

Application of ICTs  
in Africa:  
Development of  
Knowledge Workers  
in Centres of Learning

John Muraguri Waibodhi

Published by the African Technology Policy Studies Network (ATPS).  
P.O. Box 10081, 00100 General Post Office, Nairobi, Kenya.

©2002 African Technology Policy Studies Network (ATPS)

PRINTING & LAYOUT BY: IDEAS & PLACES  
P.O. BOX 00100-30706,  
Tel/Fax: 02 4445777, Nairobi, Kenya

ISBN: 1966 - 916 53 - 9

## ABOUT THE AFRICAN TECHNOLOGY POLICY STUDIES NETWORK

The African Technology Policy Studies Network (ATPS) is a multi-disciplinary network of researchers, policy makers, actors in the private sector and other end-users interested in generating, promoting, and strengthening innovative science and technology policies in Africa. With a regional secretariat in Nairobi, the network operates through national chapters in 17 African countries, with an expansion plan to cover the entire sub-Saharan Africa.

One of the objectives of the network is to disseminate research results to policy makers, legislators, the organized private sector, civil society, mass media and farmers' groups through publications, dialogue and advocacy. Among its range of publications are the Working Paper Series (WPS), Research Paper Series (RPS), Special Paper Series (SPS) and the Technopolicy Briefs. Papers published under the ATPS Special Paper Series are those commissioned as concept papers, think pieces, leading conference papers and keynote addresses. In keeping with our knowledge brokerage function, ATPS publishes, with permission of the author(s) or journal editors, papers (published, or unpublished) produced by distinguished academics/researchers for a different purpose but judged by ATPS to be of excellent quality. These papers address significant policy questions relevant to the work of ATPS and/or support the Southern voice or an African perspective. We also consider theoretical papers that advance our knowledge of science and technology policy issues.

ATPS is supported by a growing number of donors including the International Development Research Centre (IDRC), the Carnegie Corporation of New York, the Rockefeller Foundation, the World Bank, the OPEC Fund, Ford Foundation, Coca-Cola Eastern Africa, the African Development Bank, and the Royal Dutch Government.

## Acronyms and Abbreviations

|       |   |  |
|-------|---|--|
| GDP   | - | Gross Domestic Product                   |
| ICT   | - | Information Communication and Technology |
| IT    | - | Information Technology                   |
| KIA   | - | Kenya Institute of Administration        |
| KMTC  | - | Kenya Medical Training College           |
| K-REP | - | Kenya Rural Enterprises Programme        |
| KSTC  | - | Kenya Science Teachers College           |
| KTTC  | - | Kenya Technical Teachers College         |
| KWFT  | - | Kenya Women Finance Trust                |
| NGO   | - | Non-governmental Organizations           |
| SME   | - | Small And Medium Scale Enterprises       |
| TOT   | - | Trainers Of Trainers                     |
| TSC   | - | Teachers Service Commission              |

# Contents

|  |    |
|--|----|
| Abstract   | 1  |
| Role of Knowledge in Sectors of the economy          | 3  |
| Knowledge Development Process in Centres of Learning | 8  |
| Development of Knowledge Resource Centres            | 10 |

## Abstract

For any economy, organization or individual to be competitive, the application of information communication and technology (ICT) is critical. Recent debates on the digital divide and its impact on emerging markets appreciate that the growth and application of technology in all facets of life is inevitable. Consequently, less developed soc

In Kenya today, gainful eities must embrace the information age to survive. The UNDP Human Development Report (2001) strongly supports technology as an essential ingredient in any development effort, and it proposes that subsequent interventions include technology of some kind.

Employment in the private and non-governmental organizations (NGOs) requires an appropriate level of understanding of ICT, because of the growing use of the skill in conducting business. In the government, through the World Bank sponsored restructuring programme of the Department of Personnel Management, there is a move to outsource non-core support activities and employ better qualified individuals, empowered with essential skills. Development, as an individual or corporate, entrepreneur or employee, private or public body is becoming more dependent on the knowledge base of its units. The "knowledge worker" is rapidly replacing the labourer as basic activities are automated and consolidated by economies of scale because of globalization. Any economy, organization or government that misses this paradigm shift in human resource development will find it difficult to sustain growth and remain competitive.

The Kenyan economy is currently going through its worst post-independence recession, caused by politics, government inefficiencies, donor support freeze, poor infrastructure, bloated civil service, deteriorating service provision, among other factors. Some of these problems result from poor policies implemented in the 1980s and early 1990s, and also the simultaneous liberalization of several sectors of the economy. The overall effect has been negative growth in several key segments of the economy with grim consequences for the people. The economy is expected to grow by only 0.6 per cent this year, against the backdrop of -0.3 per cent decline in 2000. The Nairobi Stock Exchange is at its lowest in eight years. According to sources from the Central Bank of Kenya:

*Agriculture, which contributes approximately 24% of GDP, grew in real terms by 1% in the twelve months to May 2001 compared with a 2.4% decline in 2000. Growth of agricultural output, however, continues to be hampered by poor infrastructure, high cost of inputs and low international commodity prices. The manufacturing sector, which accounts for about 13.1% of GDP, continues to deteriorate. The sector declined by 1.2% in the twelve months to May 2001 compared with a decline of 1.5% in 2000 and 1.0% growth in 1999. The building and construction sector, which contributes about 2.4% to GDP and has a direct impact on unemployment, declined in real terms by 1.5% in the twelve months to May 2001. The decline reflected the high cost of inputs, particularly fuel and power, and the decline in construction works undertaken by the government during the period. The sector is likely to remain depressed for the rest of the financial year (2001-2) in view of government budgetary constraints on public sector construction works. Trade, restaurants and hotels, which accounted for 12.7% of GDP, is estimated to have grown by 0.8% in the twelve months to May 2001 reflecting positive developments in the tourism sector. Data for January to June 2001 indicated a 27% increase in tourism earnings, although this is now under serious threat due to ripple effects on global travel from recent terrorist attacks in the USA and subsequent war in Asia. Government services, which accounted for 14.6% of GDP, grew by 0.7% in the 12*

*months prior to May 2001. Finance, insurance, real estate and business services, which contribute 10.6% to GDP, grew by 0.8% in the period compared with 0.4% in 2000. (Source: Central Bank of Kenya).*

The questions are:

- How well prepared is the Kenyan economy and its work force to compete in the global economy?
- What winning strategies are Kenyans employing to ensure proactive participation in the global stage?

# Role of Knowledge in Sectors of the Economy

To arrest the current economic decline, all stakeholders must look for long-term solutions, based on solid foundations, to ensure that the current Kenyan experience does not repeat itself. As Kenyans explore ways to uplift themselves from a developing to developed country status, they must also take advantage of innovations that can assist them to leapfrog into the new economy. Ways of achieving this must be sought from every sector, individually and collectively. It is, therefore, important that stakeholders in every profession learn new technologies and above all, apply them in their activities.

Recognizing the interdependency and importance of each sector of the Kenyan economy allows for development of efforts that will assist each one of them to attain full potential. This paper explores ways of developing “knowledge workers” in the key sectors of the economy by incorporating ICT into their areas of expertise. The paper also targets industry-specific centres of learning where stakeholders master new technologies, to become better equipped to serve as trainers of trainers (TOTs) on the application of technology in their occupations.

The ICT training offered to the TOTs would comprise mainly of the use of technology to gain knowledge. The focus is on how to apply ICTs in research, documentation, collaboration and dissemination of information and technology, in contrast to basic computer skills. Although some degree of basic computer training is a requisite in the early stages, the main emphasis is on how to tap ICTs, Internet, libraries, and others, to enhance knowledge. On leaving learning institutions, the knowledge workers should be capable of using ICTs and the Internet in their everyday duties.

The paper targets centres of learning in the following sectors of the economy:

- education
- agriculture
- health
- Industry
- policy and regulation
- small and medium scale enterprises (SME)

These are the key drivers of the Kenyan economy.

## Education

Education is a core component of any kind of development, formal or informal. It impacts on all other sectors as the basic foundation of all specialized skills and professions. Primary, secondary, tertiary, graduate and post-graduate instructors are the instruments of change to improved behaviour, and increased productivity and performance.

There are over 234 000 teachers, countrywide. About 41 000 of them teach in secondary schools, while the majority work in primary schools. Despite their role as providers of knowledge, skills and attitudes, teachers in Kenya are



oblivious of the use of ICTs in learning. Besides, hardly any initiatives have been instituted to train them on the use of these technologies. The Teachers Service Commission (TSC) is mandated to provide schools with qualified teachers but there is no infrastructure for the institution to develop the necessary skills, such as ICT.

As instruments of change, teachers must be acquainted with the subjects they teach and keep abreast of changes that may occur. They need to access relevant and timely information on subjects of their expertise and they must also continuously train to keep informed about innovations, theories and practices in the subject that they teach. An economics or physics teacher, for example, must keep updated on current theories and experiences by having access to facilities to conduct further research. An effective ICT system that taps the wealth of resources, through the Internet or digital libraries on CD-ROM, would greatly enhance teachers' performance and enrich the students' knowledge.

Empowering teachers with skills in ICTs would allow them to access information that is otherwise not easily available. By using the Internet, teachers can research on relevant topics, create databases on subjects of interest to enhance their skills and keep abreast of developments in their careers. Once trained, teachers would, in turn, equip the students with valuable skills to prepare them for the competitive job marketplace. There is need to develop a teacher-base comprising of knowledge workers that can apply technology in their work.

Centres of learning in the education sector like the Kenya Science Teachers College (KSTC), and Kenya Technical Teachers College (KTTC) would benefit immensely from curricula that emphasize ICT application and incorporates ICTs into traditional courses. The emphasis, as explained earlier, would be on how to use ICTs in research, documentation, collaboration, and dissemination, as opposed to basic computer skills.

This would be best supported by the development of a sector-specific resource centre in institutions with links to other resource bases through the Internet, and accessible to users inside the institution and other external stakeholders. Knowledge resource centres facilitate exchange of information between students, researchers, staff members and other stakeholders, thus serving as a platform for the exchange of ideas, queries, learning, research, collaboration and promotion of innovations.

## Agriculture

Agriculture is the mainstay of Kenya's economy. The sector has encountered many hurdles causing unsustainability to the industry. The liberalization of several sub-sectors in agriculture during the past decade has exposed the traditional and unsophisticated farmer to global dynamics that he/she is ill equipped to comprehend and compete in. Subsidies have been removed in agricultural products and market forces introduced without the supporting infrastructure that would allow farmers to ably control and predict the future. The agricultural community in Kenya needs to know how to handle these changes and also learn from experiences of other countries that have gone through these phases.

The sector needs to keep abreast of changing technologies to grow. Stakeholders in the agricultural sector must be equipped with tools that would help them to keep in step with global trends, developments and technologies. Professional training and extension services should incorporate methods and tools that empower the trainees to become knowledge workers in their disciplines, by continuously tapping the latest information from all sources, including the Internet. In today's information age, it is difficult to imagine a procedure, technology, manufacturer or resource that is not represented or accessible through ICTs. Agriculturalists can seek membership, not only through their local resource centres, but also with global research organizations and libraries through ICTs. Training on ICT skills would enable them to think "outside of the box" that forms their physical domain, into the information age.

Agricultural research institutes, extension service providers, and agricultural training centres need to ensure that their best practices are updated. They should empower their staff to disseminate knowledge and technologies to the vocation where they are most needed to improve the rate of outreach and adoption of ICTs. Those in the field should also be empowered to update their competence and knowledge. As extension services offered by the government diminish due to declining resources, other means of information dissemination and knowledge transfer must fill the gap. Researchers, extension workers and other change agents could then serve as knowledge workers applying ICTs to remain current and competitive.

## Health

Health is a sector where staying updated and revising best practices cannot be understated. Medical practitioners trained several years ago are deployed into society without any policy to ensure continuous learning, and they are losing touch with the greatest period in the history of medical research. The challenges faced by developing countries in fighting HIV/AIDS, for example, require technological breakthroughs of industrialized countries, and also community-based best practices used to combat the epidemic in South Asia and other parts of the world. Knowledge transfer, in this case, is critical in designing strategies and implementing local solutions.

Health and medical training institutions need to impart a culture of consistent learning through research, information exchange and on-site training. Medical practitioners are often exposed to new or different strains of ailments beyond what they learnt during their professional training, and they need a resource base to fall back on and learn about new procedures, practices or drugs. ICTs are best placed to serve these needs, by providing access to resources, or to communicate with better-equipped resource facilities or specialists. Therefore, the professionals must be trained to use the wealth of information to be knowledge workers in their field of specialization.

Institutions, such as the Kenya Medical Training College (KMTTC), that serve as entry points into the medical fraternity, and are responsible for training programmes need to ensure that the knowledge they transfer is relevant, current and accurate. The information base of such institutions should be captured, structured and managed for long-term benefit of the students and other professionals already practising medicine. Students graduating from these institutions should be well equipped, not only with the latest skills in the medical profession but also with knowledge to remain proficient.

Medical practitioners and community health workers should be empowered to access value-added services, such as professional health advice, ailment related research output, patient support and best practices information. Support education, advocacy, counseling and consultation, by them, would greatly serve the sector. Schools in the community would benefit from information on preventative measures in health. As knowledge workers, medical practitioners and researchers learn to value their work, and also to address issues of patents and intellectual property.

## Industry

Industry is the vehicle of growth in most economies, but not in Kenya despite a more professional workforce in comparison to others in the region. A major component of the industrial sector in the country comprises of packaging and distribution of products for global companies. Industrial innovation is limited, and incentives are minimal. The number of manufacturing concerns that are relocating to other countries or closing down because of poor policy, infrastructure, decreasing market, regional trade pacts and the effects of globalization has reached unprecedented levels. Industries are moving away from manufacturing, and limiting their activities to marketing and distribution. This has had far reaching effects on the economy, especially employment. Unemployment among university graduates is increasing rapidly and some of them are resorting to menial jobs.

Industrial development in this country must take account of global trends and the new economic order. The human resource base should be developed according to market demands and skills requirements. Entrepreneurs, companies and employees must innovate to synchronize with global trends and technologies. Knowledge of market needs and latest technologies are, therefore, essential to maintain the competitive edge in the global marketplace. This is best achieved by incorporating ICTs in key areas. Players at all level of industrial development need to train to become knowledge workers, skilled in their trade and equipped to maintain and improve the skills base.

### Policy formulation and regulation

Policies and regulations, documented or otherwise, govern institutions. Excessive regulation can hamper positive economic growth by imposing costs and rigidity that deter innovation. There is, therefore, need to have policies based on researched, informed and reliable information. As an emerging economy, Kenya should tap the finest policies developed across the world and match them with local practices to develop a solid policy framework. ICTs offer the platform to study, research, debate and incorporate policies developed around the globe. Professionals in policy or regulatory sectors of the economy must be empowered to access local legislature and to refer, study and evaluate it with ease.

Institutions, such as the Kenya School of Law, Kenya School of Monetary Studies, Kenya Institute of Administration (KIA), among others, train policy makers. Regulators admit that globalization of policy research, regional or international co-operation, and the capacity to access and evaluate knowledge from elsewhere is as critical as the ability to develop policy locally. Practitioners in the field must also recognize the need to be connected and well informed on changing practices in law. Law enforcers also need a forum for debating and exchanging ideas. Once deployed in the market, practitioners should have the skills base to always research and apply current and relevant information through ICTS to serve as knowledge workers in their professions.

### Small-micro enterprises

The informal sector in Kenya is recognized as a major contributor to the growth and development of the economy. Policy makers acknowledge the potential of the sector to narrow the income gap, generate employment, stimulate economic growth and alleviate poverty. In a labour force of 14 million, about 61 per cent of those working outside smallholder agriculture are employed in SMEs. In urban areas, 35 per cent of households participate in small business, with 59 per cent based in peri-urban centres.

With the ongoing restructuring programmes in large corporations, such as manufacturers and government agencies, there is a decline in employment. The high levels of retrenchment in these agencies and in government departments are rendering many jobless. About half a million job seekers, including 10 000 university graduates, join the overpopulated labour market annually. With the sluggish growth of the formal sector that employs a meagre 1.6 million people, it is clear that improving the informal sector could improve the situation. Growth of micro enterprises is thus seen as the major course for reducing poverty and improving food security in the country.

Like other sectors of the economy, micro enterprise cannot develop in a vacuum. It is imperative that NGOs, government agencies and other institutions are involved in training SME practitioners in techniques, processes and strategies used to promote the sector in other parts of the world, like Asia and South America. In addition, dissemination of best practices and success stories, local and global, would enhance the capacity and the quality of production. Extension workers, therefore, need to be trained to access the information, localize and disseminate it to be proficient in these practices.

Knowledge for SMEs, in records and in human resources exists in Kenya. Several institutions, such as Pride Africa, Care-WEDCO, the Kenya Women Finance Trust (KWFT), the Kenya Rural Enterprise Programme (K-REP), to name a few, have hands-on local knowledge of the SME market. This wealth of information needs to find a channel, through knowledge workers, to reach those who need it most. These knowledge workers must also maintain competence and relevance by updating themselves on techniques, procedures, and processes through ICTs, to access websites, libraries, research centres, and other sources.

# Knowledge Development Process in Centres of Learning

The first step in developing Knowledge workers is to incorporate ICTs in the curricula of centres of learning. ICTs would initially be taught as a subject where the basics are explained.

The next phase would be to incorporate ICTs in the subject matter of the discipline of the learning centre where it becomes part and parcel of the learning experience. In this case, ICTs would be used for research, data processing, content packaging and information dissemination. In addition, using ICTs to collaborate with peers and communicate with instructors would be beneficial.

The next phase of the process would be to develop centres of excellence for each key sector in the model of sector-specific knowledge resource centres. The main objective of these centres would be to enhance economic development through proactive use of ICTs to teach required skills, influence attitudes and impart knowledge to stakeholders in key sectors of the Kenyan economy. The knowledge resource centre would intensify the information bases of the centres of learning with links to other local/global resource centres and to a central point of reference. Resource centres would be specific to institutions or sectors of the economy.

Trainers of trainers (TOTs), that are enrolled in these institutions and use the facilities of the resource centre to study and for personal development would instinctively seek out such ICT-based support services when deployed in the field. Importantly, they would serve as TOTs to other practitioners in the sector, including those already working in the field, but seeking to enhance their experiences. Each of these empowered practitioners would then be knowledge workers, who can use ICTs to search, analyze, package and disseminate information appropriately.

The methodology in developing knowledge workers in centres of learning can be categorized based on four main objectives, namely:

Cognitive objectives: These deal with the recognition of Knowledge, understanding and the development of intellectual abilities and skills. They include learning how to:

- search and identify a broad range of sources of information
- translate information into useful material
- solve problems by collecting, structuring, editing, prioritizing and categorizing data
- Interpret data by manipulation
- develop databases for specific subjects
- compute specific issues using IT and develop appropriate dissemination tools
- create content packages
- compose maintenance procedures, quality control and validation

Affective objectives: These pertain to feelings or emotions depicted by words, such as value, attitude, motivation,

appreciation, interest and enthusiasm. These will be transferred by:

- creating eagerness, among participants, by making the contents interesting and relevant, for example, using IT to create maps and analyze data
- changing attitudes by appreciating the information age
- demonstrating a participant's commitment by encouraging them to suggest small but relevant projects

Psychomotor objectives: These refer to the development of motor or manipulative skills and the participants will be trained to:

- operate computers
- type and hyperlink data
- Research using the Internet
- compile data
- disseminate information
- collaborate with other institutions

# Development of Knowledge Resource Centres

Typical knowledge resource centres comprise of the Internet (or Intranet) based web sites that help in the exchange of information between staff, researchers and partners and also serve as a platform for ideas, learning, research, queries, promotion and administration. The aim of the centre would be to consolidate the information base and experiences of a particular skill, profession, industry or organization into a central point of reference that is reliable, user friendly, with the capability to disseminate information seamlessly.

The value of the knowledge resource centre is not so much in the gross quantity of information but in its ability to link up related data, from miscellaneous sources, with a common platform. The centre allows for flexibility to search, retrieve, sort and analyze data from a host of different sources and produce an information package that is relevant and adds value to the user.

Collaboration techniques allow stakeholders to contribute towards a common goal from different locations. Development of rules, e-law, curricula and presentations, and the setting of standards, and the drawing of treaties can occur simultaneously using proven collaboration methodologies.

## Constraints

Costs of basic ICT equipment, hardware and software

- Telecommunication infrastructure
- Resistance to change
- Co-ordination of several institutions
- Lack of resources to implement the programme
- Lack of resources to sustain the programme
- Lack of government support
- Lack of information
- Difficulty in defining curricula
- Inadequate time to implement the programme
- Acceptance by partner institutions
- Dissemination of ICT application processes to field

## How Cost Effective is it?

Developing knowledge workers in several key sectors of the economy would require substantial investment in time, finances, goodwill and coordination. Although, initial hardware costs, and the costs of hiring human resources to develop the curricula and the resource centres could be prohibitive, it is easier to do it now than in the future when the Western World will have fully embraced it. The entry barriers of implementing it, then, will be insurmountable.

## Expected Impact

Some of the expected impacts include:

- Sector specific "ICT for Knowledge" curriculum;
- ICT based projects specific to field of study;
- TOTs in each institution proficient in application of ICTs for research, documentation, collaboration, and dissemination;
- Online resource centres established in each of the institutions providing information available on the Internet as centres of excellence in their fields. The resource centres will provide access to: projects, initiatives, programmes, publications, best practices, case studies, discussion boards, global links, support, expert contacts, and other resources pertinent to the sector and/or institution;
- Skills transfer to "change agents" in each department of the centres of learning to ensure collaborative approach to management of knowledge within institution and sustainability;
- ICT for knowledge course incorporated in the training curriculum; Dissemination of ICT for Knowledge to private sector, government and non-governmental organizations through seminars;
- Dissemination of ICT for Knowledge to industry stakeholders through open day demonstrations of online resource centres;
- Participation of stakeholders in online resource centres through interactive exchanges and links; and this will initiate avenues for growth in local employment opportunities and emergent of strong (in terms of financial/production viability) local arts and crafts industries.
- Development of sustainability plan.

## Conclusion

With the advent of genetic engineering, just-in-time manufacturing, outsourcing, World Trade Organization rules, subsidy removal, regional communities, remote workers, Internet, e-commerce, m-commerce, and all the major transformations happening in the global landscape, Kenyans can ill afford to ignore the impact that knowledge workers will have in tomorrow's economy. The traditional labourer, businessman, entrepreneur will be highly disadvantaged in the new economy.

The existing and recognized centres of learning where the country's human resources are trained must be enhanced to cater for tomorrow. Graduates from these institutions must be equipped with tools and supported by the resources to compete in the global economy. They must be empowered to face the world that awaits them and they must also be capable of transferring the skills base to their peers they must be knowledge workers!