ICT4D: the case of the information society in Africa

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Abstract: Information and Communication Technology (ICT) has evolved regularly over the last three decades. It helped realise business and socioeconomic development based on different channels for information acquisition and knowledge dissemination and allowed the creation of an emerging global information society with innovative means of communication that can help increase competitiveness for individuals, organisations and societies. Information and Communication Technology for Development (ICT4D) is used as an effective venue for social inclusion. The transformation process enabled through ICT encourages organisations and governments to restructure the way they handle their socioeconomic challenges as they move forward in their developmental paths. This chapter addresses sample initiatives in Africa to integrate actively in the global information society through investing in the ICT infrastructure to help improve electronic readiness. The chapter demonstrates how ICT coupled with skilled human resources and timely infostructure are vital in improving the balance in economic and social progress between nations, leveraging economic growth, boosting the capacity to face societal challenges, enhancing the progress of democratic values and augmenting cultural creativity, traditions and identities. The chapter provides an overview of using ICT4D in Africa and the establishment of an information society that supports overall development.

1 Introduction

Technology has not only changed the world, but it has also increased its potential (Figueres, 2003). Innovative Information and Communication Technology (ICT) coupled with globalisation and the role of societal norms, values and cultures is constantly affecting societies around the world. It is forcing organisations and corporations to rethink and reengineer the way they manage their operations and resources and face competition both locally and globally. Moreover, it is fair to claim that the processes of globalisation are increasingly depending on ICT (Musa, 2006). This situation has generated new forms and structures of economic, business and social organisations that are no longer affected by geographic or time constraints but depend mainly on teleworking, which is emerging as the platform for business and socioeconomic development in the 21st century.

Africa, a continent with many resources and a variety of economies in transition, has been investing in building its ICT infrastructure for three decades to overcome its status of being the most unconnected continent when it comes to ICT, although it has a major spectrum of developmental challenges (Figueres, 2003). This chapter covers the developmental phases that Africa implemented en route to building its information-based society, where many nations are experiencing tremendous growth in the use of

computers, internet connectivity, wireless communications and a variety of other related technologies (Mbarika, 2002). The drive of the African continent is based on multiple aspects including the announcement of the G8 members (the USA, Japan, Italy, Britain, Germany, France, Canada and Russia) in 2000 stating that nations who will succeed in harnessing the ICT potential can look forward to leapfrogging conventional obstacles of infrastructure development and that everyone should be able to access information and communication networks. The deployment of emerging ICT provides a unique opportunity to developing nations to capitalise on the experiences and learn from the lessons of the past witnessed by different developed nations. In that respect, ICT is causing an industrial and societal evolution based on information acquisition and knowledge dissemination and allowing the creation of an emerging information-based society with innovative means of communication that could help increase competitiveness for individuals, organisations and societies. The introduction and diffusion of emerging ICT at different socioeconomic aspects of life are gradually contributing in the formulation of the global information society, where all forms of information are merging into an electronically delivered ecosystem that is accessible from all corners of the world (Branscomb, 1994).

During the 1990s, there was an unprecedented link between the technological innovation process and the economic and social organisations. Moreover, as the links between economic development, productivity and the availability of information resources became invaluable, governments around the world started to invest heavily in building their National Information Infrastructure (NII) (Petrazzini and Harindranath, 1997). This led to major changes and transformations in the activities and relationships of individuals and organisations within the society, leading to the evolution of the information society, where the services provided by ICT represent a set of challenges and opportunities for the global society. However, it is important to note that, although access to ICT is a prerequisite to its use, individual differences in time and space as well as capabilities and choice may play a role on the use, value and application of ICT (Alampay *et al.*, 2003).

In today's global environment, it is becoming easier within business and socioeconomic development and growth to identify and evaluate ICT4D tools and applications as well as compete across all sectors and industries using the wealth of information and knowledge that are disseminated through global information networks. The ICT infrastructure makes information more accessible with more benefits to the society (Shapiro and Varian, 1999), which puts more pressure on firms around the world to exploit all possible opportunities to leverage productivity and efficiency. Businesses are increasingly becoming more aware of the vitality of ICT to stay competitive, with other global implications to productivity, employment and profits to the extent that organisational operations are becoming unthinkable without the effective and efficient use of ICT, especially in a global society, where information travels across national boundaries (Branscomb, 1994). Therefore, many nations in Africa have taken concrete measures in that direction, such as Egypt, South Africa, Tunisia, Morocco and Kenya, which have restructured initiatives in telecommunications and informatics as part of an overall strategy that targets socioeconomic development in the continent.[1] This includes deregulation, encouraging private investment and Foreign Direct Investment (FDI), and the use of tools such as public private partnerships (Kamel, 2009b). ICT is an opportunity for the development of Africa because it is a powerful tool for economic growth, social

inclusion and poverty eradication, which can facilitate the integration of African nations into the emerging, digital global marketplace (Annan, 2003). Africa stands to gain a great deal from participating in the globally connected economy; however, it must first establish the necessary ICT infrastructure, and government and economic conditions to attract and maintain an effective position in the global economy (Ajayi, 2004).

One decade into the 21st century, the world is becoming smaller and the public is rapidly gaining access to new and dramatically faster ICT (Shapiro and Varian, 1999). Moreover, the gradual move towards establishing the information society is irreversible and will have implications to all aspects of the society. The formulation of information-based societies among different nations will positively contribute to the creation of the global information society and availing of a powerful platform for knowledge dissemination and sharing. The information-based society encompasses information converted and collated in digital forms, hardware and software for users to process the information, and physical telecommunications infrastructure and services such as terrestrial cables, radio communications networks and satellites, electronic mail, file transfer, interactive access to databases and interactive digital image transmission (Kamel, 2009a). Moreover, the information society, using its different tools, supports users in optimising the potentials of ICT4D by helping them perform the storage, processing and transformation functions of information (Garito, 1996). Moreover, the above-mentioned high-technology-oriented national development needs might come in the form of significant investments in telecommunications, computerisation and connectivity, e-government, e-commerce and e-society in addition to many other e-strategy initiatives, activities and projects that started surfacing in the mid-1990s (Sorensen and Sayegh, 2007).

The information society is becoming a global force and a fundamental element of change in the global society (Garito, 1996). The information infrastructure (infostructure) is a factor for socioeconomic improvement and represents a major support mechanism that can assist African nations in leapfrogging stages of development towards achieving a better standard of living and quality of life. In the current competitive context, access to and mobilisation of information are becoming the central aspects of productivity and competitiveness and the investment required to set up ICT infrastructures directly supports growth and contributes to structural improvements in various services and industries (Kamel, 2009a). The move towards an information society, and the opportunities which it provides, will eventually be as important as the first industrial revolution (Kamel, 1995a). It is difficult to predict the pace at which this change will take place, but the economies that will be the first to succeed in completing this change satisfactorily will have major competitive advantages. The development of an information society will be a global phenomenon, and the potential offered by ICT will directly contribute to the creation of new service markets and facilitate the provision of services by the private and public sectors through partnership agreements and the reengineering of administrative decision-making procedures. This process is being coupled with a growing trend to internationalise businesses and organisations to gain competitive advantages in a global setting made smaller by the emerging developments in ICT. The information society can be an effective contributor in this process (Hax, 1989; Ohmae, 1989).

Change, transformation, competition, collaborative work and partnerships could be institutionalised through customised strategies targeting the diffusion of best practices and the development of ICT applications, which are the fundamental objectives in view

of the contribution that they can make to leveraging development and growth as well as strengthening competitiveness. Such a process should include the liberalisation of the telecommunications sector, the provision of a regulatory framework, the provision of a broad range of attractive tariff options to users, the organisation of specialised training and human resources development programmes focusing on the needs of ICT industries and rendering information to be timely, shared and publicly available (Branscomb, 1994). This is because the lack of a basic telecommunications infrastructure is a severe hindrance to the growth of the internet in different countries (Mbarika, 2002), especially where most of the developments are taking place in the capitals and major cities (Kamel, 2005). Innovative technologies have continuously implied major changes in the society that affect various sectors and industries and set the pace of business and socioeconomic growth, thus becoming an important good in the business environment (Shapiro and Varian, 1999). Today and for decades to come, the motto for development and growth will remain the development of the information society (Kamel, 1995b), where value resides in the accumulated information and knowledge (Davis and Meyer, 1998). Moreover, the development of the information society will yield sectors that are contributing to the national treasury, after long periods of consuming massive amounts of resources allocated for different developmental activities. For example, in the case of Egypt, the ICT sector has realised an overall growth of 20% over the period 2004–2008 while contributing over USD7.8 billion to the treasury (Fayed, 2009).

During the 1990s, ICT became a vital platform in business and socioeconomic development with the growing role of the internet (Kamel, 1995b). This led to the development of the global information society with new global trends and challenges such as competing in time, time to market, customer-oriented services, the online society, smart communities, social inclusion, electronic readiness, the market economy, intellectual capital, investing in human resources and the sharing of information and knowledge. Therefore, the internet and open data network at large became major driving forces of change in the global marketplace (Kamel, 1999), especially with the massive emergence of online trends such as electronic business applications including e-commerce, e-government, e-learning and other emerging digital society applications. ICT, in this respect, promises to revolutionise the global society in the way business, education and entertainment are being performed, with the global society as the ultimate beneficiary, especially with the remarkable growth in the number of internet users since the early 1990s. More phenomenal growth rates are expected in the years to come (Cerf, 1999). In the 21st century, the internet is becoming a worldwide phenomenon with over 1.4 billion internet users (Kamel, 2009b) as it provides new ways of exchanging information, transacting business and restructuring organisations (Mbarika, 2002; Ah-Wong *et al*., 2001; Rosenbaum, 2000). There are changes taking place globally and the move towards an information age, coupled with the world ICT innovations since the 1980s, has led to rapidly falling costs for ICT and major managerial, economic and organisational transformations in the ICT sector, creating a window of opportunities for massive developments and a chance to accelerate business and socioeconomic growth in Africa.

Today, there is a high-level commitment from African leaders to bring about change in the way ICT is perceived. The new wave of African leaders, executives and decision makers are more into the information age of the 21st century and they are more prepared than ever to initiate new ideas, formulate a vision, set the strategy and

support these throughout the implementation phases. It is perceived that such a trend represents a unique opportunity for Africa's younger and growing generations to adapt and adopt new tools and techniques using state-of-the-art ICT. Africa, more than ever, is prepared to capitalise on the capacities enabled by emerging ICT to help leverage its development process and engage actively in the global information society, by transforming its societies into becoming more socially included, digitally connected and electronically ready.

2 The evolution and developments of ICT in Africa

Few doubt the significance of IT for African economic and social development (Odedra-Straub, 1993). Three major development goals have been articulated by African leaders who represent the driving force behind the embarkation on ICT evolution across the continent. The primary target is improving the quality of life for every African, working on the integration of the economies of the different African nations and leveraging trade linkages with other regions outside Africa based on mutual development purposes and growth targets. In that respect, building the African Information Infrastructure (AII) is becoming essential for the future of Africa since it is perceived to formulate the backbone for the comprehensive socioeconomic development plans for the continent in the 21st century and beyond. Table 1 demonstrates the strategy elements that the African Information Society Initiative (AISI) intends to realise by 2010. AISI is widely perceived as having the power and ability to narrow the gap between developed and developing nations and to allow developing nations to leapfrog in the development process as well as create real opportunities for socioeconomic development in remote and rural areas (Holmes and Grieco, 1999). IT is perceived to have the ability to improve the lives of people with low incomes who have limited access to services such as healthcare and education (Qureshi, 2007). ICT is an invaluable platform for underprivileged communities and societies with the opportunities it creates, especially in a global community transformed through mobility. Moreover, ICT holds the promise of development by connecting people to more accurate and up-to-date sources of information and knowledge (Ahmed, 2007).

Table 1 The AISI's ICT strategy elements for Africa

• To provide information accessibility to all Africans through computing and internetworking
• To develop information and decision support systems to support decision making in all major sectors of each African country
• To link Africa globally through information networks
• To invite the private sector to take a leading role in growing information-based economies
• To access major African information resources globally
• To empower all sectors of the national economies with timely, accurate and relevant information and knowledge

Based on the literature review, there is an enormous gap in the availability of ICT capacities in developed societies compared to the developing world. According to the World Telecommunications Development Conference, many nations in the developing

world still lack the basic forms of an ICT infrastructure. However, with all the gaps that exist between developed and developing nations, none is growing faster than the information gap. This reflects the different role and usage of information in these societies and the urgency to take all necessary matters to build an agile information infrastructure, which will represent a milestone in realising the information society and connecting to the growing global digital economy. Moreover, with the regular innovations and amendments in the information highway concept with its social, cultural and political implications, there are strong potentials and opportunities to narrow the gap, turn things around and become a platform supporting the development in Africa. It is important to note that, since the year 2000, there has been a large number of national and regional initiatives and projects within the African continent that are targeting the development and deployment of both ICT and information dissemination (UNECA, 2003; ESCWA, 2007). This includes, for example, the Partnership for Information and Communication Technologies in Africa (PICTA), which is an informal group of donors and executing agencies committed to improving information exchange and collaboration on ICT activities in Africa.

Moreover, there are a number of civil society initiatives, with the informal sector playing a major role through Nongovernment Organisations (NGOs) in contributing to ICT development in Africa. NGOs are very active in contributing to the eradication of poverty, to the social, educational and political empowerment of the underprivileged with a focus on women and children, and to the universal access to ICT services through innovative and affordable technologies (Okpaku, 2003a). There are also industry-based initiatives such as the digital factory, which is an initiative to create a capacity in Africa for the development of software applications at global standards to support the global ICT industry as well as, and more importantly, to meet the indigenous continental demand (Okpaku, 2003b).

Some ICT introduction and diffusion initiatives were nation based, such as in the case of Egypt, Rwanda, Cameroon, Kenya, Mauritania and Morocco. In Egypt, for example, the free-internet model was formulated and migrated to a number of developing nations in both Africa and beyond. Up until 2002, internet users in Egypt had to pay two fees to go online: a subscription fee to an Internet Service Provider (ISP) ranging between 250 and USD1000 per year in addition to the phone bill calculated at a rate of 20 cents per hour paid to Telecom Egypt (Mintz, 1998). However, based on the new internet economic model, which was accredited for helping boost the rate of growth of the internet, users no longer pay the subscription fee; instead, they only pay their phone bills (Kamel, 1998; Kamel and Hussein, 1999). It is important to note that 70% of the 20 cents paid to Telecom Egypt is directed to ISPs and the remaining 30% is retained by Telecom Egypt. This has led to raising the internet penetration rate during the period 1994–2002 to 500 000 subscribers (Kamel and Abdel Ghaffar, 2003) and hitting 14.2 million in February 2009 (Fayed, 2009). The essence of the initiative is to provide free nationwide access to the internet to all citizens. This has created a larger demand for connectivity and had an impact on the streets of Egypt with the establishment of internet cybercafes, a sign that there is a strong market demand for connectivity (Kamel, 2009b).

In the case of Rwanda, with its ambitious Vision 2020 programme approved in 2000, ICT has been anchored into broader economic, social and developed policies and strategies in the form of the National Information and Communication Infrastructure (NICI) plan. The essence of the programme is to help build the Rwandan information

society and to start integrating it into the global information society. The programme is led by the National Information Technology Commission (NITC), which is a high-powered ICT policy think-tank advising the government and other stakeholders on the different paths and steps that should be taken. NITC is chaired by the president, who is well known as the national ICT champion, a solid and effective indication of the role of ICT in societal development (O'Siochru, 2007). The positioning of ICT at the highest political level sends a message that Rwanda is determined to capitalise on the opportunities enabled through ICT to boost its developmental process.

In the case of Cameroon, an integrated national ICT strategy was developed, initiated by United Nations Economic Commission for Africa (UNECA) and supported by the United Nations Development Programme (UNDP). The strategy benefited from the input of all stakeholders in the marketplace including the government, the private sector and the civil society. One of the key decisions taken was the establishment of a high authority in charge of ICT issues in Cameroon. According to the NICI in Cameroon, priorities were set based on three main targets: the policy and regulatory environment, tools and technology deployment, and applications, services and networks (UNECA, 2003).

In the case of Kenya, the approach was different because, while the private sector took the lead, the government was reluctant to embrace ICT for socioeconomic development at the beginning. However, the momentum was built up in a later stage and was embedded in the nation's poverty reduction strategy, which positioned ICT at the core of the national development plan. Currently, an integrated ICT-driven socioeconomic development of Kenya has been transformed from being supported and driven only by the private sector to becoming the cornerstone for the development of the Kenyan Information Society (UNECA, 2003).

In the case of Mauritania, there were massive telecommunications reforms during the period 1998–2001. Moreover, new private investments in the telecommunications sector were introduced which were equivalent to 10% of the Gross Domestic Product (GDP) and telephone lines multiplied 20-fold with the creation of 6000 new telecommunications-related jobs as well as the establishment of a multisector regulatory agency that is currently regarded as a model in Africa (World Bank, 2003).

In the case of Morocco, the liberalisation process of the mobile industry in 1999 led to significant growth in the mobile sector. The total number of subscribers increased from 150 000 in 1999 to over 8 million in 2004, taking the country from having the lowest teledensity in the region to the highest, which also enticed FDI to be channelled to the North African nation (Wellenius *et al.*, 2004).

3 The African Information Society Initiative (AISI)

The AISI aims to address the different issues associated with ICT and to demonstrate its potential and roles in the development process in Africa. The AISI targets decision and policy makers and leaders in virtually all sectors of the economy, including, but not limited to, planning, economic development, social inclusion, laws, regulations and regulatory reform, health, education, trade, tourism, the environment, transportation and the ICT sector itself. The AISI targets the support of the development of the African continent within an environment where information is a crucial economic and social resource and where electronic networks and IT represent a new venue for socioeconomic and cultural activity at all levels (Cogburn, 1995). The AISI was endorsed by the

Organization of African Unity (OAU) heads of state and recognised by the UNECA conference of ministers of planning and finance. In this respect, UNECA has convened the Committee on Development Information (CODI) every two years since 1999, during which AISI policy and implementation issues are discussed. One of the resulting instruments of these discussions was the NICI, which was recognised by CODI as a means to realise AISI goals (Lance and Bassole, 2006).

The AISI calls for the formulation and development of a NICI plan in every African nation that should be driven by national development challenges such as debt management, food security, health, education, population, unemployment, job creation, industrialisation, land reclamation, water, tourism and trade, among other priority issues. To date, the nations that have developed their NICI implementation plan have a recognised government body that oversees the budgeting and execution of the plan. With respect to this, ICT has become central to planned government expenditures (Bahta, 2005). For example, Ethiopia, one of Africa's poorest nations, is spending 10% of its GDP every year on IT (Cross, 2005). In general, the AISI proposes cooperation and partnership between African nations to share the success of accumulated implementation experiences and stimulate regional development in various ICT aspects. The emerging global information infrastructure and the diffusion of connectivity are helping to realise a number of outcomes affecting different societal stakeholders (Cogburn, 1995). For example, students are studying and doing research using PCs, multimedia and networks; physicians diagnose aided by information accessed through global networks; businesses compete more effectively with timely and accurate market information; transportation costs are reduced, resulting in less pollution; and cultural heritage is captured electronically, documented and globally disseminated.[1] Therefore, the creation of the AII is both a necessity and an opportunity to accelerate development in all spheres of African economic and social activity (Lance and Bassole, 2006). Based on the literature and previous experiences, the use of ICT in development can only be realised through comprehensive national ICT plans, strategies and policies that would characterise the specific needs of the community and set out initiatives and projects accordingly. To confirm this notion, improving universal ICT access was one of the primary recommendations of the World Summit on the Information Society (WSIS) that was held in Geneva (Switzerland) in December 2003 and was emphasised in the second summit in Tunis (Tunisia) in November 2005 (ITU, 2007)[2] with follow-up projects and activities.

The development of the AISI enables African leaders, decision makers and planners to position Africa in the world's rapidly expanding global economic system and accelerate the pursuit of Africa's development goals. The emerging ICTs offer the potential to create jobs at much lower levels of capital investment and exploit Africa's information resources without the need for corresponding financial wealth. The cost of entry into global markets is becoming virtually insignificant and exploiting the information economy consumes minimal resources other than the effort and ingenuity of its members, enabling a great potential to leapfrog developmental stages. However, it is important to note that, while high-level commitment from African leaders is necessary, it should also be coupled with a vision and strategy to be shared by the different stakeholders, with an emphasis on the youth, to bring about the desired change and be able to attract the masses rather than just the elites to the opportunities enabled through ICT.

4 Vision

The AII aims at supporting and accelerating business and socioeconomic development across the African continent. Driven by critical development imperatives, it focuses on priority strategies, projects that can assist in the sustainable build-up of an African information society in accordance with the regional integration goals of the treaty establishing the African Economic Community (AEC), which foresaw the necessity of an information network, regional databases development, information sources and the development of human capacities.[1]

5 Strategic objectives

To achieve the ambitions of the AII reflected in the above-mentioned vision, there was a strong and urgent need to realise a number of strategic objectives, which are presented in Table 2.

Table 2 AII's strategic objectives

• To ensure a timely information flow within the society by improving and creating information and communication services in key economic sectors including education, health, employment, culture, trade and tourism
• To create an African-wide information and telecommunication network availing of low cost and reliable communication with other users in Africa and the world
• To optimise the use of available information by encouraging the development of a fully integrated system allowing universal information dissemination to individuals and organisations
• To foster a new generation in Africa who use ICT to leverage the development of their nation
• To link Africa globally by improving the inflow and diffusion of emerging ICT products and services

6 Related goals

To achieve the strategic objectives, African nations need to coordinate their activities and help realise the following set of goals:

- develop a master plan for building nationwide ICT infrastructure
- establish a regulated Public/Private sector Partnership (PPP)
- eliminate and/or reduce taxation and legal barriers on the use of ICT
- establish an enabling environment to foster the development of ICT
- encourage the private sector to play a leading market role in the provision of information and communication services
- implement a policy for using ICT in government services in key sectors of the economy
- identify and develop ICT applications in areas with major impacts on socioeconomic development

- take effective steps to facilitate the establishment of local-based, low-cost and widely accessible internet services
- develop human resources in information and communication facilities to serve the grassroots of the society in rural and underprivileged communities
- create an awareness of the potential benefits of the AII.

7 Transforming challenges into opportunities

There are a number of challenges facing the development and realisation of the NII. These challenges need to be transformed into opportunities in order to realise the targeted objectives from their design and development. The impact of emerging ICT is no longer confined to the IT domain. It is predicted that, by 2020, over 12 billion computing facilities will be connected to the global information infrastructure. However, as per the reports of UNECA, there are a number of priority challenges which hinder the development in Africa and the opportunities that ICT offers African nations. They mainly relate to job creation, health, education and research, culture, trade and commerce, tourism and food security, among others. Table 3 presents some of the challenges and opportunities related to some of these elements.

It is important to note that the main challenge facing African nations is to formulate effective strategies to bridge the gap between the penetration, use and effective implications of ICT within the African continent when compared to other regions in the world. In that respect, the New Partnership for Africa's Development (NEPAD) has set a number of ICT development objectives that address this challenge. They include doubling teledensity to two lines per 100 people, reaching an adequate level of access per household, lowering cost and improving reliability of service, achieving electronic readiness for all African nations, developing a pool of ICT-proficient youth from which Africa can draw trainees, software developers and engineers, and developing local content based on local culture (Okupaku, 2003a).

Table 3 Challenges and opportunities

Elements	*Challenges*	*Opportunities*
Job creation	• Where to create jobs? • Who will create jobs? • How will jobs be created? • What resources will be used to attain a given level of unemployment?	• Use ICT in linking unemployment to job markets (availing of opportunities) • Manage the existing job market more efficiently • Make employment information publicly available by gender, sector and geographic location • Create job opportunities through teleworking and online market jobs such as information services and software development (offshoring)

Table 3 Challenges and opportunities (continued)

Elements	*Challenges*	*Opportunities*
Health	• Spread of epidemics and infectious diseases • Highest level of infant mortality rate globally • Lowest level of life expectancy globally • Lowest global ratio of doctors per capita	• Enhance health administration through medical IS • Establish IS/Decision Support Systems (DSSs) on health profiles at regional, national, rural and district levels • Link health centres and delivery services • Introduce telemedicine (benefits will be maximised in remote locations) • Improve the distribution and cost of medical supplies
Education and research	• Highest illiteracy rate globally, especially among women • Lowest number of teachers and largest number of students per class • Few schools, universities and libraries and limited access to international intellectual products • Lack of educational materials, researchers and research facilities	• Provide remote access to resources to strengthen local educational capacity • Connect school, universities and research centres to national and international educational facilities • Reduce communication and administrative costs • Link all educational establishments • Promote collaboration among teachers and researchers
Culture	• Deteriorating cultural heritage resources • Lack of regional access to national culture sites • Lack of awareness and knowledge about different African cultures, values and norms	• Make Africa's museums accessible globally • Electronic preservation and documentation of African culture and heritage • Develop digital materials on African cultures to be accessible to a wider audience globally
Trade and commerce	• Intra-African trade is 5% of total trade • Internal and external trade is hindered by poor transport and communication infrastructure • Lack of information on procedures, import and export opportunities, markets and prices	• Link business communities and associations • Increase regional and global trade • Reduce commercial transaction costs • Provide access to online trading information • Market new products through electronic networks
Tourism	• Lack of information on untapped tourist resources • Lack of information on tourism estimations, services and facilities	• Attract tourists by offering high-quality ICT-enabled services • Reduce the cost of promotion • Improve Africa's image through online promotional campaigns • Build regional tourism databases • Provide mechanisms for virtual tourism on the internet

Table 3 Challenges and opportunities (continued)

Elements	*Challenges*	*Opportunities*
Food security	• Limited national food production to satisfy market needs due to underutilisation of available resources • Lack of information relating to importing from the best markets based on good terms • Lack of information on agricultural exports with the most competitive advantages • Lack of access to food market information and pricing	• Establish IS for monitoring market performance and measuring market failures • Development of IS to address food security issues such as government subsidy for food security, monitoring of water and land resources, disease problems and food transportation and storage • Efficient marketing of agricultural products through information and telecommunication networks • Reduced food storage losses through more efficient distribution and warehousing
Gender and development	• Women constitute 50% of the population but do 60% of the work, earn 10% of the income and own 1% of the assets • Women generally have more limited access than men to ICT, information and media • Lack of readily available information on women in society, culture and economy	• Improve women's rights through access to information and indicators which may be used for tracking gender issues • Ensure the equitable access of women to information, technology and technology education • Enhance the role of modern communication media to promote awareness of equality between men and women

8 The AII ecosystem

Establishing the AII requires the development and continuous improvement of four major building blocks:

1 an effective enabling institutional framework with its legal and regulatory environment

2 universal access to ICT

3 usage of ICT

4 investing in human capacities.

8.1 An effective enabling institutional framework

It is essential to address the legal, regulatory and institutional practices in African nations which inhibit the development of national information services and connectivity to the global information infrastructure that could create fertile conditions for ICT-led growth (World Bank, 2007). This includes the high cost of telecommunication services (which constitutes the major obstacle preventing the establishment and use of value-added services), high taxation for value-added service providers (which are particularly harmful for startup businesses) and high import duties on ICT equipments. There is also a need

to address the issue of the lack of an appropriate legal framework for the creation of enterprises providing value-added services such as IT consultancy, training and other support services, and the barriers facing the obtaining of capital for startup and growth. Moreover, there are issues on the underdeveloped intellectual property rights provisions, restrictions on freedom of expression and the general lack of understanding of the importance of the development of an ICT infrastructure and the insufficient commitment to the use of ICT. There are a number of ways to address these obstacles, which could be perceived as the starting points towards the establishment of a strongly based AII with solid roots across African nations. This could be demonstrated through a number of key roles that need to be played in the society and with the coordination and support of different parties.

8.2 Universal access to ICT

Universal access is an important element in introducing and diffusing ICT within the community and minimising the inter- and intradigital divide, with an emphasis on rural and underprivileged areas and communities, where around 70% of the population in developing nations live (World Bank, 2007). Improving public access is an important step in the development of the information society for Africa, since having access to the telecommunications infrastructure for all households is not a realistic goal given the resources in the African continent. This could be realised by setting up universal access funds to encourage infrastructure development in rural communities, and establishing community access centres and telecentres, as is the case in Egypt where IT access centres have reached 1751 clubs with an annual growth of 13.5% (MCIT, 2008). This could also be replicated in other African nations. Moreover, PPP projects and programmes in that domain have proven to be successful and effective. In Ethiopia, for example, low-cost PCs are being supplied to the community to help increase the penetration rate and usage levels (World Bank, 2007). Additionally, in Egypt, multiple PPP programmes and initiatives have been introduced, such as Egypt PC 2010, IT clubs, mobile IT units and free internet, with effective outcomes such as increasing PC penetration to 13% and internet penetration to 15% of all households in Egypt in 2008.

Moreover, mobile telephony provides an enormous potential for expanding access throughout the community, especially since the World Bank (2006) reports indicate that mobile phones outstrip fixed phones in most developing nations (including African nations), encouraging policy makers and decision makers to consider achieving universal mobile phone access. It is important to note that, in Africa, mobile is clearly growing, while fixed lines remain by far the lowest in the world in terms of percentage per capita. The limited availability of fixed lines has been a barrier to the uptake of fixed broadband and it is most likely that Africa's broadband market will be dominated by mobile broadband. The digital divide remains a major problem in terms of internet and especially broadband uptake. It is important to note that fixed broadband penetration stands at less than 0.05% in Africa, and internet use remains low in Africa, where only 5% of the population is online.[2] Table 4 demonstrates the penetration rates of mobile phones compared to fixed phones.

Table 4 Phone and internet access in low and middle income countries per 1000 people

Item	*1980*	*1990*	*2000*	*2005*	*2007*
Mobile phones	00	0.09	46	258	305
Fixed phones	14	27	83	135	145
Total phones	14	27	129	393	450
Internet users	00	00	15	67	92

It is important to note that, in the African continent, while Ethiopia has one of the slowest growth rates in mobile phone subscribers, Egypt has one of the highest growth rates, reaching 50.7% penetration (MCIT, 2008). Providing access remains one of the most important challenges for most African nations especially in rural and underprivileged areas where many groups of people remain largely excluded from the social, economic and political fabric of their society (World Bank, 2007). Africa has the lowest penetration of fixed phone lines with a continental average of around three lines per 100 people (ITU, 2006). Africa, which accounted for 13% of the world's population in 2004, then had only 3.7% of all fixed and mobile subscribers worldwide (Kwaku Kyem and LeMaire, 2006). However, Africa experienced the highest mobile phone growth rate of all continents between 1999 and 2004, reaching close to 60% – more than twice the global average – with close to 100 million total telephone subscribers recorded in Africa (ITU, 2006). But, despite the decreasing disparity between haves and have-nots in mobile penetration, the gaps are still wide between rural and urban areas (Hudson, 2001).

8.3 Usage of ICT

Access to ICT is an important factor; however, it does not lead to socioeconomic development. The vital element is in how ICT is employed and is adapted to special local needs. ICT must improve people's lives, help obtain basic services and enable the community members to communicate with each other (World Bank, 2007). Therefore, the focus must be on understanding and prioritising the needs of the users as well as potential users. For example, Ethiopia is spending 10% of its GDP on ICT with an objective to linking all of the country's schools and local government offices as part of the poverty reduction plan (World Bank, 2007). It is important to note that mobile telephony is accessed by the poorest people, thanks in part to its widespread sharing nature. Additionally, mobiles have effective implications on Small- and Medium-sized Enterprises (SMEs), reflected in increased sales and profits, time savings and greater efficiency. Usage is the most critical dimension for African nations as they gradually transition into the information society. In the case of Egypt, ICT investments by the private sector reached USD 2.7 billion during the period 2004–2008.

8.4 Investing in human capacities

Skilled ICT human capacities are a critical condition for the success of ICT projects and for the successful deployment of an information society. This requires technical training, general education, capacities development and regular awareness campaigns on the potential role ICT can play in the society. African nations have all devised massive plans for human capacities development in ICT. In July 2006, Microsoft pledged to provide

computer training to more than 45 million Africans by 2010 (World Bank, 2007). Nations in the African continent are increasingly integrating ICT in the schools' curricula. Governments are also promoting and supporting policies that ensure sufficient human capacities in ICT. Most initiatives follow the PPP model. An example is the Egyptian Education Initiative (EEI) that was launched in 2006 with the participation of local and ICT multinational companies in collaboration with the ministries of ICT, Education and Higher Education and Scientific Research in Egypt (World Bank, 2007). The EEI has four main tracks: pre-university education, higher education, lifelong learning and e-learning industry development (MCIT, 2007).[3]

9 The role of multiple stakeholders in building the African Information Society

The formulation of the information society requires the collaboration of multiple stakeholders in the community, including the government, private sector, civil society and media. Following is a discussion of the role and responsibilities that should be played by each party.

9.1 The role of the government

The government should provide an enabling environment to develop the national ICT infrastructure and to ensure that all sectors of the economy can benefit from it. Thus, each African government should assign a national entity to be responsible for the coordination between different stakeholders involved in the buildup of its NII. Moreover, African governments should promote the use of ICT to improve decision-making effectiveness. They should design, develop and implement national policies and plans adopting ICT within various sectors. The government should help establish a framework that ensures the participation of all sectors involved in implementing NII and coordinate with other nations as well as international organisational and regional bodies for development purposes. Additionally, the government should develop a legislative framework to address the cost and accessibility of telecommunications through the liberalisation process, public broadcasting services, intellectual property rights, privacy and the free flow of information, which may require the modification of laws and regulations. The government should also encourage the private sector to support, help, establish and use the information infrastructure.

9.2 The role of the private sector

The private sector should stimulate growth and assume market leadership in developing the national ICT infrastructure through investing in relevant areas and seizing new business opportunities that arise from the implementation of the AII. The private sector can contribute through empowering the main private sector components by supporting the managers of SMEs' ICT issues, establishing an organisational framework that eliminates constraints and supports business development, and encouraging the formulation of information services agencies.

9.3 The role of civil society

The civil society, including NGOs, voluntary organisations and labour groups, should play a catalytic role in coordination with other stakeholders in establishing the AII by identifying the needs of rural communities, contributing to human capacities development, reflecting public concerns and needs in terms of ICT and promoting the concerns of the workforce to employers and government.

9.4 The role of the media

The media could play a critical role in spreading awareness in Africa of the importance and benefits of the information revolution. Newspapers, radio and television provide an easy, accessible and cheap means of diffusing information to the end user. Communications in Africa do not have to wait for the internet to receive much of the information it carries. The mass media can access many of the existing sources of information and provide broad channels of communication to the remote rural communities, especially with the increasing convergence.

10 Proposed African Information Society (AIS) projects

The projects proposed to support the development of the AII encompass a wide variety of activities that cut across many different sectors of society and will require continuous coordination from different government departments and agencies as well as different stakeholders. Example projects are outlined in Table 5.

Table 5 Sample proposed AIS projects

Projects	*Objectives*	*Beneficiaries*	*Goals*
Debt management	Support economic development through better debt management	Government decision makers	• Establish loan databases and guarantee integrity • Secure dynamic tracking for crisis avoidance and debt management
Education and training	Improve basic education and workforce skills and capacities	• Teachers in public schools • Employees of SMEs • Individuals in remote areas	• Linking public schools to the national communication backbone • Establishing distance learning centres in major cities • Support on-the-job training
Higher education and research	Enable a vehicle for pooling national and regional human resources to contribute to research and development efforts	• Universities • Researchers • Industrial and private research centres	• Build a communication infrastructure at every university • Connect universities and research centres to the national communication backbone
Tourism	Support tourism in Africa	• Society • Tourists • Business community	• Promote tourist attractions • Assist tourists in reservations • Create regional online databases for tourism service providers
Cultural preservation	Assist in protecting the African cultural heritage	• Society • Museums • Cultural organisations • Research institutes	• Putting African museums online • Preserve and document manuscripts and artefacts • Increase the accessibility of manuscripts and artefacts to the general public and researchers
Healthcare	Achieve more efficient and affordable healthcare	• Society • Healthcare providers	• Establish and maintain databases on public and private medical centres, physicians and healthcare providers • Provide online access to national and international medical databases and expertise (telemedicine) • Link healthcare systems with insurance companies, medical practitioners and the public
Food security and agricultural production	Improve the production and distribution of agricultural products	• Society • Farmers • Food producers and distributors	• Provide access to global networks on food production technology • Provide access to databases of national food • Storage facilities

11 Conclusions

The AIS is the least developed globally, reflecting the most primitive information infrastructure and indicating one of the least socioeconomically developed regions, despite the waves of change introduced over the last couple of decades capitalising on ICT and an enabling ecosystem. At the core of all the changes was the evolving nature of global ICT. Efforts to sensitise national policy makers in Africa to the impact of ICT for development and to the importance of formulating a national policy in this area have been under way for some time. The transition to an information-based society is so massive and comprehensive that, from a policy perspective, no nation can proceed on all fronts at the same time and it will all depend on the national priorities. For example, the national information needs of most African nations are different from those of the developed world. The NIIs built in African nations should reflect Africa's information needs which is currently considered as important to economic, social and cultural development as other basic needs including food, housing and education. African nations, in that respect, must develop their own NII with a view to a future connection to the global information infrastructure to bridge the gap with the developed world and to establish links for cooperation and the exchange of experiences, skills, capacities and knowledge.

ICT is transforming the global economy and creating new networks that cross cultures as well as great distances. The progress made by different African nations has been remarkable, but they are still a long way from considering AII as mature or capable to become the platform for socioeconomic development for the continent. There is a need not only to develop the NII for each nation but also to implement programmes and projects that have both qualitative and quantitative impacts on the African society. The transformation from the formulation of policies and directions to the implementation and institutionalisation of such programmes and projects represents the greatest challenge to strategically deploying ICT in the African continent. The current figures of ICT expenditure, standing at 6% of total GDP, 62 internet users (per 1000), 285 mobile phone users (per 1000) and 39 fixed-line users (per 1000) need to be improved remarkably for the AIS to have an effective role in Africa's development and growth (World Bank, 2007).

12 Looking forward

One of the most important roles to be played in the information age will be the collaboration among different stakeholders including the government, the private sector and the civil society. This role will be determined by how governance will be exercised in the information-based world. In that respect, while the framework has yet to be defined, information society services will probably be provided by the private sector, with governments providing a supporting regulatory framework based on greater public participation and consensus. Development of the information society in Africa cannot be left to market forces; it deserves and needs the attention of the highest political decision makers. Thus, nations should prioritise information needs for socioeconomic development in the same way as they do for different sectors such as industry, agriculture and health. Consequently, governments have a responsibility to take a strategic view in facing the coming information-intensive world. These strategies should include creating

a shared vision of the new communication era, intensifying the process of information acculturation, developing the required human capacities and accelerating the development of the communications infrastructure. The integration of information, communication and computing developments with other social and economic policy goals is one of the priority issues globally.

African nations will have different priorities in the transformation process and in the use of information for socioeconomic and cultural development. These priorities will change over time. However, success in achieving pervasive development lies in the proper design and delivery of applications that would fit the needs and requirements of the sectors targeted. In any case, special attention would have to be directed to human and professional development, especially to the skills and knowledge needed to provide employment in an information society and the incentives needed to provide both the ability and the willingness for citizens to participate in an information society. Unless these prerequisites are available and efficiently maintained, the information society will not yield its targeted objectives.

Africa should establish its AII to encourage private investment, support economic reform, improve productivity, leverage education and training, improve healthcare, optimise the use of natural resources and avoid creating information haves and have-nots. Therefore, the governments should formulate an action agenda for the next 20 years identifying the key directions for Africa's information society, which should include issues such as completing the buildup of NIIs, realising interconnectivity between different national and regional stakeholders, investing in humanware, making information publicly available, developing a high-tech industry and building a smart community.

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Notes

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