

Information Technology in Africa: A Proactive Approach and the Prospects of Leapfrogging Decades in the Development Process

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Abstract

This paper examines perspectives for the growth of information technology (IT) in Africa. The central thesis is that, as in other development sectors, technological solutions are more readily available than the political will to implement them. Policy aspects of IT therefore need to be addressed, in terms of formulation, dissemination, and implementation. In the absence of clear and enforceable policy, the African information industry is likely to evolve in a haphazard manner in reaction to uncoordinated external motives, thus allowing improper practices that would impair the growth of enthusiasm for IT. One strategy proposed is to concentrate IT development in priority sectors identified by governments themselves, such as education, health, and the environment, thereby opening new vistas of application. Examples are given of how this can be done. Another strategy is to pursue IT at the regional level with strong interagency collaboration, given the interdisciplinary nature of the technology. This would have two positive outcomes. It would contribute to bringing down the barriers that currently circumscribe countries into fairly closed information entities. Second, it would exploit the bandwagon effect, which has worked successfully in the health sector, to commit African governments to IT development programs. Such development should take a long-term view and reach for the cutting edge of technology, for which some institutional capacity already exists. The continent could thus leapfrog decades in the development of IT and provide an empowering environment for development in other sectors.

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Introduction

In the continuum of human development five overlapping phases can be identified: the nomadic/agrarian, agrarian, industrial, service, and knowledge. In the latter stages Africa has lagged behind the rest of the world. During the industrial phase, this lag was attributable to the colonial experience, which denied most of this region its sovereignty over decisions and policies affecting its development and imposed on it activities that contributed to the development of the colonial powers. The colonial period was one during which Africa lost control over its political, economic, administrative, and technological destiny.

If the lag in development in the past can be attributed to the loss of sovereignty, it will be difficult to explain the continuing lag in this era of political and administrative independence. Africa must avoid the specter of a new form of colonialism based on the generation, storage, processing, retrieval, transmission, and distribution of information. Many African countries are saddled with inadequate communications infrastructure. The development of IT in African countries will be influenced by answers, if any, to questions concerning the economic benefits of IT, IT policy, and its impact on government, society, business, and the security of the state. It is not clear how these concerns will be handled, given the limited experience of other societies. Nevertheless, they deserve consideration because acceptance of IT will depend on its perceived benefits in solving some of society's pressing and anticipated problems in education, health care, business, governance, and sustainable rural development. This paper examines perspectives for the growth of IT in Africa. The central thesis is that, as in other development sectors, technological solutions are more readily available than the political will to implement them. We will sketch in broad terms our views on how African countries can leapfrog decades of IT development.

A proactive approach

African countries, by virtue of their potential market size, should not be obligated simply to react to trends in the IT industry, but should play an active part in their determination. A proactive rather than a reactive approach should be adopted in the development of IT in Africa. This means anticipating problems and designing strategies to resolve them before they occur. Kwankam [1] addresses this issue in these terms:

Our vision should not be limited to catching up with what exists in the developed world. This will simply guarantee the propagation of the gap between them and us. Secondly, it will perpetuate problems of appropriateness, adaptability, etc., perennial issues which will continue to eat up our meager resources.

The paper cites, as a prime example, backup power supplies for microcomputers, which cause power to be converted from d.c. to a.c. and back to d.c. Proactivity would lead to Africans being at the forefront of such developments as a microcomputer insensitive to power line fluctuations and even total outages, or seamless integration of various platforms used for e-mail in the region.

The IT policy environment in Africa

Policy issues are central to most development efforts. Problem trees in most sectors of the African economy usually show policy issues at the base, driving everything else. In most countries there is a policy vacuum in IT, with only inadequate coverage (if any) being provided from related areas such as telecommunications and the computer industry. The policy aspects of IT therefore need to be addressed, in terms of formulation, dissemination, and implementation. In the absence of clear and enforceable policy, the industry is likely to evolve in a haphazard manner in reaction to uncoordinated external motives, thus allowing improper practices that would impair the growth of enthusiasm for IT. As George Sadowsky puts it, one stroke of the pen by a government official may be more important than the enthusiasm of a host of practitioners.

The need for government policy

Fortunately, there is some overlap between policy issues for IT and for computer technology, which only a few years back was a preoccupation of many African countries. These latter issues are discussed by Kwankam [2]. We echo some of the ideas advanced in these documents.

The prospect of a technology with such potential impact as IT evolving totally unchecked within our countries is disquieting. Although there are many successful instances of IT introduction, a few bad examples are sufficient to give the industry a bad name, particularly with potential users who are not fully committed to the idea. The rational transfer and application of this technology requires that some guidelines be set down for service providers, distributors of equipment, and end users alike. Such guidelines must have the backing of government in order to be effective, and should cover:

- acquisition of information technology,
- use and application of the technology,
- human resource development, and
- regulation/deregulation and management.

The most pressing needs are for:

- government policies and legislation to support IT development;
- informatics policy and management infrastructure;
- establishment of financing mechanisms, with adequate financial analysis, controls, and accounting;
- a clear position on the level of control to be exercised locally and a desired level of dependency on foreign sources; and
- coordination and integration of the needs of the public and private sectors' continuing awareness of the state of the art in IT.

Strategy 1: build IT into other development sectors

One strategy to ensure IT's growth is to build it into priority development sectors identified by African governments themselves: areas such as education, health, and the environment, which open up new vistas of application. We give examples below of areas where IT can be used not only to promote development of the sector but also to serve a hidden agenda of promoting use of the technology. This development should take a long-term view, reaching for the cutting edge of the technology, for which some institutional capacity already exists.

Area of application: health

Epidemiological data

Planning of public health interventions is based on epidemiological data, which is collected from health districts on a regular basis. Most countries are plagued with problems of this data either arriving late or getting lost en route. There is a dire need to ensure that these statistics get to planners in health ministries, and as soon as possible after the end of the collection period. Computer-mediated communications using connectivity among health care facilities would provide a means of meeting this need.

Consultations

Although most Africans live in rural areas, the bulk of the health care dollar is spent on facilities in urban areas. This raises issues of equity, an area of increasing concern to funding and aid agencies. IT can provide improved access to specialists for rural populations who are now concentrated in tertiary care and teaching institutions in urban centers, and thus partially address the equity issue without costly replication of infrastructure.

Adult health literacy

Adult health literacy is one of three major aspects in the Health-for-All package in the WHO (World Health Organization) African Region. Health care interventions for the vast majority of people in the region occur in the home and the community. As one goes from health centers through district and provincial hospitals to tertiary care facilities, progressively fewer interventions take place in each type of facility [3]. However, as neither the home nor the community is an "organized" health care institution, there is a tendency for ministries to focus health literacy programs elsewhere. The resulting mismatch between where people receive their health care and where they are instructed about health care leads to inefficiency and ineffectiveness. There is therefore a need to reorient adult health literacy toward delivery in homes and the community. Connectivity offered by electronic networking and distance learning technology can be used to fulfill this need.

Medical records

Availability of computers and communications facilities in health care institutions would allow national standardized systems of medical recordkeeping, thus permitting the transfer of records from one facility to another as patients move around the country. Terms such as "health passport" or "smart card" have been given to portable condensed versions of medical records--credit card-sized electronic data banks--envisioned in this scenario.

Management and maintenance of equipment

Remote consultation of databases and knowledge bases (using inference engines built into expert systems) would permit multiple simultaneous access to the limited know-how that currently exists on the management and maintenance of equipment. Broken-down equipment represents anywhere from 50% to 80% of the stock of health care equipment in African countries. The same scheme could be used for planned preventive maintenance (PPM) of the IT infrastructure itself.

Area of application: education

As far back as 1988, the World Bank proposed distance learning as an alternative to Africa's current educational delivery systems [4]. IT offers such a mechanism. This must be accompanied by proper design that takes into account the local context, as suggested by Papagiannis, Douglas, Williamson, and Le Mon in connection with earlier technologies [5].

Area of application: environment

The potential advantages of IT in the management of the environment are clearly exemplified by the joint efforts of USAID's Central African Project for the Environment (CARPE) and the World Bank's Regional Environmental Information Management Project (REIMP). The latter is a component of the former. CARPE, in seeking to promote rational exploitation of the forest resources of the Congo Basin, has introduced a connectivity component to enable stakeholders to freely, effectively, and seamlessly exchange information through Internet service providers using technology that is locally available. REIMP builds on the Sustainable Development Networking Program (SDNP) servers in the subregion to facilitate exchange of information among government ministries concerned with the implementation of national environmental management plans (NEMPs).

Area of application: development

The United Nations has recently set up interagency task forces and committees to provide integrated support to country-level efforts to follow up recent global conferences such as Rio (environment), Cairo (population), and Copenhagen (social development). IT is glaringly absent in this lineup, either as the focus of a task force or as a specific issue to be addressed. We assume that this is because of the ubiquitous nature of IT in development and that IT will be woven into the activities of all the task forces.

Strategy 2: regional action and the bandwagon effect

Another strategy, given the similarity of problems faced by various countries, is to pursue IT at the regional level. Experience from the health sector has confirmed the wisdom of pursuing common goals in common forums. In the African region, the Alma Ata Declaration (primary health care) and the Bamako Initiative (cost recovery) are outstanding examples of how the bandwagon effect can be used to propel otherwise lethargic governments into action. Although the individual governments participated in these declarations, it can be argued that few would have made the significant progress they have achieved if the declarations had never been made--a classic case of the whole being greater than the sum of its parts. Similarly, it can be argued that a declaration on IT at an Africa-wide forum would have the same effect on the development of the technology in the region. The UN Economic Commission for Africa (ECA) is well placed to play a lead role in bringing about such an outcome.

The ECA is charged with management of the task force concerned with harnessing information technology for development within the UN Special Initiative for Africa. Along with the World Bank, UNESCO, and other participants, it is expected to:

- bring about policy reforms to enable full participation in the information age,
- set up infrastructure for Internet access in a number of countries,
- build human capacity for computer networking, and
- improve African capacity to use information for development.

The ECA also plans to establish and operate "outreach electronic clearinghouses on African development." Although this is simply a new delivery mechanism associated with the Pan African Development Information System (PADIS), which has functioned in the past as a hierarchical network, the idea is to be applauded. The very structure of the PADIS network severely limited its ability to disseminate information; the gatekeeper role of the national and subregional centers was the major limitation. Although service will be offered through local Internet service providers in the new structure, and thus physically the network will still have all the features of a hierarchical network, logically it will operate as a star-connected network, with the PADIS server in Addis Ababa as the hub. The use of IT will eliminate the filtering effect of the national and subregional centers.

Strategy 3: strong interagency cooperation

There are a number of initiatives under way to address the successful development of IT in Africa. UNESCO's INFORMAFRICA project aims to introduce IT by using such strategies as training specialists (maintenance personnel and software producers) in and through IT and creating awareness among the public. UNESCO also claims to be the only international agency offering an information technology program, the Intergovernmental Informatics Program (IIP), which supposedly operates in all UNESCO member states. Unfortunately, the very existence of this program is not known to many IT enthusiasts in African countries.

UNDP's Sustainable Development Networking Program (SDNP), which among other objectives seeks to bring about increased connectivity between sources and users of information, is in operation in several African countries, and the World Bank's Infodev project will begin shortly. What is needed is strong interagency cooperation to bring about mechanisms for collaboration among these projects, which all seek to solve all or some of the same problems.

Technology leapfrogging in Africa

The IT development process elsewhere

To understand the opportunities for Africa to leapfrog decades of development, it is necessary to briefly review the development of IT in advanced countries at both the technological and policy levels.

The development of connectivity has been intimately linked to developments in telecommunications, especially

telephony [6] [7]. From the telegraph through the telephone to wireless, the information transmission industry developed in distinct and segregated segments with deep cleavages between broadcasting, cable television, wireless, and point-to-point communications. Each sector had a specific line of technology and services it offered to its customers. Through legislation or mutual agreement, one sector did not compete with another even when its technology permitted it or its services were of interest to clients of another sector. As segmented as the telecommunications industry had become, it was further categorized into providers of common carrier services and providers of content. In this regard, telephone companies as common carriers provided the local and long distance network necessary for the provision of content through network radio and television broadcasting.

This state of affairs was put into question by developments in digital technology in general and more particularly by the near ubiquity of computers and their eventual connectivity. With the entities at both ends of the connection no longer necessarily two humans, and with communication no longer confined to voice, the rigid division was no longer tenable and cross-sector competition began to appear. Through legal or regulatory changes or through cross-sector mergers and acquisitions, companies originally in different media or content began to seek to provide information services by advocating removal of the limits imposed by earlier regulations.

Until recently the transmission medium in telephone systems was overwhelmingly twisted-pair and coaxial (copper) cable. Though entirely adequate for speech, this placed profound limitations on connectivity in terms of capacity, speed, and bandwidth for transmission of other types of signals, such as video and sound. Even though recent developments in telephony have resulted in high-bandwidth systems - microwave, satellite, optical fiber, radio, cellular, and so on - these systems have been introduced only on major transmission routes. The connection between subscriber and local exchange still remains twisted-pair copper wire.

If a certain degree of order reigned during the autocratic period imposed by regulation, then the democratization of the industry brought about by the computer and deregulation is leading to policy chaos. Major questions about the public interest and (de)regulation of the IT industry have not received satisfactory answers. In essence, how is the spread of IT to be regulated in order to assure universal service, or at least universal accessibility?

Low technological inertia and IT leapfrogging

Africa's lack of infrastructure, at first glance, may be seen as a disadvantage. But, on closer examination, this can be turned into an advantage if properly managed. African countries are not encumbered by extensive networks built on obsolete technology, which will require an evolutionary process of replacement. The technological inertia is thus quite low. In technology leapfrogging the extent of the leap is in inverse proportion to the technological inertia carried along. The push should therefore be for the cutting edge. The latest technology should be used in building new infrastructure. African countries will thus leapfrog several stages and decades in the IT development process. In doing so, they will learn from the experience of more advanced countries the ways and means of providing the greatest social benefits to a large fraction of the population while avoiding any unpleasant side effects.