CHAPTER

10

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Africa's Digital Rights

Today, the new buzzword in describing the state of the Internet in Africa is the number of exchange points, which are a local interconnection among providers to increase their local speed of communication and reduce somewhat what they pay for International traffic. Though exchange points are good, we do not see this as a good measure.

–Nii Narku Quaynor

A Vision for Information Freedom

Africa faces a threat of extended economic oppression and strangulation in the new information-intensive global economy, unless it acts proactively to acquire access to, and effective mastery of the facilities of information and communications technologies. The Internet and related software have become driving elements of worldwide ICT and ought to be the priority ingredient in all Information for Development visions. This chapter presents a vision of the eAfrica Commission of NEPAD as it relates to Internetworking and Software Systems covering a period of 10 years.

According to the United Nations Development Programme's Human Development Report of 2002, 127 countries, with 34% of the world's population, have not grown at the rate of 3.7% in per capita incomes, which is needed to halve the share of people living on or less than $1 a day. In Sub-Saharan Africa, the quality of life has actually regressed, and the quality of life of its very poor people is getting worse. The number of people living on $1 a day or less, increased from 242.3 million at the start of the 1990s to 300 million at the end (See Table 10–1).

How we ensure that ICT is engaged to reduce poverty and prevent technical know-how from becoming a tool of oppression and further colonisation of the people of Africa is of paramount importance to the development community.

The same Human Development Report also reveals some startling statistics:

- The world's richest 1% of people receive as much income as the poorest 57%.
- The richest 10% of the U.S. population have an income equal to that of the poorest 43% of the world. In other words, the income of the richest 25 million Americans is equal to that of almost 2 billion people.
- The income of the world's richest 5% is 114 times that of the poorest 5%.

Table 10–1: Worldwide–No. of people living on less than $1 a day (millions)

	1987	1990	1993	1996	1998	1999
Sub-Saharan Africa	217.2	242.3	273.3	289.0	290.9	300
East Asia and the Pacific	417.5	452.4	431.9	265.1	278.3	260
Excluding China	114.1	92.0	83.5	55.1	65.1	46
South Asia	474.4	495.1	505.1	531.7	522.0	490
Latin America and the Caribbean	63.7	73.8	70.8	76.0	78.2	77
Eastern Europe and Central Asia	1.1	7.1	18.3	23.8	24.0	17
Middle East and North Africa	9.3	5.7	5.0	5.0	5.5	7
TOTAL	**1,183.2**	**1,276.4**	**1,304.3**	**1,190.6**	**1,198.9**	**1,151**
Excluding China	879.8	915.9	955.9	980.5	985.7	936

Source: World Bank Poverty Site, UNDP HRD Report 2002

A recent study by ORBICOM on "Monitoring the Digital Divide" in 9 sample countries, and using Canada as the benchmark, concludes that progress in narrowing the Digital Divide is unsatisfactory (see Table 10–2). The study also said "it could literally take generations before a substantial narrowing of the Digital Divide takes place without further intervention."

Table 10–2: The Evolution of the Digital Divide

	1995	1996	1997	1998	1999	2000
Canada	100.0	100.0	100.0	100.0	100.0	100.0
China	5.2	7.0	7.1	7.5	9.9	10.2
Colombia	14.4	17.5	18.6	19.6	21.2	20.9
Finland	114.7	107.3	108.8	101.5	97.0	91.0
India	2.7	3.2	3.6	3.8	4.3	4.6
Malaysia	25.2	32.8	33.0	31.9	32.7	32.8
Mexico	16.8	18.0	19.0	21.1	24.9	27.6
Senegal	2.9	3.9	4.3	4.9	5.7	7.1
South Africa	25.5	28.1	28.3	27.7	28.8	28.2

Source: "*Monitoring the Digital Divide*", Orbicom-CIDA Project, 2002

As things stand at present, Africa does comparatively little manufacturing or processing and can hardly count on reliable utility services, such as electricity, water supply and telecommunications, with which to undertake these processes as well as enjoy quality life. Add to this, the glaring absence of industrial capacity for the synthesis of new materials and advanced information technologies that are now becoming an activity of competitive advantage in a global economy in relation to knowledge services, and we have a serious problem.

It is therefore certain that unless Africa takes drastic steps to overcome these deficiencies, it will be very difficult for her to meaningfully participate in the emerging new economy. Furthermore, it is doubtful whether any competitive advances would be possible in the new global knowledge economy, without addressing the lapses in the functions of the industrial economy that preceded it. Basically, the various infrastructure and info-structure needed for such competitiveness would not be available. The solution for us, therefore, is to seek to bridge the

digital divide by deliberately utilising the advantages of the Internet and software technologies.

A major strategic initiative under the Global Bridge the Digital Divide (BDD) Program must focus on twin strategies:

1. BDD for social upliftment and e-enablement; and
2. BDD for economic empowerment via e-commerce.

Africa can bridge the digital divide given its history of strong elements of Information Processing tools, such as its calculating board instruments. These board instruments had supported early African societies with such calculations as addition, subtraction, multiplication and division of up to 10 digit numbers.[2.] A set of calculating boards readily record information. Thus, though Information processing is not foreign to the African society, it has not, in recent times and given the acceleration of new electronic technologies, developed in pace with the rest of the world.

This chapter first presents a proposal of a preferred measure of progress of ICT development in Africa using the Internet as a vehicle. An ICT vision for Africa is thereafter articulated showing the transformation from a learning society to a learned society, in which knowledge products with secured intellectual property are primary outputs of industry.

To accomplish this, an eAfrica Agenda is defined that identifies the key components to be strengthened in order to be able to implement the vision. The synergy of the components is relevant in creating good dynamics for development. The core digital rights principles and an implementation framework is specified to ensure satisfactory footprints of the ensuing interventions of the eAfrica Commission.

Internet Measures

In the early 90s, the common method of describing the state of Internetworking of the African continent was simply whether there existed an

interconnection to the global Internet.[3] These were often shown on maps that used colors to distinguish between no connections, email only, or full Internet availability (see Figure 10–1).

Due to the concerted effort of indigenous enthusiasts with some overseas assistance, the entire continent soon gained full connectivity within a decade. There was mention of access from secondary cities as a new measure, but it soon became obvious that many developed societies did not have access in all their secondary cities, and the measure quietly disappeared from the literature. There were some developing countries with effective Intranets, but they had no connection to the international public Internet network.

We have had to contend with a new measure of aggregate bandwidth in any given country as the indicator of Internet development on the African continent. This was at a time when the international connectivity bandwidths of several countries were sub-rates of the common basic unit of bandwidth of 2 MBPS. Today, many of the countries on the continent have in excess of 2 MBPS public Internet bandwidth

Figure 10–1: Interconnection to the Global Internet

connectivity to the Internet. Thus this has now become a beauty contest of who is willing to pay more money to the International community. These international Internet links require that the country seeking a connection pay for both half circuits, in-country and in the termination country, at unusually very high rates, several times larger than same bandwidth purchased in the developed countries. This is thus more a measure of capital flight than of how ICT is advancing the social development of Africa.

The focus turned to the number of users, with calculations of penetration described in colorful charts showing how poorly Africa was performing in accepting the Internet and its promises. During these times, the continent was ridiculed with acclaimed high growth rates the developing countries were supposedly enjoying. These claims of the number of users doubling every few months have all been demonstrated to be mere marketing spins by corporations in developed countries to enhance their exploitation of the global economic system to the disadvantage of Africa. In any case, the number of users is a volatile measure, which changes rapidly as users depart the service and new users enter into service. Likewise, it did not capture the numerous occasional users who often used universal access services. Therefore, we at the eAfrica Commission do not consider the number of users to be a good measure to characterise Internet development in Africa.

Today, the new buzzword in describing the state of the Internet in Africa is the number of exchange points, which are a local interconnection among providers to increase their local speed of communication and reduce somewhat what they pay for International traffic. Though exchange points are good, we do not see this as a good measure. In fact, we wonder why the developed countries do not have many exchange points and yet they seem eager to want to mislead us in this direction. The United States of America has only a handful of Internet exchanges to which the entire global community connects. The proliferation of Internet exchanges needs to be based strictly on local traffic in order for costs to desired locations to be meaningful.

Internet Domain Names and Addresses

The Internet info-structure has two main parts: domain names and addresses. We look to these two structures as a way of defining measures of Internet for the eAfrica Commission. This is better as it relates to the fundamental workings of the Internet technology. We recognise that domain name as a measure is fuzzy and is a mixture of global names, whose destinations cannot be traced easily to Africa, as well as country-based domain names, which can be operated from anywhere. This great flexibility in the domain name system reduces the efficacy of the names as a measure of Internet development in Africa.

The addresses on the other hand have been specified to be within regions of continental sizes. The allocation of the addresses is also managed regionally by regional organisations, which are address registries that ensure uniqueness of the blocks allocated to providers in the region. Furthermore, the allocations are based on the demonstrable use of previous allocations and the presented network plan of organisations. Although the emerging African Address Registry, AfriNIC, is not fully established, information from existing registries covering the Africa region provide precise data on progress in Africa. The eAfrica Commission will use addresses as the primary measure of growth in Internetworking in Africa. This measure lends itself to similar detailed analyses of all the other measures including per capita studies and other higher-level functionality, such as information flows.

With respect to Internet addresses,[4] the status of Africa may best be understood by consideration of Figures 10–2 to 10–6. About 43% of possible addresses in Ipv4 address space had been pre-allocated prior to systematic allocations through Regional Internet Registries. The three Registries located in North America, Europe and Asia Pacific have since allocated 6%, 4%, and 4% of the addresses respectively, amounting to approximately 256 million addresses. The allocation within Africa, a continent yet to have a Registry, is included in the figures of the three registries. This amounts to 2 million addresses, as shown in Figure 10–4.

In other words, the three Registries have allocated less than one percent of the addresses directly to ISPs or organisations in Africa. Note that this percentage is significantly less than one percent when one includes the pre-allocated addresses (43% of the addresses), which had previously been allocated to non-African countries.

Figure 10–2: IANA Allocation IPv4 Address Space

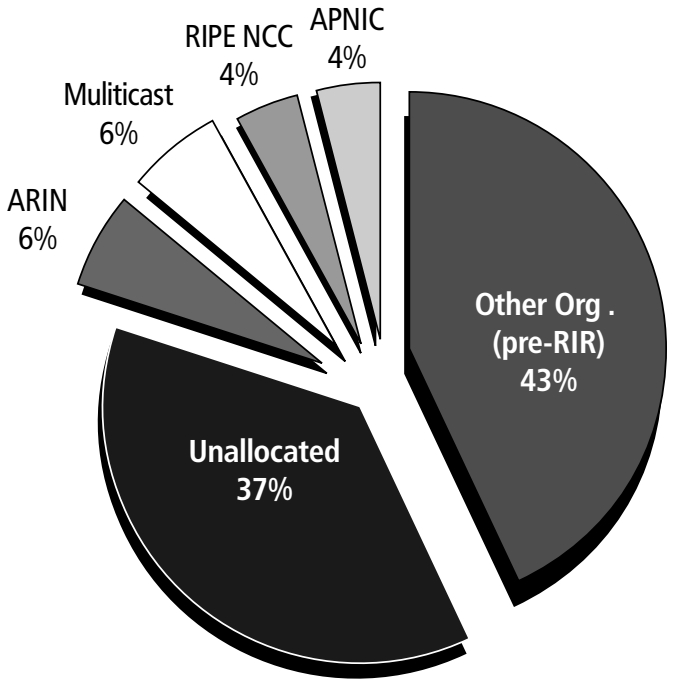


Figure 10–3: IPv4 Allocations per RIR 1999–2002

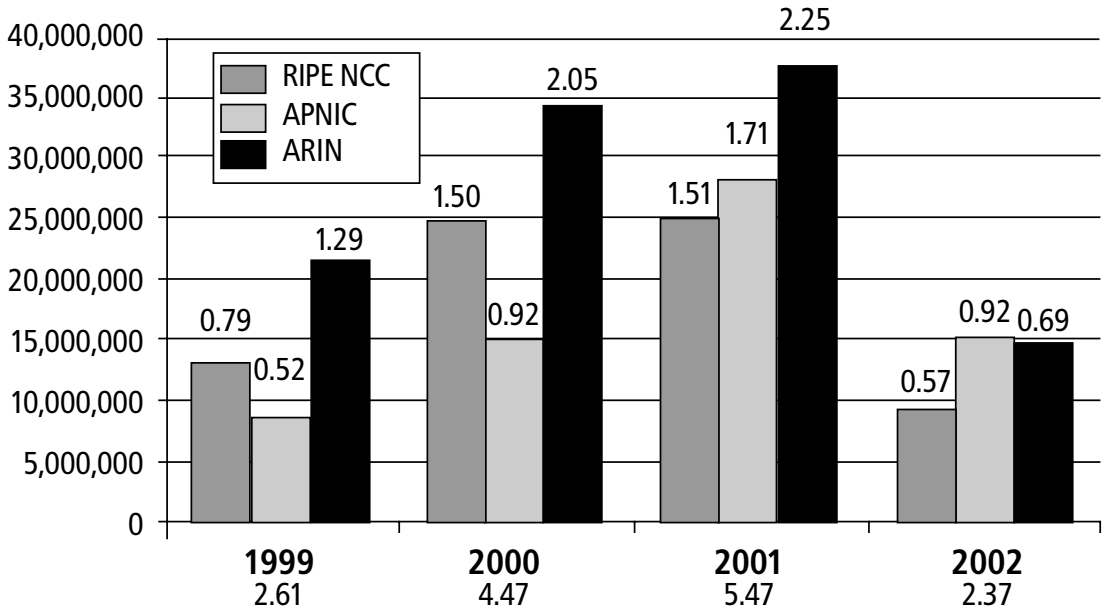


Figure 10–4: Region Summary

Source	Countries	ISP/LIR	Addresses	CIDR Block	Revenue USD
APNIC	1	1	8,192	/19	2,500
ARIN	4	19	933,888	~/12	52,250
RIPE NCC	21	69	1,187,840	~/12	110,000
AfriNIC TOTAL	**26**	**89**	**2,129,920**	**~/11**	**164,750**

The number and geographic distribution of organisations in Africa that have received allocations is shown in Figure 10–6. Observe that the six leading countries in Africa, according to this measure of the number of organisations receiving addresses directly are Egypt, South Africa, Nigeria, Algeria, Kenya and Ghana. This is contrary to what is usually expressed by earlier more subjective measures. It comes as a real surprise, because few cite Nigeria or Algeria as making progress with respect to Internet or ICT, but this measure observes their progress.

The number of organisations receiving these addresses directly from the Registries, as shown, continues to grow and is depicted in Figure 10–5. This illustrates a growth from 15 organisations in 1998 to 86 organisations in 2002.

Figure 10–5: ISP/LIR Growth

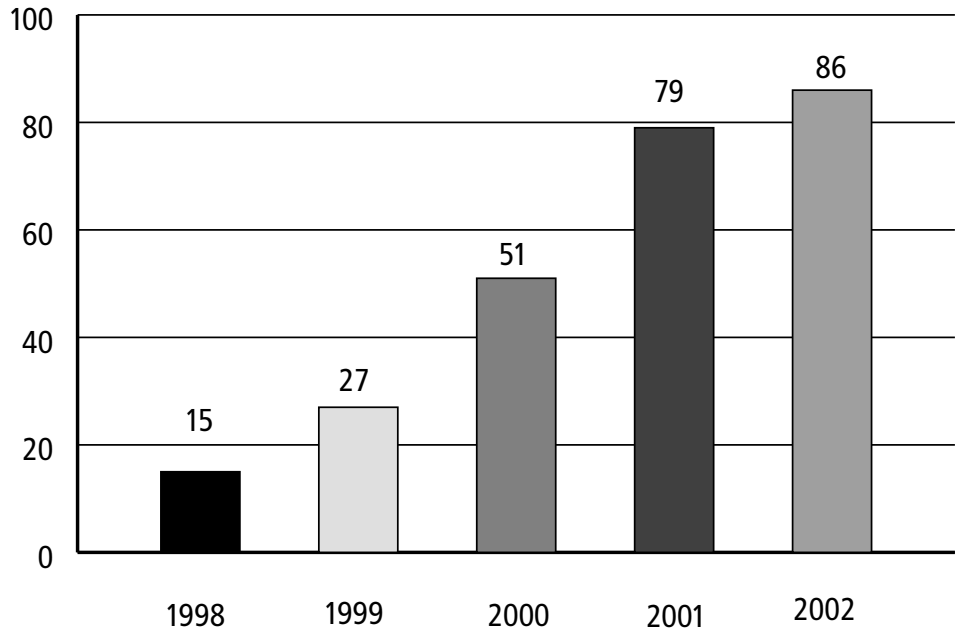
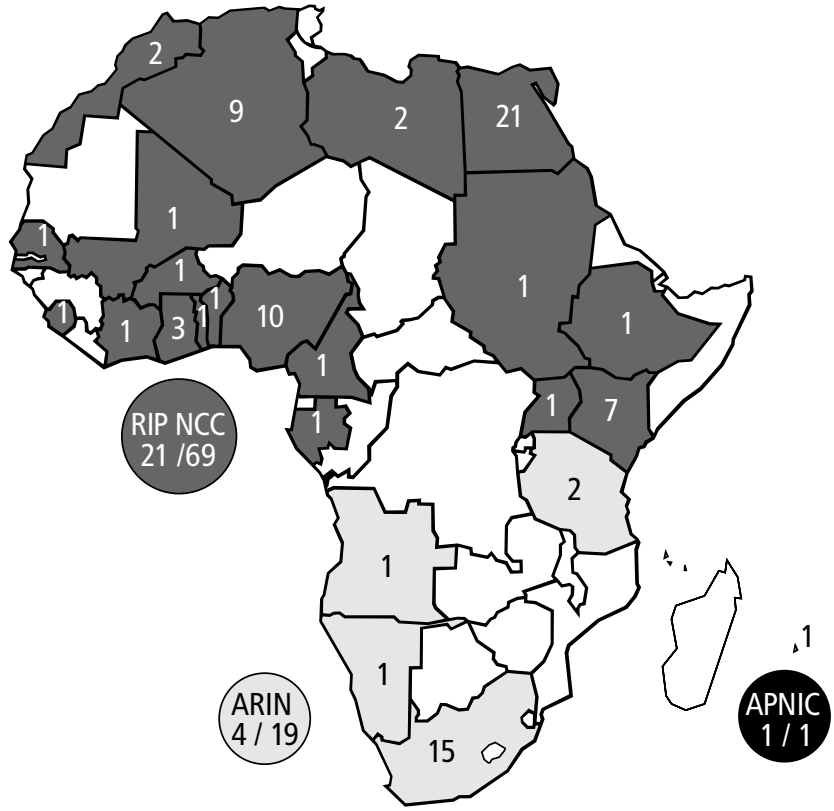


Figure 10–6: Member Distribution 26 Countries/89 ISP/LIR



There is available, a block of 37% of un-allocated address space and a 6% space reserved for multicast applications. The registries allocate other number spaces, such as Ipv6 and ASN numbers, but it suffices to work with the Ipv4 allocations in this instance.

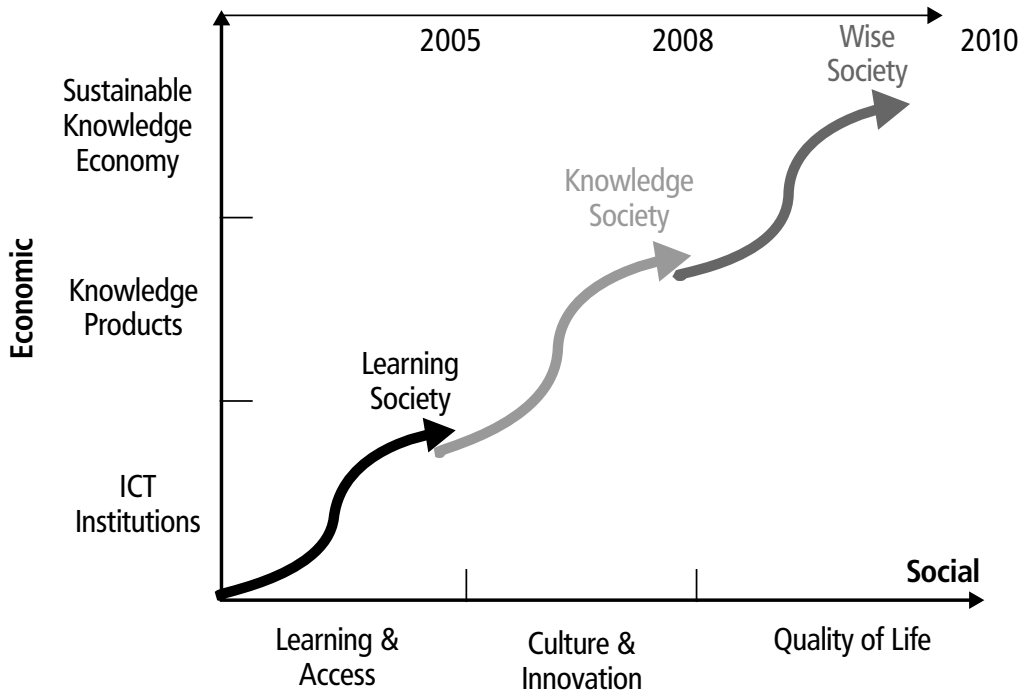
The ICT Vision for Africa

The ICT vision for Africa is to establish ICT, in particular the Internet, as an empowerment tool, and through that, reinforce the people to become critical players in the social and economic transformation of the continent.

The eAfrica vision is a three-step vision, which is intended to transform Africa first from a "Learning" society to a "Knowledge" society and, finally, to a "Wise" society (see Figure 10–7). Such a transformation needs to generate actions on both the economic and social axes in order

to leave an acceptable footprint. The vision may thereafter elaborate on other axes of interest.

Figure 10–7: eAfrica Vision



The first phase is to empower the people while ICT is positioned as a management instrument for economic development, and access for learning is achieved in the societies. A society with a culture of learning is the result.

Subsequently, in the second phase, knowledge products and services are focused on as the economic output of ICT institutions in a sector. In this phase, the use of information and the culture of innovation and creations are encouraged as social values. A knowledge society is the result.

In the third and final phase, a sustainable economy is built around knowledge products by securing the Intellectual Property that is uniquely African while ensuring that the quality of life is enhanced socially with the benefits of ICT.

The prevalent structure of society reflects those who have a means and those who do not. Africa exhibits similar structures, except that the "haves", even though they are ineffective "haves", are insignificant in

number. They are only apparently excessively endowed economically in a people-centered information society.

In fact, the very few that are well-endowed economically are equally poor in information know-how. Africa therefore survives on the knowledge of the many "information have-nots". This necessitates making the inclusion of ICT into society an Information Right without which there will be further deprivation.

The fact is that the "economic-haves" do not have impediments beyond a value appreciation of ICT, whereas the "information poor" have insurmountable barriers to participating in the new information economy that is emanating from the barriers that poverty imposes.

The opportunities of the application of ICT in these information-poor countries are manifold:

- Improvements in overall productivity and daily routine of society.
- Good governance through consultative decision-making and partnerships.
- Enhanced social and economic development through carefully engineered productivity improvements.
- Richer lifestyles and life fulfillment through culture, education and recreation.

The failure, however, to utilise ICT in poverty reduction will lead to gross inequities that will fuel global unrest and threaten peace and harmony. For those who may question the basis for this caution, even though the entire African community is at risk, nonetheless important sub-groups may be identified. These include rural communities, the urban poor, women, youth, the disabled, orphans, senior citizens, street hawkers, workers, and SMEs.

The need, therefore, is to define specific programs in ICT that focus on these groups. The indigenous population, on the whole, is an at-risk group who need special attention. The ICT programs that focus on these groups should be clearly defined, identified and addressed as part of the Global BDD Agenda.

The eAfrica Agenda

The African ICT agenda on Internetworking and software is defined as having six components in policy environments. Several facilities considered prerequisites for rapid assimilation of ICT do not exist and hence institutional development becomes an essential piece of the agenda. Likewise, much of Info-structure is non-existent in Africa and must be established as part of the development dynamic. These particular components, institutions and info-structures make the eAfrica Commission agenda distinct from other proposed agenda.[5]

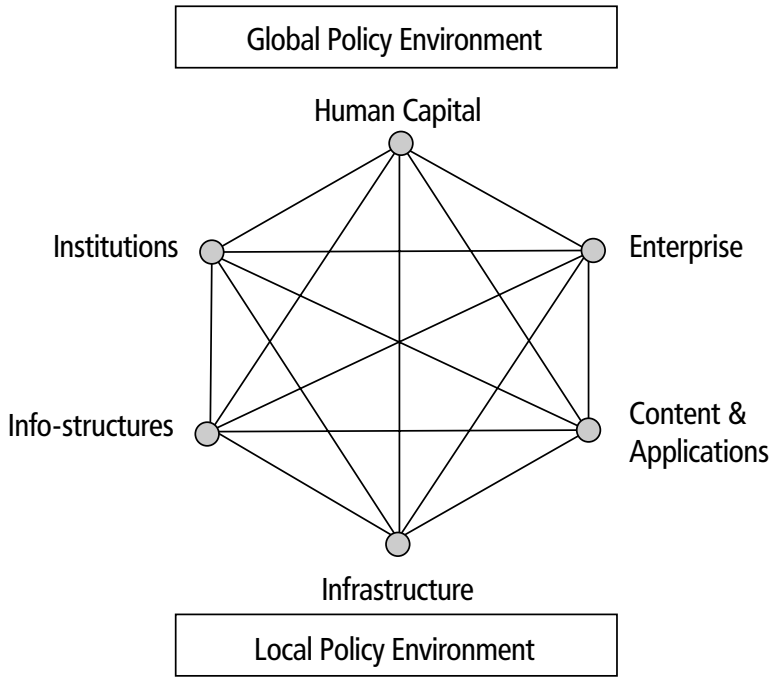
The Components of the Agenda

The components contemplated include human capital (people), institutions, enterprise, infrastructure, info-structure and content with applications. The ICT agenda is implemented in an environment of global, regional and national policy frameworks (see Figure 10–8). All the components interact within the policy environments to achieve the vision of creating a "wise society" in 10 years. These interrelated areas complement each other in ensuring an adequate footprint in all interventions in ICT, especially the Internet.[6] All the components are important and the degree of emphasis would vary as the scheme is adapted from location to location for Africa's advancement.

In this environment the role of global policy organisations is as important as that of nation states as well as that of international development partners with complementary agendas. The agenda includes:

- *Human capital*: The people are the most important currency in a knowledge economy and must be consciously developed and accounted for. Aside from the tangible human values essential in knowledge development, they come with their own norms and values reflected in ethics and language, among others. These are a very essential part of knowledge products. The preparedness of the people and the availability of adequate access to information

Figure 10–8: The eAfrica Agenda



services would lead to the desired innovations. Knowledge workers, computer science leaders and entrepreneurs must be created for sustenance.

- *Institutions:* ICT must be supported and fully established. There is the need to build and support institutions in the public, private and non-profit sectors, many of which have very weak ICT focus. These institutions will then become repositories of knowledge and behavior as well as enforcers of key processes for society. Institutional capacity is relevant for sustenance of ICT development in Africa.
- *Enterprise:* The growth of ICT is led by the private sector in a policy environment with the non-profit organisations. This community needs to be strengthened with the keys to business, including property rights, finance, tax regime, indigenous participation rights, market development and stimulation of demand.
- *Infrastructure:* We must continuously enhance the Infrastructure to transport knowledge products and services. These have suffered in

the past because there has not been sufficient coverage of the demography to be effective in reaching the majority of the community.

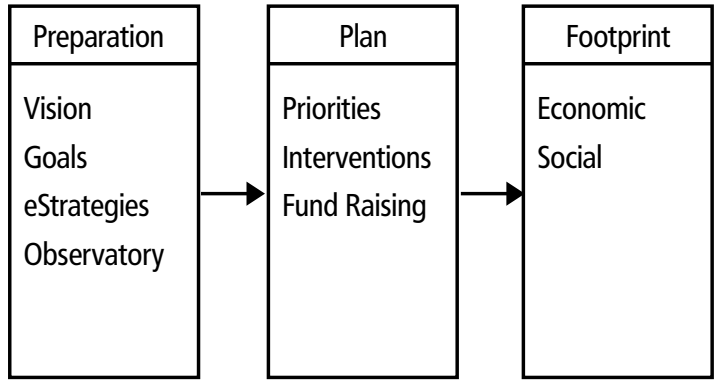
- *Info-structure:* The logical structures that utilise infrastructures to make the knowledge services seamless have in the past been performed on behalf of Africa outside of the continent. The end result is that the info-structure of the developed countries is enhanced at the expense of Africa's own info-structure development. Examples of these include Internet names and numbers registries, certificate authorities, secure-key escrow, legal framework and others.
- *Content and Applications:* The content and applications that will enable the realisation of the desires of the people and institutions, for quality use of the infrastructure and the related info-structures.
- *Local/Global Policy:* ICT is developed within a framework of policies, which may be global, regional and local. The more transparent and inclusive the policy regimes, the more they attract participation from the components of the dynamic. An adequate regulatory framework needs to be created, but this must be flexible to admit newer technologies knowing full well that policy lags behind technology advancement.

Implementing the eAfrica Agenda

This approach offers flexibility in the emphasis on the policy environments as well as the components of the development dynamics. To derive an implementation framework, therefore, requires preparation, development of an implementation plan and an associated footprint analysis to keep the implementation goal-oriented (see Figure 10–9).

During the preparatory phase, the eAfrica vision is crystallised, and clear development goals (probably related to the Millennium goals) are determined. Various national and regional eStrategies are harmonised for coordinated action in Africa. An important part of this phase is the initiation of an Observatory function to keep track of all on-going ICT activities.

Figure 10–9: Implementation Strategy



Subsequently, in the planning phase, priorities and specific interventions that match available funding are initiated. Given the eAfrica commitment to ensuring that every intervention leaves behind a satisfactory "footprint", all the interventions will be continuously assessed along both the economic and social value axes.

Digital Rights Principles

The digital divide has often been defined in terms of ICT gaps between one society and another more developed society, or between a community and another considered more developed. We find this inadequate because, for it to be meaningful, it must be normalised and applied to all other sectors of development. We note that there are gaps in agriculture, manufacturing, education and health, to name a few sectors, as well between Africa and the developed societies. In all these cases, not only are the products and services under-developed, but they are also dependent on acquiring further services from the developed countries. This may be an unfortunate form of dependency that may be reduced with the careful utilisation of ICT. The preferred definition of the digital divide is self-relative, and is a measure of how much of an economy is derived through ICT. In this regard, every sector strives to apply more and more ICT while ICT is developed as an identifiable sector.

The goal will be to provide basic ICT access to all institutions including the at-risk groups in the society, while making global information available to all for competitive knowledge creation:

- The scaling of the little local expertise through the utilisation of ICT in enhancing their impact on the community in all aspects of society. Despite the need to produce more well-trained human resources, in the meantime the few qualified resources must be made to serve more people with use of the Internet and ICT to accelerate development.
- Ensure that ICT, Internet and Software Development are applied to address the Millennium Development goals in poverty reduction.
- Preservation of the intellectual property in language, culture, music, art, medicine, among others, to ensure that in the anticipated global knowledge economy, any value that accrues as a result of African heritage is protected for the benefit of its impoverished peoples. Currently, a fair amount of genuine African Intellectual Property is in free use through a variety of schemes.
- Balance in national policy and global policy is essential because much of the policy and standards pertaining to the transport of information services is determined globally. Yet successful implementation depends on local national environments and supports.
- Synergy within the six components of the environment (which are the people, institutions, infrastructure, enterprise, info-structure, and content/applications) would be desirable. Intense interaction among the five elements and the environment would be key to achieving the goals of the Africa digital rights vision.
- Utilise all resources and stakeholders—public, private, non-profit and traditional institutions—to mobilise attention to the deployment of ICT in African societies. Accepting the interests of these varied groups will moderate the goals and expectations of the programmes.
- Establish policy and implementation coordination guidelines for the African region to make easy interconnections and cooperation in ICT deployment possible.

- Prioritise educational and training programmes to first create the creators of money, followed by managers of money and finally users of money in ICT services. Africa is able to produce professionals to the highest of levels of specialisation as needed and must resolve retention of capacity and engagement of the Diaspora.
- Provide Internet and Software Development Services support to all the programs of the eAfrica Commission.
- Leverage on the other eAfrica Commission programs to enhance Internet and Software Development.
- Identify and implement relevant pilot projects and incubate innovation centers of Internet and Software Development.
- Incorporate monitoring and evaluation mechanisms to assess the effectiveness of the proposed pilot projects.
- Incorporate a business model approach with community participation in all pilot projects so as to ensure project sustainability and potentials for project upscaling and replicability.
- Establish an integrated platform for learning based on the Internet, and open standards in order for the community to enjoy the rights to lifelong learning through formal and informal activities.

Implementation Framework for Action

The Implementation Framework is organised along the components of the African Digital Agenda. These are not intended to be specific projects, but a framework within which specific projects may be defined to meet digital divide needs. See Figure 10–10 for the scope of actions within component areas of the eAfrica Agenda. The scope includes activities in community development, institutional development, industrial development, access, connectivity, and content and applications.

The role of national and regional policy in stimulating the intended development of these six components is emphasised as being the "middleman" and a source of energy for growth.

The global policy as pertaining to the Internet and other software activities are very important to the success of the actions. Similarly, donor organisations have unique contributions in shaping the actions stipulated.

Figure 10–10: Scope of Implementation Framework

Framework for Action

The proposed framework for implementing the Africa BDD Agenda is based on the PDCA (Plan-Do-Check-Action) Cycle, as follows:

Plan

- Identify the real needs of the targeted at-risk community;
- Identify the key players (public, private and civil society organisations) and the leaders of the targeted community; and
- Form a Programme Planning Implementation Team comprising of members from public, private and civil society organisations, leaders of the target community, and others who have genuine interests to assist.

Do

- Describe the problem/issue in terms of seriousness and magnitude;
- Formulate a thesis statement;
- Propose pilot projects, expected deliverables/outcome, and action plans;

- Identify project champions/promoters, project managers and various project partners (content and technology);
- Identify sources of funding and obtain the necessary resources required;
- Form Project Implementation & Management Teams;
- Determine the scope of work and terms of reference for team members; and
- Implement pilot projects using the integrated project management model.

Check

- Set up a monitoring and evaluation mechanism to review stages of project implementation;
- Determine a standardised project-reporting format;
- Identify weaknesses and shortcomings; and
- Take appropriate action to overcome the weaknesses or shortcomings identified.

Action

- Document all project reports, experiences and lessons learnt;
- Publish and publicise successful projects; and
- Plan for project upscaling and replication in other areas.

Global Policy

A lot of the standards activity and policy for a global network, such as the Internet, is developed globally by participation in several International forums. In the Internet community, a number of these forums are relevant and include ICANN (policy & coordination), IETASK FORCE (IP standards), ITU (link level standards), Unicode (character representation standards), W3C (web standards) and others. There are also donor agencies that are supporting Africa's digital divide initiatives through mainstreaming ICT for development. The initiatives include:

- Identification of important forums, maintaining contacts with organisers, disseminating such information to stakeholders and facilitating their participation;
- Coordination of country programs and donor programs to achieve optimum benefit for the region;
- Establishment of relations with various silicon valleys overseas and cyber villages for maximum technical exchange; and
- Enhancement of African participation in Internet/software Global policy Forums by assisting in reducing barriers.

Local/Regional Policy

Local and Regional policy has a compelling impact on the acceleration of ICT and Internet advancement. Many countries are continuously evolving their national policies and strategies. Some initiatives are:

- Identification of important forums, maintaining contacts with organisers, disseminating such information to stakeholders and facilitating their participation.
- Networking and Software associations are critical to keeping abreast of developments in the industry. They also form an industry body that gives input to policy makers on proposals. These would be strengthened.
- Coordination of the various country programs for effective regional harmonisation and interconnections as necessary.
- Establishment of relations with various silicon valleys and cyber villages in Africa for maximum technical exchange and networking.
- An Observatory to study, track and report the progress made in ICT, Internet and software for Africa is to be developed. This effort would also evaluate the footprint of various interventions.

Enterprise

The private sector's role in the diffusion of ICT and the Internet cannot be underestimated, considering the inter-relationship of economic and

social developments in the eAfrica vision of creating a wise society in a decade. The unique role of the private sector in the creation of jobs for knowledge workers and developing infrastructure and info-structure are key to building a sustainable development dynamic. Some of these initiatives are:

- Finance and Credit facilities for ICT would be developed either through specific ICT development banks or through funds exercised through the existing development banks. Venture capital is scarce, but is considered an alternative as wealth creation ventures mature.
- The creation of an environment that attracts foreign investment without excluding indigenous players from genuine participation in the ICT industry is paramount.
- Intellectual property laws and other property laws that secure investment and protect the creations of Africa and its partners must be developed.
- The creation of competition among providers by funding the demand side of ICT to stimulate the market.
- Ensuring that electronic payments become an acceptable practice in the society in order to fuel e-commerce development.
- Looking to incubators as a vehicle for initiating new enterprises that will keep Africa involved in ICT technology production activities, not only usage.
- Positioning the uniquely African assets, intellectual property, for competition in the global market.
- Considering chambers of commerce and other business roundtables as instruments for injecting ICT, Internet, and Software into commercial concerns.

Human Capital

In the vision of creating a wise society, the quality and values of human capital become a determinant of success. Activities that stimulate,

strengthen and organise human resources for action are desired. Some initiatives are:

- Technical skills are on the critical path of Africa's entry into the ICT, Internet and software arena. The few such professionals are overused and practically inaccessible. This bottleneck must be quickly eliminated by a buildup of critical mass of highly specialised professionals with international-level quality skills.
- Support for academic programs in computer network architectures and software development, in particular, and computer science in general. These computer science programs would be engaged in collaborative networks to share teaching methods, faculty and exchange programs. Sufficient graduate programs in computer science and networking should be established to meet the needs of the continent in the stipulated timeframe.
- Coordination of R&D centers in networks & software fields with interest in the more applied aspects of computing science and engineering. The new subject areas of next generation Internet, biotechnology, new materials, genetic programming and artificial intelligence may be rewarding topics for initial exploration.
- Universal Internet Access services to bring the benefits to more of the people in Africa should be promoted.
- Rural Internet solutions should be devised that can be readily deployed in rural communities at affordable prices.
- Change Management should be deployed to assist the communities being impacted by the changes caused by ICT and the Internet.

Institutions

Many of the necessary institutions that support ICT absorption have not been constructed in many African societies. Yet institutional memory is paramount for sustainable systems, especially in the newer technology fields. Some initiatives include:

- Networking & Software associations.

- Institutions for Internet in Africa and groups for ccTLD (AFTLD), for African ICANN (AfriCANN), for African Network Information Center (Address Registry AfriNIC), African Network Operators Group (technology transfer organisation AfNOG) and other trade associations, including African ISP Associations (AfrISPA).
- Institutions for Software Development and Associations essential for promoting Africa's participation in the industry.
- Collaboration on software incubators with eAfrica business programmes.
- Collaboration on software research with eAfrica Institution, Research & Space Communication Programmes.
- Standards & certification programmes.

Infrastructure

The Internet and software require a variety of infrastructures to operate. Africa would prefer to participate in the development of these. Some Initiatives include:

- Manufacture of hardware/software products to meet local needs, thus creating possibilities for innovative products that may compete globally.
- Promotion of national Internet exchanges & regional inter-exchange carrier development to retain continental traffic completely terrestrial with minimum transit outside of Africa.
- Collaboration with eAfrica Infrastructure programmes to establish terrestrial and International bandwidth needs of Internet services for the next decade.
- Bulk purchase of International bandwidth to reduce costs of Internet connectivity to the international backbone.

Info-structure

There are a few information structures required to make the Internet function globally, and they must be developed to become competitive. Some of the initiatives include:

- Developing the country code Top Level Domain name (ccTLD) Registries in Africa to serve the local Internet community completely and ensure that capital flight, which occurs as a result of residents using global (international) generic Top Level Domain Names (gTLDs), ceases.
- The eAfrica Commission should request the Top Level Domain ".Africa" be delegated and operate dotAfrica TLD for its purpose.
- Supporting the AfriNIC Address Registry, a private non-profit organisation being established to allocate Internet numbers to the African community.
- Promoting the establishment of Uniform Domain-Name Dispute-Resolution Policy(UDRP) service providers for Internet domain name disputes in Africa.
- Supporting the operation of a Root Server in Africa as part of eAfrica's desire to participate in all aspects of the Internet operation.
- Internet and Software Laws are lagging behind the advancement in usage of these services, and this needs to be corrected.

Content and Applications

The principal contact of the majority of the community to the Internet and software is through access to content and the execution of applications. The eAfrica Commission has initiatives to address these, and they include:

- Promoting new Internet applications, in particular, how Internet telephony (VOIP) may reduce costs of access, and also how to use Internet-enabled solutions to participate in e-commerce and e-tourism to Africa's advantage.
- Software development of African games is a natural point of entry for Africa into the industry and should be utilised to gain some intellectual property for these creations.
- African languages must be available on the Internet and useable in software applications. Hence all the languages need to be registered and the corresponding alphabets properly included in Unicode. The

eAfrica would prepare for the introduction of Internationalised Internet Domain Names.

- Educational software tools present another opportunity for African-developed software from the adaptation and creation of instructional material through stand-alone software or the Internet. Learning aids based on ICT for all levels of education should be developed specifically for Africa.
- Africa's folklore, music, art, culture and herbal medicine need to be digitalized for preservation and protection of the Intellectual property. This database would become an asset in a knowledge society for economic purposes and for the improved quality of life of Africans and people of African descent.
- Microprocessor applications and instrumentation for SMEs is also a potential for innovation in simple system, hardware and software products peculiar to the needs of Africa, and would be developed. Small VSLI Application Specific Integrated Circuits (ASIC) are of interest in solving unique system problems of the region. Design Centers and design entry are potential enterprises to be developed in support of ASIC applications.
- Methods of access to the internals of commonly available software is a must and consideration would be given to the merits of proprietary and open source tools as vehicles to realising the objective of enabling active development of software on the continent.

ICT Priority Areas

The details of ICT Priority Areas are best determined after an observatory is in place. However, the guideline is that projects that involve Africa in the development of technology and technology solutions should be of higher priority. Africa wishes to participate in the advancement of the technologies as well as their usage. Africa also wants to preserve its natural intellectual property as it relates to the emerging

knowledge industry and therefore should be the ones to develop such projects.

In BDD, there should be a balanced development between three strategic elements; namely, community development, connectivity and access, and content and application development. Each of the strategic elements will have to focus on priority areas, as follows:

a. Community Development (Individuals and groups)

- Human capability building (awareness, training & skills-development)
- Institutional capacity building (arrangement/administrative machinery)
- Sustainability (processes & empowerment)

b. Connectivity and Access

- Affordable network access
- Affordable ICT appliances
- Rules and procedures

c. Content and Application Development

- Relevant local content
- Community-focused applications
- Content management and knowledge sharing

Conclusion

There is hope that the application ICT, Internet and software technologies would reduce poverty and avert the potential of further oppression of Africa in the new information-intensive global economy. This chapter proposes a vision for information freedom and an agenda that will enable Africa narrow the digital divide while preserving its place in the

emerging knowledge-based global economy. The vision promises to initially create a learning society that can evolve to become a knowledge society and lead to a wise society that preserves its knowledge assets for global competitive positioning. It further proposes a framework for action that ensures that good footprints are the result of all interventions within the eAfrica vision.

NOTES

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