effective than manual data entry, with the goal of surveying populations for crucial disease information. With the ability of mobile phones to track and record GPS locations, governments can be more informed about emergency disaster relief scenarios. RapidSMS, InSTEDD's GeoChat, and Ushahidi are all applications that have been used to assist governments with rapid response to emergencies from famine to flooding to earthquakes.

Aside from surveying public information for use by the government, there are many ICT for health efforts that aim to deliver key public health messages from the government to the public. Launched to encourage healthier behaviour that avoids future treatment costs, Praekelt Foundation's Project Masiluleke, a programme that offers free information about HIV testing locations via customers' mobile phones, resulted in 1.5 million calls to a local AIDS helpline. Mobile phones are also being used in Uganda in the Text to Change campaign, which seeks to increase knowledge and understanding of HIV/AIDS through SMS-based quizzes.

Health financing

Patients often forego care owing to the inability to pay healthcare costs out of pocket, and providers and health system administrators are struggling to make care truly accessible in low-resource environments. Considering that, by the year 2012, there will be an estimated 1.7 billion people with no bank account but who own a mobile phone, the proliferation of mobile money systems like M-PESA in Kenya is an emerging ICT solution. Such services allow even low-income people to manage small payments from their mobile phone without requiring a bank account. Programmes like Changamka in Kenya provide patients with pre-paid "smart cards" coded to approve them to receive specific kinds of healthcare at designated health facilities, and can be topped up by M-PESA or

at physical terminals. The opportunities for personal finance to strengthen health systems are numerous since both require components like user IDs, identity authentication and security measures. By enabling patients to set aside funds for health specifically, and make more direct payments, efficient delivery of health services becomes quicker and more cost-effective.

Table 6.1 summarizes the opportunities for ICT interventions to address the major challenge areas listed above. Yet it also indicates that such interventions cannot be realized without adequate infrastructure and committed leadership.



Table 6.1 Summary of opportunities and challenges for ICT to improve health systems

Health Sector Challenge	ICT Opportunity	ICT Challenge
Insufficient skilled healthcare workers	eLearning and telemedicine solutions can extend expertise to remote areas and provide otherwise inaccessible care.	Facility set-up and maintenance costs and efforts; sufficient will for providers to participate (liability concerns).
Lack of health information systems	Data collection and surveillance mHealth applications can monitor and track health indicators in real time, providing insight to policymakers on true challenges and providing valuable data enabling health workers to better serve and patients to be more proactive in their own health.	Requires widespread mobile connectivity and sufficient access to phone hardware, but not always the case.
Shortage of drugs, equipment and supplies	Supply Chain Management mHealth applications can decrease stock-out frequency and increase efficacy of and trust in health system.	To realize full potential, ICT solutions still rely on physical transport of goods and services. If entire system poorly organized, digitizing system likely will not help.
Inadequate public information about preventable diseases	Public health promotion applications can be used to disseminate empowering information in friendly, personal manner. Engaging without being intrusive.	To be successful, ICT solution still relies on end user to take action on information, and assumes health system is prepared to handle increased patient load.
Financing constraints	Health financing and personal insurance programmes offer increased opportunities for savings, both for patients and healthcare providers.	Participation in mobile savings programmes still requires commitment from users. Also, governments still are challenged to commit more significantly to health systems.

CASE STUDIES

6.3

ICTs for
HEALTH
in Africa

Several countries, including Ethiopia and Mali, have made notable advances in utilizing ICT to increase health-care access and quality of service to their populations. Ethiopia and Mali were analysed as case study countries

within the framework outlined above to identify their micro and macro challenges, and to investigate key eHealth interventions that have gained traction within each country.

Lessons from Ethiopia

Ethiopia's health sector challenges range from the macro-level concerns of funding, human capital, infrastructure and cultural norms to specific health-sector challenges such as equipment and supply shortages, insufficient quantity of skilled healthcare workers, and a relatively uneducated population. Over the past six years, the Ethiopian government has rolled out significant national telecommunications infrastructure. This has enabled the Federal Ministry of Health (FMOH) to use ICT to improve data exchange within hospitals and to support the national cadre of Health Extension Workers (HEWs) in remote areas.

Integrate efforts and look for synergies

The FMOH began the process of integrating all ICT solutions in the health sector by commissioning a strategic framework for delivering eHealth and mHealth interventions to the population. Though they have yet to implement the strategy, discussions from within FMOH indicated that all stakeholders value the increased efficiency and expanded reach of services provided via ICT solutions, while expending fewer incremental resources.

One example is the application of ICT to supply chain management, specifically through the DELIVER PROJECT which began in 2003. The FMOH, USAID, and other development partners implemented the Logistics Management Information System (LMIS) in order to ensure the availability of vital health supplies. DELIVER ensured efficient delivery systems, transparent and cost-effective procurement processes and strong supply chains that worked both domestically and internationally. Two crucial projects followed DELIVER, interoperating with its system: the Improving Supply Chains for Community Case Management of Pneumonia and Other Common Diseases of Childhood (SC4CCM) project, focusing on improving supply chain management at a local level in order to improve the treatment of children under five; and the Supply Chain Management System (SCMS) focusing on procuring and distributing medicines and supplies needed for HIV/AIDS patients.

Refine underlying systemic and organizational processes

Ethiopia's FMOH also demonstrated the ability to refine the underlying systemic and organizational processes that control operations in the health system before attempting ICT interventions. This approach is exemplified by their HIS reform, during which the FMOH and all partners undertook a painstaking reorganization of the paper data collection system before introducing electronic capture and transmission of data. Through this process, Ethiopia recognized that even advanced technology overlaying faulty processes is unlikely to deliver improvements in health system functioning or service delivery.

In applying ICT to solve health systems problems, Ethiopia has been most effective at national-level initiatives, such as supporting the Health Extension Programme (HEP), through which all HEWs are employed, with ICT tools, and building private-sector participation with the ICT sector, such as allowing France Telecom to manage Ethio Telecom.

HEWs and ICT in Ethiopia: opportunities and challenges

Opportunities

- Utilize telemedicine to connect HEWs to the appropriate health personnel in order to receive assistance in diagnosing and referring patients.
- Leverage ICTs to allow for the continued training of HEWs while they are still in the field.
- Use mobile applications to efficiently collect patient data and keep longitudinal records.

Challenges

- Large volume of HEWs to train and provide phones for (30,000).
- Language barriers in written information.
- Technology limitations on the quantity of information that can be delivered.



Box 6.2

Lessons from Mali

Mali provides an example of a low-income country with extraordinary health challenges that has acknowledged the value of ICT and is attempting to expand its technological capacity on a limited healthcare budget. Mali has recently adopted many of the recommended short-term interventions in the fields of telemedicine, distance learning, remote data collection and healthcare worker communication.

Use ICT to realize efficiency and combat waste

Telemedicine is being used to overcome the lack of trained healthcare workers and specialists in rural areas, specifically the IKON Tele-radiology programme, and digital distance learning tools are being used to improve healthcare worker training and efficacy, such as the RAFT network, CATEL and Keneya Blown. Further, open-source digital medical record systems are being used to develop e-administration systems, further improving efficiency and combating waste. The upcoming Flotte de Mobile programme will further improve healthcare worker communication and allow for remote data collection.

Partnerships increase access to expertise, funding and ICT

The programmes in Mali result from a wide range of partnerships which increase access to expertise, funding and ICT options. Some of these programmes, such as the adoption of an e-administration system, are government initiatives. Others, such as Pesinet, have been developed by NGOs with the approval and potential future involvement of the government, within a public-private partnership framework. The Flotte de Mobile programme is the result of such a partnership that involves the Ministry of Health, the mHealth Alliance, the Orange Foundation and the Rockefeller Foundation. Similarly, IKON Tele-radiology and Keneya Blown grew out of partnerships between an NGO (IICD) and groups of Malian medical professionals. These programmes illustrate how the private healthcare sector can optimize local resources through coordinated efforts with government. The decentralized nature of the country also allows regional and community healthcare centres to independently experiment with

interventions, creating an environment conducive to innovation and partnerships.

Growth strategy

Though it has made some promising steps toward a more comprehensive eHealth programme, Mali would benefit from adopting more appropriate ICT interventions and programmes. A mobile-assisted supply chain management system would be useful to prevent waste and stock-outs and improve management of medications, immunizations and insecticide-treated bed nets. Given the lack of access to financial services and insurance, Malians would benefit from mobile-based savings and insurance programmes that could be used for basic and emergency health needs. ICT-based public information campaigns such as radio shows, information hotlines and mobile-recorded messages about preventable diseases and healthy practices for expectant mothers and children could vastly improve health education and help reduce mortality rates. In the long term, Mali will need to address many of the country's systemic challenges, including improving rural connectivity, roads and healthcare infrastructure, and training capacity.

Mali's communication infrastructure: opportunities and challenges

Opportunities

- Communication between rural and urban areas can be further developed by strengthening telehealth programmes, the e-administration intranet, and various practitioner networks including RAFT, Keneya Blown and CATEL.
- Additionally, the use of data collection software packages such as DHIS2 and OpenClinic should better facilitate the exchange of information and data between rural and urban centres.

Challenges

- Limited internet connectivity.
- Weak infrastructure, particularly electricity in rural areas.

6.4

RECOMMENDATIONS

The degree to which an eHealth service can be effectively established and provided is often dependent on the complexity of the system being implemented in relation to the enabling in-country environment. Yet, for many countries, eHealth interventions are generally neither systematic nor fully strategic. Typically, there is a lack of emphasis on:

1. Infrastructure and standards: creating an enabling environment,
2. Partnerships: amplifying collaboration between critical stakeholders, and
3. Interoperability: exploring effective combinations of interventions.

A strong, enabling environment includes scalable and appropriate infrastructure, transparent processes, fair legal frameworks, rules and standards for ICT component interoperability and incentivizing policies. The success of interventions could be accelerated through stakeholder collaboration involving end-users, government (cross-sector), civil society (including donors), private sector (industry) and researchers, and a well-designed mix of ICT interventions could help a country create synergies and avoid redundancies. The resulting product would improve resource allocation, reduce delays to care, improve continuity of care, improve health worker skills and make ICT useful to health workers as a tool for overcoming the challenges discussed earlier.

Recommendations for policy makers, regulators, administrators and project managers

The recommendations listed below will help those who participate in and influence the delivery of ICT-based health solutions in Africa to:

- Design appropriate and sustainable ICT solutions for health systems strengthening efforts.
- Implement interventions that produce measurable results.
- Evaluate the impact and cost-efficiency of ICT solutions before going to scale.
- Develop fast-track options for multi-country collaborations.

RECOMMENDATION 6.1

Create specific and scalable architecture

A scalable architecture should be established to assure an eHealth system can expand to meet new capacity requirements, adapt to social or political changes and continue to function despite financial limitations. One useful reference model is the mHealth Alliance's Enterprise Architecture initiative (see Box 6.3), coordinating all stakeholders, including



consumers, administrators, application developers, vendors, policy makers, regulators, civil society and funders. System rules provide boundaries that govern stakeholders' use of health systems and the platforms on which they are managed, allowing developers, in particular, to create appropriate applications. Another example of an eHealth ecosystem becoming more common in Africa is ongoing in Sierra Leone.

With a multi-phased approach to target specific segments of the healthcare community, administrators can consider the needs, situation and infrastructure of the country to optimize intervention and cost. It is important to aim for simple, low-cost interventions before attempting more complex system-based interventions that interact with other health technology initiatives. The more ICT is a part of the healthcare worker's daily engagement, the more likely eHealth interventions will become accepted as the norm.

Box 6.3

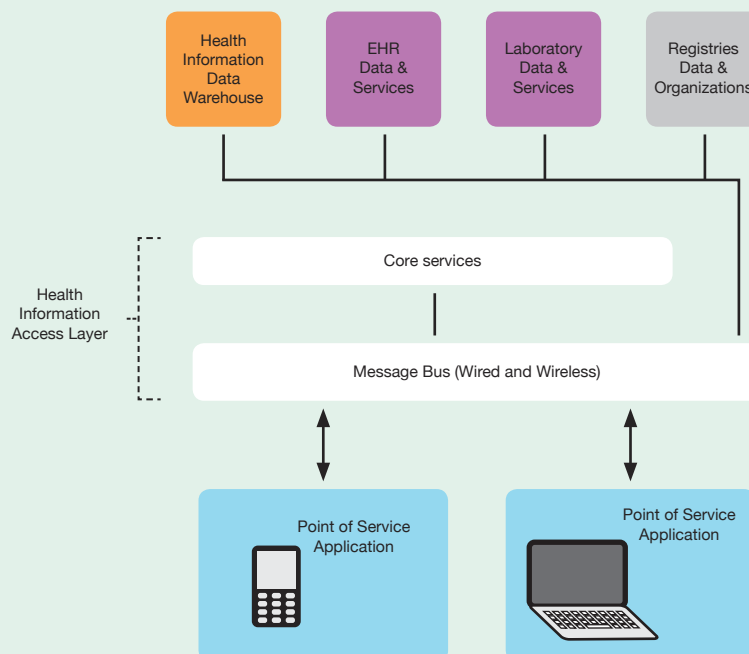
The mHealth Alliance's Enterprise Architecture Initiative

The mHealth Alliance is working with a wide variety of organizations to create a coordinated, flexible, global collaborative team able to support leaders from developing countries in:

- Developing requirements,
- Designing systems that addresses those requirements,
- Deploying first reference models,
- Learning from mistakes and successes, and

- Continuing a process of rapid prototyping and spiral development

With its partners, the mHA is developing a draft enterprise architecture as a first reference model – initially to be deployed in South Africa – so that the various stakeholders can see the benefits of such a system and test various collections of software and services. The diagram below is a depiction of what the “info structure” might look like for a system with an Electronic Health Record (EHR), repository for laboratory data and core services, authorization/access control.



RECOMMENDATION 6.2

Precede ICT interventions with needs assessments

Before large-scale investments in eHealth are undertaken, policy makers should commission a comprehensive needs assessment to provide an up-to-date, objective view of the health and intervention needs of the population and of health workers. An additional situational analysis can also provide an examination of the resources available to support ICT-based interventions, including physical infrastructure, human capacity and telecommunications networks. Similarly, an infrastructure asset assessment will ensure that eHealth strategies and interventions properly leverage existing and available infrastructure, and that policy makers map evidence-based interventions.

RECOMMENDATION 6.3

Create fora to unite decision-makers

National governments should facilitate cross-sector dialogue and cooperation by creating forums in which public and private-sector decision makers can collaboratively determine priorities and identify available assets, reducing fragmentation and accelerating the potential for scale. A well-executed forum allows diverse stakeholders to share best practices and capitalize on economies of scale, even through regional collaborations. Regional Economic Communities (RECs), supported by the African Union, World Bank, International Finance Corporation (IFC) and African Development Bank, could also play a role in bringing decision makers together.

One example of this type of forum is “Connect Africa”, a working group convened by the African Union and International Telecommunication Union, in partnership with the World Bank, governments of donor countries, and governments of participating African countries. Launched in October 2007 with USD \$55 billion pledged at that time, the initiative is designed to mobilize all resources needed to bridge ICT infrastructure gaps across Africa. In such a regional forum, economies of scale can easily be derived; for example, the success of UNICEF’s rollout of RapidSMS to improve supply chain management during the famine in Ethiopia could be replicated in similar situations in other countries, such as Somalia.

RECOMMENDATION 6.4

Create incentives for partnership and foster cross-sector collaboration

Development of ICT-based solutions tends to be “siloed”, within a vertical sectors, yet the multi-faceted nature of eHealth requires the skills and resources of multiple sectors. National policy makers can facilitate multi-sector partnerships that include the private sector, universities and other research and development organizations. Public-private partnerships can encourage corporate fiscal discipline and deep understanding of consumer needs.

Creating a cross-sector digital platform with potential use across health, financial services, agriculture, public services and education could accelerate the scaling and sustainability of ICT-based interventions by increasing economies of scale and return on investment. This is particularly important in African countries that are small markets, where sector-specific platforms may not be viable given their relatively small user or customer base. In some countries, mobile platforms that offer services in other sectors, such as mobile money transfer, may provide a base on which health services can be added.



RECOMMENDATION 6.5

Create national ID systems to facilitate impact measurements

Health records linked to uniquely identifiable individuals are a key pillar of successful eHealth strategies, because of their potential to improve continuity of care, enable point-of-service devices, and feed nationwide health information systems. The creation of unique identifiers that can form the basis of individual, digitized health records is a strong first step. These unique IDs are also extremely useful for targeting social protection systems.

Further, the lack of measurable, longitudinal data is one of the biggest barriers to eHealth investment because it prevents the ability to measure the impact of the solutions and justify the investment in these interventions. After enabling national unique ID systems, governments should take a more active role in conducting rigorous impact studies through robust monitoring and evaluation programmes, or through engaging universities and NGOs as research partners.

RECOMMENDATION 6.6

Conduct a total cost of ownership analysis

A common reason for the inability of eHealth interventions to scale or sustain themselves is the failure by planners to consider all of the financial costs associated with such programmes, and the comparative cost effectiveness with non-ICT solutions. Technology costs, especially hardware, often comprise an entire budget with inadequate attention given to training, support, maintenance and operating costs. Conducting a rigorous total cost of ownership study can prevent unforeseen costs from damaging projects' chances for success, and can also force planners and partners to consider all of the elements they will need to plan for and how each of them will be funded.

Recommendations for donors

Though policy makers play the central role in setting a course for national eHealth development, many African countries remain heavily dependent on donor funds and expertise. The donor community plays a critical role in supporting and enabling sustainable and scalable eHealth solutions, and the following recommendations are aimed to help donors and other health sector investors to:

- Design a course of action to include ICT in planning discussions with policy makers when considering developmental investments.
- Designate a role for the public and private sector, keeping in mind that government is a lead user and regulator of ICTs while the private sector is primarily a lead provider.

RECOMMENDATION 6.7

Incentivize policy makers to follow system rules

Donors should encourage countries to adopt policies within a set of architectures that enable developers and vendors to provide the best services and applications at the most affordable prices. Donors could, for example, create or add to project checklists the desired systems characteristics (i.e. interoperable, scalable, sustainable, multi-layered, and supported by a private-public partnership) that must be present before donors fund projects. Countries that fulfil the conditions listed on the checklists would then benefit from a fast-track status on applications.

RECOMMENDATION 6.8

Establish cooperation within and between donor agencies

Donors should use ICT to establish standards among themselves – regarding nomenclature, metrics and databases. They can use ICT to automatically cross-reference one another’s research, pre-empt disagreements and promote collaboration, thereby reducing overall system costs, minimizing duplication and increasing the benefit of each of their efforts. ICT systems that are built only to support an individual donor’s programmes, especially in disease-specific projects, are often cited as a major reason for the fragmentation of the eHealth landscape. Donors can do their part to improve this situation by coordinating their technology funding initiatives and seeking alignment with each other on common standards, as well as by adhering to the “rules” established by national governments.

Within their respective institutions, donors should archive and make available impact assessments for all projects, and reward projects that provide useful assessments like impact analyses and standardized return on investment calculations. Such standardization should encourage policy makers, administrators and project designers to actively and consciously integrate measurement and evaluation into their eHealth strategies.

RECOMMENDATION 6.9

Reward cross-sector and PPP efforts in eHealth systems development

Donors should encourage and reward countries that demonstrate a commitment to maximizing ICT for cross-sector and public-private partnership (PPP) and collaborations. Such a position among donors will encourage meaningful dialogue, interaction and collaboration between such agencies and ministries of health, technology and education with more revenue-driving ministries such as communication and finance. Donors should make cooperation within government, and involvement of other relevant sectors, a pre-requisite for financial or technical assistance.



FURTHER READING



ICTs for
HEALTH
in Africa

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<http://www.vitalwaveconsulting.com/pdf/2011/mHealth%20Framework%20for%20Ethiopia%202011.pdf>

WORLD BANK

(2004) *World Development Report: Making Services Work for Poor People*

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For a more detailed presentation on the role of ICT in health in Africa, see the full eTransform Africa sector report:

<http://www.etransformafrica.org>



chapter

7

*The Transformational Use
of Information and
Communication Technologies
in Africa*

MODERNIZING GOVERNMENT



1. Introduction

2. Landscape analysis

Commitment to excellence in public service delivery
Accountability, transparency, citizen collaboration and interaction
ICTs as a means of extending social democracy
Convenience and efficiency in service delivery
Reform and re-engineering of government
Exploiting technological advances to meet service delivery objectives

3. Case studies

4. Recommendations

Recommendations to policy makers and regulators
Recommendations to the donor community

Further reading

7.1

INTRODUCTION

ICT is fundamentally changing the way in which government representatives, citizens, business and other agents of the state interact throughout the world as well as in Africa. The public service sector has strategic significance as it impacts not only on the well-being of individuals, families and communities and on individual national governments but indirectly on the stability of the global economy. The associated high expectations, particularly regarding the speed and flexibility with which public service providers can respond to individual requests, provide feedback on programmes and expenditure and handle national crises, are extremely challenging.

However, attention to how governments communicate should not overshadow the importance of the accuracy, completeness and relevance of what they communicate. This requires achieving a balance between the citizen-facing aspects as well as the underlying efficiency and effectiveness of back-office systems. Hence, not only are the delivery tiers of eGovernment and mGovernment important, but attention must also be paid to the foundational tier and the design, development and implementation of ICT systems making up the enabling tier. A comprehensive framework for service delivery comprising these three tiers is illustrated in Table 7.1.

Table 7.1 ICT-enabled public service delivery framework

Foundational Tier: constitutes the core foundations for service delivery	Performance monitoring	Legal and quasi-legal	Institutional structure
	Well-defined service objectives Monitoring and evaluation indicators Monitoring mechanism	Codified laws and rules in conformity with processes Flexibility to enact rules for enhancing service delivery	Dedicated institutional structure for service delivery Appropriately skilled and empowered Clear responsibilities
Enabling Tier: enables efficient and effective delivery of services	Organizational capability	Procedures and processes	Systems and technologies
	Organizational staff strength Staff capability regarding rules, process and technology Capability related to customer service	Re-engineered and standardized processes Clearly defined role allocations Well-defined timelines and platforms	Integrated data structures Standardized applications Omnipresent networks
Service Delivery Tier: in direct contact with the service-seeker	Service delivery	External communication	Front office or citizen interface
	Service delivery principles Service delivery parameters Redress or escalation mechanisms	Regular awareness sessions Institutionalized customer feedback Consultative mechanisms	Front office, ambience or infrastructure Service delivery channels Helpdesk features



Efficient service delivery is frequently hampered by programme developers who do not listen sufficiently carefully to the poor and hence are not able to identify their needs and prioritize them. Planning that focuses on supplier interests rather than those of the end-user is also a problem.

Figure 7.1 represents the vicious cycle in which service delivery in developing countries is often trapped. A way of breaking the cycle is by investing in ICTs and other infrastructure as new, ICT-enabled systems will increase accountability and transparency and improve many other aspects of service delivery. When citizens see the benefits, demand for services will grow resulting in increased

government revenue, followed by improved employee motivation and prompting more such investments. Hence this vicious cycle can be transformed into a virtuous one.

ICTs, however, cannot miraculously turn bad governance into good, although they can be used as tools under the right conditions and circumstances to effectively reach out to communities as part of the reform process. ICTs are therefore necessary but insufficient as a solution. Associated factors, like pro-poor policies, decentralized decision-making, education, basic infrastructure and political will, are all pre-requisites for effective service delivery. Insufficient fulfilment of these conditions will likely lead to inadequate outcomes.

Figure 7.1 **The vicious cycle of ineffective service delivery**



7.2

LANDSCAPE ANALYSIS

Landscape analysis of ICT and public service delivery in industrialized nations and emerging economies highlight trends in six major categories:

1. Commitment to excellence in public service delivery
2. Accountability, transparency, citizen collaboration and interaction
3. ICTs as a means of extending social democracy
4. Convenience and efficiency in service delivery
5. Exploiting technological advances to meet service delivery objectives
6. Reform and re-engineering of government

Examples of best practice or extended uses of technologies already employed are outlined below. Also described are examples of implementations from Africa to illustrate the options, opportunities and constraints. Some ICT-enabled public service implementations reveal particularly good opportunities for replication elsewhere. Although there is no intention to suggest that “one size fits all” or that “best practice” is transferrable to all other contexts, these examples can inform and possibly inspire programmes elsewhere.

Commitment to excellence in public service delivery

At national level, commitment to excellence in public service delivery by political as well as executive leaders is generally expressed as policies, legislation, regulation and contributions to international bodies. Mechanisms and budget allocations are needed so that these intentions can be enforced. This trend is located in the foundational tier of the framework.

Although ICTs are recognized as being important by the role players at this level and technologies are specifically referred to in their statements, it is essential that these technologies are acknowledged as being necessary but insufficient in raising the standards of service delivery. Associated factors, like pro-poor policies, decentralized decision-making, education, basic infrastructure and political will are all pre-requisites for effective service delivery. Insufficient fulfilment of these additional conditions will likely lead to inadequate outcomes even if ICT use is increased.

The clearest example of a commitment to excellence is the Open Government Partnership, launched in 2011 with Brazil, Mexico, Indonesia, Norway, the Philippines, South Africa, the United Kingdom and the United States as founding members. These nations made commitments to open government, supported by individual national plans. A further 41 countries undertook to develop their own national plans by May 2012. The plans published by the first eight nations include specific actions: publishing information regarding government expenditures and budgets, improving access to information laws, harnessing information technology, improving means by which the public can participate in government, and improving corporate accountability outside the public sector.

Public service monitoring and evaluation can be improved by regularly using purpose-built tools such as the Canada Common Measurements Tool developed by the Government of Canada together with the Institute for



Citizen-Centred Service. This is an easy-to-use, computer-based, client-satisfaction survey instrument that allows jurisdictions to be compared and ensures that public-sector managers are able to understand client expectations, assess satisfaction, and identify priorities for improvement.

Within Africa, Mauritius and Namibia in particular have demonstrated commitment. The National ICT strategic plan for Mauritius (NICTSP) includes eGovernment as one of ten domains of concern. The area of strategic importance most relevant to eGovernment is to accelerate ICT adoption in society by embracing eGovernment and by taking measures towards making ICT widely and equitably available. Three strategies pertaining to eGovernment are:

1. collaborate widely when designing and implementing eGovernment systems so as to enhance citizen convenience and improve internal efficiencies and effectiveness in the government;
2. undertake key investments for higher visibility of eGovernment; and
3. accelerate the uptake of ICT in society by making it accessible, available, applicable and affordable to everyone.

Recommendations made in the NICTSP relate to a revamped institutional structure and eGovernment intervention. Implementation risks were identified and implementation and review plans were drawn up in 2010 and set out a course of action for the following three years (2011-2014).

The Government of the Republic of Namibia (GRN) has formulated a National eGovernment Policy whose main objectives are to:

- Provide credible information about political processes and government services that will be available to citizens at all times;
- Progress from passive information access to active citizen participation;
- Fulfil citizens' needs and expectations by simplifying interaction with GRN and providing services based on their choices;
- Provide speedy, transparent, accountable, efficient and effective administration;
- Widen access to rural areas and other marginalized sections.

Accountability, transparency, citizen collaboration and interaction

The internet and mobile applications make it increasingly easy for citizens to interact directly with government and social media, such as Twitter and Facebook, can also facilitate dialogue between representatives of government and members of society and hence enhance transparency and accountability. Increasing numbers of governments are recognizing this by implementing “transparency portals” accessible via the internet, where interested parties can find current, detailed information about government procedure and process as well as decisions made, activities, budgets, expenditure and official project reviews.

There are also cases where complete data sets originating from government sources are available on the internet for access by everyone (open data) but not many of these come from developing countries. These transparency mechanisms allow public servants to be held accountable by donors and citizens and form at least the first part of citizen collaboration and interaction

although they do not necessarily include features that allow input from the citizens back to the government. These new technologies form the delivery tier of the framework.

One example of a transparency portal is found in Timor-Leste (East Timor) launched in January 2012 (<http://www.transparency.gov.tl>). Portals typically focus on fiscal transparency but there are others that focus on particular sectors, e.g. forestry.

Open data is the embodiment of the ideal that data should be freely available for everyone to use and republish, without restrictions from copyright, patents or other control mechanisms. These have generally only become available since 2009 but some collections now house thousands of open data sets. Examples are from the Australian, Canadian, Kenyan, Norwegian, United States and United Kingdom governments.

There are many examples worldwide of legislation that protects the citizens' right to information. One example is India's Right to Information Act.

Mobile applications can provide a versatile, adaptable management information system for crowd sourcing and hence for citizen collaboration. Several applications that have been used by projects in Africa to improve transparency, and hence reinforce accountability, involve crowd sourcing as a means of collecting information that is then overlaid on interactive maps. Ushahidi was used to report: post-election violence in Kenya in 2008 and wildfires in Russia in 2010. In Egypt, FrontlineSMS is used to collect reports of harassment via SMS. FrontlineSMS is used by a Zimbabwean civil society organization, Kubatana.net, as

an information service for human rights organizations. RapidSMS is useful for data collection in geographically remote areas with limited infrastructure. Extractive industries locations and data are mapped in Ghana. In Dar Es Salaam community assets, water points, etc, are mapped during a series of "hackathons" financed by the World Bank and other donors. The World Resource Institute's Forestry Transparency Initiative is financing a map of DRC's forests, while the WWF is financing Moabi Platform in Cameroon.

Kenya is the first country in Africa to launch a national open data initiative (national census data, government expenditure, parliamentary proceedings and public service locations).

ICTs as a means of extending social democracy

Social media and mobile devices can facilitate effective citizen participation. eParticipation includes contact between people and their elected officials, access to public information, participation in public decision-making and monitoring how government programmes are being run. Examples of social media for the exchange of ideas and requests for comments on government policies are Challenge.gov in the United States and the use of Twitter by the Israeli Consulate in New York City.

Social media are increasingly used to handle crises. For example, in the recent Libyan uprising, the US and UK embassies in Tripoli used Facebook to connect their citizens with ferries so that they could escape danger. The Haiti earthquake, typhoon Morakot disaster in Taiwan and flooding in Thailand are recent natural

disasters where social networks were used effectively by citizens to obtain and contribute essential information.

Examples of eParticipation are growing in Africa, e.g. the ADEN project in Burkina Faso, Maison du Citoyen in Cape Verde, and Abidjan.net launched by the Ivoirian diaspora.

The use of ICTs during "The Arab Spring" is another recent example of the use of social media. Mass protests sweeping through the Middle East in early 2011 highlighted the distinct role that ICT and digital social media tools and networks could play, particularly with respect to organization and communication. Social media networks played an important role in the disintegration of Tunisia and Egypt, while also contributing to sociopolitical mobilization in Bahrain and Syria.

Convenience and efficiency in service delivery

The importance of multi-channel service delivery is illustrated by the various SMS-based services in the Philippines that provide citizen feedback, information dissemination and service delivery.

In the German Mobile Citizen Services (MoBüD) project, currently undergoing pilot testing, mobile devices are used by civil servants who regularly visit neighbourhood centres to connect with central databases and applications

rather than directly by the service seekers. Citizens, therefore, do not need skills or equipment to access the eGovernment applications or interfaces themselves but benefit from less travel time, cost and queues as they visit local centres.

Portals are part of the delivery tier of web and mobile citizen interfaces and are intended to make it easy for citizens to find information and access services. They are



ideally one-stop-shops, backed by integrated procedures and processes and the collaborative delivery of public services at the lower levels of the framework. There are many African countries where eGovernment portals give citizen's access to services. Angola, Botswana, Ruanda and South Africa all have well-designed web sites that offer information about government and services and some interaction such as application for licences or responses to requests for specific information such as progress of a particular application.

Service delivery needs to be accessible via more than one channel. Access to government web sites via mobile phone rather than via a computer is one example of multi-channel service delivery. This only addresses the needs of those who have mobile phones that currently allow this. The alternative is to equip community centres with computers, and to facilitate knowledge sharing and build capacity. There are many examples of projects to extend access to information by setting up multi-purpose community centres (MPCC), Public Internet Access Points (PIAP) and telecommunications networks to remote communities in rural areas. Amongst those in Africa are Nteletsa Botswana; Kitsong centres, Botswana; Knowledge sharing initiatives, Egypt; Marwan Project, Morocco; Community Multimedia Centres, Mozambique; and eBrain, Zambia.

National identity systems deserve particular attention as several African countries are reviewing their national systems for identifying citizens and others have recently adopted such systems. Examples include: Angola, Uganda, Botswana, Nigeria, Sudan and Kenya. The case of Somalia reveals important issues. The ePassports and ID cards could be provided by the contractor within four months, but this is the off-the-shelf technology component. The difficult and expensive process of issuing these will take an estimated five years. In the case of Somalia this process will be complicated by the political situation.

Related systems involve recording life events (birth, marriage, death) – the Moroccan eFez system is an example of renewed efforts in this regard.

Whereas in the United States and other western countries the debate related to compulsory national identification systems regarding cost, effectiveness, privacy and civil liberties starts at the time that the systems are proposed, in Africa the debate seems to arise only after these systems have been approved and development is far advanced. Only then is attention focused on cost, challenges involved with accurately identifying and registering all bona fide citizens and possible unintended consequences such as disenfranchisement.

Reform and re-engineering of government

Business process re-engineering (BPR) exercises have been carried out by the public services sector in order to modernize government in Ethiopia and Namibia. Key points arising from these include:

- Management relies on the rules, procedures and regulations of the regulatory agencies.
- ICT is crucial in re-engineering business processes. African countries have a latecomer advantage since in many cases computerization has not taken place; therefore BPR can be followed by computerization.
- The government needs to pay attention to change management and appropriate awareness raising efforts should accompany the BPR effort.
- BPR strategies for different organizations are usually different, principally divided according to the extent to which organizations are customer-facing.

The use of ICT to create and support collaborative networks are another aspect of reform and re-engineering. ICT is used to create and support networks between different stakeholders and service providers but each case places emphasis on different aspects of the network. For instance, in Ethiopia's WoredaNet, the communications network receives particular attention and there are a wide variety of users, whereas in the case of GCNet in Ghana two systems are linked that have complementary functionality but are both related to import and export. The third type of network, iNetwork in Uganda, was created to share knowledge and information on how to use ICTs. All of these systems are intended to facilitate collaboration, communication and partnerships and national agencies play some role in each of them.

Exploiting technological advances to meet service delivery objectives

Examples of how technological advances may be exploited include:

- Establishment of an automated back-end to an open data portal so that data is always up-to-date without requiring a dedicated person to maintain the site or update data manually;
- Sophisticated mobile software applications, e.g. allowing secure payment, as in the US Department of Corrections, Arkansas, inmate deposit service, property tax payments;
- The German Mobile Citizen Services (MoBüD);

- Advanced biometrics used for identification.

Specifically with regard to Africa, mobile telephone solutions are very important although the most recent mobile applications are not necessarily the best options for Africa. Biometric technologies are being introduced in national identification cards and ePassports with digital colour photographs. Substantial amounts of additional data can be stored directly on the card and are updateable and the cards are counterfeit-resistant, durable and do not need access to communications infrastructure. Other examples include linking social media initiatives with other technologies, e.g. interactive maps.

7.3

CASE STUDIES

Deeper analysis of Malawi's Integrated Financial Management Information System (IFMIS) allows identification of the circumstances under which ICTs can be applied successfully and quickly. This creates opportunities for transformation in other African countries, some of which have a poor track record of IFMIS implementation. In Africa, the main drivers for most of the ambitious IFMIS projects are an urgent need to improve Public

Financial Management (PFM) practices and to increase development funds substantially. Although this case does not aim for total integration of systems or a customer-facing interface (eGovernment), it is an example of reform and re-engineering of government as well as providing the necessary high standard financial information for accountability and transparency. The case is described in Box 7.1.

Box 7.1

Malawi's Integrated Financial Management Information System (IFMIS)

In line with the country's Financial Management and Transparency and Accountability Project, the IFMIS in Malawi was developed and implemented to modernize the public accounting system. The main aim was

to ensure that it was efficient, linked to the budget development system and would improve and strengthen public expenditure management and bring about fiscal discipline.



More specifically, the IFMIS was set up with the following objectives in mind:

- To integrate all accounting modules
- To provide government with a state of the art computerized accounting system
- To ensure that other sub-systems properly interfaced with IFMIS
- To enable government to reduce domestic borrowing and the accumulation of arrears
- To assist government in the production of timely and reliable financial data.

Three lessons from Malawi's IFMIS are instructive:

- The Malawian draft ICT policy provides a framework that has been successfully used elsewhere and can be readily embraced in other developing countries.
- Large ICT projects require buy-in at the highest levels of government, but also at the lowest levels from those expected to work with and manage this technology.
- A comprehensive project plan must be created as the foundation on which not only the IFMIS but also all other major national ICT projects must be built.

IFMIS systems implementations of this kind are challenging and success depends on:

- Allowing sufficient time for planning and system design;
- Realistic cost/time estimates, procurement plans, disbursement schedules and technical specifications (bidding documents), including clarification of IFMIS prerequisites;
- Country-specific solutions that meet functional and technical requirements;
- Functionality of the IFMIS system that fits government strategy;
- Strong political will and support from senior management and policy makers;
- Limiting reliance on consultants and developing of appropriate in-house capacity;
- Carefully designed change management programmes;
- Sound project methodology and collation of information for system improvements;
- Small, manageable steps in implementation (incremental implementation);
- Developing the necessary infrastructure including connectivity.

The South African government is proud of the achievements of the South African Revenue Service (SARS) which has made immense strides through eFiling, the online service delivery tool that has made the Receiver the front-runner in public service delivery in the country. First-world countries are aware of the achievements made and are in constant interaction with SARS to learn about the eFiling system. A modernization agenda was adopted in 2007/08 to improve services to taxpayers, educate

taxpayers and engage traders by automating routine processes and redeploying the resources that were released to bolster both service and enforcement initiatives. This programme improves compliance by improving service to honest taxpayers and enhancing enforcement for non-compliant taxpayers. This is a clear example of Convenience and efficiency in service delivery as well as Accountability, transparency, citizen collaboration and interaction. The case is described in Box 7.2.

Box 7.2

The South African Revenue Service (SARS) eFiling System

The environment within SARS is one that supports innovation, improvement, change and efficiency including annual improvement of the eFiling system. Surveys are conducted regularly to get feedback to

enhance these systems and processes. The eFiling system is now operated, extended and managed in-house as outsourcing as a permanent solution is not ideal. SARS believes that it is important to own

these systems fully and to bring the associated skills in-house.

The eFiling system is designed to be easy to use, has a secure interface and is easy to access via the internet. SARS has automated as many functions of the system as possible. Their aim is to incentivize citizens to register on eFiling rather than provide manual submissions.

- A wizard pre-populates the form, asks a few questions and provides a four-page tax return.
- No substantiating documents are required unless requested by SARS.
- A record of contacts made with SARS is kept on file electronically.
- VAT returns can be submitted five days later – on the 31st of every month.
- Assessments or re-assessments of submissions (audits) have a quick turnaround time and payment is made quickly.
- A taxpayer can amend a return without going through an objection and can appeal online.
- eFiling can be done when convenient and where convenient.

The eFiling system has resulted in:

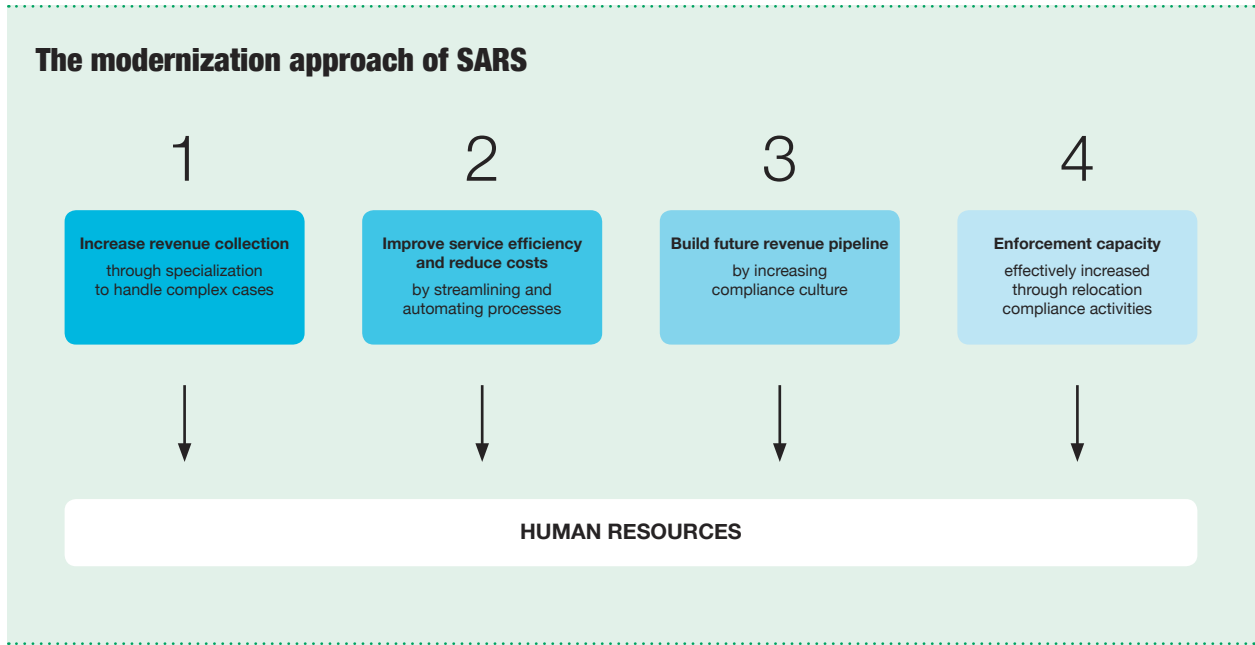
- Greater compliance in submitting tax returns, identifying and automatically registering new taxpayers and enforcement, resulting in increased revenue collection;
- Simplified tax returns including absolving those with low income and only one employer from submitting a return;
- Improved service and turnaround time with efficient support services for tax professionals;
- Continuous improvements to the eFiling system including extensive usability research;

- Improved communication: SARS communicates with users via SMS and email;
- Engagement with stakeholders: Many tax professionals representing large companies in South Africa sit on the advisory committee;
- Improved general perception of SARS;
- Easier client management for tax professionals – the client management process is easier as eFiling provides a client database and access to a statement of accounts.

Although the eFiling system is efficient there are some challenges and limitations:

- When the tax computation becomes complex the use of the system becomes complicated and the system cannot assist the individual leading to frustration.
- Some individuals lack the skills to complete tax returns correctly.
- Users cannot always gain access to the system when too many users are online.
- Many taxpayers still do not have access to the internet.
- Resistance to change among individual taxpayers and even tax practitioners.
- SARS under-estimated the difficulties experienced by small businesses when using eFiling.
- Lack of adequate skills by SARS call centre operators.
- The electronic system still requires a manual process: This is seen as the biggest challenge of SARS's service offering. An example includes tax clearance certificates that are requested online but still require users to collect from the branch.

It should be noted that the introduction of SARS followed a lengthy period of cleaning up basic processes and organizational issues as a necessary step to enable the move to eFiling.



RECOMMENDATIONS



ICTs for
MODERNIZING
GOVERNMENT
in Africa

Recommendations to policy makers and regulators

RECOMMENDATION 7.1

Develop new organizational and legal support structures

Individual countries should develop over-arching national eGovernment plans that look at the public service of the country as a whole. By integrating existing systems, agencies can share information and communicate quickly, easily and frequently and access and participation by the citizens can be facilitated. A complete legal framework for ICT-enabled service delivery should address aspects such as cybercrime and misuse, electronic signatures and data protection. Awareness campaigns need to drive home the message among communities that payment over electronic channels is safe and that the data they share with governments is confidential and will not be used to their detriment.

RECOMMENDATION 7.2

Establish national identification systems

Accurate, effective and efficient national identification systems, incorporating technology that reduces fraud and identity theft (e.g. biometric technologies that complement textual information), mean that people can be identified even without having a document at hand. Cost, including the cost of reaching citizens in remote areas and issuing national identification cards, privacy, risk of disenfranchisement and other civil rights issues need careful attention. Technology is necessary but by no means sufficient for a successful outcome.

RECOMMENDATION 7.3

Address socio-economic and digital divides

The digital divide in African countries is wide. Without access to ICT-related infrastructure the poor cannot easily benefit from other eGovernment initiatives. Those in rural communities, the poor and women are least likely to have access to technology. However, access via mobile phones can remedy the problem to some extent and connectivity can be addressed by exploiting mobile phone networks. A second strategy is building and equipping internet-enabled community information centres.

RECOMMENDATION 7.4

Recognize the power of social media

Public agencies should exploit social media to their advantage. Governments can use social media as a platform to enhance transparency, exchange ideas and invite comments on government policies, handle crises, and build political opinion among the masses.

RECOMMENDATION 7.5

Exploit economies of scale

Projects should be identified that have the greatest potential impact, that can provide benefits simultaneously to more than one large group of stakeholders, and that have the potential for quickly recovering development costs. Economies of scale and scope can also be brought about by intra-public sector collaboration, leading to better cost-benefit factors in at least the following ways:

- A unified data centre with adequate disaster recovery to host applications for all agencies
- A government-wide ICT network with high availability and adequate redundancy
- Common citizen helpdesks for trouble-shooting and general assistance
- Shared information systems (e.g. human resources management systems, financial management systems, and inventory and asset management systems)
- Sharing the same service delivery infrastructure through citizen service centres.



Recommendations to the donor community

RECOMMENDATION 7.6

Support citizen-centric initiatives with social media

Learn from existing initiatives. This could be notably applicable in countries with upcoming elections, particularly where previous elections have been tainted by allegations of corruption, suppression of information or intimidation. Ensure that legislation and institutional requirements imposed by government do not restrict adoption and use of Web 2.0 and social media technologies.

RECOMMENDATION 7.7

Pilot cloud computing in independent election monitoring

Funding will be needed for pilot projects that could serve as a proof of concept for the use of cloud computing in election monitoring.

RECOMMENDATION 7.8

Establish technology platforms for anonymous whistle-blowing

Pilot a technology system using anonymous web communication and other technologies to completely hide the identity of whistle blowers who expose corruption in the public sector.

RECOMMENDATION 7.9

Create incubation spaces for innovative technical solutions

Create incubation spaces for collaboration and innovation for applications in the public service sector. Cloud computing can assist sites in sharing data and software, hence only occasional face-to-face meetings are required.

RECOMMENDATION 7.10

Support capacity building programmes for open data projects

Replicate open data capacity building projects for transparency and accountability.

RECOMMENDATION 7.11

Empower public sector workers in rural areas

Reduce administrative burden on workers. This could be achieved through the reduction of paperwork through the development of mobile applications to replace paper-based solutions.



FURTHER READING

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For a more detailed presentation on the role of ICT in modernizing government in Africa, see the full eTransform Africa sector report:
<http://www.etransformafrica.org>

Part III

**CROSS-
CUTTING
ISSUES**



chapter

8

*The Transformational Use
of Information and
Communication Technologies
in Africa*

REGIONAL TRADE AND INTEGRATION



1. Introduction

Trade, regional integration and Africa's development
ICTs and trade facilitation

2. Landscape analysis

3. Opportunities and challenges

4. Regional and national experiences

5. Recommendations

Governments
Regional Economic Communities
International financial institutions and other development partners

Further reading

8.1

INTRODUCTION

Trade, regional integration and Africa's development

Trade is critically important to Africa's economic prospects, as a source of revenue, investment and employment, yet Africa's trade is highly fragmented and the weakness of its trade performance constrains growth and poverty reduction. Africa today generates only about 2.5-3.5 per cent of world trade. African countries mostly export primary commodities while importing manufactured goods, from Europe, North America or developing regions outside Africa. Only about 10 per cent of Africa's trade is exchanged within the continent, a much lower proportion than in other world regions. Small domestic markets, landlocked status and limited natural resources restrict the trade potential of many countries. These structural factors inhibit the development of manufacturing sectors which could supply both African and world markets.

Two factors are important in addressing Africa's trade problems. First, trade costs on the continent are higher than in other regions, making African exports less competitive both on the continent and globally, while also raising the cost of imports. Second, formal tariff barriers have fallen but non-tariff barriers are considerable. Critical factors include:

- inadequate transport and other infrastructure – ports and airports, roads, railways and river routes – particularly for the continent's sixteen landlocked countries;
- complex, unnecessary and inconsistent non-tariff requirements at ports of continental entry/exit and border-crossing posts;
- inefficient and uncoordinated management of trade, both within countries and along trade routes; and
- inadequate information about trade requirements and import/export opportunities.

These challenges result in three main problems for trading businesses:

- increased costs (including fees, bribes and management expenses);
- delays in the transit and delivery of goods, which add further transport and warehousing costs; and
- unreliability, resulting from inaccurate data management.

Transit times for African consignments between point of origin and continental ports are substantially higher than those in other regions, and African countries perform poorly against the World Bank's Logistics Performance Index. A recent World Bank report suggests that the continent is losing billions of dollars in revenue as a result.

Regional integration is crucial to reducing non-tariff requirements and improving cross-border infrastructure and coordination, which in turn reduce trade costs and improve trade performance. The African Union supports regional integration through eight Regional Economic Communities (RECs)¹, which have some overlapping membership. Some of these have implemented free trade zones and four (COMESA, EAC, ECOWAS and SADC) have implemented or are

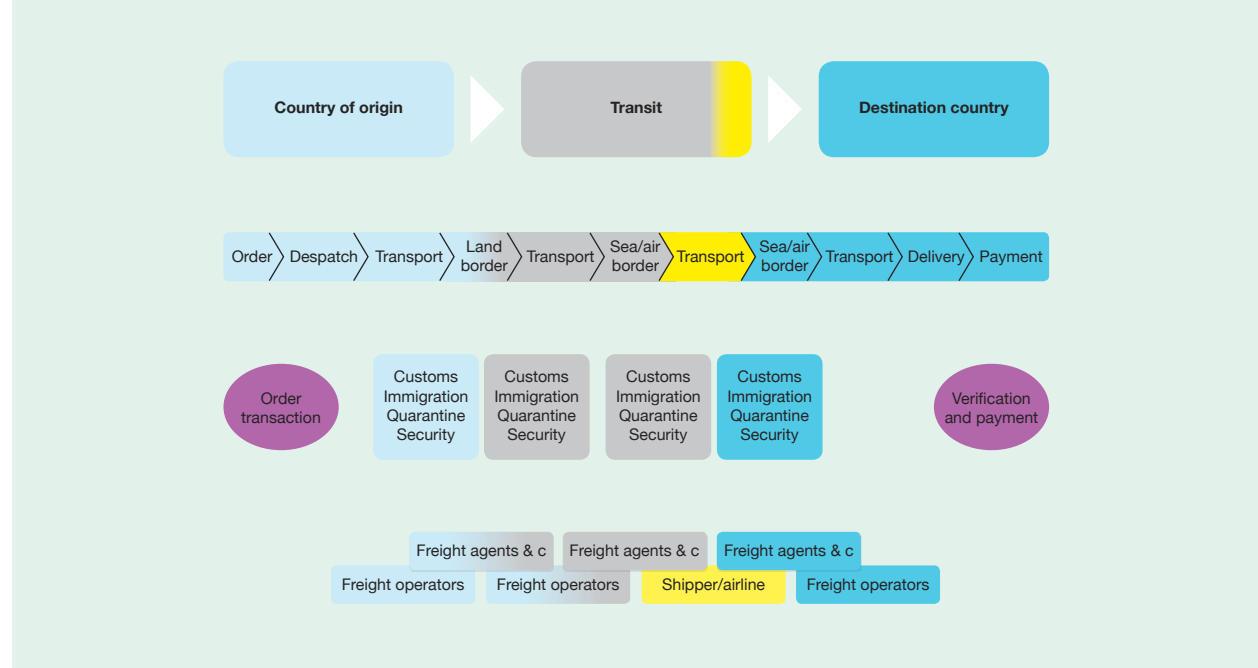
1. The Arab Maghreb Union (AMU), the Community of Sahel-Saharan States (CEN-SAD), the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Intergovernmental Authority on Development (IGAD), and the Southern African Development Community (SADC).



implementing custom unions, with further progress anticipated towards common market principles. The remaining RECs have failed to achieve comparable integration.

Trade barriers are strongest at critical points along the supply chain between producers and consumers of goods and services, particularly points of entry/exit between countries. These are illustrated in Figure 8.1, together with the main actors involved at each stage.

Figure 8.1 **Supply chain model between producers and consumers**



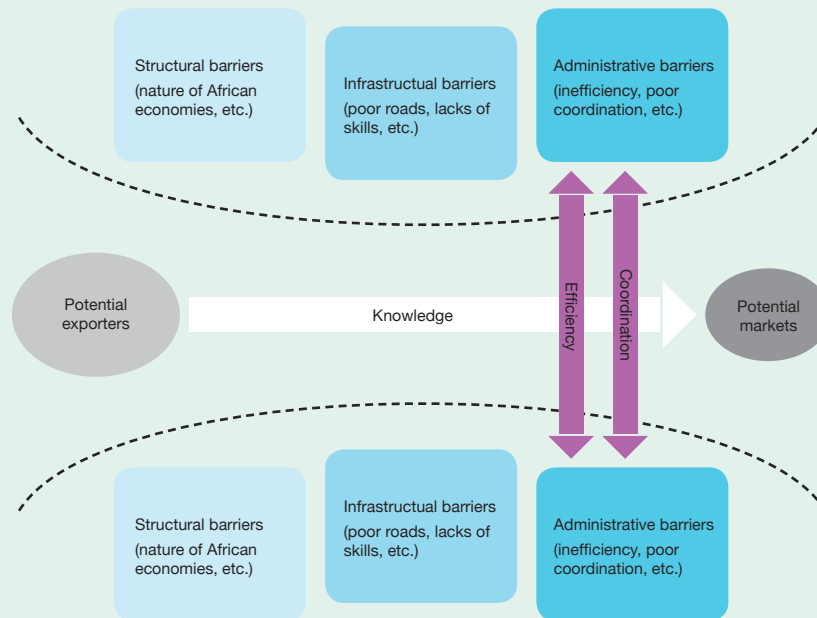
ICTs and trade facilitation

Trade facilitation aims to simplify, harmonize and standardize processes in order to minimize the delays and costs incurred at bottlenecks and to improve reliability for both trading businesses and governments. ICTs are crucial to trade facilitation for three main reasons:

- they improve the efficiency with which trade transactions are handled, improving transparency and accountability, reducing the cost of human interfaces, eliminating delays and reducing the scope for corrupt interactions between traders and officials;
- they improve coordination between different actors in the trade management process, particularly between government agencies within individual countries, and across national borders;
- they improve the information and knowledge about trade processes and markets which are available to businesses, enabling them to manage consignments more efficiently and to enter new markets at lower risk.

ICTs are therefore important inputs to the enabling environment for cross-border and regional trade. They cannot directly address the structural and infrastructural deficits which undermine Africa's trade performance but, in these three ways, they can reduce the administrative barriers that contribute to costs, delays and unreliability. Their effectiveness will be greatest when they are integrated with other measures to address the structural, infrastructural and non-tariff barriers that also inhibit trade. Their contribution is illustrated in Figure 8.2.

Figure 8.2 The impact of ICTs on trade facilitation



8.2

LANDSCAPE ANALYSIS

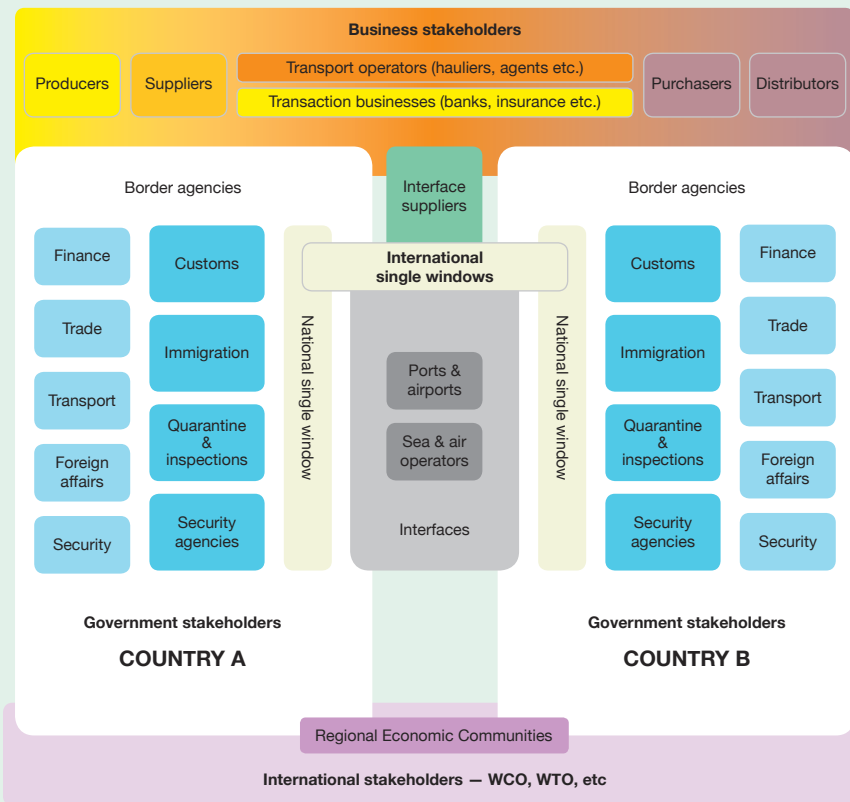
Cross-border trade involves a large number of different stakeholders, as illustrated in Figure 8.3. As well as the principals (the suppliers and purchasers of goods), these include at least four government agencies in each of the countries through which a consignment travels (customs, immigration, quarantine and security, abbreviated to CIQS), together with a variable range of other agencies in individual countries), port and airport authorities, freight businesses, banks, insurance companies and other businesses and agencies.

Trade processes, as a result, are highly complex systems in which many different stakeholders interact. The most significant ICT applications are likewise large and complex systems with a higher degree of centralization and information-sharing than in most ICT/development sectors, although these also increasingly rely on internet and other networks and benefit from the spread of mobile and other personal ICTs.

Experience in ICT applications for trade is most advanced in industrial countries and global trading centres,



Figure 8.3 Stakeholders in cross-border trade



particularly in Europe, North America and Asia. The most widespread use of ICTs in African trade is in customs automation, though there is growing experience of other ICT deployments along the supply chain, such as consignment tracking and port management, particularly in countries with major seaports such as South Africa, Kenya and Senegal. Global experience of ICTs in trade is increasingly based around single window principles, which allow for the sharing of data between government and business actors throughout the supply chain. African experience with single window principles, and the processes that put them into practice, is limited but growing.

As indicated above, the main trends in the use of ICTs for trade exploit their capacity to improve efficiency, coordination and information resources available to trade stakeholders, thereby reducing costs and delays while improving reliability. Eight main types of application are identified. Three of these are principally concerned with

improvements in the efficiency of trade and supply chain management:

- The automation of customs administration was the earliest major application of ICTs in trade, dating from the 1980s. Automated customs systems expedite the clearance, and thereby transit, of goods while improving identification of suspect consignments and raising revenue collection rates. The ASYCUDA customs management system pioneered by UNCTAD has been adopted in more than thirty African countries, while other countries (including Mauritius, South Africa, Kenya and Senegal) have preferred systems specifically designed for their own national contexts or other off-the-shelf systems which they believe give them greater flexibility. Recent customs automation programmes aim to incorporate online payments and to move trading businesses towards paperless trade based on digital data shared along the supply chain through single windows.

- Transport corridors play a significant part in trade logistics in Africa, particularly for landlocked countries. While the most substantial challenges along transport corridors are often infrastructural, the multiplicity of administrations, government agencies, permit issuing authorities and others along these routes causes substantial delays. A survey in West Africa indicated an average of about three checkpoints per hundred kilometres along major trade routes. Advance information on the movement of goods, people and money reduces the need for checkpoints, expedites transit at those remaining, and reduces the incidence of fees and bribes. Electronic cargo tracking systems using Radio Frequency Identification (RFID) and Global Positioning Systems (GPS) technology are becoming more widespread.
- Enforcement is an essential part of trade management, largely dependent on inspection regimes. Tracking systems, data management, and data sharing through ICTs enable CIQS agencies to focus inspection resources, with intelligence-led inspections taking the place of random selection or universal examination of consignments. Where well implemented, this results in higher levels of security from fewer stoppages, raising revenue while reducing delays for the majority of trade in transit. It is, however, highly dependent on the quality of data shared.

Three trends in ICT-enabled trade facilitation are principally concerned with improved coordination between government and other stakeholders:

- Border management is a complex multi-agency environment involving CIQS agencies enforcing tariffs and non-tariff regulations with the aims of safeguarding lawful trade, identifying and preventing illegal trade, and ensuring national security. The data-sharing and coordination capabilities of ICTs enable CIQS agencies in individual countries to integrate and synchronize inspection processes, share customer-facing systems and core databases, and thereby reduce transit times at border crossing-points from days to hours.
- Integrated cross-border management (ICBM), coordinating the activities of CIQS agencies on both sides of border crossings, adds greater complexity which can only be managed effectively through the data-sharing enabled by ICTs backed by supporting intergovernmental agreements. The most effective deployments of ICBM – just beginning to appear in Africa – include one-stop border posts, where joint operations of both countries' CIQS agencies, backed by intelligence-led transit management, implement single inspection regimes.

- The most complex trade environments are those at ports and airports, where multiple actors – including shipping lines and agents, freight forwarders and brokers, transport operators and port administrations, as well as CIQS and other border agencies – form highly complex “port communities”. Consignments passing through ports and airports undergo many different operations and movements before onward transit to their final destinations. In the past, these multiple processes were coordinated manually. ICTs have enabled them to be coordinated electronically, increasing efficiency and reducing delays. Governments and businesses in ports worldwide have implemented Port Community Systems (PCS), often as joint ventures, to maximize the value derived from ICT-enabled systems, and these are now being deployed at major ports in Africa. Similar Cargo Community Systems (CCS) are being implemented in airports.

Two further trends are principally concerned with information and transactions:

- Trade processes involve extensive transactions between trade principals, businesses involved in freight transport and logistics (such as insurance companies), customs and permit issuing authorities. Many of these are international transactions. ICT-enabled data-sharing allows transactions to be automated and digitally recorded, reducing the need for data-checking and face-to-face interactions that are susceptible to corruption. Online payments are increasingly common in PCS and CCS, while micropayments are increasingly made by mobile phone. These applications can significantly reduce the gross cost of transactions relating to consignments along the supply chain.
- African businesses have often been deterred from engaging in cross-border trade by lack of information about trade requirements (non-tariff barriers), export opportunities and goods available for import from neighbouring countries. Internet-based trade portals, some implemented through Regional Economic Communities, are improving information available to potential trading partners and enhancing scope for intra-regional trade. While information resources cannot overcome structural limitations in African economies, they can increase opportunities for trade and cooperation between trading businesses in neighbour countries.

Many of the trends described above rely on the potential for ICTs to:

- replace the need for data on consignments to be entered



at multiple points along the supply chain with a single data entry point; and

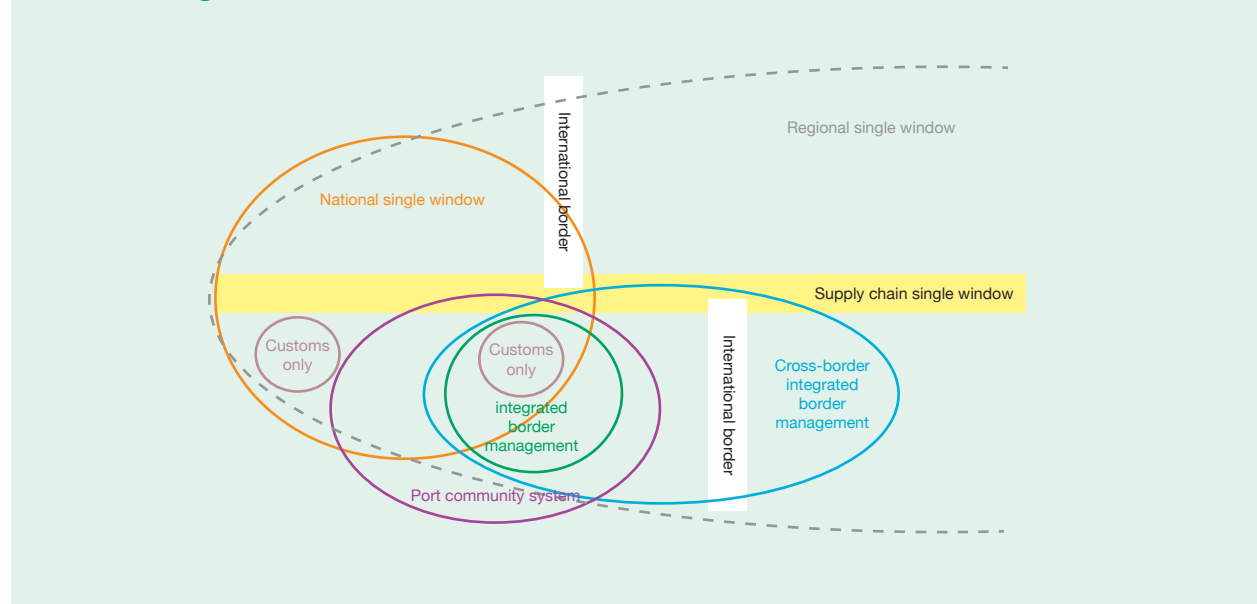
- share the resulting data between all stakeholders that need access to them either within particular communities or along the supply chain as a whole.

These are coalescing into a meta-trend in trade facilitation, which is the integration of trade management processes into ICT-enabled “single windows”, integrated systems which allow all parties involved in trade transactions to lodge standardized documentation through a single entry point, and to share such data as required

along the supply chain, both within individual countries and across national borders.

The implementation of single window principles in practice depends on close cooperation between government and business stakeholders. Implementation can occur in localized environments such as border crossings, PCS and CCS; at national level, involving trade and transport businesses as well as government agencies and trade principals; and at regional level, for example along entire trade corridors or on trans-oceanic transit routes. The various types of single window process are illustrated in Figure 8.4.

Figure 8.4 **Single window variants**



Transition towards a single window process is a major trend in trade facilitation worldwide, and an increasingly important goal for trade facilitation in Africa. A fully integrated single window process at national level is a highly complex arrangement involving many different government departments and business actors. Gradual integration of systems is therefore usually preferable to a “big bang” approach.

This can begin with adoption of the principles of data gathering and sharing that underpin single window processes, build over a period of time through

implementation of processes at critical points along the supply chain, and lead over time to fully-integrated national systems. In Kenya, for instance, the sharing of data between the Kenya Revenue Authority (KRA) and the Kenya Port Authority (KPA) was a critical early step towards initiating a single window. Data-sharing can also begin to take place across borders from a relatively early stage where both countries concerned have appropriate and compatible automated customs systems, though data-sharing in other CIQS functions may take longer to establish as automation in these is less well established.

8.3

OPPORTUNITIES AND CHALLENGES

The opportunities arising for Africa from the trends described above are considerable, but there are also substantial challenges to bringing them about. These challenges, and the time required to overcome them and deploy new systems, should not be underestimated. In particular, new systems are unlikely to be effective if they are not associated with reforms in the organization and management of trade administration which simplify procedures and eliminate bureaucratic inefficiencies.

Africa's poor trade performance derives from a number of factors. Some of these are structural factors related to the continent's resource base (in terms of raw materials and human skills) and political and economic contexts (such as regional conflict and varying degrees of regional economic integration). Some are infrastructural, related to inadequate port, transport, power and communications facilities, whose improvement is often dependent on investment by international financial institutions (IFIs) and development partners. Some, however, are the result of inefficiencies, poor coordination and limited information resources, all of which are susceptible to improvement by the deployment of ICTs. ICTs can alleviate some of the constraints undermining Africa's trade performance, opening up new opportunities for trade to generate employment, investment and growth, though their overall impact will depend on the extent to which governments and development partners also address the structural and infrastructural challenges which beset African trade performance.

The value of ICTs in trade facilitation derives, to a larger extent than in most development sectors, from the implementation of large-scale systems which are increasingly networked and thereby leverage the efficiency and coordination gains that can be achieved through system-wide data-sharing and data management. The engagement of all stakeholders in the trade environment is required to maximize these gains: experience worldwide suggests, for example, that complex applications such as PCS are often best implemented as public-private partnerships which

draw on the expertise, address the needs and secure the support of both government agencies and trading businesses. Businesses also gain value from exploiting the potential of ICTs within their own systems, for example by using electronic transactions and by enhancing communications with employees and business partners, and from ensuring that their systems are compatible with official applications for cargo tracking, customs administration and e-commerce.

The adoption of single window principles and the gradual development and implementation of single window processes offers the greatest potential value for ICT-enabled trade facilitation in Africa. The structural and infrastructural deficits of African trade are exacerbated by inefficiencies that result from poor data sharing, inadequate coordination and low standards of administrative practice, including corruption. By building trade processes around a single point of entry, which governs progress of a consignment along the supply chain, single window systems reduce the number of interventions and inspections required from government agencies, eliminate many of the errors that appear in manual documentation, allow resources to be targeted on suspect consignments, enable more secure collection of fees and customs revenue, and reduce the time required for transit.

Particular opportunities for ICTs in trade arise through the continent's Regional Economic Communities, the agreed framework for the development of economic integration on the continent, including trade promotion, and the logical framework therefore for the implementation of regional single windows. Trade is, by definition, dependent on cooperation between governments and businesses in more than one country. Africa's more successful RECs have sought to promote regional trade through the creation of free trade zones (one of which now covers the combined COMESA-EAC-SADC region), the development of customs unions (with a common external tariff), and preliminary agreement on progress towards a common market which enables the free movement of people



and capital together with freedom of business establishment, extending free trade principles more fully to trade in services.

While single window processes have value at a national level, they have greater potential value at a regional level where a single point of data entry and data-sharing can cover the entire transit route for goods with regional destinations and transit between landlocked countries and their continental points of import/export. Some cross-border data-sharing is already taking place, for example between customs agencies, and this can provide evidence for further progress. The development of regional single windows, however, will require high levels of intergovernmental cooperation. The more successful RECs are therefore better placed to move towards this goal. Progress towards regional ICT-enabled trade is evident in the COMESA, EAC, ECOWAS and SADC regions, but much less evident in other regions where RECs have been unable to achieve significant integration. Where RECs do achieve progress in trade facilitation, this can provide a model for ICT-enabled integration in other economic and social sectors, particularly where it builds on improvements in regional communications infrastructure.

However, ICTs are not able to transform trade performance on their own. The benefits described above are dependent on other factors, such as the quality of data input into single window processes, the compliance of trading businesses, and the modernization of administrative systems. Evidence in the report emphasizes the following challenges which need to be addressed if the potential benefits of ICTs, and particularly the successful implementation of single window processes, are to be achieved.

- Africa lags behind other world regions in the deployment of ICT infrastructure, particularly broadband. More investment is needed in regional backbones, and in the reliability of communications networks, to enable all trade posts to be integrated in single windows and ensure continuity of data transmission. Power infrastructure also needs to be addressed.
- Regional integration and single windows require standardization of non-tariff regulations and documentation along trade routes. This includes adoption of standardized digital formats for data entry, interoperable systems for data interchange (based on globally agreed standards such as EDIFACT), and reliable processes for the authentication of documents and signatures. The quality of data input also needs to be improved. Legislation enabling electronic commerce still needs to be enacted in some countries.
- The shortage of ICT skills in developing and managing distributed data networks is acute. Complex systems such as PCS and national single windows require specialist ICT skills that are often unavailable. Both governments and businesses need to invest in capacity-building in order to secure the benefits of ICT-enabled trade.
- Business and administrative systems also need to be redesigned to take advantage of ICT-enabled trade – transiting, for example, from paper-based to paperless record-keeping and from full to intelligence-led inspection regimes. Cohesive decision-making, appropriate fee structures and integration along the supply chain are critical. The efficiency and coordination gains achievable through ICTs in contexts like customs administration can only be unlocked if underlying bureaucratic systems are also simplified.
- A high level of commitment is required, at national and regional levels, on the part of both governments and trading businesses. Political leaders must be prepared to address the sovereignty challenges and partnership requirements of regional integration. Users must have confidence in the integrity and value of the systems that are being introduced. Issues of corruption need to be addressed. A high degree of cooperation, including public-private partnership in the management of systems, has proved beneficial in other world regions.
- Major ICT systems such as PCS and single windows require significant finance. While the benefits of automation can be considerable, some governments are reluctant to spend resources on costly ICT solutions and associated capacity-building, particularly in those regions where regional integration has so far been limited. There is an important role here for International Financial Institutions and other development partners.

The impact of ICT-enabled trade facilitation, and single windows in particular, can be substantial, but it is unlikely to be achieved overnight. Major system changes such as those required take considerable time to implement and to gain the confidence of users. Long-term gains are likely to be more important than short-term gains. Systems need to remain viable over a significant period during which other ICT deployment may change rapidly – in particular, the adoption of new mobile and internet applications by trading businesses, and changes in the balance between formal and informal trade.

Underpinning these developments are changes that have taken place in African communications. The rapid growth towards ubiquity of mobile networks has increased cross-border communications, though it is not

yet clear what impact this has had on the movement of goods and people. Liberalization of communications markets and the deployment of new international submarine cables around the African coast have facilitated Africa's global connectivity and encouraged investment

in inland broadband infrastructure. The advent of mobile transactions and of low-cost mobile roaming has had an impact on transactions and cross-border business interaction in some regions.

8.4

REGIONAL/NATIONAL EXPERIENCES

Extending ICT-enabled trade from national implementation to regional integration is critical to leveraging developmental gains. There has been significant variation in the development of regional integration in Africa, with consequential impacts on ICT-enabled trade. Developments in East, West and Southern African regions have been more encouraging than those elsewhere, including a Tripartite Agreement which establishes a free trade zone among the 26 countries of COMESA, EAC and SADC. Progress has been made towards greater integration, the establishment of customs unions and, especially in the EAC, towards a common market. In East and Southern Africa these efforts have been boosted by the launch of public-private-donor "Trade Mark" partnerships, which include ICT-enabled initiatives for trade facilitation.

The report identifies examples of progress that has been made in these regions towards ICT-enabled trade. These include initiatives to support the transit of goods along trade corridors in four REC regions (COMESA, EAC, ECOWAS and SADC), experiments with one-stop border posts, integration of customs administrations in landlocked countries with continental entry points in other states, the establishment of regional business information portals and payment systems, and steps towards the establishment of regional single windows.

The weakness of the four remaining RECs – AMU, CEN-SAD, ECCAS and IGAD – is, however, a major challenge. With the exception of the CEMAC sub-region in ECCAS, where cross-border trade is limited, these have been unable to move towards effective free trade zones.

Political borders and relationships are problematic in some cases, making progress towards regional economic cooperation and data-sharing hard to manage. These RECs are also seriously under-resourced. Progress is, therefore, to a significant degree, dependent on the resolution of regional conflicts and the development of effective intergovernmental cooperation outside ICTs and trade.

Kenya and Senegal illustrate both the potential and the challenges of ICT-enabled trade facilitation. Both are significant trading nations, which provide continental ports of entry/exit for landlocked neighbours. In both countries, customs automation has been critical to ICT-enabled trade. Senegal was one of the first African countries to automate customs, building its own GAINDE system rather than adopting the generic ASYCUDA system which is in wider use in Africa. Kenya also uses a variant of GAINDE known as SIMBA. In Kenya, a three year process of integration between SIMBA and the KWATOS PCS at Mombasa has been completed, but there is as yet no comparable integration between GAINDE and the port management system at Dakar in Senegal. Both countries have sought to adopt intelligence-led risk-management for goods in transit through their territory to neighbouring countries, in an effort to reduce evasion of customs payments. Business information services have been developed in both countries, though Senegalese businesses benefit more than their Kenyan counterparts from information about potential market opportunities in their region.



The integration of customs administration with PCS and other CIQS systems is complex and challenging. Senegal has made more progress in developing a national single window, ORBUS, which has reduced clearance times and reduced transaction costs for trade consignments. Additional facilities are being integrated with ORBUS, including online payments, with the overall objective of achieving a paperless trade environment. The Government of Kenya has established a company, Kentrade, to develop a national single window building on the experience of integration between SIMBA and KWATOS.

Both countries' single window deployments are lengthy processes, owing to the complexities involved in securing coordination between government agencies, partnership between government and business, and the necessary system upgrades and redesign. The most important

challenges to ICT-enabled trade illustrated by experience in Kenya and Senegal are not technical but infrastructural and institutional, including skill and resource limitations. New legislation and regulations are required, especially in areas like eCommerce. Vested interests are often reluctant to support transition to new systems. Power shortages and teething problems can undermine user confidence. These challenges are serious and substantial, and ICT implementations that ignore them are unlikely to succeed. Nevertheless, the experience of these two countries illustrates the potential for ICT-enabled trade facilitation and for achieving progress towards integrated single windows at national level. In particular, it illustrates how the introduction of ICT-enabled systems at particular points along the supply chain, such as PCS and customs management, acts both as a precursor to and a prerequisite for the implementation of a national single window.

RECOMMENDATIONS



ICTs for
REGIONAL TRADE
AND INTEGRATION
in Africa

The objectives of ICT-enabled trade facilitation are to:

- improve the efficiency with which individual trade processes are undertaken;
- improve coordination between different actors along the supply chain; and
- improve access by trading parties to necessary information on trade management and market opportunities.

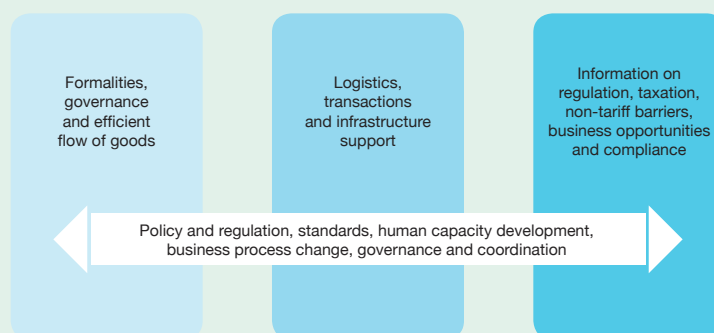
Together with administrative reform and simplification of trade management, ICT-enabled trade facilitation should help to reduce costs and delays experienced by trading businesses and to improve the reliability of trade.

The value of ICTs in trade facilitation can only be effectively realized if it is integrated with broader cross-cutting activities by governments and development partners, as illustrated in Figure 8.5.

These cross-cutting areas of activity include:

- the development of trade and industrial policies aimed at economic diversification, including manufacturing and services as well as primary commodity production;
- investment in power and transport infrastructure;
- the establishment of an enabling environment for communications sector investment and an enabling legal and regulatory environment for eCommerce;
- greater attention to regional integration and economic partnership by governments; and
- the adoption of common standards for data interchange and non-tariff requirements.

Figure 8.5 **ICTs and trade – the supporting environment**



Within this context, governments, RECs and development partners should work with other stakeholders progressively to build ICT-enabled trade facilitation in Africa by:

1. assessing the needs of actors in the supply chain, strengthening the capacity of government institutions and trading businesses to use ICT-enabled systems;
2. deploying ICT-enabled applications at critical points along the supply chain such as customs, ports and border crossings;

3. adopting single window principles and gradually developing national single window systems for data management and sharing; and
4. extending single window principles and practice to regional levels.

The adoption of single window principles lies at the heart of the core programme of ICT-enabled trade facilitation recommended in the report, with the implementation of single window processes derived from these principles evolving from individual locations through national to regional trade environments.

Governments

Governments are particularly concerned with revenue collection, compliance and trade promotion leading to economic growth. The starting point for government engagement with ICTs and trade should be a national policy framework based on a critical assessment of trade barriers and opportunities, through which the most effective points of implementation for ICTs can be identified. Governments should also invest in infrastructure improvements, without which ICT-enabled trade facilitation will have limited impact.

Within this context, governments should prioritize the following ICT-enabled interventions, building sequentially from points 1 to 7:

1. Adoption of international standards for non-tariff barriers and for trade documentation, and harmonization of both across land borders.
2. Adoption of single window principles and development of a strategy for gradual implementation of these based around needs assessment and stakeholder participation.
3. Upgrading of integrated customs management and development of joint government/business-led Port and Cargo Community Systems at ports and airports.



4. Introduction and development of intelligence-led inspections with high levels of data integrity.
5. Integration of compatible border management systems aimed at minimizing clearance time at border crossings.
6. Procurement and implementation of a national single window process which is consistent with automated customs management, and which will integrate ICT-enabled applications at particular locations and in particular communities within a coherent system which has the active engagement of both government agencies and trading businesses (and which may be jointly managed by them through a public-private partnership).
7. Experimentation with bilateral one-stop border posts with neighbouring countries where harmonization of non-tariff structures has been achieved.

In addition, from an early point in the sequence just described, they should address issues of transaction and information access:

8. Enactment of legislation and implementation of regulations and procedures that enable e-commerce and electronic transactions.
9. Implementation of portals that provide information concerning national trade processes, including rules, regulations and procedures, and information concerning business opportunities.

Implementation needs to be undertaken gradually, in prioritized and manageable stages which can be properly resourced, with the consent and engagement of all stakeholders, particularly trading businesses. Retraining and capacity-building will be critical, and progress should be monitored and evaluated.

Regional Economic Communities

Regional Economic Communities have an important role to play in enabling regional integration of ICTs and trade. In the case of the weaker RECs – AMU, CEN-SAD, ECCAS and IGAD – the priority should be to establish better coordination and begin to make progress towards free trade zones and customs unions. Where the stronger RECs – COMESA, EAC, ECOWAS and SADC – are concerned, they should build on existing experience and agreements by:

- adopting a regional vision for trade facilitation, based on the single window concept;
- focusing attention on the infrastructure challenges that inhibit trade, including transport and communications networks;
- developing guidelines to foster national and bilateral trade facilitation that will have regional value, for example on trade corridors;
- supporting the harmonization of national approaches to trade management across the region, including common non-tariff requirements (such as rules of origin and plant hygiene standards) and common data and documentation standards;
- implementing portals and other business information resources; and
- monitoring and evaluating the development of regional trade, including trade in services and informal trade as well as formal trade in goods.

International financial institutions and other development partners

International financial institutions and other development partners should support these national and regional initiatives in three main ways:

- by investing in the enabling environment for trade, including power, transport and communications infrastructure;
- by providing financial support for the implementation of national and regional ICT-enabled trade facilitation programmes along the lines described above; and

- by providing policy and capacity-building support in areas including the assessment of national policies, regional harmonization and standardization, and the monitoring and evaluation of trade performance.

They should also provide institutional and financial support to develop the capacity of Africa's RECs.



FURTHER READING



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in Africa

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For a more detailed presentation on the role of ICT in trade and regional integration in Africa, see the full eTransform Africa theme report:
<http://www.etransformafrica.org>



chapter

9

*The Transformational Use
of Information and
Communication Technologies
in Africa*

ICT COMPETITIVENESS



1. Introduction

2. Landscape analysis

3. Opportunities and challenges

4. Case studies

Kenya
Morocco
Nigeria

5. Recommendations

Further reading

9.1

INTRODUCTION

The ICT sector has proven to be a strong driver of GDP growth in nations across the world. From developing countries such as India and the Philippines, to developed nations such as the United States of America and Ireland, the ICT sector has contributed to the success of each of these nation's economies, the advancement of its people's skills and capabilities and positioning the nation as a place for global firms to more efficiently do business. The ICT sector is socially and economically relevant to Africa in that it has been the major economic driver in Sub-Saharan Africa over the past decade. Although mobile and internet penetration remains

comparatively low in Africa, never before in the history of the continent has the population been as connected as it is today.

This summary outlines the current and historical landscape of the local ICT sector in Africa, explains the primary areas of ICT that would most benefit the continent, makes tactical recommendations to continue the momentum of growth, lists roadblocks to overcome in order to implement the recommendations and describes case studies from specific African nations that currently lead the way.

9.2

LANDSCAPE ANALYSIS

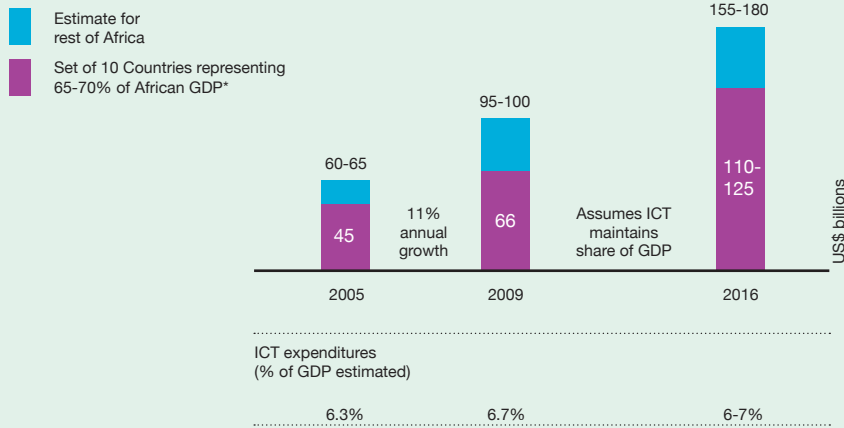
The opportunity in ICT for Africa is significant. Provided the ICT market continues its impressive double-digit growth, expenditures in ICT within Africa could exceed US\$150 billion by 2016 (see Figure 9.1).

Nevertheless, although current performance indicators and financial predictions are largely positive, there are still challenges for the continent in the ICT sector. A number of African countries have made progress on

access to ICT services but the continent largely lags behind the rest of the world in terms of ICT readiness. The ITU Development Index, for instance, indicates that the African region has made slower progress when compared to other regions in the past 2 years, with roughly half the improvement on an aggregate basis (see Figure 9.2). According to the ITU, most of the limited gains have taken place in providing greater access to ICT.



Figure 9.1 Projected ICT expenditures in Africa to 2016

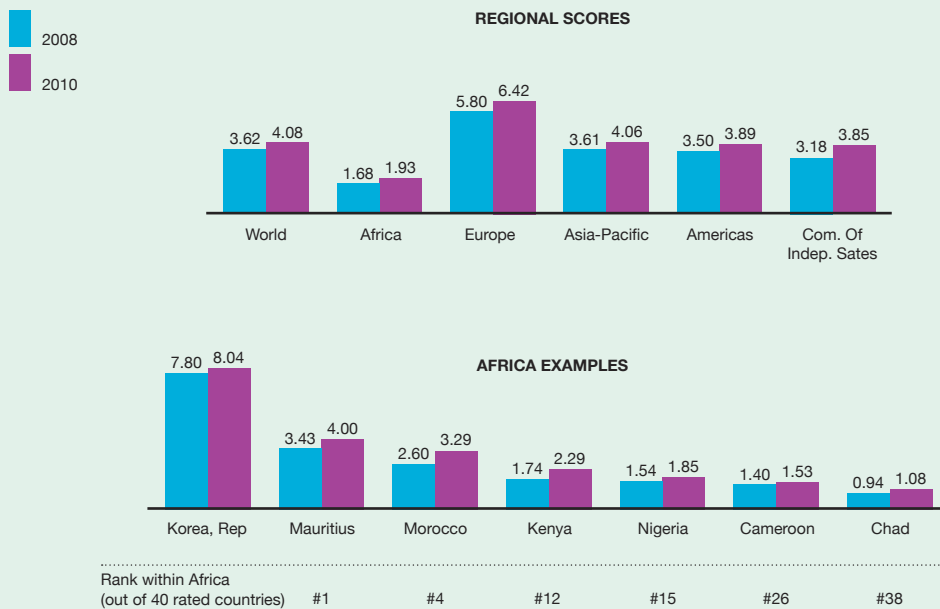


* Countries in sample set are Algeria, Cameroon, Egypt, Kenya, Morocco, Nigeria, Senegal, South Africa, Tunisia.

Note: ICT expenditures include computer hardware and computer software, computer services (information technology consulting, computer and network systems integration, Web hosting, data processing services, and other services); and communications services (voice and data communications services) and wired and wireless communications equipment.

Source: World Bank Databank - African Development Indicators, ITU Measuring the Information Society, 2011, consultant analysis.

Figure 9.2 ICT Development Index indicators
Score of weighted factors of ICT Access, Use and Skills.



Source: ITU Measuring the Information Society, 2011.

A key indicator in determining access and usage is the price of service, such as for voice and data. Pricing of voice services in many African countries has become competitive and comparable with the rest of the world. However, broadband costs continue to be beyond the reach for most Africans. Furthermore, when differences in GDP are taken into account as compared to global benchmarks, Africans pay even more owing to the lower GDP base. The ITU's ICT price basket analysis details the extent of the gap: for mobile cellular calls, Africans pay on average 25 per cent of monthly gross national income (GNI) per capita versus 11 per cent in other developing nations. On the other hand, the story of mobile penetration across the continent is far better than the internet. Overall, 45 per cent of African residents have a mobile subscription;

this is more than four times the penetration of the internet. Spending on ICT within Africa is roughly in line with the global average, although there is a considerable variation between countries. For example, Morocco spends 3.5 times its GDP on ICT than Nigeria.

Africa has improved its relative share of foreign direct investment (FDI) over the past two decades, albeit from a small base. From 1995 to 2010, Africa's FDI inflows grew at 16 per cent compared with 11 per cent for developing world counterparts, and 9 per cent globally. Furthermore, Africa's perception as an investment destination, including ICT, has improved tremendously in the past few years, according to Ernst and Young's Africa attractiveness survey.

9.3

OPPORTUNITIES AND CHALLENGES

The continent is primed to continue its momentum in the ICT sector. Continent-wide opportunities include:

- increasing industrialization of the ICT industry,
- greater fragmentation and differentiation within software,
- continued growth of the business process offshoring sector,
- leveraging open source software adoption, which has lowered barriers to entry for firms, and
- encouraging greater intra-Africa FDI to allow sharing of solutions already proven on the continent.

Areas where these opportunities can be capitalized are with eCommerce, microwork, and the establishment of ICT parks. These areas not only already have a relatively strong presence throughout Africa, but multinational firms are increasingly looking to Africa to leverage these areas for greater efficiencies and productivity.

The most prevalent challenges across the continent to fully move forward in these business areas are infrastructure, energy constraints and the ICT skills gap (compared to other parts of the world), which impacts users as well as the pool of available, skilled labour for firms wanting to do business in Africa. These challenges are further outlined in a few case studies throughout the study.



CASE STUDIES

9.4

ICT
COMPETITIVENESS
in Africa

Three nations that are emerging in the area of ICT are Kenya, Morocco and Nigeria. Case studies which outline

each of these nations' opportunities and roadblocks are included in the study. Some of these insights are as follows.

Kenya

The Kenya ICT Board (KICTB), the implementation arm for ICT policy in Kenya, focuses on action-oriented approaches to boost ICT including partnerships with MNCs. The board's eGovernment initiatives have attempted to replicate best-in-class Ethiopian and US eGovernment systems to streamline public service delivery. In addition, the KICTB's public-private partnership initiatives (PPPs) have enhanced self-sustaining development projects and skill building initiatives around the country. The board is now focused on closing other gaps such as rural connectivity, lagging business process outsourcing (BPO) performance relative to global providers, content exports, and enabling ICT in the private sector beyond mobile finance.

Kenya has made great strides in ICT development in the past few years and is now considered to be a leader within Africa. The government's focus on developing an ICT-enabled country has contributed to development of a robust ICT landscape. Science, technology and innovation (STI) are core pillars of Kenya's Vision 2030 plan. Through STI initiatives, the Kenyan government intends to raise productivity and efficiency through increased resource allocation to scientific research penetration.

Within the BPO sector, three players have risen to the top as full service BPO providers:

- DDD Kenya is a data entry and back office services provider backed by US philanthropic organizations that train disadvantaged Kenyan youths to play an active role in the BPO sector.

- KenCall is the first independent Kenya based company that provides a full suite of BPO services from call centre functions to supply chain management (in partnership with Seven Seas).
- The third major BPO player is Horizon, which has carved out a niche in IT maintenance and HR provision.

The emergence of these three players on the Kenyan local ICT landscape is important as it offers proof of concept of Kenya as a potential global hub for specialized ICT services.

Kenya is unique in that a single, non-government owned operator, Safaricom, dominates the market, with a 70 per cent and 92 per cent share of mobile and internet subscriptions respectively (CCK, 2nd Quarter). This market dominance has enabled Safaricom to launch initiatives that have rapidly changed the cadence of Kenyan ICT at a retail level. Most notable is the ubiquity of Safaricom's mobile payments platform, M-PESA, that has served as a foundation for eCommerce and mobile BPO companies like Virtual City and Seven Seas. With a widespread and common platform for sending and receiving payments, barriers for eCommerce have come down from both a vendor and purchaser perspective.

A difficult but important task is to change Kenya's image on the international stage as the perception of corrupt practices at both corporate and government levels has stymied the inflow of international capital. Kenya has recently implemented policies ensuring accountability and transparency across both political and business mediums

but should also focus on acquiring credibility through partnerships with international organizations with trusted brand equity. In the same vein, the government needs to relax labour restrictions on Kenyan businesses so that the private sector can achieve scale through international trade. The Kenyan Private Sector Alliance (KEPSA) was created to provide a single corporate voice for Kenya so that dialogue with government could add more value. It is currently managing a number of projects and initiatives, including a US\$15m programme on Youth Employment that has created 700 internships to date. KEPSA has been particularly praised for its systematic approach to setting and monitoring key performance indicators to track programme objectives.

Another constraint for Kenya is its lack of reliable data centres and general infrastructure. This has led to higher costs for software-as-a-service (SaaS) or “on-demand” offerings. Research suggests that the largest constraint within the East African region is the existence of affordable and sustainable ICT infrastructure, implying that the existing infrastructure is neither cost effective, nor scalable. Although current mobile penetration rates are over 60 per cent and growing rapidly, Kenya’s internet penetration rate remains low at about 15 per cent, attributed to limited cable installation in rural areas. Also, constant power outages as well as hardware security risks have constrained overall productivity.

Table 9.1 Kenya roadblocks and pathways to success

Roadblocks	Pathways
Small pool of qualified young tech graduates: Limits pool of talent to enable scale in existing companies, reduces likelihood of breakout tech entrepreneurial ventures	Examples of success as a motivator: Raise profile of tech successes in Kenya, continue to attract high value competitions to make income generation potential of tech tangible Additional rigor of university level ICT programmes: International standards applied to University technology curricula
High cost to entrepreneurship: Reduces tendency of talent to move into young innovative ventures	Lower cost of failure via fellowships and development programmes: De-couple professional and personal success Implement guarantees for small business AR: Reduction of cash conversion cycle, starting with most reliable payers serves to improve small business cash management and prospects
Low perception of quality and trust in Kenyan businesses: Kenyan businesses must be “that much better” to succeed, limits tendency to execute large, outside of network, initiatives	Conduct joint initiatives between international bodies and local companies Boost credibility through partnerships Implement counterparty verification: Objective assessment of risk of doing business with reviewed counterparties
Limited exposure to foreign innovations and markets: Few beyond Diaspora benefiting from innovations developed elsewhere and bringing international perspective	Increase pathways to foreign exposure: Support efforts to introduce foreign experts to Kenya and vice versa
Unclear government policy and protectionist tendencies: Strict labor policies reducing ability to do business internationally and benefit from scale	Collaboration with governments to dialog on labor policy: Initiate conversation between business leaders and government on specific areas for labor policy improvement Central policy clearinghouse and interpretation: Develop hub for dissemination of easily understood policy information



Morocco

In Morocco, the Government has created two different public bodies along with an ICT federation to facilitate development, research and legislature in the sector. The Moroccan Telecommunications Regulatory Agency (ANRT) is in charge of granting telecom licences, implementing ICT framework and supporting development and research in the sector. Although not solely created for the ICT sector, the Ministry of Finances and Privatization plays a large role in the ICT sector by preparing tax and finance law to aid the ICT sector as well as to create value added services in the field of eGovernment.

The local ICT sector in Morocco is largely concentrated in the outsourcing (BPO), advisory, and infrastructure space though there is a strong concentration of content and solutions developers. In fact, over two hundred technology and BPO focused companies operate from technology complexes in Casablanca and Rabat and four additional complexes around the country are in development stages.

There are over five major telecommunications companies serving the domestic space in Morocco. This high level of competition has led to a high quality of phone and internet service at affordable prices with internet penetration nearing 50 per cent, mobile penetration eclipsing 100 per cent, and the average cost of broadband ranging from US\$15 to US\$30 per month. Further, the Moroccan government's action to reduce trade restrictions for IT equipment has helped to lower prices for enterprise grade networking hardware and retail devices. In 2009, Morocco joined the WTO Information Technology Agreement (ITA) that removed all tariff barriers to IT products. In addition to reduced hardware costs, the strong brick and mortar retail presence of telecoms providers has also helped to boost telecoms penetration by lowering barriers to access. In fact, in most major travel hubs (train stations and airports), there are several

providers offering affordable prepaid and subscription based telecoms services and mobile phone setup time takes less than five minutes as SIM registration is currently not required. The confluence of low cost, easy access and relatively high GDP per capita of about US\$5,000 has led to a country with one of the highest penetration levels on the continent.

To become a global hub, Morocco cannot sequester itself from continental exposure; it must open knowledge and economic pathways into Sub-Saharan Africa and the world. One way to do this is by hosting international ICT symposiums and engagements. The country also needs to focus on becoming a research and development destination and unlock some of the value hidden in its universities. To achieve this, the country should borrow best practices from Israel, which was able to boost its research capabilities in part by loosening constraints on the commercialization of technology developed in universities by offering professors a greater share of any realized profits. Another educational initiative that Morocco should focus on is increasing support for government programmes to enhance digital literacy. In 2008, only 20 per cent of public schools in Morocco had computer labs and equipment to enable greater digital literacy and a tech-competent labour force. ICT adoption and uptake have a greater chance of success if the population has had ICT exposure during seminal stages of education.

Despite the rapid pace of technology adoption among the Moroccan population and accelerated development of local businesses through government partnerships, Morocco faces high hurdles to developing into an ICT hub that maximizes the likelihood of scale among locally developed companies. Utilization and locally developed content has not yet been maximized as the majority of Moroccans are still adapting to using technology for more than just checking basic email and making phone calls.

Table 9.2 **Morocco roadblocks and pathways to success**

Roadblocks	Pathways
<p>Limited exposure to sub-Saharan Africa: Limits extent to which Morocco serves as a continental leader and scope of market access for domestic tech companies</p>	<p>Knowledge exchange events in sub-Saharan Africa: Use education as a means to open up markets and support other African countries</p> <p>International partnerships and engagement in continental symposiums: Leverage opportunities for in person meetings with potential partners</p>
<p>Lack of research and development commercialization: Top talent largely in Universities with limited ability to commercialize technology</p>	<p>Lower barriers to University researcher participation in upside to commercialization: Leverage Silicon Valley and Israel models to tech research acceleration</p>
<p>Opportunity for greater exposure of top technology talent to non-Africa innovation hubs: Current exchange programmes limited to only a few participants (ex. Only 20 in South Korea exchange)</p>	<p>Expand exchange programmes to include greater diversity of Morocco (age and sector) and increase number of people who are able to attend</p>
<p>Limited utilization of technology by broad population beyond basic services: Adoption in schools still in transition period with some push-back from teachers. Few popular organically developed websites. Limited use of mobile and purely online payments</p>	<p>Increase familiarity with technology at a young age: Provide continued support to educational initiatives (ICT as a right not a privilege)</p> <p>Provide greater support to very young, innovative companies: Offer stepping stone incubators to support companies not yet prepared to enter techno-parks</p>

Nigeria

In 2008, the Nigerian government in coordination with the World Bank began implementing an integrated personnel and payroll information system (IPPIS) to decrease fraud and increase accountability in payroll administration and HR recording. Some estimates say the technological implementation has already saved 12 billion Naira (US\$120 million) solely in the pilot phase by eliminating “ghost workers” or fraudulent payees on the payroll. Nigeria has also recently partnered with Intel to increase access to rural healthcare and boost delivery systems via ICT related to health care providers. Multiple stakeholders including ethnic leaders, the Ministry of Health, Intel executives and participating hardware and software vendors have come together to increase productivity and the IT presence in rural areas.

In recent years, a number of entrepreneurial companies throughout Nigeria have realized the potential opportunity within the mobile payments space, which could

create a new set of mobile entrepreneurs and new business models with strong value realization in a market of over 90 million mobile subscribers, a large segment of whom remain unbanked. The impressive growth recorded in the Nigerian telecommunications market has unfortunately been challenged by criminal activity and as such, the success of the mobile payments sector appeals to many Nigerians as it provides a cost-effective solution to authenticate payments and reduce the overall risk of theft. Effective mobile payment companies have provided the Nigerian population with an innovative and detailed payment management process that covers the entire scope of the value chain across all the participants in the mobile payment system. The recent focus on initiatives and licensing opportunities in both the mobile and financial industry on mobile banking and payment services has driven a number of companies to develop innovative mobile payment solutions to transform Nigeria’s banking landscape.



Nigeria needs first and foremost to address its endemic power issue, one that if left unaddressed will keep not only the ICT industry but also the country in economic stasis. Even though Nigeria's political leaders have promised to solve the crises for years now, it is still a huge barrier to growth. Multilaterals such as the World Bank and African Development Bank should galvanize sustainable energy and power experts, issue

tenders, offer financing, and share resources to tackle this problem.

In addition to enhancing infrastructure, Nigeria needs to focus on enabling its people with enterprise-scale development skills and literacy in ICT via educational initiatives and dedicated training programmes for students and business owners.

Table 9.3 Nigeria roadblocks and pathways to success

Roadblocks	Pathways
Low digital literacy: Constrains ICT adoption and innovation at consumer and commercial levels	<p>Mobile phones as digital gateway: Increased access to smart phones, mobile enabled web pages, mobile as information portal, mobile application monetization</p> <p>ICT education: Increased access to ICT in schools, dedicated training for students and business owners</p>
Lack of exposure to external markets, few domestic forums: Reduces visibility into new technology and scale of business	<p>International leadership enabler: Mix of domestic and foreign managers, advisors, and directors</p> <p>Exposure as a two way street: Expert exchange and learning trips, in country forums and incubators</p> <p>Online tech community portal: Development and networking tools for African tech skateholders</p>
High barriers to business development: Little early stage capital, high cost of operation, high cost of failure	<p>Investment rather than aid: Low returns to early stage venture in Nigeria, but necessary for growth</p> <p>Operating cost parity: Support for high cost of power, connectivity, and facilities</p>
Limited access to virtual payments: High non-banked population (80%) and limited means for online payment limits ability to automate for domestic needs	Mobile money adoption: Support for regulation and encouragement of mobile money movement and interaction across banking and alternative systems
Rampant fraud and msitrust: High levels of distrust within businesses and among partners, strong reliance on relationships rather than capabilities, international perception of risk	<p>Technology as a fraud reduction tool: Business automation to enable scale and increase intra business accountability via transparency</p> <p>Certification promotion: Objective certifications of ability and reliability among individuals and businesses to enable non relationship-based counter party verification</p>



RECOMMENDATIONS

Despite the successes and the roadblocks, there are specific, proven interventions that African nations can develop to sustain and further grow the ICT sector. These recommendations include:

RECOMMENDATION 9.1

Reduce the cost of access for mobile and broadband

Addressing the direct cost challenges will require improving the regulatory and competitive environments for operators as well as better coordination in developing the infrastructure. There will be some negative near-term effects on the largest or incumbent players, since many of these interventions encourage increased competition. However, the improvement of the long-term outlook for the ICT sector should benefit operators by expanding the customer and business base for these services.

One method is to encourage nimble billing approaches to lower end-user costs and drive up usage. Interventions may include allowing for longer periods of validity for pre-paid credit, enabling per second billing, nation-wide tariffs, low denomination recharges, and enabling discounts for “friends and family” networks.

Regulators will have to own most of these initiatives. The nature of the underlying barriers is business competition and product design. That said, there is a potential role for donors to provide limited subsidies to jump start ICT usage in countries with high retail access costs.

RECOMMENDATION 9.2

Support government/private-sector collaboration

While government and the private sector may not agree on all issues, it is important that the two have an ongoing, structured dialogue. In order to ensure this, the first task would be to create a vehicle and the expectation for interaction between the two groups. The Kenya ICT Board is an example of this. Established five years ago to be the implementation arm for ICT policy in Kenya, this board has played the role of mediator between the government and private sector and, more importantly, advocate for the sector and its advancement.

Areas where such partnerships can create success include jointly develop and manage infrastructure projects, e.g. large broadband projects like EASSy and SEACOM. Governments can also spotlight private sectors on joint priorities to engage and attract donors and MNCs to promote the local BPO industry.



RECOMMENDATION 9.3

Improve the eCommerce environment

Governments, the private sector and donors all play a role in improving the eCommerce environment. All three can set an example by themselves embracing eCommerce in their own operations, by engaging in online (mobile) procurement practices and creating incentives for companies to go online. Other methods include launching communication campaigns to promote eCommerce, adopt model eContracting/transactions and eSignature legislation for a region, develop data and electronic security laws to include data protection and develop online consumer/supplier protection laws including IP sections.

RECOMMENDATION 9.4

Improve ICT worker skill levels

African countries need to continue to invest strongly in education as the complexity and competition for vendors in the arena is increasing. Human capital is a weakness for most African countries and BPO success is largely predicated on reliable talent. Owing to intense global competition in virtually every segment of the BPO value chain, African countries need to delineate exactly where they would like to participate (medical transcription, coding, billing), build up relevant experience in these niche areas, and improve infrastructure to execute seamlessly.

Methods to develop skills amongst the local population include supporting broad primary and secondary education efforts, customizing tertiary schooling efforts to reflect greater context of business and supporting technical skills development through incubators and the private sector. For example, Kenya, Nigeria, South Africa and Uganda have all established networks and academies to advance BPO skills and capabilities, including BPO certifications supporting global standards. Nigeria has established the BPO Academy and the Association of Outsourcing Practitioners of Nigeria. In Uganda, the School of Uganda's Makerere University, a leading computing school in East Africa, has collaborated with Orion Outsource World and the African BPO Academy to offer a training programme focused on skills to work for global BPO firms and ultimately qualify students for the BPO Certification Institute's (BCI) globally accredited certification. The programme is currently aiming to train 3,000 young Ugandans. Donors can provide both technical and financial support to design and implement these initiatives.

RECOMMENDATION 9.5

Encourage innovative business models that drive employment, such as microwork

Microwork represents the promise of ICT as an enabler of broad economic impact. This is possible due to the disaggregation of complex problems into work products that can be addressed by a variety of skill levels and the ability to leverage the relatively well-distributed mobile phone as a work interface.

Tactics to encourage microwork can be divided into both the demand side and the Supply-side. Demand side tactics include expanding the number of business issues that can be addressed through microwork, creating a marketplace for retail/individuals for microwork-related solutions, and creating an internal demand for microwork from local African governments or large corporations. Supply side tactics include addressing the standard basket of ICT SME challenges (e.g. technical skills of the microworker), as many of the issues will be similar for the microworker, creating standards on workflow management to allow for interchangeability between the various players in the value chain, and creating voice-enabled interfaces to expand the labour pool of microworkers. The standard setting exercise would be a particularly critical area for donor involvement, as the standards would need to be continent-wide, if not world-wide, to drive transformative business impact and visibility for this sector.

Likewise, the BPO opportunity is large but highly competitive. Even operating in the right business environment and maintaining strong BPO fundamentals, there are industry pitfalls that need to be avoided for African BPO companies to survive. An example of a pitfall is BPO firms locking in long-term unprofitable deals in a reaction to the intense competition, thereby dooming the partnership to ultimately fail. The large amount of upfront cash investment required for large BPO deals often causes vendors to increase capacity very quickly, putting them into a situation with excess capacity. Although these pitfalls are substantial, there are enough methods and experience in the marketplace so that with the right due diligence a firm can avoid them. There may be a role for the donor community to disseminate these business decision best practices to BPO players on the continent.

RECOMMENDATION 9.6

Create ICT parks in countries that meet infrastructure requirements

The development of the ICT sector has been proven to contribute heavily to the growth of a nation's GDP and, therefore, expanding that investment in developing countries in Africa would be a strong initiative for the continent and its future growth. Not all countries, however, are poised to successfully implement, operate and sustain an ICT park. However, there are common success factors across the most successful parks from which countries can learn as they determine their own viability to establish a park.

Some of these success factors include park organizers having very clear and concise plans to address and mitigate the critical barriers of lack of sponsorship, availability of skilled labour, weak university curricula, infrastructure challenges and programme leadership. Successful parks are, furthermore, located in countries or sub-regions where literacy rates and Human Development Index (HDI) ratings are high, have relatively stable governments and have the right balance of both government and private sector interest and sponsorship.

The location of an ICT park is also quite crucial in supporting these success criteria. For example, the proposed Konza City in Kenya is being built 60 km from Nairobi, on the opposite side of the perennially crowded central business district from the airport. At the same time, it is building the infrastructure improvements to ensure that this is not a bottleneck, e.g. independent power supply incorporating green elements, water management and a mass-transit transportation model.

Clearly, governments have been the primary drivers behind these efforts, which is appropriate given the scale of the operational and regulatory challenge. The donor community can be helpful in sharing best-practices and providing access to finance to develop the projects (e.g. IFC, AfDB, other development banks).

RECOMMENDATION 9.7

Support ICT entrepreneurs

Kenya, Morocco and Nigeria have established themselves in the ICT marketplace, and, although there are still many challenges that each nation faces, they have successfully advanced their journey to offer best practice to their fellow African nations. In particular, all three have removed roadblocks and created pathways for ICT entrepreneurs to be successful from which others may learn.

One example is overcoming the high cost to entrepreneurship, which reduces the tendency for talent to move into innovative ventures. A solution to this includes reducing that cost by decoupling business and personal success through the creation of fellowships and business development programmes. Another challenge is the perceived lack of quality and trust in African business. However, through the creation of joint initiatives with local companies and partnerships with international bodies, this too can be overcome. The donor community can support these programmes through both financial and technical assistance.

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UNCTAD

(2011) *Information Economy Report 2011: ICTs as an Enabler for Private Sector Development*

United Nations Conference on Trade and Development

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For a more detailed presentation on ICT competitiveness in Africa, see the full eTransform Africa theme report:

<http://www.etransformafrica.org>

STATISTICAL ANNEX

		MOBILE									BROADBAND		
		Total Mobile Subscriptions			Mobile Subscriptions (per 100 people)			Mobile cellular prepaid tariff (US\$ per month)			Mobile broadband subscriptions		
		Compound Annual Growth Rate (CAGR) 2005-11 (in %)						Mobile cellular prepaid tariff (% of GNI per capita)			Total broadband subscriptions		
		2005	2011		2005	2011	2005	2010	2005	2010	2010	2010	2010
*	ALGERIA	13,661,355	28,229,835	15.6%	41.54	78.46	17.48	12.49	7.71	3.42	900,000	--	900,000
	ANGOLA	1,611,118	11,443,293	48.0%	9.77	58.33	--	19.24	--	5.82	20,000	873,216	893,216
	BENIN	596,267	7,074,914	85.6%	7.81	79.94	22.35	13.04	47.05	20.00	3,569	--	3,569
	BOTSWANA	563,782	2,933,000	39.1%	30.06	144.43	--	13.16	--	2.35	11,978	116,817	128,795
	BURKINA FASO	633,554	7,246,000	62.8%	4.46	42.70	23.66	21.20	72.81	46.25	14,193	--	14,193
	BURUNDI	153,000	2,149,212	69.6%	2.11	25.06	--	--	--	--	200	0	200
	CAMEROON	2,252,508	10,623,000	36.4%	12.83	53.03	30.98	20.07	39.98	20.10	1,000	--	1,000
	CAPE VERDE	81,721	371,871	46.1%	17.28	74.97	34.48	41.64	--	--	15,971	--	15,971
	CENTRAL AFRICAN REPUBLIC	100,000	736,000	64.7%	2.49	16.72	--	--	--	--	--	--	0
	CHAD	210,000	3,968,922	80.0%	2.15	34.44	--	15.35	--	29.81	150	--	150
	COMOROS	15,523	244,463	73.6%	2.41	32.45	--	24.25	--	--	150	--	150
	CONGO, DEM. REP.	2,746,094	9,095,000	34.9%	4.78	13.79	--	--	--	--	8,673	--	8,673
	CONGO, REP.	558,192	3,885,000	47.4%	15.80	93.85	--	--	--	--	124	0	124
	CÔTE D'IVOIRE	2,349,439	17,041,000	48.6%	13.04	84.56	45.03	13.61	62.11	14.07	7,900	--	7,900
*	EGYPT, ARAB REP.	12,828,000	80,389,817	44.3%	17.29	97.40	11.12	7.02	10.68	3.47	1,449,904	4,988,001	6,437,905
	EQUATORIAL GUINEA	96,900	403,000	42.8%	15.94	57.57	--	--	--	--	1,186	--	1,186
	ERITREA	40,438	185,275	46.3%	0.90	3.53	--	--	--	--	118	--	118
	ETHIOPIA	410,630	10,526,190	91.3%	0.55	12.42	--	4.10	--	12.62	4,107	442,997	447,104
	GABON	736,690	2,533,000	28.0%	53.74	165.10	--	--	--	--	4,082	--	4,082
	GAMBIA, THE	247,478	1,478,347	56.3%	16.46	85.50	--	--	--	--	350	9,229	9,579
	GHANA	2,874,560	21,165,843	49.1%	13.28	84.78	16.18	7.37	42.21	7.10	50,082	201,000	251,082
	GUINEA	189,000	4,731,000	90.4%	2.09	46.28	--	4.13	--	12.30	500	--	500
	GUINEA-BISSAU	98,825	869,000	54.5%	7.23	56.17	--	--	--	--	--	--	0
	KENYA	5,329,000	28,080,771	39.4%	14.96	67.49	21.07	10.78	48.63	16.00	4,155	1,405,814	1,409,969
	LESOTHO	249,786	961,000	40.1%	12.09	44.27	--	24.14	--	26.53	400	62,942	63,342
	LIBERIA	160,000	1,677,000	60.0%	5.03	40.62	--	--	--	--	186	--	186
*	LIBYA	2,000,000	10,900,000	52.8%	34.66	171.52	--	--	--	--	72,800	2,714,269	2,787,069
	MADAGASCAR	510,269	7,711,721	97.2%	2.85	37.23	21.82	15.43	87.27	42.98	5,359	157,190	162,549
	MALAWI	421,163	4,050,000	57.3%	3.28	26.33	--	21.24	--	77.09	5,120	23,189	28,309
	MALI	761,986	10,940,000	70.4%	5.78	69.07	33.90	14.44	104.30	28.80	2,314	99,924	102,238
	MAURITANIA	745,615	2,961,000	31.8%	24.47	83.61	--	14.62	--	17.52	6,624	--	6,624
	MAURITIUS	656,828	1,190,900	16.0%	52.83	92.97	6.57	6.84	1.47	1.04	79,227	194,360	273,587
	MAYOTTE	--	--	--	--	--	--	--	--	--	--	--	0
*	MOROCCO	12,392,805	36,554,000	24.2%	40.78	113.27	32.99	33.10	20.20	13.94	498,682	3,321,325	3,820,007
	MOZAMBIQUE	1,503,943	5,947,000	41.0%	7.24	25.43	--	16.95	--	46.36	14,633	347,097	361,730
	NAMIBIA	448,857	2,549,392	41.5%	21.58	109.70	26.30	17.01	9.56	4.52	9,640	135,066	144,706

	MOBILE						BROADBAND						
	Total Mobile Subscriptions		Compound Annual Growth Rate (CAGR) 2005–11 (in %)	Mobile Subscriptions (per 100 people)		Mobile cellular prepaid tariff (US\$ per month)		Mobile cellular prepaid tariff (% of GNI per capita)		Fixed-broadband Internet subscribers		Total broadband subscriptions	
	2005	2011		2005	2011	2005	2010	2005	2010	2010	2010	2010	2010
NIGER	323,853	3,664,000	83.4%	2.49	23.62	27.15	20.81	125.32	67.46	3,707	--	3,707	
NIGERIA	18,587,000	95,167,308	38.6%	13.29	58.58	25.76	13.74	49.06	13.37	99,108	4,783,403	4,882,511	
RWANDA	222,978	4,304,532	80.8%	2.42	39.34	21.82	13.92	96.98	32.08	2,640	420,593	423,233	
SÃO TOMÉ AND PRINCIPE	11,953	102,700	71.2%	7.83	62.24	--	12.72	--	--	582	--	582	
SENEGAL	1,730,106	9,384,300	40.2%	15.91	73.50	25.83	12.68	38.74	14.11	78,647	232,309	310,956	
SEYCHELLES	58,806	126,635	21.1%	70.94	145.56	--	15.90	--	--	6,278	4,938	11,216	
SIERRA LEONE	--	2,000,000	--	--	34.09	15.84	--	--	--	--	5,749	5,749	
SOMALIA	500,000	3,236,332	45.3%	5.98	33.86	--	--	--	--	--	--	0	
SOUTH AFRICA	33,959,958	64,613,000	13.7%	71.95	127.73	24.68	23.26	6.11	4.59	743,000	8,097,586	8,840,586	
*SUDAN	1,827,940	22,517,000	65.2%	4.76	50.45	9.00	--	--	--	164,500	2,027,225	2,191,725	
SWAZILAND	200,000	834,000	33.1%	19.66	78.11	--	24.17	14.16	9.91	1,626	--	1,626	
TANZANIA	2,964,000	25,666,455	54.0%	7.63	55.53	17.01	9.69	52.35	21.56	3,150	1,032,697	1,035,847	
TOGO	433,635	2,452,433	54.2%	8.02	40.68	29.29	19.90	103.37	48.73	3,852	--	3,852	
* TUNISIA	5,680,726	11,300,401	14.7%	56.64	105.87	11.49	10.00	4.31	2.88	481,810	109,611	591,421	
UGANDA	1,315,300	14,676,505	62.0%	4.63	42.53	14.41	12.20	57.63	29.28	54,804	239,628	294,432	
ZAMBIA	949,559	7,308,000	50.4%	8.28	54.23	21.23	16.85	50.95	18.95	10,267	--	10,267	
ZIMBABWE	647,110	7,500,000	84.5%	5.15	59.66	6.00	20.49	16.37	53.48	33,000	433,312	466,312	
NORTH AFRICA SUB-TOTAL	46,562,886	167,374,053		30.38	99.69	14.49	11.25	9.20	3.45	3,403,196	11,133,206	14,536,402	
SUB-SAHARAN AFRICA SUB-TOTAL	91,085,364	448,325,314		12.14	57.10	22.09	14.98	50.01	19.48	1,477,152	21,346,281	22,823,433	
AFRICA TOTAL	137,648,250	615,699,367		15.24	59.26	21.82	14.53	47.84	16.76	4,880,348	32,479,487	37,359,835	

Notes

* North African countries.

2010 data is in white.

* Data for 2005 and 2010 refer to the former country of Sudan before the independence of South Sudan in July 2011.

Mobile-cellular telephone subscriptions refers to the number of subscriptions to a public mobile-telephone service.

Mobile-cellular prepaid tariff refers to the price of a standard basket of mobile monthly usage for 30 outgoing calls per month (on-net, off-net, to a fixed line and for peak and off-peak times) in predetermined ratios, plus 100 SMS messages. It is based on the 2009 methodology of the OECD low-user basket.

Fixed broadband subscriptions refers to subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s.

Mobile broadband subscriptions are the sum of the number of subscriptions using the following technologies: CDMA2000 1xEV-DO, WCDMA, TD-SCDMA, LTE and mobile WiMAX.

Source: ITU World Telecommunication/ICT Indicators Database, ictData.org, Wireless Intelligence, and World Bank.

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*Information and communication technologies (ICTs) have the potential to transform business and government in Africa, driving entrepreneurship, innovation and economic growth. This new flagship report – **eTransform Africa** – produced by the World Bank and the African Development Bank, with the support of the African Union, identifies best practice in the use of ICTs in key sectors of the African economy. Under the theme “Transformation-Ready”, the growing contribution of ICTs to Agriculture, Climate Change Adaptation, Education, Financial Services, Government Services and Health is explored. In addition, the report highlights the role of ICTs in enhancing African regional trade and integration as well as the need to build a competitive ICT industry to boost innovation, job creation and the export potential of African companies.*

eTransform AFRICA

