Africa's Digital Rights

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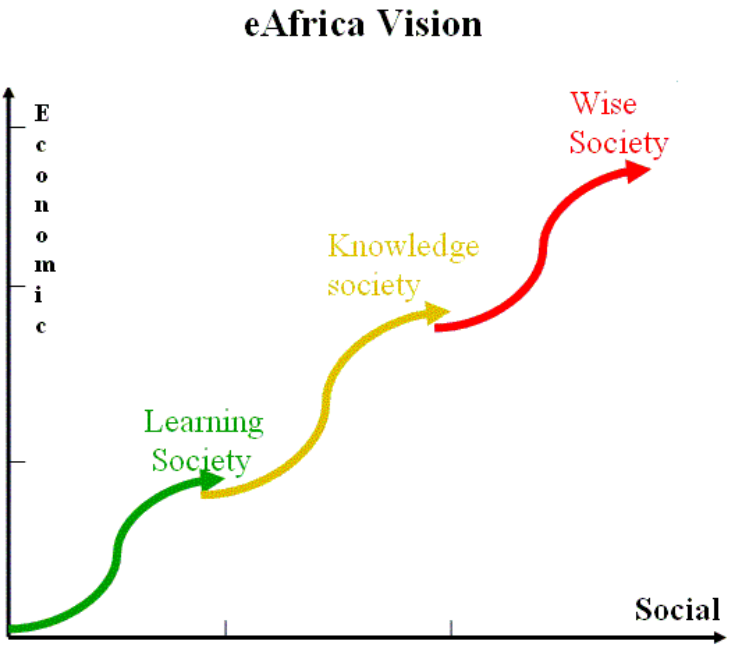

August 2002

Table of Content

1. A Vision for Information Freedom

Africa is heading towards a future of poverty and oppression in the new information intensive global economy. The Internet and related software have become driving elements of worldwide ICT and ought to be priority ingredient in all Information for Development visions. This document presents a vision of eAfrica Commission [1] as it relates to Internetworking and Software Systems covering a period of 10 years.

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

Table 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

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

The same HDR also reveals that in many parts of Sub-Saharan Africa the lives of the poorest people are getting worse. The worst-off Sub-Saharan countries now have incomes 1/40th or less of those in OECD countries. On the global scale, the inequality should be a major concern:

- 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%.

The evolution of societies have identified a number of stages ranging from primitive hunting and gathering, to farming, agricultural, mining developing societies, to Industrial societies that are heavily involved in manufacturing processing while utility services are abundant. Beyond these pre- developed societies are the developed societies who are laden with material synthesis and information Services are the norm. The most advanced societies are currently exploring Knowledge services and their implications. It is saddening to note that Africa is not participating to any significant degree in post-developing society evolution.

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 (Table 2). The study also said "it could literally take generations before a substantial narrowing of the Digital Divide takes place without further intervention."

Table 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

Africa does little manufacturing or processing and barely operates any reliable utility services. Forget for the moment, the glaring absence of synthesis of new materials and advanced information technologies that is now becoming an activity of competitive advantage in a global economy in relation to knowledge services.

It is therefore certain that it will be very difficult for Africa to meaningfully participate in the emerging new economy. It is furthermore doubtful, whether without addressing the lapses in the functions of the earlier stages of societal development, any competitive advances would be possible in the new global knowledge economy. Remember, that the various infrastructure and info-structure would not be available. The solution to us therefore, is to seek to bridge the digital divide by deliberately utilizing the advantages of the Internet and software technologies.

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

- BDD for social upliftment and e-enablement

- 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 calculations such as addition, subtraction, multiplication and division of up to 10 digit, numbers [2]. A set of calculating boards readily record information. Thus, Information processing is not foreign to the African society but has not developed in pace with the rest of the world in the more recent times with the acceleration of new electronic

technologies creating gaps to be mended.

The document 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 wise 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.

2. 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 map using colors to distinguish no connection, email only or full Internet availability. See Figure 1.

Due to concerted effort of native enthusiasts with some overseas assistance soon the entire continent gained full connectivity in the 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 its secondary cities and the measure quietly disappeared from the literature. There were some developing countries with effective Intranets but had no connection to the international public Internet network in the meantime.

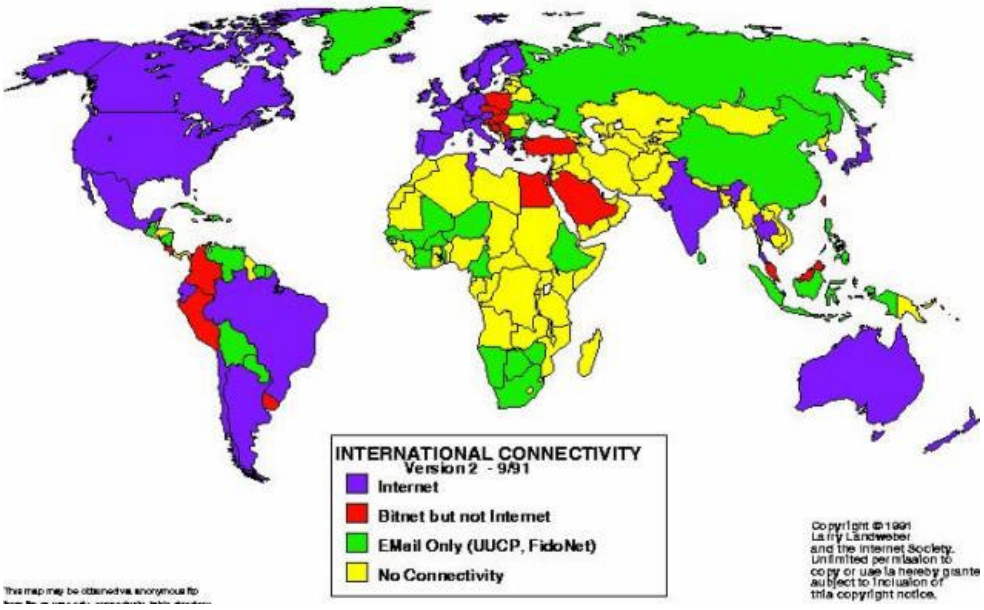

Figure 1: Interconnection to the Global Internet

We have had to contend with a new measure of aggregate bandwidth, in a country as status of Internet development on the African continent. This was at a time that international connectivity bandwidth of several countries were sub-rates of common basic unit of bandwidth of 2 MBPS but now many of the countries on the continent have excess of 2 MBPS public Internet bandwidth 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 termination country, at unusually very high rates several times larger than same bandwidth purchased in the developed countries. This is thus a measure more of capital flight and not a measure of how ICT is advancing the social development of Africa.

One turned to number of users and calculations of penetration equally 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 enjoying. These claims of number of users doubling every few months have all been demonstrated to be mere marketing spins of corporations in developed countries to enhance their exploitation of the global economic system to the disadvantage of Africa. In any case, 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 eAfrica Commission, do not consider number of users a good measure to characterize Internet development in Africa.

The new buzzword in describing state of the Internet in Africa is number of exchange points, which are a local interconnection among providers to increase their local speed of communication and reduce some cost on International traffic. Though exchange points are good we don't see that as a good measure and wonder why the developed countries do not have many exchange points but yet we seem to be misled in this direction. The United States of America has only a handful of Internet exchanges to which the entire global community connects. Proliferation on Internet Exchanges needs to be based strictly on local traffic in a local and costs to desired location to be meaningful.

The Internet info-structure has two main parts of 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 working of the Internet technology. We recognize 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 regional by regional organizations, address Registries that ensure uniqueness of the blocks allocated to providers in the region. The allocations are furthermore based on demonstrable use of previous allocations and presented network plan of organizations. 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 analysis as all the other measures including per capita studies and other higher level functionality such as information flows.

With respect to Internet addresses [6] the status of Africa may best be understood by consideration of Figures 2-6. 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% 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 amount to 2 million addresses, as shown in Figure 5, i.e. less than one percent of the addresses, has been allocated directly to ISPs or organizations in Africa by the three Registries. Note that this percentage is significantly less than one percent when one includes the pre-

allocated addresses, 43 % of addresses, which had been previously allocated to non-African countries.

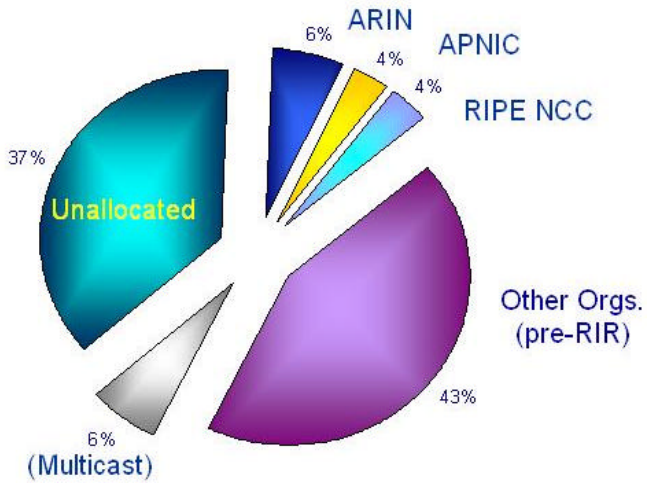

Figure 2: IANA ALLOCATION IPV4 ADDRESS SPACE

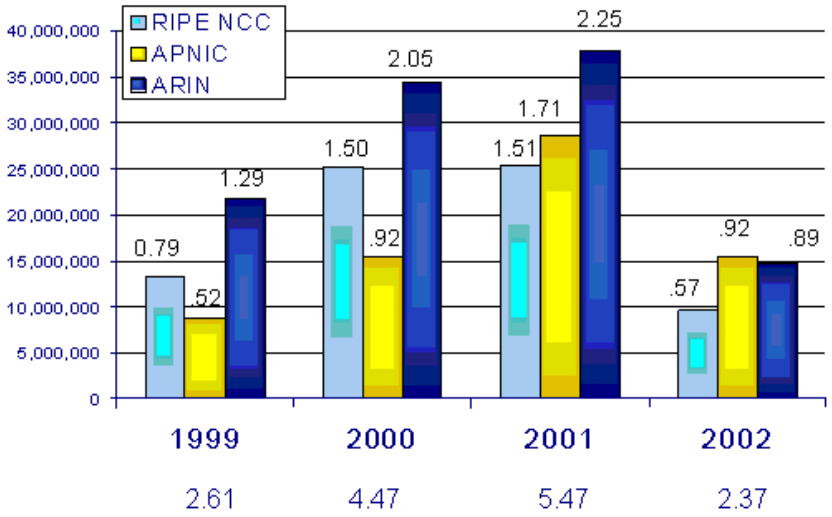

Figure 3: IPv4 Allocations per RIR 1999-2002

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

Figure 5: Region Summary

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

The organizations that are receiving these addresses directly from the Registries as shown continues to grow and is depicted in Figure 4. This illustrates a growth from 15 organizations in 1988 to 86 organizations in 2002.

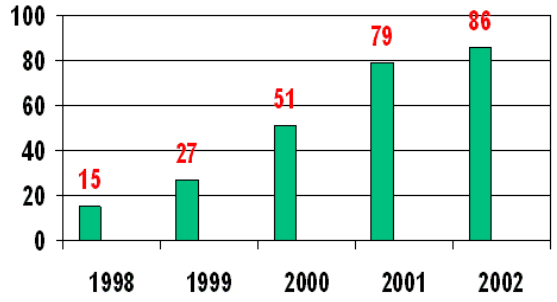

Figure 4: ISP/LIR Growth

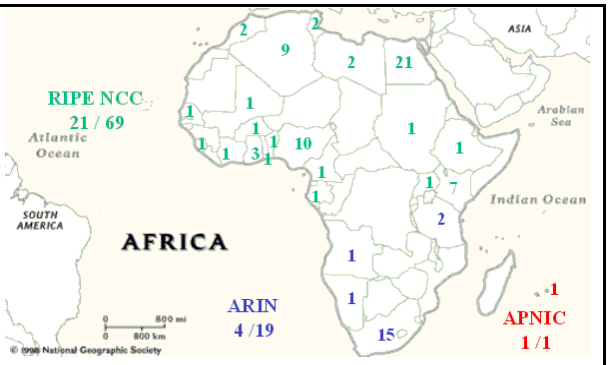

Figure 6: Member Distribution 26 Countries / 89 ISP/LIR

There is available a block of 37% 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.

3. The ICT vision for Africa

The ICT vision for Africa is to reveal ICT and Internet, in particular, as an empowerment tool while reinforcing people as a critical ingredient in the social and economic transformation of the region.

The eAfrica vision for is a three-step vision. The vision is intended to transform Africa first from a "Learning" society to a "Knowledge" society and finally to a "Wise" society. See Figure 7. Such a transformation needs to generate actions on both the economic and social axes in order to leave acceptable footprint. The

vision may thereafter elaborate on other axes of interest.

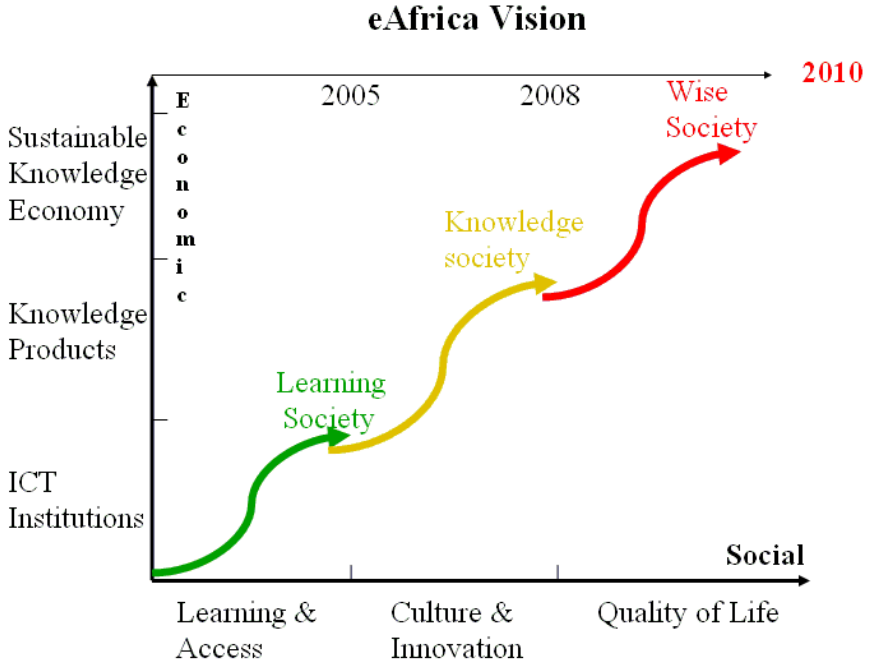

Figure 7: eAfrica Vision

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 focussed as 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 don't. 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 depravation.

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 participate 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 over - all 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.

Note however that the failure to utilize ICT in poverty reduction would lead to gross inequities that will fuel global unrest and threaten peace and harmony. And 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, 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.

4. 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 [4].

4.1 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 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 adequate footprint [5], in all interventions in ICT, especially, the Internet. 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.

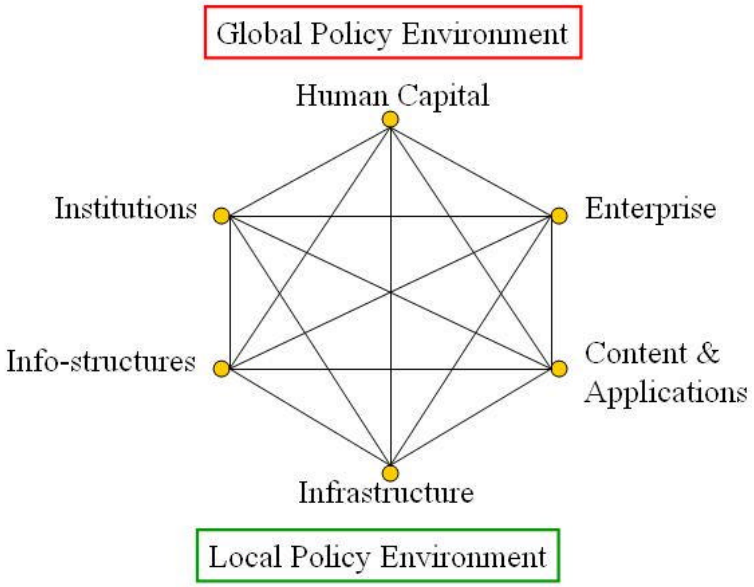

Figure 8: The eAfrica Agenda

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

- Human capital: the people are the most important currency in a knowledge economy and must be consciously developed and accounted for. Aside 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 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. It is noted that African countries are handicapped in their ability to absorb and apply ICT. This is in

part, a result of the inadequate development of the early stages of their societies and deliberate effort will be necessary. 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 organizations. This community needs to be strengthened with the keys to business, including property rights, finance, tax regime, native participation rights, Market development and stimulation of demand.

- Infrastructure: We must continuously enhance the Infrastructure to transport the knowledge products and services. These have suffered in the past because there has not been a sufficient coverage of the demography to be effective in reaching the majority of the community.

- Info-structure: The logical structures that utilize 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 realization 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 it attracts participation from the components of the dynamic. An adequate regulatory framework needs to be created but flexible to admit newer technologies knowing full well that policy lags technology advancement.

4.2 Implementing eAfrica Agenda

The dynamic offers flexibility in 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 9.

During the preparatory phase the eAfrica vision is crystallized and clear development goals, probably related to the Millennium goals, are determined. Various national and regional eStrategies are harmonized 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.

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.

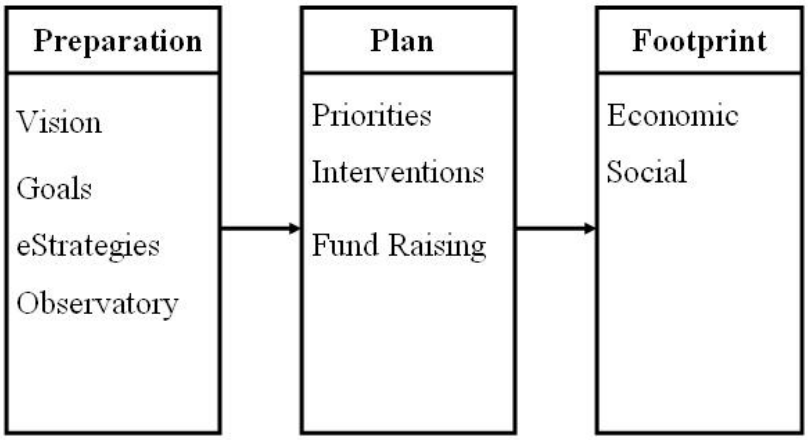

Figure 9: Implementation Strategy

5. 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 normalized 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 utilization of ICT. The preferred definition of 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 native expertise through the utilization of ICT in enhancing their impact on the community in all aspects of society. Despite the need to produce more of well-trained human resources, in the meantime the few qualified resources must be made to serve more people with use of Internet and ICT's 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 etc, to ensure that in the anticipated global knowledge economy any value that accrue as 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 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, i.e. 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.

- Utilize all resources and stakeholders - public, private, non-profit and traditional institutions to mobilize attention to the deployment of ICT in African societies. Accepting the interests of these varied groups will moderate the goals and expectations of the programs.

- Establish policy and implementation coordination guidelines for the African region to make easy interconnections and cooperation in ICT deployment possible.

- Prioritize educational and training programs to first create the creators of money first 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 specialization 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 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 mechanism 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 an Internet- and open standards for the community to enjoy the rights to lifelong learning through formal and informal activities.

6. Implementation Framework for Action

The Implementation Framework is organized 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 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 emphasized as being middle and source of energy for the growth.

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

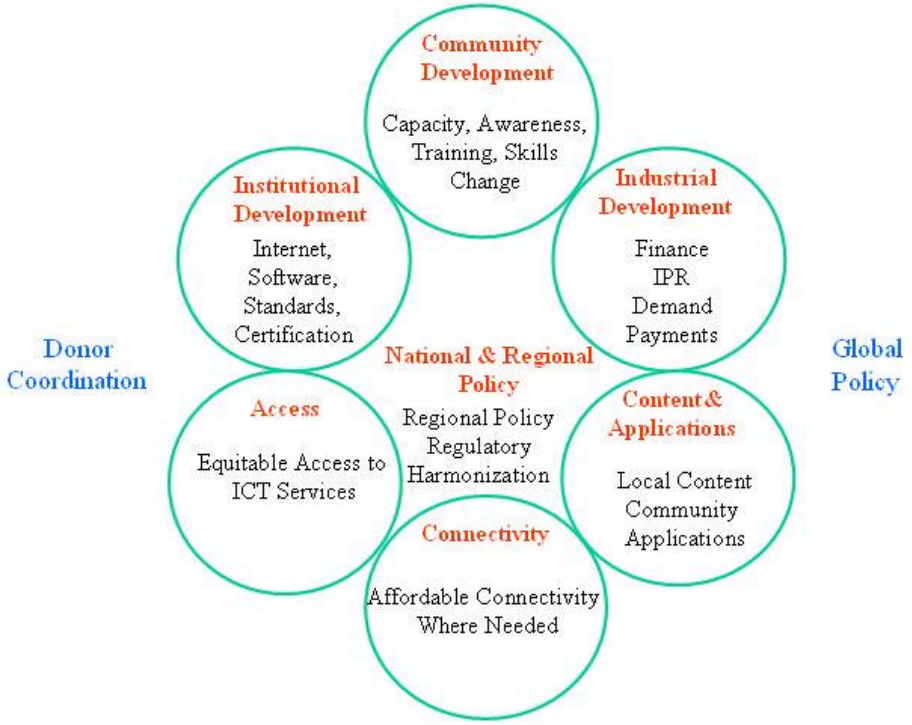

Figure 10: Scope of Implementation Framework

6.1 Framework for Action

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

Plan

Identify the real needs of the targeted at risk community
Identify the key players (public, private and civil society organizations) and the leaders of the targeted community
Form a Program Planning Implementation Team comprising of members from public, private and civil society organizations, 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 necessary resources required.
Form a Project Implementation & Management Teams
Determine the scope of works and terms of reference for team members
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 standardize project reporting format
Identify weaknesses and shortcomings
Take appropriate action to overcome weaknesses or shortcoming identified

Action

Document all project reports, experiences and lessons learnt
Publish and publicize successful projects
Plan for project upscaling and replication to other areas

6.2 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 includes ICANN (policy & coordination), IETF (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. Some initiatives are:

- Identification of important forums, maintaining contacts with organizers, disseminating such information to stakeholders and facilitating their participation.

- Coordinate country programs and donor programs to achieve optimum benefit for the region.

- Establish relations with various silicon valleys overseas and cyber villages for maximum technical exchange.

- Enhance African participation in Internet/software Global policy Forums by assisting in reducing barriers.

6.3 Local/Regional Policy

Local and Regional policy has a compelling impact on 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 organizers, disseminating such information to stakeholders and facilitating their participation.

- Networking and Software associations are critical to keeping abreast with developments in the industry. They also form an industry body that gives input to policy makers on proposals. These would be strengthened.

- Coordinate the various country programs for effective regional harmonization and interconnections as necessary.

- Establish 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.

6.4 Enterprise

The private sector's role in diffusion of ICT and the Internet cannot be underestimated given 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, developing infrastructure and info-structure are key to building a sustainable development dynamic. Some 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 bank. 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 the indigenous from genuine participation in the ICT industry is paramount.

- Intellectual property laws and other property laws that secures investment and protects the creations of Africa and its partners must be developed.

- Create competition among providers by funding the demand side of ICT to stimulate the market.

- Ensure that electronic payments become acceptable practice in the society to fuel e-commerce development.

- Look to Incubators as a vehicle for initiating new enterprises that will keep Africa involved in ICT technology production activities, not only usage.

- Position the uniquely African assets, intellectual property, for competition in the global market.

- Consider the chambers of commerce and other business round tables as instruments for injecting ICT, Internet, and Software into commercial concerns.

6.5 Human Capital

In the vision of creating a wise society the quality and values of the human capital becomes a determinant of success. Activities that stimulate strengthen and organize the human resources for action is 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 over used and practically inaccessible. This bottleneck must be quickly eliminated by a buildup of critical mass of highly specialized professionals with international quality skills.

- Support 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. Establish sufficient graduate programs in computer science and networking to meet the needs of the continent in the stipulated timeframe.

- Coordinate 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 early on.

- Devise rural Internet solutions that can be readily deployed in rural communities at affordable prices.

- Change Management to assist the communities being impacted by the changes ICT and Internet bring.

6.6 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 be supported and groups for ccTLD (AFTLD), for African ICANN (AfriCANN), for African network Information Center (Address Registry AfriNIC), African Network Operators Group (technology transfer organization AfNOG) and other trade associations including African ISP Associations (AfrISPA) be enabled.

- Institutions for Software Development and Associations are essential for promoting Africa's participation in the industry.

- Collaborate on software incubators with eAfrica business program.

- Collaborate on software research with eAfrica Institution, Research & Space Communication Program.

- Standards & certification programs.

6.7 Infrastructure

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

- Manufacturing of hardware/software products to meet local needs creating possibilities for innovative products that may compete globally.

- Promote national Internet exchanges & regional inter-exchange carrier development to retain continental traffic completely terrestrial with minimum transit outside of Africa.

- Collaborate with eAfrica Infrastructure program 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.

6.8 Info-structure

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

- Develop 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) do not occur.

- EAfrica Commission should request the Top Level Domain ".Africa" be delegated and operate dotAfrica TLD for its purpose.

- Support AfriNIC Address Registry, a private non-profit organization being established to allocate Internet numbers to the African community.

- Promote the establishment of Uniform Domain-Name Dispute-Resolution Policy(UDRP) service providers for Internet domain name disputes in Africa.

- Support the operation of a Root Server in Africa as part of the eAfrica's desire to participate in all aspects of the Internets operation.

- Internet and software Laws are lagging behind the advancement in usage of these services which needs to be corrected.

6.9 Content and Applications

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

- Promote 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 are goals.

- Software development of African games is a natural point of entry for Africa into the industry and should be utilized 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 Internationalized Internet Domain Names.

- Educational software tools present another opportunity for African developed software from the adaptation and creation of instructional material through standalone software or the Internet. Learning aids based on ICT for all levels of education should be developed specifically for Africa.

- To digitize Africa's folklore, music, art, culture and herbal medicine for preservation and protection of the Intellectual property. This database would become an asset in a knowledge society for economic purposes and for 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 realizing the objective of enabling active development of software on the continent.

7. ICT Priority Areas

The details of this section 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 is better and of higher priority. Africa wishes to participate in the advancement of the technologies as well as its usage.

Africa also wants to preserve its natural intellectual property as relates to the emerging knowledge industry and therefore 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 identified below:

a. Community Development (Individuals and groups)

Human capability building (Awareness, Training & Skill dev.)
Institutional capacity building (institutional arrangement/administrative machinery)
Sustainability (Processes & empowerment)

b. Connectivity & Access

Affordable network access
Affordable ICT appliances
Rules and procedures

c. Content & Application Development

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

8. 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. The document 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.

9. Acknowledgements

We wish to acknowledge the contribution of Lyndall Shopemafole, Henry Chassia, Pierre Dandjinou, Pierre Ouedrago, Clement Dzidonu, Mouhamet Diop, K.J. John, William Tevie, Ernest Brown and Mawuko Zormelo to the document.

We thank the eAfrica commission for giving us an opportunity to serve Africa with our specialization in Internet and Software Development.

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