FOSTERING INNOVATION, PRODUCTIVITY, AND TECHNOLOGICAL CHANGE

TANZANIA IN THE KNOWLEDGE ECONOMY

Anuja Utz*

Abstract

Sustained growth that capitalizes on Tanzania’s recent macroeconomic stability and structural reforms will increasingly depend on the economy’s capacity for innovation—that is, the capacity to produce of a wider array of goods and services, accelerate the pace of technological change, and integrate with the global economy. Enhancing this capacity will require investment in human resource development, strengthening of the innovation environment, and strengthening of Tanzania’s information and communication technology (ICT) infrastructure. This paper argues that the quality of education, particularly post-primary education, is a crucial element of the capacity to innovate. The paper clarifies that innovation in the Tanzanian context refers to products that previously have not been produced successfully in Tanzania and the adoption of technologies and processes that are new to the country. Innovation is the path to economic diversification and moving up the value chain. Finally, while Tanzania has been able to benefit from the ICT revolution, more work is needed to review and modernize telecommunication policies and regulations to generate fair competition and reduce high communication and operational costs. Improvement in these areas could have important payoffs for Tanzania.

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Fostering Innovation, Productivity, and Technological Change: Tanzania in the Knowledge Economy

Anuja Utz

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<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AERC</td>
<td>African Economic Research Consortium</td>
</tr>
<tr>
<td>AIST</td>
<td>African Institute for Science and Technology</td>
</tr>
<tr>
<td>COSTECH</td>
<td>Tanzania Commission for Science and Technology</td>
</tr>
<tr>
<td>CDTT</td>
<td>Centre for the Development and Transfer of Technology</td>
</tr>
<tr>
<td>EIU</td>
<td>Economist Intelligence Unit</td>
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<tr>
<td>EPZs</td>
<td>export processing zones</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<td>FDI</td>
<td>foreign direct investment</td>
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<td>GER</td>
<td>gross enrollment ratio</td>
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<tr>
<td>IPI</td>
<td>Institute of Production and Innovations</td>
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<td>K4D</td>
<td>Knowledge for Development</td>
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<td>KE</td>
<td>knowledge economy</td>
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<td>KEI</td>
<td>Knowledge Economy Index</td>
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<tr>
<td>MSI</td>
<td>Dutch-German consortium</td>
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<tr>
<td>NER</td>
<td>net enrollment ratio</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PEDP</td>
<td>Primary Education Development Program</td>
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<tr>
<td>R&amp;D</td>
<td>research and development</td>
</tr>
<tr>
<td>RPED</td>
<td>Regional Program on Enterprise Development</td>
</tr>
<tr>
<td>SSA</td>
<td>sub-Saharan Africa</td>
</tr>
<tr>
<td>TARP</td>
<td>Tanzania Agricultural Research Project</td>
</tr>
<tr>
<td>TCRA</td>
<td>Tanzania Communications Regulatory Authority</td>
</tr>
<tr>
<td>TTCL</td>
<td>Tanzanian Telecommunications Company</td>
</tr>
<tr>
<td>TVET</td>
<td>technical/vocational education and training</td>
</tr>
<tr>
<td>UNECA</td>
<td>United Nations Economic Commission for Africa</td>
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Acknowledgments

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Introduction

The application of knowledge, as manifested in areas such as entrepreneurship and innovation, research and development and in people’s education and skills levels is now recognized to be one of the key sources of growth and competitiveness in the global economy. But many developing countries are failing to tap the vast and growing stock of global knowledge because of their limited awareness, poor economic incentive regimes, and weak institutions. By building on their strengths and by carefully planning appropriate investments in human capital, effective institutions, relevant technologies, and innovative and competitive enterprises, developing countries can benefit from the knowledge revolution and make the transition to a knowledge economy.

The knowledge economy (KE) is often taken to mean cutting-edge scientific discoveries, high-tech enterprises such as semiconductor fabrication, or information and communications technology (ICT). However, the term can describe more broadly the creation of any new knowledge and the use of existing knowledge to do things better. Developing countries can benefit by tapping and transferring knowledge from other countries and by applying that knowledge to suit local needs. But lessons from developed countries need to be properly contextualized to the situation of developing countries.

This paper examines how Tanzania can use knowledge and technological advances to foster innovation productivity, and competitiveness in all sectors of the economy. The paper highlights Tanzania’s position on four pillars of the knowledge economy that are considered to be critical for countries to make more effective use of knowledge for their overall economic and social development. These pillars are as follows:

- An *economic and institutional regime* that provides incentives for the efficient use of existing knowledge, creation of new knowledge, and the flourishing of entrepreneurship
- An *educated and skilled population* that can create, share, and use knowledge well
- A *dynamic information infrastructure* that can facilitate the effective communication, dissemination, and processing of information
- An *efficient innovation system* of firms, science/research centers, universities, think tanks, consultants and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge

A country’s economic and institutional regime describes the framework within which society and economy work—in other words, the “rules of the game,” both formal and informal. And the basic enabler of any country’s transition to the KE is an education system that encourages learning and the exploration of new knowledge. The information infrastructure and ICT provide mechanisms to exchange knowledge and to reduce knowledge transaction costs. The innovation system drives technological change. Effective use of knowledge in any country requires appropriate policies, institutions, investments and coordination across the above four pillars, though not necessarily all at the same time.

**Organization of the Paper**

This paper is organized as follows: Section 1 provides a brief background discussion of recent economic developments in Tanzania. Section 2 looks at the concept of the KE and highlights some global trends. Section 3 benchmarks Tanzania’s knowledge readiness. Section 4 looks at Tanzania’s performance on the four critical pillars—economic and institutional regime, education, innovation, and ICT. Section 5 presents some conclusions.
1. Recent Economic Developments in Tanzania

Since the mid-1990s, political stability and sound fiscal and monetary policies have allowed Tanzania to make substantial progress in macroeconomic stabilization and structural reforms. Macroeconomic stability in turn has laid the foundation for economic growth and a wide range of structural reforms, including privatization of state-owned enterprises, liberalization of the agriculture sector, efforts to improve the business environment, and strengthening of public expenditure management. As a result, Tanzania’s GDP has grown at a rate of more than 5 percent over the last five years, and reached 5.7 percent in 2003 and 6.7 percent in 2004.

<table>
<thead>
<tr>
<th>Sectors</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>46.7</td>
<td>46.4</td>
</tr>
<tr>
<td>Industry</td>
<td>18.4</td>
<td>19.1</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>3.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>8.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Electricity and water</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Construction</td>
<td>5.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Services</td>
<td>39.3</td>
<td>39.2</td>
</tr>
<tr>
<td>Trade, hotels, and restaurants</td>
<td>16.8</td>
<td>17.0</td>
</tr>
<tr>
<td>Transport and communications</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Financial and business services</td>
<td>9.9</td>
<td>9.7</td>
</tr>
<tr>
<td>Public administration and other services</td>
<td>7.2</td>
<td>7.1</td>
</tr>
<tr>
<td>Minus financial services (indirectly measured)</td>
<td>–4.6</td>
<td>–4.6</td>
</tr>
<tr>
<td>Total GDP</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>


Sectoral characteristics of recent economic trends in Tanzania are shown in Table 1 and discussed below.

- Agriculture accounted for 46.4 percent of GDP in 2004 and average growth in the agriculture sector has been about 5 percent in recent years. Enhancing agricultural sector performance is critical for growth and poverty reduction because it is the largest sector of the Tanzanian economy. It comprises about 70 percent of employment, mostly in subsistence farming and smallholder cash cropping, and a large share of foreign exchange earnings.
- The industrial sector accounted for 19.1 percent of GDP in 2004. Rapid growth was because of strong performances in manufacturing (see next bullet point), mining and quarrying, and construction. Mining has been among the fastest growing subsectors of the Tanzanian economy in recent years. Mining and quarrying output grew at 15.6 percent in 2004, accounting for 3.2 percent of GDP. Growth rate in construction was 11 percent in both 2003 and 2004, and the contribution of this sector to GDP was 5.5 percent in 2004 as compared to 5.2 percent in 2003. Electricity and water grew at 4.7 percent in 2004, contributing to 1.6 percent of GDP.
- The performance of the manufacturing subsector has also been steady. Growth in manufacturing was 8.6 percent for both 2003 and 2004. The share of manufacturing in GDP increased from 8.6 percent in 2003 to 8.8 percent in 2004. According to the Organisation for Economic Co-operation and Development (OECD), in 2002 this subsector was the top recipient of foreign and local investment, and 103 manufacturing projects were approved by the Tanzania Investment Centre (TIC), compared with 82 in 2001. Of the approved projects, 35 were by local
investors, 42 were by foreign investors, and 26 were joint ventures (OECD Development Centre 2004).

- In the service sector, the trade, hotels, and restaurants subsector grew quickly from 6.5 percent in 2003 to 8 percent in 2004, mainly because of the strong growth in tourism (Box 1). The contribution of this subsector to GDP increased from 16.8 percent in 2003 to 17 percent in 2004. Growth in the transportation and communications subsector increased from 5 percent in 2003 to 6.2 percent in 2004 because of increased investment in mobile telecommunications, the construction and rehabilitation of airports and roads, and increased investment in transportation agencies. The contribution of transportation and communications to GDP in 2004 remained the same as in 2003, at 5.4 percent. Financial and business services grew at around 4.5 percent in 2004 (the same as 2003), contributing to 9.7 percent of GDP. The public administration and other services subsector also grew at around 4.5 percent in 2004, contributing 7.1 percent to GDP.

### Box 1: Tourism in Tanzania

According to the Economist Intelligence Unit (EIU), the development of Tanzania as a multicenter tourism destination has considerable potential. A growing number of international travel companies are offering tours combining safaris in the country’s national parks and game and forest reserves with trips to the “Spice Island” of Zanzibar. According to the Directorate of Tourism, the number of tourists rose from 201,744 in 1992 (earning US$120 million in foreign exchange) to a peak of 628,188 in 1999 (earning US$733 million). Numbers fell for a few years after that because of concerns about terrorism in East Africa. However, after some time with no new major incidents, tourist figures recovered from the low of 501,688 in 2000 to 576,000 in 2003, earning a total of US$731 million.

There has been considerable investment in the tourism industry in recent years, partly helped by the government’s privatization policy. According to the Tourism Confederation of Tanzania, US$400 million has been invested in 160 projects since 1990, of which 130 were new ventures. This has increased the quality and number of hotels and rooms available. Nevertheless, although prospects for increasing the number of visitors are good, there is a risk that in the short term the tourism industry will run up against capacity constraints, which, coupled with Tanzania’s poor infrastructure, could hinder the rapid development of the industry.

*Source: EIU (2004b).*

A significant change appears to be taking root in the composition of Tanzania’s exports. The share of traditional goods in total exports has been declining, from about 40 percent in 1997 to 22 percent in 2002. The decline reflects both the sharp fall in agricultural commodity prices in world markets and stagnant volumes of exports. But some interesting pockets of vitality also are emerging in the Tanzanian economy, such as gold, fish, and flowers.

- The value of merchandise exports rose in 2004 to about $1.335 billion from $1.129 billion in 2003 (and increase of 18.2 percent), mainly because of Tanzania’s nontraditional exports, especially gold (Box 2). Overall, traditional exports (coffee, cotton, sisal, tea, tobacco, cashews, and cloves) contributed 21.9 percent and nontraditional exports (mainly gold) contributed 78.1 percent of total merchandise exports.
Gold production has expanded in Tanzania because of the increased participation of foreign and local investors with substantial capital and modern technology. Commercial gold production in Tanzania is dominated by five mines: the Bulyanhulu and Pangea mines, which are owned by a combination of Barrick Gold (Canada) and the Khama mining company (in which Barrick is a major shareholder); Geita gold mine, owned by a Ghanaian/South Africa company, AngloGoldAshanti; Golden Pride Mine, owned by Australia’s Resolute Mining Ltd.; and the North Mara mine, owned by Placer Dome (Canada). Together, these mines have boosted output from only 4,890 kilograms of gold in 1998 to 45,299 kilograms in 2003. This makes Tanzania the fourth-largest gold producer in Sub-Saharan Africa, just behind Mali (which produced 52,000 kilograms in 2003) and well behind Ghana and South Africa. Reform of the mineral law has also boosted investment in the gold mining sector.

Source: EIU (2004b)

Another success story has been the sharp increase in exports of fish and fish products in recent years. In 2004, however, the export value of fish and fish products decreased by 8.8 percent to $124.2 million from $136.2 million in 2003, because of unfavorable weather changes, among other factors. Thus, there is concern that both the gold and fishing industries are reaching the limits of expansion of natural resource extraction and therefore of future growth, coupled with concern about the industries’ environmental impact. A recent study has examined the supply chains for fish in Tanzania and highlighted several ways in which this sector could be strengthened (Box 3).

Two different supply chain systems for fish coexist in Tanzania, both of which support lake- and ocean-to-market commercial operations. The two chains serve two distinct markets: one international and one domestic. The international export-oriented supply chain system is sophisticated, entails low transaction costs, is well invested, and is quite close to best international practice. The domestic supply chain is rudimentary in technique and technology, is poorly organized, entails high transaction costs, and incurs substantial risk for fishermen and boat operators. The amount of investment in the domestic supply chain, moreover, is very small compared to the level of investment in the parallel export chain. The same primary products move through both channels. However, the way in which they are processed and marketed is quite different. A substantial portion of Tanzania’s fish move in a fresh-product form, some move to market in a fast-frozen form, and still others are processed and distributed in a salted, smoked, or cooked form. Distinct distribution channels serve these two markets, and the channels vary in sophistication from “near World Class” to rudimentary, and from “best in class” food safety practices to “hit or miss” practices that are neither controlled nor regulated. Moreover, the service industries that have developed on the periphery of these two supply chains have also developed along separate tracks. Little crossover service provision and even less common use of assets (such as in cold chain warehousing, information systems, and so on) takes place beyond the point at which primary fish products are landed, sorted, and sold.

In the supply chain that supports the domestic market, transactions are executed directly between fishermen and a relatively small number of retailers, wholesalers, buyer’s agents, and even consumers who buy at fish-landing sites and pay on a cash-and-carry basis. Intermediaries in the domestic market are highly specialized by type of fish and by end market. They typically resell fish in specific markets where they believe that their superior knowledge and access to local commercial networks can realize above-market returns. In many parts of Tanzania, fish marketing is limited to the local village in which fishermen are domiciled or to neighboring communities within walking distance. Little trading takes place in support of long-distance commerce. As a result no integrated market exists in Tanzania for fish.
The supply chain that supports export fish processing and international distribution is the most developed. The private sector companies that have invested in this chain are mostly locally based and operate not only in Tanzania but also in Uganda and sometimes in Kenya. Most Nile perch continues to be purchased by the major fish processors, as are most of the prawns, and because of sharp increases in demand for both fishes in overseas export markets, prices have risen slightly and demand continues to exceed supply. Thus, this supply chain is more intensely managed. Export processors purchase their inputs through specialized agents who typically provide fuel, equipment, and credit to fishermen who are affiliated with them, who are trained, and whose fishing processes are certified. The export chains are integrated by the large export-processing companies. Inventory moves transparently through these chains. Prices are set for extended periods and are based on published guidelines that the industrial processors set collectively and that normally entail a significant premium above domestic market prices. Quality control standards are rigorously enforced; as a result a substantial volume of fish rejected by export processors finds its way back into the domestic market.

Recommendations for strengthening the fish supply chain in Tanzania, especially the domestic supply chain, include building stronger linkages within the domestic channels; developing the two major wholesale fish markets of Banda Beach Market in Dar es Salaam and Kirumba Market in Mwanza; and investing in transport, storage, and cold-chain handling. Furthermore, the domestic supply chain could gain new markets by following the product-sourcing requirements of the new supermarket chains that have recently arrived in Tanzania; similarly, the domestic chain or could follow the seafood-procurement requirements of fast food outlets. Note that meeting higher product requirements can also lead to improved food safety standards. Another potential leverage point is the landing/market/processing clusters and commercial focal points around fishing communities. The domestic fishing sector would also benefit from such improvements as external markets for specialized products and services, equipment leasing, logistics management, transport, market information, and storage and banking. These improvements can be accomplished by defining service specifications and then outsourcing the desired services to qualified providers, by joint venturing the development of new services with qualified providers, or by demonstrating the commercial viability of new service launches through feasibility studies or business plans. Finally, new market network services need to be developed to include issues such as third-party inventory management and temperature-controlled storage, cash management, price discovery and data dissemination, insurance, and transport delivery.

Source: Adapted from Kopicki (2005).

- The cut-flower flower industry in Tanzania has also experienced notable growth since its inception in 1987. In particular, the switch to greenhouses has resulted in productivity gains and profitability, as well as the entry of investors into the industry. The Netherlands is the main market for Tanzania’s flowers with a take of 90 percent; the remaining 10 percent goes to Germany, Norway, England, and Sweden. Box 4 highlights some factors that have been responsible for the success of the cut-flower industry in Tanzania.
The success of the cut-flower industry in Tanzania, beginning in the mid-1990s, has been facilitated by a combination of factors that provide lessons for developing other export commodities in the country.

- Cut-flowers are a nontraditional, high-value commodity with access to a rapidly expanding international market.
- Initial producers in Tanzania were able to tap international linkages and gain access to overseas sources of technology and capital. A key facilitating factor was that foreign firms with essential know-how were permitted to come to the country and provide the crucial ingredients that allowed the industry to take off and become competitive in a world market dominated by producers from developed countries.
- Growth in interregional linkages involving technology transfers and the physical movement of people further contributed to the development of cut-flower exports.
- Water, land, and abundant cheap labor were readily available.
- In contrast to most other agricultural (traditional) crops in Tanzania, there has been very little government involvement in the floricultural industry; the government has neither given special consideration to the cut-flower industry nor provided intensive services to it. Instead, the cut-flower industry represents an interesting case of a private sector enterprise that organizes itself and makes its own arrangements in order to meet international standards.

Source: Semboja, Mbelwa, and Bonaventura (2000).

Foreign direct investment (FDI) in Tanzania has seen its ups and downs over the last few years. Spurred by investments in mining, FDI surged in the late 1990 to reach highs of $517 million in 1999 (or 6 percent of GDP) and $463 in 2000 (5 percent of GDP). Subsequently, FDI fell to about $327 million in 2001 (3 percent of GDP) and further declined to $240 million in 2002 (2 percent of GDP). The IMF estimates that Tanzania received FDI inflows of $478 million in 2003–04 and an estimated $495 million in 2004–05 (IMF 2005).

Donors play an important role in the Tanzanian economy. The country is heavily dependent on donor assistance, which finances more than 40 percent of Tanzania’s budget. During the past few years, the government in collaboration with donor community has developed a range of strategy papers and policy initiatives to guide its development agenda and poverty reduction efforts, including the Tanzania Development Vision 2025, National Poverty Eradication Strategy (NPES), Tanzania Assistance Strategy (TAS), Poverty Reduction Strategy Paper (PRSP), Public Expenditure Review (PER), and Medium-Term Expenditure Framework (MTEF), among others.

Sustaining and accelerating economic growth in Tanzania will require greater attention to the acquisition and use of new knowledge to increase productivity in all sectors of the economy. In particular, Tanzania needs to develop strategies to use existing and new knowledge to improve performance in traditional sectors, exploit opportunities for leapfrogging, and develop competitive new sectors. These developments require Tanzania to assess its current global standing and learn from the experiences of other countries. A priority in the battle against poverty will be the creation of a greater range of sustainable income generation and employment activities, including more export opportunities. More effective sharing and use of knowledge could contribute significantly to the creation of new economic activities by, for example, increasing farm productivity, identifying of new markets for farm products, creating new enterprises based on traditional craft industries, and diversifying of rural economies. With its rich endowments of natural resources and with government committed to achieving higher levels of growth and development, Tanzania is well placed to benefit from the global KE, as discussed below.

1 Source: World Bank internal database.
2. What is the Knowledge Economy?

Knowledge has always been at the core of any country’s development process. Figure 1 illustrates this concept for the cases of Ghana and the Republic of Korea. Nearly 40 years ago the per capita income of Korea and Ghana were the same. However, since that time Korea has increased its per capita income by a factor of 8.9 in real terms, mainly because of more effective use of policy and technical knowledge, while Ghana has decreased almost by 0.1.

![Figure 1: Knowledge Makes the Difference between Poverty and Wealth](image)

Today, we are in the midst of a knowledge revolution that is being spurred by the twin forces of globalization and technological advances. This knowledge revolution manifests itself in many different ways: there are closer links between science and technology; innovation is more important for economic growth and competitiveness; education and life-long learning are increasingly important; and more investment is being made in intangibles (such as research and development (R&D), software, and education) than in fixed capital. And, of course, there is the ICT explosion that brings with it worldwide interdependency and connectivity. These trends have led to increased globalization and competition: in 1990, trade represented 38 percent of world GDP; in 2001 it represented 57 percent (Box 5).

The knowledge revolution is creating a constant state of restructuring at the global, country, sector, and firm levels. While this raises tremendous possibilities for enhancing growth and competitiveness, it also carries risks that countries, firms, organizations, and individuals will not keep up with the rapid changes. Consequently, countries’ competitiveness depends more than ever on their ability to access, adapt, and utilize knowledge for development.

The term “knowledge economy” (KE) was coined to reflect the increasing importance of knowledge for economic development. Despite the hype that surrounds this concept, the idea of a KE is not new. Knowledge and its use has always been a critical ingredient of economic success. However, recent times have seen its importance increase. In fact, knowledge has become the key driver of economic competitiveness and success, and has added massive value to economic production through increases in productivity. The application of new technologies and new ideas—both in the form of new inventions and new applications of existing knowledge—has brought revolutionary change to virtually all markets and sectors.
Box 5: Growing Importance of Knowledge—Global Trends

The OECD uses the term, “knowledge economy,” (KE) to draw attention to the importance of knowledge in all economic activities. The definition has evolved to focus on manufacturing industries that make intensive use of technology to include services that are also heavily knowledge based. The KE now accounts, on average, for roughly half of nongovernment economic activity in the OECD. Some features of the KE are as follows:

- **More investment and trade in intangibles.** Investment in intangibles has been skyrocketing. In OECD countries, public investment in intangibles (such as education, R&D, and software) has now reached almost the same level as that for machinery and equipment—8.6 percent of GDP compared to 9.0 percent. This estimate almost certainly is low because it does not include private investment in education, public and private investment in skills training, or investment in design, marketing, advertising, brand development, engineering, publishing, and the arts.

- **More emphasis on education and training.** In OECD countries the proportion of adults with at least an upper secondary education rose from 61 percent to 66 percent and with tertiary education from 21 percent to 24 percent from 1998 to 2003. In high-income OECD countries, the percentage of the labor force with tertiary education increased from roughly 21 to 27 percent from 1989 to 2001. Developed countries have also been improving the skills of their labor force through extensive continuing education both in universities and in firms. Developing countries lag in this respect as their educational attainments are low and their workforces need retraining to be competitive in the knowledge economy.

- **More FDI.** FDI, one of the key agents of globalization, affects areas such as technology, management, access to markets, and access to finance, labor, and natural resources. FDI inflows increased 16 times between 1982 and 2002 and FDI’s share of world gross fixed capital formation increased from 2.4 percent to 10.3 percent.

- **More R&D.** Of global R&D, 88 percent is undertaken by high-income countries, with 31 percent of global R&D centered in one country, the United States. Multinational companies are now carrying out R&D in foreign countries and are establishing more strategic alliances—even mergers and acquisitions—to collaborate on technology and acquire technological assets. For example, R&D expenditures of foreign affiliates worldwide climbed from an estimated US$30 billion in 1993 to US$67 billion in 2002, with more R&D going to developing countries. But at the same time, only a small number of developing countries and economies in transition are internalizing R&D, with developing countries in Asia being the preferred destination. Also on the rise is the number of international collaborations in patenting and technical publications. For example, from 1999 to 2001, 6.7 percent of all patents filed at the European Patent Office were the result of international collaborative research and 15.4 percent were owned or co-owned by a foreign resident.

*Source:* UNCTAD (2005b); OECD (2005a, 2005b); World Bank internal databases.

In short, a KE is an economy that creates, disseminates, and uses knowledge to enhance its growth and competitiveness. Contrary to some beliefs, it is not necessarily about high tech or IT. The application of new techniques to subsistence farming can increase yields significantly, or the use of information and logistical services can allow traditional craft sectors to serve much wider markets than before. These are both examples of the KE in action. A successful KE requires a strong and robust economic and institutional regime, a well educated and skilled population, an efficient innovation system, and a dynamic information infrastructure.

Section 3 benchmarks Tanzania’s overall readiness for the KE, or its “knowledge readiness.” This concept should be distinguished from “e-readiness,” which is mainly concerned with a country’s physical ICT infrastructure and the skills of the population to utilize this infrastructure. Knowledge readiness, on the other hand, has a much wider scope and includes other systems such as education, wide-ranging vocational skills training, and business research and innovation, as well as progress in ICT. It is about the ability of a country to create, access, share, and apply knowledge across a wide range of sectors, whether or not “e-technologies” are used.
3. Benchmarking Tanzania’s Overall Knowledge Readiness

This section looks at three sources that benchmark countries’ overall receptiveness to knowledge and innovation. The first is the World Economic Forum’s *Global Competitiveness Report 2005–2006*; the second is the World Economic Forum’s *Africa Competitiveness Report 2004*; and the third is the World Bank’s Knowledge Assessment Methodology (KAM). In these three sources, Tanzania is compared mostly with neighboring countries such as Kenya and Uganda, which share many aspects of economic structure and environment. For example, these three countries have revived the East Africa Community, set up processes to oversee the new community, and established commissions for increased cooperation in areas such as joint railways operations and the harmonization of revenue collection methods.


The recently released *Global Competitiveness Report 2005–2006* by the World Economic Forum provides information for 117 countries. The main aim of the report is to enhance understanding of the key factors that determine economic growth and to explain why some countries are much more successful than others at raising income levels and opportunities and in joining the upper ranks of international competitiveness. The report includes two indices:

- The *Growth Competitiveness Index* (GCI), which aims specifically to gauge the ability of the world’s economies to achieve sustained economic growth over the medium to long term. The GCI identifies three “pillars” in the evolution of growth in a country: the quality of the macroeconomic environment, the state of the country’s public institutions, and the level of its technological readiness. The index uses a combination of hard data, such as budget deficits, the level of Internet access in schools, and survey data, and examines such areas as judicial independence, the prevalence of institutionalized corruption, and the extent of inefficient government intervention in the economy. These various pieces are brought together under several “sub-indices,” each capturing a different aspect of the growth process and aggregated to give an overall competitiveness “score” for a country.

- The *Business Competitiveness Index* (BCI) emphasizes a range of company-specific factors that are conducive to improved efficiency and productivity at the micro level. The BCI is a complement to the medium-term, macroeconomic approach of the GCI, and evaluates the underlying microeconomic conditions defining the current sustainable level of productivity in each of the countries covered. The underlying concept is that whereas macroeconomic and institutional factors are critical for national competitiveness, they are necessary but not sufficient factors for creating wealth (which is created at the micro level by companies).

In the 2005–2006 report, Finland is number one in the GCI rankings for the third consecutive year. The country is very well managed at the macroeconomic level and it also scores very high in measures that assess the quality of its public institutions. Furthermore, the private sector shows a high proclivity for adopting new technologies and nurturing a culture of innovation. The United States, like last year, is ranked second: its overall technological supremacy is partly offset by a weaker performance in areas that capture the quality of its public institutions and the stability of the macroeconomic environment.

While most of the countries of sub-Saharan African are not very competitive, the region does have a number of relative success stories, including South Africa (42nd), Botswana (48th), and Mauritius (52nd).
The survey shows that Tanzania improved its growth competitiveness and therefore its rank on the GCI from 82nd place last year (out of 104 countries) to the 71st this year (out of 117 countries), while Kenya and Uganda both fell in the rankings, from 78th spot last year to 92nd this year for Kenya, and from 79th spot last year to 87th place this year for Uganda. According to the 2005–2006 report, among low-income countries, Ghana, Tanzania, and Pakistan have made the largest improvements in competitiveness. Ghana has benefited especially from improved public schools and less corruption, and Tanzania and Pakistan have both reported better labor-employer relations.

The sub-indexes that comprise the 2005–2006 GCI showed the following trends:

- Tanzania maintained its ranking from last year in the *Macroeconomic Environment Index* at the 72nd spot, surpassing Uganda at the 88th spot, and increasing its lead over Kenya which is placed 106th.
- Tanzania rose in the *Public Institutions Index* from 88th position last year to the 60th spot this year. Kenya comes in at 94th place this year and Uganda at 95th.
- Tanzania dropped slightly in the *Technology Index* from 84th spot last year to 86th this year. In the current rankings, Kenya and Uganda claimed the 71st and 82nd spots, respectively.

The 2005–2006 global BCI ranking showed the following trends:

- Tanzania improved its position from 90th place last year to 82nd this year, while Kenya captured the 68th place (down from 63rd last year) and Uganda fell from the 71st spot last year to 85th this year. Tanzania gained some ground in both sub-indices that comprise the BCI—company operations and strategy and the quality of the national business environment.

**World Economic Forum’s Africa Competitiveness Report 2004**

This report, also developed by the World Economic Forum in 2004, highlights the prospects for growth, obstacles to improving competitiveness, and the need to accelerate the pace of economic change in 25 selected African economies. It also uses the GCI, and shows that the following trends:

- Tanzania ranks 9th out of 25 countries on the overall GCI index, surpassing Uganda, which is ranked 14th, and Kenya, which is placed 15th. The most competitive economy among the 25 countries is Botswana, followed by Tunisia, South Africa, and Mauritius (Table 2).

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Botswana</td>
<td>4.56</td>
</tr>
<tr>
<td>2</td>
<td>Tunisia</td>
<td>4.49</td>
</tr>
<tr>
<td>3</td>
<td>South Africa</td>
<td>4.37</td>
</tr>
<tr>
<td>4</td>
<td>Mauritius</td>
<td>4.12</td>
</tr>
<tr>
<td>5</td>
<td>Namibia</td>
<td>3.99</td>
</tr>
<tr>
<td>6</td>
<td>Gambia, The</td>
<td>3.93</td>
</tr>
<tr>
<td>7</td>
<td>Egypt</td>
<td>3.84</td>
</tr>
<tr>
<td>8</td>
<td>Morocco</td>
<td>3.77</td>
</tr>
<tr>
<td>9</td>
<td>Tanzania</td>
<td>3.49</td>
</tr>
<tr>
<td>10</td>
<td>Ghana</td>
<td>3.46</td>
</tr>
</tbody>
</table>


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2 These include: Algeria, Angora, Botswana, Cameroon, Chad, Egypt, Ethiopia, The Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Senegal, South Africa, Tanzania, Tunisia, Uganda, Zambia, and Zimbabwe.
The rankings on the three sub-indexes that comprise the GCI reveal the following:

- On the Public Institutions Index, Tanzania is ranked 9th again, ahead of Uganda at 18th spot, and Kenya at 21st. Botswana once again tops the list, followed by Tunisia, Malawi, and The Gambia.
- On the Macroeconomic Environment Index, Uganda is ranked 12th and Tanzania placed 14th, followed by Kenya at 15th. The top four spots go to Botswana, Tunisia, South Africa, and Morocco.
- The Technology Index places Tanzania in the 12th spot among 25 countries, where it lags behind Kenya, which is ranked 8th, and Uganda, which is ranked 10th. South Africa claims the top rank in this index, followed by Mauritius, Tunisia, and Botswana.

The 2004 report also provides national competitiveness balance sheets for all 25 countries. Tanzania’s balance sheet makes note of the following competitive advantages:

- In the area of macroeconomic environment, Tanzania’s advantages include low recession expectations, public trust of politicians, and low levels of distorting government subsidies and diversion of public funds.
- In the case of Tanzania’s public institutions, the country has advantages in the areas of judicial independence and lack of favoritism in decisions of government officials.
- Tanzania also rates well in terms of technology variables, such as prevalence of foreign technology licensing, FDI and technology transfer, company spending on R&D, university/industry research collaboration, and firm-level technology absorption. According to the report, the country also has had success in ICT promotion and in government prioritization of ICT.
- Other indicators where Tanzania exhibits competitive advantages include wage equality of women in the workplace, government effectiveness in reducing poverty, reliance on professional management, and railroad infrastructure development.

On the other hand, the report also refers to several competitive disadvantages:

- In the macroeconomic environment, the national savings rate, interest rate spread, real exchange rate, country credit rating, access to credit, and inflation are cited as competitive disadvantages.
- Public institutions in Tanzania need to address weaknesses in tax collection, public utilities, and exports and imports. Organized crime is a problem and property rights need to be further secured.
- In terms of technology, Tanzania ranks low in many ICT-type indicators including telephone lines, cellular phones, personal computers, Internet use, Internet hosts, Internet access in schools, quality of competition in the ISP sector, and laws relating to ICT. Tanzania does not rank highly in terms of technological sophistication or utility patents. In addition, it needs to do more to boost tertiary enrollments.
- Other areas where Tanzania exhibits competitive disadvantages include the business costs of diseases such as malaria, HIV/AIDS, or tuberculosis; infrastructure (such as air transport, telephone, and quality of electricity supply); private sector employment of women; and the extent of bureaucratic red tape.  

The national competitiveness balance sheet thus provides some insights about the relative importance of various elements relating to the macroeconomic environment, governance, the state Tanzania’s public institutions, and its level of technological readiness and sophistication. These have a bearing on

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3 For more information, see the Tanzania country table, WEF (2004).
Tanzania’s ability to be competitive and to sustain high growth rates in the long term. Even though the country shows some strengths, the balance sheet shows several areas where policy reforms are vitally needed if the country is to fulfil its potential.

Knowledge Assessment Methodology (KAM)

The third methodology that is used to look at Tanzania’s overall knowledge readiness is the World Bank Institute’s Knowledge Assessment Methodology (KAM).\(^4\) The KAM dataset includes 80 quantitative and qualitative variables and 128 economies that help to benchmark how an economy compares with its neighbors, competitors, or other countries it wishes to emulate on the four pillars of the KE. KAM helps to identify problems and opportunities that a particular country faces in making effective use of knowledge for development and where it may need to focus policy attention or future investments.

Using the KAM, the following benchmarking exercise compares Tanzania with the Africa region (comprising 25 countries),\(^5\) with Kenya and Uganda, and with leading economies in Africa such as Botswana and South Africa that have made significant strides in harnessing knowledge to improve growth and competitiveness.

Tanzania and the World

The following figures paint a preliminary picture of Tanzania’s overall readiness or preparedness for the knowledge economy. Figure 2 introduces the Knowledge Economy Index (KEI),\(^6\) which is the average of the performance scores of a country or region in the four pillars of the knowledge economy (economic and institutional regime, education, innovation, and ICT). The KEI shows that many African countries are clustered at the bottom third of the distribution on the global knowledge economy map, suggesting that these countries could do much more to harness knowledge for their overall economic and social development.


\(^5\) The following 25 countries from sub-Saharan Africa are included in the KAM database: Angola, Benin, Botswana, Burkina Faso, Cameroon, Côte d’Ivoire, Eritrea, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mauritania, Mauritius, Mozambique, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe.

\(^6\) For more information, see the KAM ([www.worldbank.org/kam](http://www.worldbank.org/kam)), where the following three variables are chosen as proxies for each of the four pillars that constitute the Knowledge Economy Index (KEI):

- **Economic and institutional regime**: tariff and non-tariff barriers, regulatory quality, and rule of law
- **Education and human resources**: adult literacy rate (percent, age 15 and above), secondary enrolment, and tertiary enrollment
- **Innovation system**: researchers in R&D, patent applications granted by the United States Patent and Trademark Office, and scientific and technical journal articles (weighted by per million population).
- **Information infrastructure**: telephone per 1,000 persons, computers per 1,000 persons, and Internet users.
Tanzania is placed at the lower end of the global KE map (with a KEI of 1.67), but has improved from 1995 when it had a KEI of 1.03. It matches the performance of Uganda (with a KEI of 1.67), but lags behind Kenya (with a KEI of 2.34), which has shown some gains in the KE. Tanzania is also behind the African regional average (KEI of 1.91), and has a ways to go to match the performance of other leading countries in Africa such as Botswana (KEI of 4.59) and South Africa (KEI of 4.89). These countries are all placed in the middle of the global KE map, suggesting that they have been successful at creating, adapting, and using knowledge for overall development.

**Disaggregating Tanzania’s Performance**

It is also possible to see how Tanzania has performed on the four individual pillars that comprise the KEI (economic and institutional regime, education, innovation, and ICT). Figure 3 compares the performance of Tanzania with the African region, with neighbors, as well as with Botswana and South Africa. The two bars represent a country’s aggregate KEI score for the most recent year for which data are available and for 1995. The color bands in each bar (see figure legend) disaggregate the KEI score by pillar. Figure 4 shows the KEI and Knowledge Index (KI) for Tanzania, as well as its performance on all four pillars between 1995 and the most recent period for which data are available.

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7 Countries above the 45 degree line have improved their recent KEI rank relative to their position in 1995 (or closest available date in the mid-1990s), and vice versa for countries below the line.

8 The KI (Knowledge Index) is the simple average of the performance of a region or country in three KE pillars (education, innovation, and ICT).
Figures 3 and 4 show that between 1995 and most recent period for which data are available, Tanzania has improved its overall knowledge readiness, which is reflected by better rankings in the KEI and KI. In particular:

- Noticeable improvement is evident in Tanzania’s economic and institutional regime because of improvements in its regulatory regime and the rule of law. This improvement is borne out by Tanzania’s sustained strong performance on many governance indicators (see Section 4).
- The country shows progress in innovation because of increasing numbers of patents and articles in scientific and technical journal.
- A small positive change is evident in education because of increasing adult literacy rates and tertiary enrollments.
- In addition, Tanzania has strengthened its information infrastructure by increasing telephony (fixed and mobile phones), Internet use, and personal computer penetration. Tanzania also has a relatively free press, and there are a range of daily and weekly Kiswahili and English language newspapers.\(^9\)

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\(^9\) There are other ways to highlight Tanzania’s performance in the KE. Individual KE scorecards are presented in Annex 1, where Tanzania is compared to the world (128 countries) as well as to the African Region (comprising 25 countries).
But Figures 3 and 4 also show that even though Tanzania has made progress, the change is not as impressive relative to what is happening in other countries. For example, Figure 3 shows that between 1995 and the most recent period for which data are available, Tanzania has made a substantial improvement in its overall knowledge readiness as evidenced by positive changes in the KEI for the economic incentive regime, ICT, and especially innovation. Uganda has also made strides in improving its economic incentive regime and innovation, and Kenya has improved both its innovative capacity and its information infrastructure over the past decade or so. But overall, Kenya’s performance surpasses that of the African region, while Tanzania’s does not. Figure 3 also shows that Botswana and Malaysia have slightly improved their performance since 1995, while South Africa and Thailand have not. Thus, this relative comparison shows that even though Tanzania has made progress, world-wide progress in the variables that are used to track knowledge and innovation-related performance is much stronger.

Section 4 looks at Tanzania’s performance on each of the four KE pillars and identifies some challenges and opportunities related to using knowledge for increasing growth and national competitiveness.
4. Tanzania’s Performance on the Four Pillars of the Knowledge Economy

**Pillar 1: Economic and Institutional Regime**

Taking advantage of the potential offered by the knowledge revolution requires a flexible society and economy, able to cope with the need for constant change. Such flexibility requires that countries have an effective regime of economic incentives as well as institutions that can promote and facilitate the redeployment of resources from less efficient to more efficient uses. A well-functioning economic and institutional regime allows organizations, people, and institutions to adjust to changing opportunities and demands in flexible and innovative ways. Without strong economic incentives and an institutional regime that deploy resources productively, it is possible to have a strong educational base and a highly developed R&D infrastructure but still to miss out on the full benefits of these knowledge-related achievements.

Key elements of the economic and institutional regime include a financial system that mobilizes and allocates capital to its most productive uses; flexible labor markets including support for up-skilling of the labor force; an appropriate legal and regulatory system and strong rule of law that supports entrepreneurship; effective safety nets to facilitate adjustment to constant restructuring; a legal system that can cope with the many demands emanating from such restructuring and redeployment; and effective, transparent, and accountable government. This section looks at Tanzania’s institutional regime from the viewpoints of governance and the costs of doing business.

**Governance**

Governance can be broadly defined as the set of traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored, and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions.

In recent years many measures have been developed to capture the governance dimensions of a country. The World Bank Institute has developed scorecards that trace six areas of governance for 209 countries from 1996 to 2004. Figure 5a compares governance indicators in Tanzania from 1998 and 2004; Figure 5b compares 2004 governance indicators for Tanzania with the rest of sub-Saharan African.10

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10 The governance indicators presented in Figures 5a and 5b reflect the statistical compilation of responses on the quality of governance. These statistics derive from a large number of enterprise, citizen, and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations, and international organizations. Countries’ relative positions on these indicators are subject to margins of error that are clearly indicated. Consequently, precise country rankings should not be inferred from this data. The 2004 confidence range at 90 percent is depicted by the dotted lines.
Figure 5: Governance Comparisons


b. Regional Comparison, 2004

Figure 5a shows that between 1998 and 2004, Tanzania improved its rankings on three of the six variables: *voice and accountability* and *government effectiveness* improved by a small margin, while *control of corruption* showed much more improvement. This is not surprising, because in 1999 Tanzania adopted a comprehensive National Anti-Corruption Strategy and Action Plan. The plan is focused on advancing institutional reforms; increasing transparency and accountability in government business; increasing transparency and accountability in the participation of civil society and private sector; and monitoring progress on areas such as the rule of law, legal framework, financial management, procurement, and so on. In order to ensure transparency and accountability in the use of funds, Tanzania also adopted the Integrated Financial Management System (IFMS) to automate all accounting activities. In fiscal 1998–99 ten pilot Ministries, Department, and Executive Agencies (MDAs) were automated; by fiscal 1999–00, all MDAs were on board and payments were being centrally processed (Mwanza 2002). Moving on to the regional governance comparison, Figure 5b for 2004 shows that Tanzania led sub-Saharan Africa on all six governance dimensions.

Afrobarometer—an organization that conducts surveys in Africa—has undertaken national sample surveys regarding the attitudes of citizens in 15 selected African countries (including Tanzania) about their national economies, democracy, good governance, markets, civil society, and other aspects of development. Through its surveys, Afrobarometer seeks to answer questions related to the economic, political, and cultural shifts in these economies. The 2002–2003 surveys for all of the 15 countries on average show that the following:

- **Economically**, the present mood in Africa is somber, but people are optimistic about the future.
- **Culturally**, Africans value equality but also express an emergent individualism.
- **Politically**, they continue to prefer democracy and reject authoritarian rule.

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11 See http://www.afrobarometer.org/. The Afrobarometer surveys are repeated on a regular cycle, and because the instrument asks a standard set of questions, countries are systematically compared and trends are tracked over time. Survey results are designed to enable Africans and interested outsiders to educate themselves about public opinion in sub-Saharan Africa and to influence policy makers accordingly.
• In terms of institutional performance, they view the management of the national economy in a moderately positive light.

Box 6 provides some highlights from this survey for Botswana, Kenya, Tanzania, and Uganda.

<table>
<thead>
<tr>
<th>Box 6: National Public Attitude Surveys on Democracy, Markets, and Civil Society in Africa</th>
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<tr>
<td>The Afrobarometer Round 2 (2002–2003) surveys show the following interesting results for Botswana, Kenya, Tanzania, and Uganda:</td>
</tr>
<tr>
<td>Tanzanians (53 percent) and Ugandans (57 percent) are more likely to opt for a “free market economy” than a “government-run economy,” as compared to Botswana (24 percent) and Kenya (43 percent).</td>
</tr>
<tr>
<td>Most people call for the protection of property rights under a rule of law. Ugandans are most insistent that “the government must abide by the law in acquiring any property, including paying the owner” (95 percent); this result is not surprising given their history. Uganda is followed by Kenya (87 percent) and Tanzania and Botswana at 83 percent.</td>
</tr>
<tr>
<td>Kenyans (67 percent) and Tanzanians (57 percent) seem to be satisfied with reform outcomes and “the government’s reduced role in the economy”—more so than their counterparts in Botswana (43 percent) and Uganda (49 percent).</td>
</tr>
<tr>
<td>Support for democracy ran strong in Kenya (80 percent) in 2002, undoubtedly reflecting the euphoria of a peaceful transfer of power following the December 2002 election. People in Botswana and Uganda are also supporting democracy by a large margin (75 percent). The Botswana result is no doubt fueled by the multi-party system, which has been gradually putting down roots over time. The Tanzanian population’s support for democracy is at 65 percent.</td>
</tr>
<tr>
<td>Africans also embrace free and fair elections. Popular support for open elections is highest in countries that have recently transitioned to democracy (Kenya, 89 percent). Support for open elections is also high in Uganda (83 percent), a country in which political competition is presently allowed among individual candidates but not between political parties. Botswana and Tanzania both come in at 76 percent.</td>
</tr>
<tr>
<td>As for whether “the government can solve … all or most … of the country’s problems,” a more pragmatic view prevails in Tanzania (45 percent) and Uganda (48 percent), compared to Botswana (58 percent) and Kenya (64 percent).</td>
</tr>
<tr>
<td>Many countries view the management of the national economy in a positive light, ranging from 83 percent in Kenya to 68 percent in Tanzania to about 60 percent in both Botswana and Uganda.</td>
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</table>


Costs of Doing Business in Tanzania

Several constraints to private sector investment and the overall investment climate have been identified in Tanzania. Taxation, cost and availability of finance, availability of electricity, and corruption are seen by a majority of surveyed firms as a major or very severe constraint to private sector development in Tanzania. The World Economic Forum’s Africa Competitiveness Report 2004 cites the following as being the most problematic factors for doing business in Tanzania (from most problematic to least): inadequate supply of infrastructure, access to financing, tax rates, corruption, tax regulations, inefficient government bureaucracy, inadequately educated workforce, crime and theft, poor work ethic in national labor force, policy instability, foreign currency regulations, inflation, restrictive labor regulations, and government instability/coups. These are important entry points for improving Tanzania’s overall business climate and thereby fostering increased economic activity and employment opportunities.

The recently released World Bank (2006) report titled Doing Business in 2006: Creating Jobs provides important information on the scope and manner of regulations that enhance or constrain business

12 World Bank 2004c; World Economic Forum 2004 (Tanzania Country Profile).
activity in a large sample of countries, including Tanzania. The report presents indicators on the ease of doing business, such as starting a business, dealing with licenses, hiring and firing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, and closing a business—all critical ingredients of an effective investment climate. The indicators are used to analyze economic and social outcomes, such as productivity, investment, informality, corruption, unemployment, and poverty, and identify what reforms have worked, where, and why.

In the 2006 report, New Zealand tops the list of economies for ease of doing business. Among the top African countries are Mauritius, which is ranked 23rd, South Africa, which is ranked 28th and Namibia, which is placed 33rd.

Annex 2 provides a detailed snapshot of the business climate in Tanzania as compared to neighbors, competitors, and countries it would like to emulate, such as Botswana, Kenya, Uganda, South Africa, Malaysia, and Thailand. The annex reveals several specific regulations and policies that discourage investment, productivity, and growth in Tanzania. Below are some examples:

- Tanzanian entrepreneurs can expect to go through 13 steps to launch a business over 35 days on average, at a cost equal to 161.3 percent of gross national income (GNI) per capita. Kenya and Uganda require 13 and 17 steps respectively, over 54 and 36 days, at a cost equal to 48.2 percent and 117.8 percent of GNI respectively. Botswana requires only 11 steps but far more days (108) at a lower cost (10.9 percent of GNI). For the two Asian comparators, Malaysia and Thailand, it requires both less time and money to start a business—30 days and 20.9 percent of GNI for Malaysia, and 33 days but just 6.1 percent of GNI for Thailand.

- Regulations in Tanzania are rather rigid when it comes to the hiring and firing of workers. Tanzania’s overall Rigidity of Employment Index is 69, higher than in Kenya (28), Uganda (13), Botswana (30), and South Africa (52). Malaysia comes in at 10 and Thailand at 18.

- In Tanzania, it takes 61 days to register property, less than in Botswana (69 days) and Kenya (73 days) but more than in Uganda (48 days) and South Africa (23 days). In Thailand, it takes just 2 days to register property, whereas in Malaysia it takes much longer—143 days.

- Regarding credit, Tanzania has a score of 5 on the Strength of Legal Rights Index as does Uganda, Thailand, and South Africa, which shows weaknesses in all these countries. Kenya and Malaysia have a score of 8 and Botswana has a score of 9, which indicates better sharing of credit information and better protection of the legal rights of borrowers and lenders.

- The degree to which investors are protected through disclosure of ownership and financial information is measured by the Extent of Disclosure Index. This index shows that Tanzania with a score of 3 and Kenya with a score of 4 need much improvement in this area. Uganda has a score of 7, followed by Botswana South Africa, both with a score of 8. Malaysia and Thailand get perfect scores of 10.

- It takes on average 248 hours to pay taxes in Tanzania, as compared to 52 hours in Thailand, 140 in Botswana, 237 in Uganda and 372 in Kenya.

- Enforcing contracts is a major problem in most countries surveyed. It takes on average 240 days to resolve a payment dispute in Tanzania, compared to 209 days in Uganda and almost a year (360 days) in Kenya. In Botswana and South Africa too, resolving a payment dispute takes a long time—154 days on average for Botswana and 277 days for South Africa. The comparator Asian countries take even longer—300 days in Malaysia and well over a year (390 days) in Thailand.

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13 Higher scores indicate that laws are better designed to expand access to credit.
14 This index ranges from 0 to 10, with higher values indicating more disclosure.
While it takes three years to go through bankruptcy proceedings in Tanzania, it takes 2.7 years in Thailand, 2.2 years in Botswana, Malaysia, and Uganda, 2 years in South Africa, and a high 4.5 years in Kenya.

The Composite International Country Risk Guide (ICRG) is another broad indicator that gives some idea of how investors view the investment climate in a particular country. The ICRG ratings for Botswana, Kenya, Tanzania, and Uganda are presented in Figure 6. It shows that Tanzania’s risk rating has been declining since 1997, which is paradoxical given that the decline coincides with a growth period in Tanzania’s economy. The reasons for the fall in Tanzania’s risk rating should be further investigated.

Figure 6: ICRG Risk Rating, 1984–2003


The indicators discussed above reveal some strengths and weaknesses of the business environments of Tanzania and other countries. The weaknesses need to be addressed in order to improve the countries’ competitiveness in an increasingly integrated and knowledge-based global economy. To its credit, in recent years the government of Tanzania has made significant progress in enhancing the business environment, especially through the implementation of a program called Business Environment Strengthening in Tanzania (BEST). Another positive government action was the establishment of the Tanzania Investment Centre (TIC) in 1997 as a one-stop center for promoting investment. The Banking and Financial Institutions Act was amended in 2003 to empower the Bank of Tanzania to regulate and supervise activities of all savings and credit associations and to facilitate the provision of long-term finance to the productive sector, for example, by allowing housing finance companies. The Tanzania Bankers Association has also improved access to credit through the establishment of a credit bureau. The Land Act of 1999 has been amended to accelerate land surveys and to modernize the land registry to enable the commercialization of land leases and to facilitate their use as collateral for bank loans. The Income Tax Act of 2004 is also considered more conducive to private sector growth than previous income tax laws. Further initiatives are underway to formalize personal property rights. These and other policy measures and initiatives will help improve Tanzania’s overall investment climate and make it more conducive to promoting investment in all sectors of the economy.

15 The ICRG risk rating is an overall index, ranging from 0 to 100 (highest risk to lowest), based on 22 components of risk grouped into three categories (political, financial, and economic).
16 OECD (2004). For more information, go to: www.oecd.org/dev/africanoutlook.
Pillar 2: Education and Human Resources

Education is the fundamental enabler of the KE. Well-educated and skilled people are key for creating, sharing, disseminating, and using knowledge effectively. Basic education provides the foundation for lifelong learning and increases peoples’ capacity to assimilate and use information. Secondary and tertiary education can develop core skills, including technical skills, which encourage the mind of creative and critical thinking needed for problem-solving and innovation. Higher education in engineering and scientific areas is needed to monitor technological trends, assess what is relevant for a firm or the economy, and use new technologies. The production of new knowledge and its adaptation to a particular economic setting is generally associated with higher-level teaching and research.

Creating a culture of continuous learning and openness to new ideas is critical for a knowledge-based economy. A lifelong learning system is a system which encompasses learning throughout the life cycle (from early childhood to retirement) and includes formal training (schools, training institutions, universities); nonformal learning (on-the-job and household training), and informal learning (skills learned from family members or people in the community). The basic elements of a system of lifelong learning are comprehensiveness, the ability to acquire new basic skills (acting autonomously, using tools interactively, and functioning in socially heterogeneous groups), multiple pathways to learning and problem solving, and multiple providers of education.

Developing countries such as Tanzania face many challenges in developing systems of education. These challenges include providing universal access to basic education; increasing access to and providers of secondary education; strengthening tertiary education, which is generally weak; improving the linkages between formal and informal education systems and the labor market; and raising the quality of learning.

Tanzania’s economy today is largely market oriented and it has in place many elements required for private sector-led growth. However, it does not have a sound base of adequately qualified and trained workers, which is essential for rapid economic growth and effective diversification of its production and export bases. Literacy is one of the keys to creating a sound workforce. Figure 7 shows that in 2001 Tanzania’s adult literacy rate (77 percent) was higher than that of Uganda (69 percent), lower than that of Kenya (84 percent), Botswana (79 percent), and South Africa (86 percent).

According to Cohen and Soto, in 2000 (Figure 8), Tanzania’s average years of schooling (3.4) was higher than that of Uganda (3.22), but lower than in Kenya (5.08), and far from that in South Africa (7.22).
In recent years the Tanzanian government has recognized the need to raise educational levels in the population as a necessary condition for enhancing economic growth. The government’s focus on investment in primary and secondary education, if sustained, will accelerate increases in literacy and in the average years of schooling for the medium to long term.

The general education system in Tanzania comprises seven years of primary education, four years of lower secondary, and two years of upper secondary. Appropriate programs for primary and secondary education have been put in place to enhance access and increase the quality of education. Key improvements to date have included the abolition of primary school fees in 2001, significant increases in budgetary funding for primary education, and the implementation of the Primary Education Development Program (PEDP). Under the PEDP Tanzania’s gross enrollment ratios (GERs) for primary education increased from 78 percent in 2000 to 106 percent in 2004. The net enrollment ratio (NER) increased from 59 percent in 2000 to 91 percent in 2004. Girls represent 49 percent of the total enrollment.

A key challenge for the government is to focus more on improving the quality of primary education. In terms of inputs, availability of textbooks has improved. On average, before launching the PEDP, one book on each subject was shared by eight students (a ratio of 1:8). In 2003, the book/pupil ratio improved to 1:4, and the government’s target is to reach a ratio of 1:1 by 2006. Teachers’ knowledge and mastery of the curriculum has also improved through the preservice and inservice teacher training interventions. The proportion of Grade A teachers increased from 46 percent in 1999 to 58 percent in
However, greater numbers of qualified teachers are still needed (World Bank 2005b). The PEDP program has strengthened education institutional capacity and management, as indicated by the enhanced capacity of the Ministry of Education and Culture to provide policy and guidelines and monitor education delivery. The PEDP has led to decentralized primary education, and has also strengthened community participation and school-level management and accountability. Resource availability and utilization has also been improved, as measured by increased nonsalary expenditures in the primary school budget.

Tanzania has one of the lowest net enrollment ratios for secondary education in sub-Saharan Africa. Only about 9 percent of the relevant age group attends secondary education compared with an average of 27 percent for sub-Saharan Africa in year 2000, including about 11 percent at lower secondary and less than 2 percent at upper secondary. Only 22 percent of primary school leavers in Tanzania have a chance to continue their education at the secondary level, compared with 50 percent in Uganda in 2001. Secondary enrollment ratios are low for all population groups, but especially for low-income youth and students in rural areas. Few government schools have been established and inadequate incentives exist to provide nongovernmental schools in rural communities because households are unable to pay the fees (World Bank 2004e).

There are three main challenges facing Tanzania in secondary education: increasing access, raising quality, and reducing costs. In order to support reforms in secondary education, the government has launched the Secondary Education Development Program (SEDP), which has among its aims the following: increasing the proportion of the relevant age group completing lower and upper secondary education; expanding enrollments with equity; improving learning outcomes of students, especially girls; and enabling the public administration to manage secondary education more effectively. In order to expand enrollments with equity the SEDP includes measures to make more efficient use of resources, provide development grants to schools and communities (mainly in underserved areas), expand the teacher supply, lower household costs for secondary education and expand the scholarship program for students from poor families, and enhance the partnership with the nongovernmental sector. The program for quality improvement includes reforms of curricula and examinations, provision of textbooks and teaching materials through capitation grants to schools, and quality improvements in preservice teacher training together with the establishment of a system for professional inservice teacher development. SEDP also includes institutional reforms and capacity building at central, region, district, and school levels for more efficient operation of the secondary education system.

The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) monitors and evaluates the quality of education in selected southern and east African countries. The SACMEQ II Project (2000–2003) has been completed in 14 countries: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, and Zambia. The results of SACMEQ II show high reading and math score results for primary schools in Tanzania compared to other countries. In reading, Tanzania is placed third of 14 countries, behind Seychelles and Kenya (Figure 9), while on math scores, Tanzania is in fifth place, behind Mauritius, Kenya, Seychelles, and Mozambique (Figure 10).

\[17\] For more information, go to: http://www.sacmeq.org/.
Tanzania should also try to integrate some of the new international practices into its education system. These practices include learning from the experience of countries that have participated in international assessments such as the Trends in International Mathematics and Science Study (TIMSS). In 2007, the TIMSS will include some countries from SSA such as Botswana, Djibouti, Ghana, and South Africa. In addition, even though assessments such as the OECD’s Programme for International Student Assessment (PISA) and the International Adult Literacy Survey (IALS) mostly pertain to developed countries, they do provide valuable insights for developing countries on the types of skills that are needed by students to effectively participate in the knowledge economy. (See Annex 3 for information on these assessments).

Tanzania’s performance in tertiary education is very weak. Tertiary GERs stood at 0.94 percent in 2002 compared to 3.24 percent for Uganda in 2002 and 2.9 percent for Kenya in 2001, whereas Botswana and South Africa had tertiary GERs of 4.69 and 15.05 percent, respectively, in 2002. The 1990s saw the inception of the Institutional Transformation Program at Tanzania’s University of Dar Es Salaam (UDSM), which led to a surge in enrollment from 3,164 in 1993–94 to 6,846 in 2000–01 and 14,221 in 2003–04. Female students comprised about 30 percent of total student population in 2003–04 (Cooksey, Levey, and Mkunde 2001). In April 2001 an Education Fund was established in Tanzania to sponsor the higher education of children from very poor families (EIU 2004b). A number of departments at UDSM have changed their course offerings and moved in the direction of demand-driven courses. Extensive computerization of the campus has been completed in recent years. UDSM is considered by many to be in the top echelon of African universities. In fact, the World Universities Ranking 2005 by Internet Lab (Aduda 2005) placed UDSM 13th among the top 100 African universities and 2,576th in the world. The University of Nairobi was ranked 24th in Africa and 4,385th globally. In the last 10 years, private universities have emerged in Tanzania. Today the country has nine private universities, mostly of denominational nature and small in size, which award diplomas in areas such as financial and business management, wildlife management, community development, social welfare and cooperatives, and transport and media operations (ESRF 2002).

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18 TIMSS 2003: See [http://timss.bc.edu/timss2003i/conference_IR.html](http://timss.bc.edu/timss2003i/conference_IR.html); PISA 2003: See [http://www.pisa.oecd.org/pages/0,2987,en_32252351_32235731_1_1_1_1_1,00.html](http://www.pisa.oecd.org/pages/0,2987,en_32252351_32235731_1_1_1_1_1,00.html); IALS: See [http://www1.oecd.org/publications/e-book/8100051e.pdf](http://www1.oecd.org/publications/e-book/8100051e.pdf).

19 These statistics should be viewed cautiously, because the countries’ systems of post-secondary education differ. Tanzania has many students enrolled in post-secondary nonuniversity courses; perhaps these are not counted in the official statistics.
Analysis of the Integrated Labor Force Survey data (Figure 11) suggest that marginal returns to education are around 8 percent for every year of primary education, but increase sharply for additional years of lower secondary education. This data provides strong support for government’s investment in expanding primary education and the current focus on secondary education.

**Figure 11: Marginal Social Returns Per Year of Education Based on the Integrated Labor Force Survey**

![Figure 11: Marginal Social Returns Per Year of Education Based on the Integrated Labor Force Survey](image)

*Source:* Authors’ calculation based on World Bank (2004e).

Analysis suggests that marginal returns to education in the manufacturing sector increase significantly for higher education (Soderbom et al. 2004) (see Figure 12).
Figure 12. Predicted Earnings in the Manufacturing Sector Based on Firm Surveys


Note: The different lines (years 1-4) represent data from different RPED surveys in which workers have been split into old and young cohorts. The Regional Program on Enterprise Development (RPED), Africa Region, World Bank, is an ongoing research project with the overall purpose of generating business knowledge and policy advice useful to private sector manufacturing development in sub-Saharan Africa.

These estimates do not take into account the cost of education, which is typically significantly higher for tertiary education. The difference in the profile of marginal social returns to education for workers in the manufacturing sector and the overall labor force may suggest that at the tertiary level there are certain degree programs that are well rewarded by the manufacturing sector, but that many other degree programs result in lower-paying jobs. A logical policy response would be to shift the supply of higher education to those programs that seem to be in demand by the manufacturing sector. The difference in the profiles of social returns to education also suggests that while a limited supply of workers with relevant tertiary education is a constraint for manufacturing, for other sectors the limited supply of Tanzanians with secondary skills may be even more of a constraint.

The government has been the major financier of technical/vocational education and training (TVET) in Tanzania, with assistance from donors. But the TVET system faces several problems, including inefficient resource utilization, inequitable distribution of educational opportunities, poor labor market linkages, and a lack of coordination between donors and the government. The unsustainable costs of training appear to be caused by low capacity utilization and low student-to-faculty ratios. Also, the distribution of education opportunities is inequitable and is biased towards primary schools enrolling students from wealthier backgrounds. Recognizing that the TVET system had failed to produce graduates who were suited for the labor market, policy changes were introduced in 1996 that emphasized the government’s continued responsibility in the provision and financing of more and better basic education. This emphasis was coupled with a reduction in untargeted subsidies through increased cost sharing, liberalization of private education and training at all levels, and decentralization of authority. The Vocational Training and Education Authority (VETA) that was set up in 1994 is working to ensure that training is responsive to the labor market (Gill and Dar 1998).
Brain Drain

Africa is a capital-scarce region and loss of this limited resource is widely considered detrimental to sustained growth and development. There is an analogous problem with human capital. Weakness in human capital and particularly skill deficiency is a drag on investment and growth in Africa. Progress in overcoming shortages of skilled and trained manpower seems to be disappointingly slow, despite substantial resources devoted by governments and donors during the last three decades. This deficiency persists at a time when Africa is losing a very significant proportion of its skilled and professional manpower to other markets and is increasingly depending on expatriates for many vital functions. Although African immigration to the developed world is comparatively low, a high proportion of its migrants are highly skilled professionals. For example, it has been estimated that for some African countries more than 30 percent of their highly skilled professionals are lost to the OECD countries. Nearly 88 percent of adults who emigrate from Africa to the United States have a high school education or higher. There are more African scientists and engineers working in the United States than there are in Africa. The UNECA estimates that between 1960 and 1989, some 127,000 highly qualified African professionals left the continent (Tebeje 2005). The emigration of technically skilled people has left some 20,000 scientists and engineers in Africa servicing 600 million people. Box 7 discusses some ways of dealing with human capital flight from Africa to the developed world (Ndulu 2001).

Tanzania is no stranger to the brain drain phenomenon. The most vulnerable occupations at the national level include medicine, accountancy, law, engineering, and science-based occupations. Data from two premier institutions of higher learning provide a proxy of this phenomenon. Out of a teaching staff of about 861, about 149 or 17.3 percent left UDSM between 1990 and March 2002. The majority of those who left were from the Faculty of Arts and Social Sciences (38), followed by Medicine (17), Engineering (13), Law (11), Science (10), and Commerce (9). The ranks at which most of them exited were Lecturer and Senior Lecturer. The same was the case at the Sokoine University of Agriculture. Of a staff of 239 people, about 50 or 21 percent, left in the same period (1990–2002). Again the majority that left were either Lecturers or Senior Lecturers (ESRF 2002).

Tanzania is also facing a massive loss of skills in the field of medicine, especially of doctors and scientists. Low salaries for doctors are the principle reason for the brain drain. The doctors that remain seek higher wages in private hospitals in large urban centers, leading to a lack of doctors in some of the country’s district hospitals. In a bid to increase the number of health professionals in the country, the Tanzanian government has recently promised to cover all training costs for medical students in both public and private universities (Balile 2003).

Box 7: Human Capital Flight from Africa

The African brain drain is manifested predominantly as a growing emigration of high-skill workers to exploit opportunities abroad. The region is losing its talent because it cannot remunerate, preserve, and utilize this talent effectively. Low productivity in the economy and sluggish job growth are largely behind the low rates of return to investment in tertiary education. Coupled with this are risks of professional atrophy because of lack of interaction with peers at the professional frontier. In the absence of a vibrant private sector to absorb talent, demand for it will remain low and rates of returns in the local market are likely to stagnate at the current low levels. Political risks and civil unrest militate against retention of skilled workers trained locally or repatriation of those trained abroad. The problem is set to intensify in the foreseeable future because of the intensification of the globalization process and reduced cost of movement.

While individual countries may take measures to reverse human capital flight, a collective initiative including enhanced labor mobility within the region would probably increase retention of skilled personnel. Such efforts could be enhanced by expanding growth opportunities at home and easier interaction with peers through profes-
Dealing with human capital flight from Africa requires actions on many fronts, including the following:

- Raise the demand for knowledge at home through private sector growth and professionalization of the public sector. The ongoing transition towards a private sector-led, market-oriented economy in many African countries, if durable, bodes well for shifting the incentive structure in favor of scarce talent. Second-generation civil service reforms that aim to reintroduce meritocracy in public service also can have positive effects on the demand for skilled and professional employees. A direct effect will be a rise in the demand for professionals, higher-quality education at entry into public service, and further training on the job. An indirect effect will be the beneficial impact of improved governance on private investment.

- Adapt the tertiary education system to the challenge of containing human capital flight. This requires a more market-oriented approach for the delivery of tertiary education. Although encouraging changes are taking place at private institutions, the bigger challenge is for traditional public-funded universities to be both cost efficient and responsive to the changing needs of their clientele. The following steps can help meet the challenge of efficient, responsive tertiary education:
  - Sharpen the responsiveness of traditional universities in Africa to the rapidly changing needs of society and subject their programs to global pressures for excellence. Makerere University in Uganda offers an innovative example: it is transitioning from a traditional, elitist, predominantly publicly financed institution to a more market-oriented institution funded largely by private resources.
  - Rationalize the tertiary education system by opening more private universities and other private tertiary institutions. Private institutions are often responsive to the increasing demands for nonconventional and nonacademic courses that address local needs and employment opportunities.
  - Increase quality control and independent certification in the tertiary education system. This includes progressive movement towards applying international standards in the certification process. International certification standards would help create a local pool of world-class talent, which in turn would encourage and sustain the relocation of multinational corporation to the region and would raise returns to tertiary graduates.
  - Encourage regional and subregional collaboration, for example by supporting and sustaining the emerging regional and subregional research and training networks. Regional networks are a rational and cost-effective way to support the capacity building of national institutions and also provide a platform for professional peer review and support.
  - Increase the cost-effectiveness of delivery of tertiary education. Cost effectiveness is necessary if tertiary institutions are to survive in the midst of strong local and world-wide competition.

- Adopt strategies for reversing brain drain, including assisted permanent return, recruitment of African talent in the Diaspora, and recruitment of qualified African emigrants in technical assistance schemes. In terms of involving Africans in the Diaspora, it is important to design schemes that allow skilled Africans working abroad to contribute to the development of their home countries without giving up the higher wages and better living standards that their current permanent residence affords. This approach will also enable the large number of African intellectuals and intellectual communities abroad to participate more actively in strengthening the capacity for quality education and training in the region.

Recently, scientists and professionals in the African Diaspora and their counterparts back home teamed up to establish a world-class African Institute for Science and Technology (AIST). AIST is rooted in strong public-private and industry-academy partnerships, which should be conducive to long-term sustainability. AIST is a global effort to foster Sub-Saharan Africa’s economic growth and diversification, industrial development, and employment creation through the promotion of excellence in science, engineering, and their applications based on competitive processes, transparency, and accountability. The institute which will form the nucleus of the Nelson Mandela Foundation for Knowledge Building and the Advancement of Science and Technology.

Source: Ndulu (2001); Aderinokun (2005).
Threat of HIV/AIDS

HIV/AIDS poses significant threat to human resource development in Tanzania. It is estimated that 3 million people including children currently are infected with the disease. It is established that the widespread HIV/AIDS epidemic has substantial slowed economic growth and productivity. Previous studies that focused on Africa calculated the annual loss of GDP growth to range between a modest 0.3 percent to a high of 1.5 percent. But a new report argues that the costs are likely to be much higher. Previous estimates overlooked the impact of HIV/AIDS on children if one or both parents die. Countries facing an HIV/AIDS epidemic on the same scale as South Africa, for example, could see family incomes cut in half and could face economic collapse within several generations if swift action is not taken (Bell, Gersbach, and Devarajan 2003). Tanzania therefore needs to continue taking steps to curb the scourge of HIV/AIDS.

A recent article by Hazlewood and Prakash (2005) reiterates the fact that Tanzania faces an acute shortage of health care workers. Low pay, poor working conditions, and limited training programs contribute to the problem, which is exacerbated by the rising burden of treating HIV/AIDS patients. Hazlewood and Prakash estimate that Tanzania will have to find nearly 10,000 more workers to address the rising needs of HIV/AIDS patients and three times that number to meet the Millennium Development Goals (Figure 13). Improving the productivity of individual health care workers and of the health care system as a whole could increase Tanzania’s capacity by two-thirds, even without hiring additional staff. Some improvements, such as telephones and motorbikes for better communication, would be relatively easy to make; others such as better management of the flow of patients and the implementation of planning and accounting tools would require more investment and training. New investment and training would require health organizations and the government increase the capacity of their training programs by at least half to ensure a sustainable workforce. Also, they would need to aggressively recruit trained staff to alleviate the immediate shortages.

Figure 13: Projected Shortfall of Health Care Workers in Tanzania

![Figure 13: Projected Shortfall of Health Care Workers in Tanzania](image)

Pillar 3: Information and Communication Technologies (ICT)

Rapid advances in ICT are dramatically affecting economic and social activities, as well as the acquisition, creation, dissemination, and use of knowledge. Advances in ICT also are affecting the way in which manufacturers, service providers, and governments are organized and how they perform their functions. As knowledge becomes an increasingly important element of competitiveness, the use of ICT is reducing barriers of cost, time, and space to economic transactions, allowing the mass production of customized goods and services and compensating for limited factors of production.

The pervasive and global ICT revolution is disrupting all kinds of relationships, helping build new types of organizations, widening the knowledge and productivity gap, and posing serious risks for the unprepared. Some countries are concerned about being left behind (the “digital divide”) and others are inspired by the opportunities to leapfrog and participate in the new knowledge industries. To avoid being left behind, countries must harness the full potential of ICT and use it to improve education and innovation, public sector management, private sector competitiveness, and capacity building.

Research shows strong linkages between ICT and growth. Compelling evidence supports the observation that strengthening the telecommunications infrastructure and service is pivotal in promoting trade and economic growth. It is estimated, for example, that a 10 percent decrease in the bilateral price of phone calls is associated with an 8 percent increase in bilateral trade (Fink, Mattoo, and Neagu 2002). A developing country which between 1996 and 2003 put into service an average of 10 additional mobile phones per 100 inhabitants would have 0.59 percent higher per capita GDP growth than an otherwise identical country (Vodafone 2005). In Africa, significant evidence exists to suggest that if telephone growth rate were 10 percent instead of 5 percent (and growth in electricity generation was 6 percent instead of 2 percent), the increase in Africa’s growth rate would be at least 0.9 percent higher (Estache 2005).

The information infrastructure in a country consists of telecommunications networks, strategic information systems, policy and legal frameworks affecting system deployment, and skilled human resources needed to develop and use information systems. Tanzania, Kenya, and Uganda are all at a very nascent stage of ICT application and use. It is not surprising that all three countries lag Botswana, South Africa, and Malaysia by a huge margin, as shown in Figure 14. The figure also shows that Mauritius has been doing better than South Africa and Botswana on telephony and personal computer penetration and is close to the level of Malaysia. In the case of Internet hosts, South Africa and Malaysia are the undisputed leaders.
Figure 14: ICT Infrastructure: Telephones, Personal Computers and Internet Hosts

**Telephones (Mainlines and Mobile Phones)**

Per 1,000 persons

- Tanzania
- Ghana
- Kenya
- Uganda
- Botswana
- Mauritius
- Malaysia
- South Africa

(Figure 14 continues on next page)

**Personal Computers**

Per 1,000 persons

- Tanzania
- Ghana
- Kenya
- Uganda
- Botswana
- Mauritius
- Malaysia
- South Africa

(Figure 14 continues on next page)
A 2005 report by the United Nations Conference on Trade and Development (UNCTAD) provides some insights into the international digital divide and evaluates ICT development using a range of indicators to benchmark connectivity, access, ICT policy, and overall ICT diffusion in 165 countries. In the benchmarking analysis, OECD countries continue to dominate the upper rankings, while South Asian and African countries occupy the lower half of the rankings. The more developed African countries enter the rankings relatively early, with Mauritius in 52nd place and South Africa in 66th Place. Botswana ranks 80th, Kenya ranks 115th, Tanzania ranks 135th, and Uganda ranks 154th. These rankings indicate that many SSA countries have a considerable way to go in terms of ICT connectivity and diffusion (UNCTAD 2005a).

However, in recent years Tanzania has been making some progress in ICT. In 2003, it published a cross-sectoral National ICT Policy (www.moct.go.tz/ict) that relates ICT to relevant sectors of the economy such as education, manufacturing, health, and tourism. It was developed in response to the poor harmonization of initiatives that has led to random adoption of different systems and standards, unnecessary duplication of effort, and waste of scarce resources, especially through the loss of potential synergies. The policy notes that weak ICT infrastructure and the lack of adequately trained and skilled personnel are the main barriers to increased adoption of ICT in Tanzania. The policy is designed to correct these weaknesses and is a broad-based national strategy that addresses Tanzania’s developmental agenda, and calls for the creation of appropriate institutional arrangements to ensure that all stakeholders can rise to the challenge of implementing the ICT policy. It is worth mentioning that stakeholder discussions on ICT policy and related issues were held mainly through an e-mail list or e-think tank comprising representatives from government, private sector, and civil society.


(Figure 14 concluded)
The policy and legal and regulatory framework for Tanzania’s telecom sector encourages private sector participation. This sector is regulated by the Tanzania Communications Regulatory Authority (TCRA, formerly, TCC). The performance of Tanzanian Telecommunications Company (TTCL) has improved considerably since February 2001, when a Dutch-German consortium, MSI, took a 35 percent stake in the company. The remaining shares were allocated to local financial institutions (14 percent), international financial institutions (10 percent), and TTCL employees (5 percent). The government retained a 36 percent stake. At present TTCL has around 250,000 operational lines (EIU 2004b).

Sector liberalization and the privatization of TTCL has had a significant impact on market dynamics, particularly in the supply of telecommunication services. Market revenues grew from US$143 million in 1998 to US$389 in 2003 and the compound annual growth rate rose to 19 percent in 2003. Overall teledensity grew from 0.3 in 1998 to 2.57 in 2003. The mobile market has grown almost 21 percent annually since liberalization and there has been growth in competition, new products, and services.

Benchmarking of Tanzania against other countries in the same region shows the need for further sector reform. Despite the competition, tariffs remain high and teledensity in Tanzania is one of the lowest in the Southern African Development Community, in part because of the poor interconnection framework, the lack of regulatory independence, and other issues such as lack of infrastructure sharing. In general, the country’s postal and telecommunications services are weak and provision of telephone lines (fixed lines) has been meager. An inadequate regulatory framework persists, and competition has been hampered by various issues such as inadequate interconnection agreements/directives, high fees and royalties levied by the TCRA, and the absence or nontransparency of regulatory oversight.

However, progress has been made under the 1997 National Telecommunications Policy, and this trend is expected to continue. Significant liberalization has also taken place in various segments and private operators are now providing basic, mobile, data, paging, Internet, payphone, and other value-added services. For example, the mobile telephone market in Tanzania has a number of operators, is fully competitive, and is growing rapidly. New mobile operators have committed significant financial resources to the development of a state-of-the-art telecommunications infrastructure and the recruitment of mobile subscribers. There are four providers operating under 15-year licences: MIC Tanzania, Zanzibar Telecoms, Vodacom, and Celtel. There are now more mobile subscriptions than fixed lines; this cross-over point was reached in 2000 (just five years after the first mobile was sold).

Table 3 shows that overall teledensity—mainlines plus mobile phones—grew to 24 phones per 1,000 inhabitants between 1996 and 2003. Tanzania’s mainline and mobile phone penetration is higher than that in Uganda.

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21 For example, Draka Comteq, which consists of 11 companies in Denmark, Finland, France, Germany, Netherlands, Norway, the United Kingdom, the United States, and Singapore, has recently won an approximately US$30 million turnkey project in Tanzania. The project involves the supply and installation of two long-distance links, covering some 2,300 kilometers of optical fiber cable and 500 kilometers of optical power ground wire. (Source: EIU 2004a.)
Table 3: ICT Indicators for Tanzania and Comparators

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<td>Mainlines</td>
<td>Mobile</td>
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<td>Televisions</td>
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<td>(per 1,000)</td>
<td>telephones</td>
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<td>Botswana</td>
<td>87</td>
<td>241</td>
<td>150</td>
<td>44</td>
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<td>Kenya</td>
<td>10</td>
<td>42</td>
<td>221</td>
<td>26</td>
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<tr>
<td>South Africa</td>
<td>107</td>
<td>304</td>
<td>336</td>
<td>177</td>
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<tr>
<td>Tanzania</td>
<td>5</td>
<td>19</td>
<td>406</td>
<td>4</td>
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<td>Uganda</td>
<td>2</td>
<td>16</td>
<td>122</td>
<td>18</td>
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<tr>
<td>Sub-Saharan</td>
<td>15</td>
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<td>198</td>
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There are also several studies documenting the improvement in prices received by farmers as a result of better access to telephony in general and mobile phones in particular in developing countries in Asia and Africa. One example is the case of fishermen in India who use mobile phones to get information about prices at different ports before deciding where to land their catch. This example was confirmed in a study done by Vodafone of fishermen on Mafia Island, off the Tanzanian coast (Vodafone 2005) as well as on the island of Zanzibar (Box 8). Anecdotal evidence also exists that traders in Dar es Salaam now can place orders with producers of bananas throughout the country, thus linking demand and supply in real time and enhancing the efficiency of markets.

Box 8: Mobile Phones in Tanzania

Mobile use in Tanzania and across Africa is gaining momentum and users continue to show creativity in using the devices. Some 97 percent of Tanzanians say they can access a mobile phone and it is interesting how those phones are being used. On the island of Zanzibar, for example, where fishing is one of the mainstays of the economy, many fishermen now carry mobile phones while they are at sea, and they use them to check market prices. If there are too many fish in Zanzibar, they go to Dar es Salaam to get better prices. Phones also serve another even more vital use—allowing fishermen in trouble to call for assistance.

Mobile phone call centers have sprung up all over Tanzania. Most people do not actually own phones, so this is how many people communicate. Others have developed even simpler businesses based around mobiles, such as reselling their air time or sending and receiving text messages. Mobile phones seem to have created a new sector of the economy and some now wonder if the emphasis on the Internet when considering the digital divide was wrongheaded.

On Zanzibar, the latest product by the island’s cell phone operator, Zantel, is a fixed-style phone for homes that will not be connected by copper wire or even fiber optics. Zantel is thinking about providing service through CDMA wireless technology. This is a very useful and effective technology that is much faster than copper wiring. Zantel has recently been granted a license to extend service nationwide. To extend their network across the country will cost just half a billion dollars. Even without expansion, Zantel’s subscriber base has been growing 25 percent per year.

Source: Hancock (2005).
The 2005 Vodafone report includes research on the social and economic impacts of mobiles. This research was compiled from the results of surveys on the use of mobiles carried out in rural communities in South Africa and Tanzania; surveys of small businesses in Egypt and South Africa were also consulted. The community surveys assess factors affecting mobile use and the range of potential impacts in relatively poor rural African communities. The surveys suggest that mobile telephony is frequently accessed by the poorest people, thanks in part to widespread sharing. The surveys suggest that gender, age, education, and even the absence of electricity do not present insurmountable barriers to access. Individuals surveyed in rural communities highlighted savings in travel time and costs and easier communication with family and friends, in addition to access to business information and easier job searches. A majority of small businesses reported increased sales and profits, time savings, and greater efficiency. The surveys also present important conclusions about social capital or the strength of social networks and contacts in the rural communities. Mobile phone ownership was positively linked to life satisfaction and a willingness to help others. A majority of respondents said owning a mobile had improved their relationship with family members living elsewhere.

Thus, according to three articles in the Economist (2005a, 2005b; 2005c), mobile phones have tremendous potential to help boost entrepreneurship and economic activity. The phones provide an alternative to bad roads and unreliable postal services, widen farmers’ access to markets, and allow swift and secure transfers of money. But the primary obstacle to wider adoption is the cost of handsets. In the developed world, phones typically cost around $200 (though most users pay less thanks to subsidies from network operators) or less than 1 percent of the average income per person. In the developing world, a $50 handset would account for 14 percent of the annual income of someone earning $1 a day. So the first step in promoting the adoption of mobile phones is to reduce the cost of the handsets. Several such schemes are under way. Motorola, for example, has agreed to supply up to 6 million handsets for less than $40 each (see Economist 2005b). Industry observers believe cheaper handsets could expand the market by as many as 150 million new subscribers a year. As well as boosting economic development in poor countries, this will help to close the “digital divide” between the communications-rich and communications-poor.

Tanzania has comprehensive Internet service, including 3 licensed data-service providers and 21 Internet service providers. Most Internet users access the Internet from urban Internet cafes—the Internet is not much present in rural areas. Tanzania in 2003 had almost double the number of Internet users (240,000) as Uganda (125,000). The government has also developed a fairly comprehensive national Website (http://www.tanzania.go.tz/), which provides considerable background information on the economy and the political structure of the country; it hopes that the site will help to raise the country’s international profile and attract foreign investment. In addition to the national Website, a number of ministries, state institutions, and embassies have their own sites.

In terms of developing human resources in IT, training centers that focus on the development of ICT knowledge workers are only now beginning to emerge. For example, the Soft Tech Training Center, established in 1993, is committed to the development of local expertise through ICT skills enhancement. The government has also initiated plans to encourage Tanzanians to develop content that is relevant to local interests, and Tanzania has implemented several ICT applications relevant to its national objectives. Examples of such applications include an information system to strengthen the capacity of wildlife institutions and a computerized case-flow management system that has facilitated an increase in transparency and professionalism in the judiciary system (Accenture, Markle Foundation, and UNDP, 2001).
Pillar 4: Innovation System

The innovation system in any country consists of the institutions, rules, and procedures that affect how it acquires, creates, disseminates, and uses knowledge. Innovation in a developing country concerns not just the domestic development of frontier-based knowledge. It also encompasses the application and use of existing knowledge in the local context, and requires a climate favorable to entrepreneurs. Such a climate is free from bureaucratic, regulatory, and other obstacles and fosters interaction between the local and global business world, as well as between global and local sources of knowledge. These knowledge sources include traditional establishments such as universities and public laboratories, as well as users, think tanks, industrial milieu, indigenous communities, and so on. Innovation systems comprise the interactions among these entities and they are more or less complex and sophisticated depending on the level of a country’s development. As an economy develops, the role played by domestic research capabilities naturally tends to increase, whereas in low-income countries innovation is much dependant on foreign technology and its adaptation to the local context.

Innovation in the context of developing countries thus needs to be understood in a broad way: it consists of the design, development, and diffusion of a technology (or a practice) which is new for the society concerned. Innovation needs and opportunities can be discussed at three main levels: the first level is the local improvements through adoption of available technologies; the second level relates to the development of competitive industries through adaptation of technologies (initially produced in or by developed countries); and the third level is developing brand new innovations of global significance. Innovation policies in developing countries must primarily deal with the building of an appropriate technical culture and the establishment of incentives to stimulate cooperation and entrepreneurship. Innovation often begins with demonstration projects that aim to creating trust among the key actors and to facilitate reforms. It is a long-term process and generally takes a decade or so to begin bearing fruits in terms of job and wealth creation or other benefits.

There are various ways that countries can strengthen their innovation systems. An important channel is tapping into global knowledge through trade, foreign investment, and technology transfer. Countries need to create and adapt knowledge, and a primary way of doing so is to harness knowledge from specialized research institutions to meet the productive needs of the economy. Along with knowledge creation, knowledge dissemination can lead to the growth of more efficient enterprises and the growth of technical services and information such as agricultural extension services.

Tanzania and other countries in sub-Saharan Africa have a long way to go in terms of technology creation. Their progress or lack of can be measured by variables such as patents granted to residents, receipts of royalties and license fees, the diffusion of recent innovations through channels such as the Internet, and high- and medium-technology exports. Countries also need to strengthen their human skill base; one measure of skills strength is the gross tertiary science enrollment ratio.

Tanzania spends about 0.2 percent of GDP on R&D. This figure is not significantly different from average R&D expenditure in sub-Saharan Africa, estimated at 0.5 percent of GDP (UNESCO Institute for Statistics 2001). R&D activities in the agricultural sector have had some success in developing high-yielding and disease-resistant varieties of crops, as well as in creating technologies for increasing crop productivity through soil and water management.22

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22 The Bank’s Second Tanzania Agricultural Research Project (TARP) aims at increasing efficiency and productivity of crops and livestock production systems with sustainable use of natural resources, focusing on the needs of the small-holder sector. The project consists of three components. First, strengthen the agricultural research system. This will result in more effective and efficient agricultural research institutions and will also produce an
In terms of outputs of the innovation system, from 1988 to 2001 the number of scientific articles published worldwide grew by 40 percent. Africa failed to keep pace with this growth, and its publication counts actually declined by 12 percent in absolute terms. In 1988, Africa accounted for 1.26 percent of all scientific publications; by 2001 its share was only 0.76 percent (Juma 2005).

A review of Tanzania’s policies shows a high commitment to science and technology in development, but it needs to develop effective public-private partnerships. In the past, Tanzania had no deliberate strategies or plans for appropriate selection, acquisition, and transfer of technology or for effective integration of imported technologies with local capacity for R&D. However, efforts have been put into place over the years to make sure that the speed of technology transfer is effective and sustainable in the economy. Tanzania enacted the first National Science and Technology policy in 1985, which was subsequently revised in 1995. The major thrust of this policy is to establish relative priorities and programs to generate new knowledge and to determine strategies for science and technology development in Tanzania. Tanzania also established the Tanzania Commission for Science and Technology (COSTECH) in 1986 and the Centre for the Development and Transfer of Technology (CDTT) in 1994 in an effort to institute workable mechanisms for coordination of capacity building efforts, adoption of new technologies, strengthening R&D, and facilitating information exchange and extension services.23

While these are laudable initiatives, the reality is that these institutions, especially the CDTT, lack adequate resources, infrastructure, equipment, and trained personnel to respond to the increased needs of the local entrepreneurial society. Their support from the government is decreasing, which has led COSTECH and CDTT to undertaking reforms to become independent executive agencies. The agencies are also look for profitable new lines of businesses that could enable them to meet their personnel and operational expenses. This trend is worrying as it could hinder these institutions from conducting unremunerated research that could be beneficial to the society as a whole.

In Tanzania there are currently about 63 R&D institutions. This includes institutions that study agriculture (including livestock and forestry) (28), industry (11), medical (11), and wildlife and fisheries (4), as well as universities and other higher learning institutions (9) (ESRF 2002). Most of these are government institutions that conduct scientific research and design and manufacture machinery and equipment for agriculture, as well as researching appropriate technologies for rural, small, and medium-scale industrial enterprises. However, these government institutions do not provide good incentives for R&D; as a result, few researchers pursue R&D activities.

effective arrangement for donor coordination and for coordinating regional and other collaborative research programs. Second, improve the organization and management of agricultural research. This will provide demand-driven, client oriented research, encourage efforts to introduce participatory techniques, and create guidelines for small-farmer oriented and gender-sensitive research. Third, increase human resource development. This will produce more research personnel for needed disciplines and will also strengthen financial management and information services. The Implementation Completion Report for this project, currently under development, should provide insight on the success in achieving the above objectives.

23 For more information, see the Science and Technology Section of the Tanzania Country Profile on Tanzania’s national Website: http://www.tanzania.go.tz/science_technology.html. According to this Website, Tanzania’s science and technology infrastructure includes education infrastructure and R&D institutions, such as the University of Dar es Salaam, Sokoke University of Agriculture, University College of Lands and Architectural studies, Muhimbili University College of Health Science, Rwegalulira Water Resources Institute, National College of Mbeya, Arusha, and Dar es Salaam Institute of Technology.
A recent paper on innovation in Tanzania (Goedhuys 2005) sheds light on the various sources of firm learning, investment, and collaboration and their relative importance for product innovation. The paper uses using firm level data on learning and product innovation in Tanzanian manufacturing and commercial farming. The results indicate that larger and foreign-owned firms invest significantly more in human and physical capital than do local microenterprises or small-, and medium-size enterprises (SMEs) and they are better connected to the Internet. Their ways of upgrading technology also reveal a better financial endowment. SMEs on the other hand report more intensive collaboration with other local firms on product development, marketing, and on the input market and upgrade technology. The collaboration takes place through in-house activities, imitation, and cooperation with suppliers and universities. Through collaboration, SMEs are able to offset the scale disadvantages they face in competing for market information and for new machinery and specialized labor necessary for product innovation in imperfect markets. Box 9 provides information on key initiatives in Tanzania aimed at financing SMEs.

**Box 9: SME Development in Tanzania—Key Initiatives**

There are three key initiatives in Tanzania aimed at financing small and medium sized enterprises (SMEs): the Small Industries Development Organization (SIDO), the National Microfinance Bank (NMB), and the newly established SME Credit Guarantee Scheme. SIDO remains the main government arm for promoting SMEs in Tanzania. Some of the key measures employed by SIDO include: the construction of 16 industrial estates with more than 140 sheds at regional headquarters; the establishment of 10 training-cum-production centers that offer simple rural-based technologies; the introduction of lease-purchase programs through which more than 2,000 entrepreneurs were assisted with machines and working tools; and the creation of feasibility studies. In collaboration with other stakeholders, SIDO supported the establishment of SME associations to empower the private sector. The Tanzania Food Processors Association (TAFOPA) and the Tanzania Small Industries organization (TASISO) are probably the two most prominent SME associations.

In April 2003, the government of Tanzania adopted, under the leadership of the Ministry of Industry and Trade, a comprehensive SME Development Policy. The SME Development Policy focuses on three main areas: (i) the creation of a supportive business environment; (ii) development of financial and nonfinancial services; and (iii) creation of an appropriate institutional infrastructure. The SME Development Policy takes into account the special constraints and opportunities faced by SMEs and aims to strengthen institutions that will address these constraints.

*Source:* OECD Development Centre (2005).

In 2001, the UNDP’s Human Development Report introduced the Technology Achievement Index (TAI), which tries to captures how well a country is creating and diffusing technology and building a human skill base, and thus reflecting capacity to participate in the technological innovations of the network age. This composite index is not a measure of which country is leading in global technology development, but focuses on how well the country as a whole is participating in creating and using technology. A good example is the comparative TAI rank of the United States, global technology powerhouse, and Finland. The United States has far more inventions and Internet hosts in total than does Finland, but does not rank as highly in the TAI because in Finland the Internet is more widely diffused and more is being done to develop a technological skill base throughout the population. The TAI thus recognizes that technological achievements are a large and complex issue.

However, it should be stressed that the TAI is constructed using indicators, not direct measures, of a country’s achievements in four dimensions. It provides a rough summary—not a comprehensive
measure—of a society’s technological achievements. Many aspects of technology creation and diffusion and human skill levels are hard to quantify. And even if they could be quantified, a lack of reliable data makes it impossible to fully reflect them. For example, important technological innovations occur in the informal sector and in indigenous knowledge systems. But these are not recorded and cannot be quantified in the TAI.

Even though the TAI results are somewhat dated, they show three trends: a map of great disparities among countries, diversity and dynamism in technological progress among developing countries, and a map of technology hubs superimposed on countries at different levels of development. Two details of the trends are particularly noteworthy:

- The map of great disparities shows a group of four countries with TAI values ranging from 0.744 for Finland to 0.066 for Mozambique. These countries can be considered leaders, potential leaders, dynamic adopters, or marginalized.
- Tanzania and Kenya are both listed as marginalized (below 0.20), which means that technology diffusion and skill building have a long way to go in these countries, and that large parts of the population have not benefited from the diffusion of technology.

Mauritius provides an interesting example for African countries interested in diversifying their economies to become more productive and achieve faster growth. Traditionally, the strength of the Mauritian economy (the “Mauritian Miracle”) has rested on three pillars: sugar, export processing zones (EPZs), and tourism (Box 10). In the short to medium term these sectors will continue to grow, but Mauritius has realized the need to diversify and has embarked on an ambitious program to find new drivers for economic growth. The country is reengineering itself to move up the value chain and build a KE based on financial services and ICT. Measures are also being taken to modernize the sugar and EPZ sectors through higher productivity, better technology, and greater capitalization.

If Tanzania can learn from the successes and failures of other countries, it may be able to “leapfrog” its past economic performance.

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24 The World Bank has also recently undertaken work to unravel the “how to” of technological change and understand why some developing countries are able to catch up with developed countries while others lag and chart low-growth trajectories. Catching up involves accessing, learning, and applying the technological standards of developed countries; growing faster, generating better-paying jobs; and reducing poverty. The Bank work includes a series of studies that cover the extremes of the industrial spectrum: wheat and maize in India; salmon and wine in Chile, Nile perch in Uganda, oil palm in Malaysia, cut flowers in Kenya, medium-tech electronics in Malaysia, high-tech electronics in Taiwan, and software exports from India. The industries have been chosen based on exceptional comparative performance in the last decade, large contributions to overall growth, and for evidence that technological change played an important role in their success. For more information, go to: http://www-wbweb.worldbank.org/prem/prmep/economicpolicy/20050216.html.
Box 10: The Mauritian Miracle—Can Others Emulate It?

In 1961 James Meade, the 1977 recipient of the Nobel Prize in economics, made a dire prognosis on Mauritius’s development prospects. According to Meade, the country’s heavy economic dependence on one crop (sugar), vulnerability to trade shocks, rapid population growth, and ethnic tensions were all against the country’s economic success. In addition, Mauritius had a tropical climate and was farther from world markets than most African countries. Meade predicted that the outlook for peaceful development was poor, but history proved him wrong. It was partly openness to FDI and trade that brought about Mauritius’ success. Local investors were heavily involved in the export processing zone (EPZ). In 1984 only 12 percent of employment in the EPZ was accounted for by wholly foreign-owned firms. Mauritian nationals owned about 50 percent of the total equity of EPZ firms. And contrary to popular belief, Mauritius had a highly restrictive trade regime: exports were relatively open but imports were closed. What, then, led to the Mauritian miracle?

Mauritius ensured that the export sector was not adversely affected by the restrictive trade regime. Policy makers used several instruments to segregate the export sector from the import sector:

- Duty-free access was provided to all imported inputs, ensuring that the export sector was competitive in world markets.
- Tax incentives were provided to firms operating in the EPZ.

The labor market for the export sector was effectively segmented from the rest of the economy. Employers in the EPZ had great flexibility in discharging workers and paying overtime. A large proportion of workers in the EPZ were women, whose minimum wages were lower than those of the rest of the labor force. In the 1980s wages in the EPZ were 36–40 percent lower than in the rest of the economy.

Sound macroeconomic policies also helped the EPZ. Between 1973 and 2000 annual inflation averaged 7.8 percent, fiscal deficits were sustainable, and the exchange rate maintained the country’s export competitiveness. The rule of law prevailed and property rights were respected. The economy has grown at 5–6 percent a year for the past 20 years and unemployment fell to 1.5 percent by 1990. Mauritius was a poor country with per capita income of just $260 (in nominal terms) at the beginning of the 1960s. In 2005, Mauritian per capita income was about $3,800.

Two other factors facilitated the export-led growth. First, Mauritius enjoyed preferential access to U.S. and EU markets (for sugar and textiles and clothing). Second, ethnic diversity helped attract investment from the Far East and ensured participatory politics that in turn established a stable political environment.

Can other countries in Africa emulate Mauritius’s success? It may not be easy. Preferential trade margins for African countries are eroding in an increasingly globalized world. Nevertheless, Mauritius’s good macroeconomic environment and political stability—conditions that ensured success despite selective trade policies—are necessary ingredients for any economic success story.

5. Conclusions

The above analysis points to several ways that Tanzania could strengthen each of the four pillars of the KE. The challenge is to build on the progress made so far and to take advantage of the opportunities offered; continue to build the conditions for more effective creation, dissemination, and use of knowledge, both domestic and global; and take practical steps, driven by knowledge initiatives, to stimulate new forms of income and employment generation. The following provides a brief summary of some of the issues that need to be tackled in each of the four pillars.

**Economic and Institutional Regime:**

Though substantial progress has been made in this domain, the following actions are recommended:

- Further strengthen the overall regulatory framework, increase government effectiveness, and control corruption in Tanzania. As mentioned, the government has adopted a comprehensive National Anti-Corruption Strategy and Action Plan, which focuses on a variety of measures of measures to increase transparency and accountability.

- Improve the overall investment climate. High cost and limited availability of infrastructure services, barriers in human resources and the labor market, and red tape in the public sector are viewed as principal constraints to achieving even higher growth rates. There is a need to understand the strengths and weaknesses of Tanzania’s national business environment in order to reveal obstacles to its competitiveness.

- Enhance the current competition policy framework in order to attract more and better FDI. This includes eliminating barriers to entry that continue to deter foreign investment and limiting the contestability of most domestic markets (including administrative barriers, taxes, and trade policies), resolving competition issues in a few strategic sectors that have benefited from FDI over the past few years, and strengthening existing legal and institutional frameworks.

- Proactively disseminate the research and analysis performed in academic institutions to government and nongovernment players. Disseminating this research requires strengthening policy-making resources and institutions in Tanzania. Currently, ESRF and Research on Poverty Alleviation (REPOA) provide such analysis, but are also constrained in financial and human resource terms in their ability to deliver timely policy recommendations. In addition, these institutes also are being used by donors to conduct research on a wide range of areas, which reduces their ability to provide timely information to government on issues that are important for policy making. Box 11 discusses the role of policy institutes and think tanks in strengthening policy making in African countries.

- Encourage the donor community in Tanzania to integrate their support through a coordinated system to avoid overlaps and duplication; and help build the capacity of local Tanzanian project teams in various aspects of project management.

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25 For more information, see International Finance Corporation/World Bank (2002).
Box 11: Strengthening Policy Making in African Countries: The Role of Policy Institutes and Think Tanks

There is no doubt that most African countries urgently need to strengthen their policy-making resources. Outside of government, capacity for policy analysis resides in universities, academically oriented research institutes, and, more recently, national policy institutes. A 1994 study conducted by the African Economic Research Consortium (AERC) in eight sub-Saharan African countries found that most government and nongovernmental organizations did not possess their own in-house capacity for policy analysis, relying instead on the institutions mentioned above. A more worrying finding from the study, perhaps, is the fact that research and analysis performed in academic institutions is rarely available to either government or nongovernment users because of poor dissemination. However, the study did find that the barriers between the two groups are coming down because researchers have gained credibility by producing more policy-oriented research and presenting their recommendations in practical formats. Thus, a key question is how policy think tanks can develop into effective and sustainable institutions that can provide leadership in policy analysis and development management.

National policy institutes have emerged during the past five years funded by regional and international donors, governments, the private sector, and by revenue generated from undertaking specific tasks for clients. As knowledge intermediaries at the local level, the national policy institutes play a particularly useful function in enhancing access to global and local knowledge. At the same time, they help shape the agenda of knowledge producers through feedback. The most successful institutes have built strong credibility with both users and suppliers of knowledge and play important roles as honest brokers in dialogues involving competing interest groups. The institutes also respond to requests for policy analysis by mobilizing local talent to carry out necessary research. In many cases, they operate knowledge access systems (including Websites) for users and researchers. By maintaining a forward-looking research agenda, national policy institutes seek to proactively influence the policy agenda.

Intermediation efforts are not confined to national levels only. Regional or subregional policy research networks are also emerging and across several disciplines and specializations. The most prominent example is a network of economists engaged in policy-oriented macroeconomic research, which is coordinated and supported by AERC. Other examples include a network of environmental economists (East Africa Environmental Economics Network), one of social scientists (Council for Development of Social Science Research in Africa), and a francophone network dealing with industrial policy. Policy seminars organized by these networks can serve to bridge the gap of suspicion between academics and policy makers. Not only do the networks provide a showcase for local talent in policy analysis, but they also foster important dialogue on policy issues. Joint initiatives between public and private researchers have also proved to be an effective way of cultivating close relations.

Another study looked at the experience of think tanks in Africa and derived the following tentative conclusions:

1. Policy think tanks in Africa that have mushroomed since the early 1990s have played a greater role in the policy process than is often acknowledged. They emerged because of demand on the supply side. These think tanks need to be encouraged to present African perspectives on development from both the demand and supply side.

2. There is no single model of a think tank or for relations between think tanks, funders, and governments. Think tanks must adapt their strategies and products to particular national or regional environments. It is important to develop a brand identity for the institution through the development of core products and to have a balance between research and consultancy. If think tanks could specialize on a subregional or even regional basis, networking could be more complementary and less competitive.

3. Think tanks should put in place proper governance structures and invest in capacity building and exchange of best practices; this could be accomplished through training in policy analysis, regional seminars on think tank management, and so forth.

4. It is important to develop linkages that allow think tanks to cover their core costs. The relationships among universities, policy research think tanks, and policy dialogue and lobbyist think tanks needs to
be revisited with a view to tapping more effectively avenues of complementarity. Greater emphasis is needed on creating twinning arrangements with think tanks from the North, Asia, and Latin America, particularly in areas such as training, distance learning, and other appropriate capacity-building activities. Global institutions such as the World Bank Institute and the Global Development Network should strengthen their institutional links with policy think tanks in Africa based on more institutionalized, continuous, and sustainable interactions as opposed to the current one-off or single activity-based networking.

5. Policy think tanks produce both public goods and private goods. Activities that produce private goods should be developed along with markets for such goods. Activities such as publishing periodic economic reports, analyzing data collected by the government, and publications on trends of interest to business could be sold to the market. The surplus generated through selling private goods can be used to finance the production of public goods.

6. Governments should be encouraged to develop tax laws and other laws governing the establishment and development of think tanks to encourage their establishment and development.

7. The demand side of policy research needs to be deepened. For instance, an exchange of visits and fellowships between policy researchers and policy makers and other practitioners would enhance familiarity with each others’ positions and promote less formal interactions. Encouraging policy dialogue and debates and toning down identification of think tanks with narrow interest groups or specific political parties could contribute to deepening demand.

8. In general, in the current situation, there is no reliable domestic resource base which can ensure the sustainability of policy think tanks in Africa. Dependence on donor resources is inevitable for some time. The challenge is to design mechanisms to ensure that the activities of policy think tanks are insulated from frequent donor policy changes and agendas.

Source: Ndulu (2001); Wangwe (2003).

Education:

Key challenges facing Tanzania in this domain include the following:

- Sustain and improve the quality of education as enrollments increase by recruiting teachers, constructing classrooms, increasing preservice teacher training, and providing subsidies for purchase of teaching and learning materials.
- Ramp up secondary education, including improving its quality and relevance to needs of the economy.
- Strengthen the governance and administration of the country’s three public universities, in terms of financial sustainability, up-to-date content, and teacher training.
- Use the potential of distance education to expand access to education services while at the same time improving equity. The Open University of Tanzania offers degree programs by correspondence and through regional centers. The costs are also low, as the state covers tuition. The university still suffers from low enrollments (about 10,000 students), partly because of lack of content and partnerships with international academic institutions that could provide online degree programs. Combining distance education modalities with extended face-to-face interactions at Tanzania’s other public universities may be one way to boost enrollments and increase access to higher education.
- Reform teaching methods and the curriculum at all levels to include skills and competencies for the KE (including communication skills, problem-solving skills, creativity, and teamwork).
- Harmonize technical education offered in secondary schools with that offered in the current technical colleges, and then link up with the proposed Zonal and Regional colleges and institutes. These institutes and colleges should offer differentiated products to meet the needs of the whole variety of enterprises in Tanzania, which includes mining, fisheries, major cash and food crops, external trade, and metal industries.
• Increase the interface between industry and education and offer differentiated curricula that better meet the new skills required by changing markets and technologies.
• Devise strategies to proactively deal with problems of skills loss through brain drain.
• Meet the challenge of HIV/AIDS, which poses substantial risks for human resource development.

**ICT:**

In order to strengthen its information infrastructure, Tanzania should take the following steps (or strengthen existing measures):

• Attract investment for the telecom area from both local and foreign entities.
• Review and modernize telecom policies and regulations to generate fair competition and reduce high communication and operational costs.
• Finalize and adopt the proposed Electronic Communications Bill, which is key to defining the ground rules for sector development (including in rural areas).
• Implement the new converged licensing framework, which will ensure further liberalization of the market.
• Build capacity to undertake such reforms, including through the establishment of systems and processes to review the performance of the regulatory institutions. For example, given the great demands and expectations placed on the national regulator (TCRA) by telecom sector reforms, the Swedish government through the Swedish International Development Cooperation Agency (SIDA) is assisting TCRA in creating capacity to meet its existing and future challenges. Also, TCRA is also learning from SIDA’s experiences in operating in a more competitive market.
• Support the development of the rural telecommunications infrastructure, for example, by universal access schemes. Rural areas mostly lack telecom services or provide only limited access in areas adjacent to main towns and on major trunk roads. Local communications content should also be developed (in Kiswahili).
• Enhance technical and business-related skills development among the population using ICT and technical institutes and vocational centers. For example, the UDSM is offering IT training in its computer center.
• Continue to use global experiences in the telecom sector. In many areas of telecom reform, Tanzania has benefited by adopting best practices from both developed and developing countries. The functions and roles of the national regulator (TCRA) is the best example in this case. Further benefits from global experience and best practices will depend on the capacity of TCRA and other institutions to learn from the experiences of other countries.

**Innovation:**

In order to encourage innovation, it is important for Tanzania to take the following steps:

• Improve the regulatory environment, which currently includes a multiplicity of taxes and conflicting laws that impede innovations in the business sector.
• Devote adequate financial resources to encouraging innovation, as through fiscal incentives such as research grants, tax incentives, and venture capital.
• Strengthen institutions like the COSTECH, CDTT, VETA, and the Institute of Production and Innovations (IPI) of the UDSM. These institutions have been established to support R&D and innovation activities in Tanzania, fund investors’ discoveries and innovations, and organize forums and technological exhibitions. However, many of these entities are weakly linked to the productive sector of Tanzania, mainly because of the lack of financial and other technical resources needed to reinforce their capacities.
• Develop adequate technical support, in the form of standards and technical assistance, for both private and public sector productive and innovative activities, and create a conducive environment for business start-ups. For example, the banking system should provide loans for new business start-ups.

• Promote entrepreneurship and support technical and business-related skills development by expanding opportunities for technical and managerial training. Such promotion includes strengthening primary, secondary, vocational (polytechnics), and tertiary education. In particular, science and technology at the university and polytechnic level should be strengthened in order to improve the quality and quantity of human resources.

• Increase sharing of information among innovative industries in both local and foreign markets. Existing industrial associations like the Tanzania Chamber of Commerce and Industry lack resources to collect and disseminate industry news on R&D innovations, quality standards, prices, and so forth. There are only ad hoc linkages between local and foreign industrial associations and government institutions such as the Board of external trade and embassies. Such weaknesses limit innovation in Tanzania.

• Tap into the growing stock of global knowledge and attract more and diversified sources of FDI, which is currently mainly concentrated in the mining sector.

• Disseminate lessons of local innovation efforts and continue promoting indigenous knowledge initiatives.26

• Enhance the transfers of knowledge and technology, not only in Tanzania, but also in sub-Saharan Africa.27

• Conduct comprehensive, nationwide innovation and R&D surveys to establish concrete factors that either facilitate or hinder innovative activities. The outcome of the surveys can help put in place concrete innovation policies and strategies.

These conclusions provide a starting point for further conversation with Tanzanian stakeholders to identify policies that can help Tanzania make more effective use of knowledge for its overall economic and social development. Through such policies, Tanzania can improve its competitiveness and growth prospects.

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27 As mentioned earlier, the Nelson Mandela Foundation for Knowledge Building and Advancement of Science and Technology in Sub-Saharan Africa is playing a leadership and catalytic role in establishing the African Institute of Science and Technology (AIST) to promote research in Africa. The Foundation will have scientific centers of excellence across the four regions of the continent. For more information, go to: [http://www.nmiscience.org/aist.html](http://www.nmiscience.org/aist.html).
Annex 1: Tanzania’s Knowledge Economy Scorecards

The following two scorecards show the performance of Tanzania between 1995 and the most recent period for which data are available on the four pillars of the knowledge economy (KE), as well as on two variables relating to performance: GDP growth and the human development index (HDI). Figure A.1a compares Tanzania with the world. On the four pillars, the scorecard reveals the same information as in Figures 3 and 4 above.

Figure A.1: Tanzania’s Knowledge Economy Scorecards

a. Compared to the World

b. Compared to the Africa Region

Source: Knowledge Assessment Methodology 2004 (KAM: www.worldbank.org/kam). Note that discontinuous lines indicate unavailable data.

Note: Figure A.1a shows the relative performance of Tanzania as compared to 128 countries that have been included in the KAM. Figure A.1b shows the relative performance of Tanzania as compared to 25 countries that represent the Africa Region in the KAM.

When compared to the Africa region, a more positive picture begins to emerge for Tanzania. Not surprisingly, Figure A.1b shows that Tanzania has improved on its economic and institutional performance; on its information infrastructure (especially telephones, both fixed and mobile), in line with the strong uptake and demand for mobile telephony that is spreading through the African continent; and on its Internet usage.
## Annex 2: Costs of Doing Business in Tanzania

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Tanzania</th>
<th>Malaysia</th>
<th>South Africa</th>
<th>Thailand</th>
<th>Botswana</th>
<th>Kenya</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ease of doing business (rank)</strong></td>
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<td>21</td>
<td>28</td>
<td>20</td>
<td>40</td>
<td>68</td>
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## Fostering Innovation, Productivity, and Technological Change: Tanzania in the Knowledge Economy

### Indicator Tanzania Malaysia South Africa Thailand Botswana Kenya Uganda

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<td>Cost (percent of debt)</td>
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<td>Recovery rate (cent on the dollar)</td>
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*Source: World Bank (2006).*
Annex 3: International Assessments

As countries move into the knowledge economy, policy makers are increasingly concerned about the role knowledge and skills can play in enhancing productivity growth and innovation. Performing successfully in the knowledge economy increasingly requires new skills. These include technical skills such as literacy, foreign languages, mathematics, science, problem solving, and analysis; interpersonal skills such as teamwork, leadership, and communication; and the ability to learn independently. The following annex reviews three tools for assessing knowledge and skills: TIMSS, and two international surveys on functional skills pioneered by the OECD, PISA and IALS.

**Trends in International Mathematics and Science Study (TIMSS)**

TIMSS is conducted every four years at the fourth- and eighth-grade levels. The test results give countries an opportunity to examine the effectiveness of their educational policies and practices in light of achievement worldwide. Forty-nine countries participated in the 2003 TIMSS (TIMES 2003); previous assessments were undertaken in 1995 and 1999. Major findings from the 2003 TIMSS include the following:

- In mathematics, Asian countries outperformed other participants and Singapore was the top performing country at both the fourth- and eighth-grade levels. At the eighth grade, other top performers included the Republic of Korea, and Hong Kong and Taiwan (China). At the fourth grade, the highest achievers were Hong Kong (China), Japan, and Taiwan (China).
- In science, at the eighth grade, Singapore and Taiwan (China) had the highest performance, and Korea and Hong Kong (China) also did very well. At the fourth grade, Singapore again had the best academic achievement, followed by Taiwan (China), Japan, Hong Kong (China), and the United Kingdom.
- The contexts for learning math and science are important determinants of performance. For example, the home context can help foster higher achievement, particularly when parents are highly educated, when the language of instruction is spoken at home, when there are many books in the home, and when a computer is frequently used.
- Providing students the opportunity to learn the content assessed is fundamental. The content needs to be delivered in the classroom and in an effective way.
- Students with higher achievement attended schools with environments that fostered positive climates for learning; such a climate had fewer students from disadvantaged homes and allowed teachers and students to feel safe.

Investing in sound comparative information for education is worthwhile, and countries such as India can profit from participating in TIMSS in the following ways:

- TIMSS helps to put education in the public eye by creating newsworthy stories that benchmark countries’ performance.
- TIMSS focuses attention on strengths and weaknesses and highlights areas where action is needed. Many countries have used previous TIMSS studies to kick-start debate on school achievement and develop reform initiatives. For example, South Africa used the previous study to probe reasons for its low performance and to tease out the interaction between home language and language of instruction. Jordan has highlighted the importance of teacher attitude and motivation, and so on. Canada and Australia have also made changes based on TIMSS results.
- TIMSS helps to improve the provision of education by highlighting it and furthering understanding of key aspects of teaching and learning. Policy makers can make better decisions and allocate resources more effectively. Teachers likewise gain through a deeper understanding of how differ-
ent students learn and what inhibits their learning. They can, moreover, benefit from new instructional materials and techniques that aim to maximizing learning.

**OECD’s Programme for International Student Assessment (PISA)**

PISA attempts to measure student achievement in reading, mathematical, and scientific literacy—that is, not merely mastery of the school curriculum but the knowledge and skills needed for full participation in society. By assessing 15-year-old children who are near the end of their compulsory education, PISA provides an indication of the overall performance of school systems. PISA thus enables countries to monitor regularly and predictably their progress in meeting key learning objectives.

PISA 2003 is the second assessment (PISA 2003); the first survey was in 2000. All 30 OECD countries participated in the 2003 PISA, as did 11 partner countries and regions including Brazil, Hong Kong (China), Indonesia, Latvia, Liechtenstein, Macao (China), Russia, Serbia and Montenegro, Thailand, Tunisia, and Uruguay. The focus of the 2003 PISA assessment was on mathematics. Students were divided into six proficiency levels: the small minority who could perform the most complex tasks was ranked at Level 6; those who could only perform very simple tasks were at Level 1. Students unable to complete these tasks were “below Level 1.” Findings of the assessment included the following:

- Only 4 percent of students in the combined OECD area, but more than 8 percent in Belgium, Japan, Korea, and Hong Kong (China), can perform the highly complex tasks required to reach Level 6.
- About a third of OECD students can perform relatively difficult tasks at Levels 4, 5, or 6 but over 49 percent of students in Finland, Korea, and Hong Kong (China) can perform at least at Level 4.
- About three-quarters of OECD students can perform mathematical tasks at Level 2.
- Schools with a positive climate, effective policies and practices, and sufficient resources perform better.

Other key features of PISA include the following:

- PISA has an innovative definition of “literacy,” which is the capacity of students to apply knowledge and skills in key subject areas and to analyze, reason, and communicate effectively as they pose, solve, and interpret problems in a variety of situations.
- PISA assessment allows countries to monitor regularly their progress in meeting key learning objectives.
- PISA measures students’ performance in the context of their backgrounds and schools, which allows exploration of some of the main features associated with educational success.
- PISA has great geographic coverage that includes the 49 countries that have participated already in a PISA assessment and the 11 additional countries that will join the 2006 PISA assessment. These countries comprise one-third of the world population and almost nine-tenths of the world’s GDP.
- PISA has relevance to lifelong learning; it not only assesses students’ curricular and cross-curricular competencies but also asks them to report on their motivation to learn, their beliefs about themselves, and their learning strategies.

**The International Adult Literacy Survey (IALS)**

Globalization, technological change, and organizational development are shaping the supply of and increasing the demand for better literacy skills. *Literacy in the Information Age*, the report from the International Adult Literacy Survey (IALS) (OECD 2000), presents evidence on the nature and magnitude of the literacy gaps faced by 20 OECD countries. Main results include the following:
• In 14\textsuperscript{28} out of 20 countries, at least 15 percent of adults have only the most rudimentary literacy skills, making it difficult for them to cope with the rising skill demands of the information age.

• In six countries less than 15 percent of adults reach the lowest level of literacy skills (Denmark, Finland, Germany, Netherlands, Norway, and Sweden), but even in the country with the highest score on the test (Sweden), 8 percent of the adult population encounters a severe literacy deficit in everyday life and at work.

• Low skills are found not just among marginalized groups but in significant proportions of the adult populations in all countries surveyed. Hence, even the most economically advanced societies have a literacy skills deficit.

IALS findings can provide insights for policy makers addressing lifelong learning, society, and the labor market. In addition:

• IALS offers insights into the factors that influence the development of adult skills in various settings, at home and at work. The survey confirms the importance of skills for the effective functioning of labor markets and for the economic success.

• In terms of literacy skills and features of the labor market, in all countries higher levels of literacy skills in the workforce are associated with larger proportions of knowledge jobs in the economy. Literacy skills increase the probability of being in a white-collar, high-skilled position and reduce the chance of being unemployed. In most OECD countries, low skills are associated with a higher incidence of long-term as opposed to short-term unemployment. The benefits accruing to improved literacy skills are much higher for workers with tertiary education than for those with secondary education.

• As regards literacy, earnings, and wage differentials, educational attainment is the most important determinant of earnings in most countries. There are, however, large differences between countries in how much their labor markets reward education and how much they pay for skills and experience. Labor market rewards associated with education, skills, and experience are amplified or attenuated by the relative conditions of supply and demand.

\textsuperscript{28} The 14 countries are Australia, Belgium (Flanders), Canada, Chile, the Czech Republic, Hungary, Ireland, New Zealand, Poland, Portugal, Slovenia, Switzerland, the United Kingdom, and the United States.
References and Bibliography


Anuja Utz


