Building The African Information Infrastructure

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The vision, strategic objective and the framework of operation for the formulation of an African information infrastructure leading to a Global Information Society have been presented. Concepts presented demonstrate how the information infrastructure will support vital issues such as improving the balance in economic and social progress, leveraging growth of the global economy, boosting the capacity to solve common societal problems, enhancing the progress of democratic values and sharing cultural creativity, traditions, and identities. Elements drawn from the case of Egypt in taking the initiative to develop its information and communication infrastructure to work as a model for African nations while accommodating for their varying needs have been highlighted.

Introduction

Three global trends, technology, business and the economy have affected information highways. These trends that characterized the last few decades were coupled with dramatic developments in information, computing and communication technologies.

The technology trends are increasingly affecting our daily life. The revolution in information, computing and communication is affecting many aspects of life such as education, health and the industry. This is highlighted by the notions of inter-networking, multimedia and doing business across national borders through “Electronic Commerce”, concept of the global village and the ability to communicate with anyone, anywhere and anytime.

The business trends are diversified, disseminating notions of competing in time, developing comparative advantages and the ability to timely respond to market changes. Moreover, the focus is on ensuring consumer satisfaction and targeting investment in consumer service orientation, shifting from physical to intellectual capital and the accumulation of efforts that contribute to the development of an on-line society.

The economy trends are similarly affected by the developments in various services and manufacturing sectors. The world is moving towards a market economy, investment in economic reform, restructuring and privatization. This is coupled with a shift from goods to services that implies a shift from wealth that is based on natural resources such as oil to information, and knowledge. Thus, there is an increasing intensity in the accumulation and use of information, as a resource for the production and delivery of various products and services that leads to leveraging the development and growth processes.

These global trends coupled with the movement towards the information age with continuous innovations of the 1980s and 1990s led to rapidly falling costs of information, computing and communication technologies which represent a window of opportunity to leapfrog strategies to accelerate socioeconomic and business development of the continent of Africa. It is a continent with great potentials to leapfrog with its planned investments into an era of development and growth. The communication and inter-networking technologies are currently small and are not growing to meet the needs of the market. However, there are many observers who believe that there is an opportunity for building Africa’s information infrastructure especially that there is a commitment from African leaders to bring about change in the way information technologies are perceived. The new wave of African leaders, businessmen and decision makers is sweeping towards more into the information age of the 21st century and are more prepared than ever to initiate new ideas, formulate the vision, set strategies and support their implementation. It is perceived that such a trend represents a unique opportunity for Africa’s younger generations to adapt and adopt new tools and
techniques using state-of-the-art information and communications technologies.

Recent Developments in Africa

Recently, African leaders articulated three major development goals that represent the driving force behind the embarkation on the information revolution. The goals include: improving the quality of life for every African, working on the integration of the economies of the region and leveraging trade linkages and relations with other parts in the world.

Building Africa’s information infrastructure is essential to the long-term strategy of its future. The infrastructure will formulate the backbone for the comprehensive socioeconomic development plans for Africa of the 21st century. The strategy is targeting providing information to all Africans through inter-networking, developing information systems to support decision and policy makers, linking Africa to the world through information highways, inviting the private sector to take the leadership in growing information-based economies, and empowering African economies with timely, accurate and relevant information. There is an enormous gap in information technology capacities between the industrialised societies and the developing world where many developing countries lack the basic forms of technological infrastructure. However, with all the gaps that exist between the developed and developing worlds, none is growing faster than the information gap that reflects the different role and usage of information in these societies. With the innovation of the information highway concept with its social, cultural, and political implications, there are strong potentials and opportunities to narrow the gap.

The African Information Infrastructure Initiative (AISI) reflects the urgency of the formulation of a national information infrastructure plan in each African country driven by its developmental challenges. These challenges usually include issues such as debt management, food security, health, education, unemployment, water, and trade. The plan reflects the urgency of a dual partnership between national, private and public sector organizations as well as cross-nations collaboration between African countries to exchange experiences that stimulates intra regional development.

The global movement to an information age has led to rapidly falling costs for information and communication technologies. Together with the changes facing global and national telecommunication regimes represent a window of opportunity for “leapfrog” strategies to accelerate the development of Africa. Information and communication technology can no longer be seen as a luxury for the elite but as an absolute necessity for the masses. Even though the non-literate and rural populations may not be able to make direct use of the African information infrastructure in the near future, the positive spin-off to the continent as a whole, will still result in benefits for all sectors of society. While the immediate returns of investment in information and communication technologies may not be apparent to administrations concerned with squeezing the most from limited resources, the long-term positive impact of a proactive strategy cannot be ignored.

Vision

The African information infrastructure aims at supporting and accelerating socioeconomic development across the African countries. It focuses on priority strategies programs and projects that can assist in the sustainable build up of an information society in Africa. This is formulated in accordance with the regional integration goals of the treaty establishing the African Economic Community which foresaw the necessity of information networks, developing regional databases and leveraging human resources skills and capacities.

Strategic Objectives

To achieve the ambitious goals of the African information infrastructure, there is a strong and urgent need to realize a set of strategic objectives that includes:

- Creating an Africa-wide information and communication network that allows low cost and reliable communication.
- Ensuring the information flow within the society.
- Optimising the use of information by developing a fully-integrated system allowing wide information dissemination.
- Fostering a new generation that uses information and communication technologies.
Linking Africa globally by improving the flow of new technologies in both directions and exporting intellectual products and services.

Framework

Building Africa’s information and communication infrastructure requires the development and improvement of four major components: The institutional framework (legal, regulatory and business mechanisms), human resources (people factor), information resources (information infrastructure) and the technological resources (infrastructure).

The information infrastructure for Africa cannot be realized without the appropriate institutional framework at the national level that inhibits the development of national information services and inter-connectivity to the global information infrastructure. This relates to legal, regulatory, and business obstacles. At the legal level, obstacles include high cost of communication services preventing the establishment of value added services, high taxation for value-added service providers harming businesses and high import duties on information technologies and communication equipment. At the regulatory level, obstacles include lack of adequacy for the certification of equipment, prohibitions on the creation of private telecommunication network and difficulty in obtaining licences to access international telecommunication carriers. At the business level, obstacles include lack of appropriate legal framework for the creation of entities providing value-added services, and difficulty in obtaining financial resources for start-up and expansion.

There are a number of ways to address these obstacles which could help the establishment of the African information infrastructure. For example, the national governments should provide an environment to develop the national information and communication infrastructure and to ensure that all sectors of the economy get benefit from it. Each African government needs to assign a leading national body to be responsible for the coordination with the government as well as with other parties involved in the buildup of the national information infrastructure. The government could promote the use of information and communication technologies, formulate policies adopting these technologies within various sectors, establish a framework ensuring the participation of all sectors involved in implementing the national information and communication infrastructure, and develop the legislative framework to address cost, accessibility, intellectual property, and privacy issues.

The role of the private sector could be reflected through stimulating growth and assuming market leadership in developing national information and communication infrastructure through investment and seizing new business opportunities that arise from the implementation of the African information infrastructure. In that respect, the role of the private sector could be to contribute in supporting managers of small and medium size enterprises in information and communication needs, establishing an organizational framework, that eliminates constraints and supports business development, and encouraging the formulation of information services agencies.

Non-governmental organizations could play a catalytic and coordinating role through the identification of rural communities’ needs, development of their capacities, and promotion of workforce concerns to employers and government that can help in defining priorities in developing the African information infrastructure.

The role of the media is critical 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 rural remote communities.

Human Resources

Africa’s social and economic development is to a large extent determined by the size and quality of its human and intellectual capital. While preparing Africa for the information age there is a necessity to invest in its human resource training and education. Learning as a concept represents the cornerstone of Africa’s new society in the 21st century. The new profile of the work force should include the ability to adopt and exploit new technologies, manage change, and the creation of new job markets where skills and knowledge learned can be applied.
The African Information Society Initiative proposes a program to introduce and diffuse the information society concepts and norms within Africa. The essence of the program is to encourage the use of information technology within the government as well as public and private sector organizations through training, professional development and education. The program includes the elements of 'awareness' to help build informed decision-makers in all sectors, 'education' to prepare new generations to deal with information and communication technologies and 'competence development' to improve the performance of professionals and skilled workers in information and communication technologies.

Infrastructure Information Resources

Building an information infrastructure for Africa could have substantial impacts on the continent. The infrastructure will enable decision-makers optimize their planning and development decisions, make Africans producers of relevant, timely and accurate information rather than passive consumers of data, participate in the formulation of the global information infrastructure, enable African researchers to collaborate with their peers worldwide and promote African cultural heritage globally. Based upon the recommendations of the African Information Infrastructure Initiative, there are sets of actions that need to be taken which include:

- Building national information infrastructures covering all sectors of the economies with a focus on issue-based databases on national priorities and establishing mechanisms for the continuous gathering, updating and processing of data.
- Providing value-added information services to ensure information availability to the public sector and enhance the competitive advantage of the private sector.
- Developing electronic libraries to close the resource gap by making textbooks and periodicals electronically available for schools, universities and research centres.

Infrastructure of Technological Resources

There is a need to upgrade and develop the physical information and communication infrastructure in Africa, improve inter-continental inter-connectivity and provide gateways to international telecommunication networks. The African Information Infrastructure Initiative with regard to the infrastructure requirements, recommended that African countries greatly increase accessibility to communication networks and services for remote and rural areas and communities. This could be achieved through using low-cost satellite communication systems, ensuring national and regional inter-connectivity of communication networks, accessing the global information infrastructure, installing cheap, simple and robust technologies, and using simple interfaces for the non-literate and those unfamiliar with computing.

A Need for Change

The transition to an information-based society is a massive and comprehensive task. Thus no country can proceed on all fronts at the same time. Moreover, countries have different priorities that need to be reflected in their national information infrastructure. Hence, the proposed information infrastructure to be built in Africa will reflect its information needs. African countries, in that respect, must develop their own national information infrastructure keeping in view a future connection to the global information infrastructure to bridge the gap with the developed world and to establish links for cooperation and exchange of experiences, skills, capacities and knowledge. African countries can no longer ignore their need for an information infrastructure. In today’s information society, inadequate information infrastructure guarantees exclusion from global economic activity, which would have serious repercussions for Africa at the economical, social and cultural levels.

Egypt Information Highway

During the 20th century and prior to 1985, a number of characteristics identified the status of the “information society” in Egypt. It was characterized and perceived as data rich (information poor), accumulated bureaucracy (red tape), computers viewed as ends (not means), islands of innovation (no bridges), focus on technical issues (not decision outcomes), poor multi-sectoral coordination, and no synergy between information and socioeconomic development strategies.

Faced with the classical problems of developing countries such as foreign debt, public sector reform, balance
of payment deficit, high illiteracy rate, poor technological infrastructure, lack of financial resources and unemployment, Egypt has been striving to implement a nation-wide strategy to support the realization of its targeted socioeconomic development objectives. Consequently, the government of Egypt adopted since the early 1970s, a set of programs for socioeconomic development, which were built on an information perspective through a phased implementation plan. The phases of the plan included open door policy (1974), economic reform program (1985), information and decision support program (1985), national information and administrative reform initiative (1989) and building Egypt's information infrastructure (1994).

These programs represented the building blocks of establishing Egypt's comprehensive national information infrastructure that can provide support for public and private sector institutions and organizations in addressing different socioeconomic issues. Additionally, the government of Egypt established in 1985 the Cabinet of Egypt, Information and Decision Support Center (IDSC) to act as a catalyst and a think tank for top policy and decision makers in addressing developmental issues and in responding to the needs of Egypt's major economic, social, managerial and technological sectors. Egypt's information highway is essential to its competitiveness as it allows Egyptian homes, businesses, governments, and institutions to be linked to a wide range of interactive services from entertainment, educational, and cultural products, to social services, databases, computers, and electronic commerce. The highway aims at making Egypt an active player in the global economy. Its mission is to support the nation to leapfrog into the information and knowledge-based era and empower its socioeconomic and business development growth opportunities and capacities. The long-term objectives include providing a cost-effective vehicle for electronic dissemination of information to a remote audience, creating an environment for disseminating and exchanging information, establishing venues for key areas that will help energize socioeconomic and business development, and developing an open and shared information access to the national information.

Egypt's information highway is diversified due to the comprehensive and dynamic nature of information drawing from different sectors and issues such as business, education, culture, tourism, and health among others. The mode of operation was formulated around the establishment of interest and working groups, each focusing on the accumulation of information, management of inter-connectivity, and development and maintenance. The highway was launched in 1994 building on the infrastructure and infrastructure build-up during the period 1985-1994. Since 1985, several sectoral and issue-based information and decision support systems were developed and implemented to assist top-level decision-makers in key socioeconomic development issues.

### Egypt's NII Building Blocks

The building blocks of Egypt's information highway combine a set of elements that relates to information and technological infrastructure requirements including people, databases, communications and inter-networking and information networks.

#### People

People are considered a vital resource in Egypt. Since 1985, many efforts were put into perspective through the establishment of several training centres. These centres have helped design and deliver professional and academic development programs in related aspects to information technology management and development. The objective was to introduce and diffuse cutting-edge information technology into the society at large.

#### Database

Over the last decade, there has been a massive growth in the build-up of Egypt's information infrastructure through the development of information systems addressing key issues in the economy and linking it both vertically across sectors and horizontally across the nation at large. The infrastructure included the debt management system to monitor and control debts, the public sector information-base to monitor its restructuring and privatization process, Egypt's legislation and decrees system compiling over 65,000 laws since 1824, and the information and decision support systems "think-tanks" for every minister and every governor in Egypt.

#### Inter-networking

Egypt has fully introduced the Internet since 1993. The objective is to use it as a gateway to the information al over the world. Currently, 38 private sector companies (Internet Service Providers-ISPs) started offering Internet services to the general public. The number of
Internet users in Egypt is estimated to be more than 120,000 including 60,000 users in the commercial sector, 20,000 users in the academic sector, and 40,000 in the government sector. Internet users include private companies, trade organizations, travel agencies, governmental agencies, environmental agencies, universities, schools, hospitals, and healthcare professionals, individuals, and others. The Internet is viewed as a medium for providing access to new markets for import and export activities, facilitating distance education and learning, supporting remote cooperation and maximizing the utilization of scarce resources, especially for rural areas.

Information Networks

The highway includes as info-structure, a number of components including trade network, legislative network, employment network, culture network, education network, health network and governate network. These networks are designed to provide information accessibility to policy and decision makers, the business society and the research community with a focus on key priority issues related to business, social, economic and cultural developments. Now some such information networks are described.

Health Net targets a healthier Egypt through connecting hospitals and enabling interchange of medical records, textual, images and video consultations. The network saves time and money and ensures proper medical care services at remote sites. The network is establishing on-line multimedia databases on Egyptian physicians, medical centres, medical equipment companies, pharmaceutical companies, medical laboratories and other healthcare providers with a special focus on supporting tele-medicine and using video-conferencing tools to facilitate remote collaboration among physicians and increase access to specialized medical facilities.

GovernorateNet aims for an accelerated socioeconomic development through inter-networking. Egypt's 26 governates offer an information architecture that supports the decision-making process, manage crisis situations and plans for socioeconomic development. Moreover, the network will design and build intra-governorate sub-ways linking each governorate vertically with its local cities and villages. GovernorateNet should act as the main information resource on Egypt providing statistical information on its administrative divisions as well as acting as a promotional reference for tourism and investment opportunities.

TourismNet focuses on the ancient Egyptian civilization as the main source of Egypt's cultural heritage. It aims at promoting Egyptian tourism by offering a walk through its history and treasures. The network offers unprecedented potentials for the travel and tourism industries through the use of electronic communication systems and the cost-effective delivery of travel-related information to a global audience.

CultureNet addresses a variety of issues that relate to cultural preservation and the protection of Egypt's historical heritage that dates back across different cultures and eras. CultureNet aims at providing information about Egypt on the Internet to promote its treasures and cultural heritage worldwide acting as a central resource for Egypt's cultural community by providing a wide spectrum of services. Also, connecting major Egyptian museums, libraries, and cultural institutions to a common communication infrastructure will provide researchers and authorities with links to existing databases and other resources available on the Internet.

Action Agenda

The continuous developments in information technology are pushing all societies to think about the future. Therefore, Egypt, in its attempt to enlarge its information-based society has formulated an action agenda for the 21st century that aims at the establishment of a fully operational information highway, the purpose of which is to leverage the business, social, economic and cultural developmental activities. The action agenda includes a set of critical success factors for the implementation and institutionalization of Egypt's information highway such as:

- Developing a full-fledged national information infrastructure.
- Establishing value-added information networks between the government, the public and the private sector organization.
- Linking Egypt regionally and globally through online inter-connectivity and the global information highway.
• Investing in people through training, professional development and education.

• Building on-line business/on-line society through the establishment of on-line trading and an on-line investment and financing societies.

• Building an IT-industry through the development of a high-tech industry that could support the development of major industries.

• Building a smart Egypt by using state-of-the-art information technology tools and techniques such as smart cards, smart organizations and smart communities.

Conclusions

There are a number of developing countries like Egypt that have adopted an information-based perspective in socioeconomic development through the establishment of a technological infrastructure and bringing information to their citizens to empower them to participate in the decision making process of key socioeconomic issues. One of the most important roles to be played in the information age will be that of the government and the private sector and the identification of their roles. However, it is perceived that the information highway services will probably be provided by the private sector while governments will provide a supporting regulatory framework based on greater public participation and consensus.

The development of the information society in Africa cannot be left to market forces. It deserves the attention of political decision-makers. Thus, countries should prioritise their information needs for socioeconomic development in the same way they do for different sectors such as industry, agriculture and health. Consequently, national governments have a responsibility to take a strategic view in facing the coming information-intensive world. The view should include issues such as creating a shared vision of the new information era, intensifying the process of information accumulation, training people, strategically planning, managing and accelerating the development of the communications infrastructure to serve Africa.

Based on the global trends in technology, business and the economics a comparative analysis seems of great importance to developing countries to identify the steps and procedures that are being implemented to make optimum use of the newly introduced technology and to boost the socioeconomic development programs. The integration of information, communication and computing developments with other social and economic policy goals is one of the priority issues globally. Countries in Africa will have different priorities in the transformation process and in the use of information highways for socioeconomic and cultural development and these priorities will change over time. However, the success in achieving pervasive development is the proper implementation of applications that would fit the needs of the sectors targeted. In any case, special attention would have to be directed to human and professional development especially, the skills and knowledge base needed to provide employment in an information society and the incentive 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 through information highways.

These lessons and guidelines have been the driving forces in building Egypt’s information highway which stemmed from the targeted strategic objective to the realisation of the birth of Egypt’s Information Society and the transformation from information islands through infrastructure to information infrastructure and to the information society. It is strongly believed that such an experience could be replicated in other countries in Africa that will collectively contribute to the building of the African information infrastructure.

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