Tanzania and the Knowledge Economy: Preliminary Assessment

Knowledge for Development Program
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Structure of Presentation

- Knowledge and Growth
- Knowledge Revolution
- Implications for Tanzania
- Framework for Country Knowledge Assessments
- Preliminary Benchmarking for Tanzania on the four pillars of the knowledge economy, including
  - inputs received by participants from Tanzania at the K4D policy workshop for Ghana, Tanzania and Uganda, May-September, 2002 via GDLN
- Challenges Ahead
- Moving Forward
GDP/Capita Growth: Korea vs Ghana

Knowledge makes the Difference between Poverty and Wealth...

Thousands of constant 1995 US dollars

Rep. of Korea

Difference attributed to knowledge

Difference due to physical and human capital

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The Knowledge Revolution

- Ability to create, access and use knowledge is becoming fundamental determinant of global competitiveness

- Seven key elements of “Knowledge Revolution”
  - Increased codification of knowledge and development of new technologies
  - Closer links with science base/increased rate of innovation/shorter product life cycles
  - Increased importance of education & up-skilling of labor force, and life-long learning
  - Investment in Intangibles (R&D, education, software) greater than Investments in Fixed Capital in OECD
  - Greater value added now comes from investment in intangibles such as branding, marketing, distribution, information management

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Innovation and productivity increase more important in competitiveness & GDP growth

Increased Globalization and Competition
- Trade/GDP from 38% in 1990 to 47% in 2002
- Value added by TNCs: 27% of global GDP

Bottom Line: Constant change and competition implies need for constant restructuring and upgrading

Many definitions of the Knowledge Economy, many of which focus only on information and communications technology (ICTs) or high technology sectors

We use a broader definition: A Knowledge Economy is one that creates, acquires, adapts, and uses knowledge effectively for its economic and social development.
Implications for Tanzania

- Tanzania has been slowly but surely making progress in improving human development (HDI) and increasing per capita income over last 25 years, but Ghana, Kenya and Uganda have been doing relatively better.
- It risks falling further behind as it is not fully exploiting its potential or successfully tapping into growing stock of global knowledge.
- It needs to develop strategies to use existing and new knowledge to:
  - Improve performance in traditional sectors
  - Exploit opportunities for leapfrogging
  - Develop competitive new sectors
- This will require it to:
  - Assess where it currently stands on the global stage
  - Learn from the experiences of other countries

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Framework for Using K4D: 

Four Key Functional Areas

- **Economic incentive and institutional regime** that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship.

- **Educated, creative and skilled people** that can create, share, and use knowledge well.

- **Dynamic information infrastructure** that can facilitate the effective communication, dissemination, and processing of information.

- **Effective national innovation system** of firms, research centers, universities, think tanks, and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new technology.
Knowledge Assessment Methodology

- **KAM**: 76 structural/qualitative variables to benchmark performance on 4 pillars of the knowledge economy (KE): economic and institutional regime, education, innovation and ICTs
- Variables normalized from 0 (worst) to 10 (best) for 121 countries
- Available at: [www.worldbank.org/kam](http://www.worldbank.org/kam)
- Basic scorecard for 14 variables for two points in time, 1995 and most recent
- Aggregate knowledge economy index (KEI), which shows the performance of a country/region on the four pillars of the KE.
Tanzania and the World: Knowledge Economy Index (KEI)

Note: Countries above the 45 degree line have improved their position in the KEI for the most recent period relative to their position in 1995 (or closest available date in the mid-90s), and vice versa for countries below the line.
Tanzania is placed at the lower end of the global KE map (1.48), but has improved its position on the KEI since 1995 (0.92).

Nonetheless, it lags behind neighboring countries such as Uganda (1.7) and Kenya (2.29) who have also registered gains in terms of their progress on the knowledge economy, and is also behind the Africa region average (2.03).

It has a ways to go to match the performance of other leading countries as Botswana (4.96) and South Africa (5.35).

The challenge for Tanzania is how to build the conditions for more effective creation, dissemination, and use of knowledge—both domestic as well as that acquired from abroad, and taking practical steps, driven by knowledge initiatives, to stimulate new forms of income generation.
Tanzania and Comparators: Knowledge Economy Index (KEI)

Note: Shows 1995 and most recent scores.
Tanzania’s Performance: 1995 and most recent


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Between 1995 and most current period, Tanzania has made substantial improvements in its overall knowledge readiness, as evidenced by positive changes in the Knowledge Economy Index (KEI) and Knowledge Index (KI).

Noticeable improvement is evident in its economic and institutional regime due to progress in regulatory quality and the rule of law.

In education, small positive change due to increase in adult literacy rates and also tertiary enrollments.

Notable progress has also been made in innovation, due to increase in patents and in scientific and technical journal articles.

In addition, Tanzania has strengthened its information infrastructure, thanks to increase in telephony (fixed+mobile), increased Internet use, as well as enhanced PC penetration.

But yet, the change is not as impressive relative to what is occurring in other countries, such as Kenya, whose performance surpasses even that of the African region.
Delving into the Four Pillars of the Knowledge Economy...
1. Economic and Institutional Regime
Range of Issues: Economic Incentive & Institutional Regime

- Competitive environment as stimulus for improved performance
- Financial system that mobilizes and allocates capital to its most productive uses
- Flexible labor markets including support for up-skilling
- Appropriate legal and regulatory system and strong rule of law that support entrepreneurship
- Effective safety nets to facilitate adjustment to constant restructuring
- Effective, transparent and accountable government
Tanzania: Governance Variables

Based on the benchmarking:

- Tanzania does relatively well on gross capital formation
- Needs to do more to strengthen trade (as % of GDP) and to reduce tariff and non tariff barriers
- In terms of governance variables, it rates in the low-medium range for the rule of law, political stability and voice and accountability
- Press freedom rates relatively highly in Tanzania
- It needs to work more on strengthening the regulatory framework, increasing government effectiveness, and controlling corruption
Since the mid-90s, Tanzania has made substantial progress in macroeconomic stabilization and structural reforms.

Over the last five years or so, Tanzania has averaged more than 5% percent growth—it reached 6.3% in 2002.

Improved budget formulation and management have led to lower interest rates and stimulated private sector growth.

Sustained strong performance in the mining (gold) and tourism sectors have been important recent contributors to economic growth.

Donors have been providing sizable financial assistance in support Tanzania's reform program.

However, investment in infrastructure has been limited over the past decade and have resulted in deteriorating facilities.

Moving forward, Tanzania needs to:

- accelerate not only agriculture sector growth, but also increase growth in the industrial and service sectors.
- improve its business climate, as high cost and limited availability of infrastructure services, human resource and labor market barriers, and red tape in the public sector are viewed as principal constraints to achieving even higher growth rates.
2. Education and Human Resources
Range of Issues: Education and Human Resources

- Access to different levels of education
- Gender balance
- Quality of educational content (core technical & social skills, relevance, creativity)
- Balance among different levels of education
- Financing & public and private roles
- Life-long learning opportunities
- Role of the ministry of education and its relations with labor, market, and economy

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Tanzania: Adult Literacy Rates

Source: World Bank SIMA Database
Tanzania: Average Years of Schooling

Average Years of Schooling (Cohen-Soto)

Source: Cohen and Soto, OECD 2001
Based on the benchmarking:

- Tanzania has improved its literacy rate (77% in 2001) and has surpassed Ghana and Uganda in this respect, but has not yet caught up with Kenya, which is close to the levels of South Africa and Mauritius.

- According to Cohen and Soto (OECD 2001*), Tanzania’s average years of schooling is higher than that of Uganda, but is again lower than that of Ghana and Kenya, and far from that in Mauritius and South Africa.

Key Issues in Education for Tanzania

- In recent years, Tanzania has invested in increasing access, as well as quality and equity in the education system.
- GERs for primary education increased from 100.4% in 2002 to 105.3% in 2003; drop out rate decreased to 3.8% in 2003 from 5.5% in 2000.
- Transition rate from primary to secondary education rose from 21% in 2001 to 21.7% in 2002.
- The Secondary Education Development Program aims at increasing access to secondary education, especially to underserved groups.
- Key challenges in the education sector:
  - sustain and improve the quality of education as enrollments increase (including by recruiting teachers, constructing classrooms, increasing pre-service teacher training, and providing subsidies for purchase of teaching and learning materials: progress is being made in these areas in Tanzania)
  - ramp up secondary education, including improving quality and relevance to needs of the economy
  - in higher education, strengthen the Tanzania Open University (financial sustainability, governance, and up-to-date content) and other universities
  - support technical and business related skills development through technical institutes and vocational centers (e.g., University of Dar Es Salaam is offering IT training in its computer center)
- Tanzania also must deal with problems of skills loss through brain drain
- HIV/AIDS also poses significant risks for human resource development
3. Information Infrastructure
Range of Issues: Information Infrastructure

- Communications infrastructure (from radio to internet)
- Telecom issues (competition, pricing, regulation)
- Digital Divide (access, content, language)
- Use and applications of ICTs throughout the economy:
  - E-government, E-business, E-education, E-health
  - Legal and regulatory regime for the E-economy
  - Software
  - Skills to use ICTs
Tanzania: Telephone Penetration

Telephones (Fixed Mainlines and Mobile Phones)

Source: World Bank SIMA Database

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Tanzania: Internet Penetration

Internet Hosts

Source: World Bank SIMA Database

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Based on the benchmarking:

- Tanzania has been improving, albeit slowly, in all aspects of the information infrastructure.
- On telephony (fixed + mobile), it is at the level of Ghana and does slightly better than Uganda but has a ways to go to match performance of leading African countries.
- But, along with Uganda, it has very low computer penetration, and Internet hosts.
- Mauritius, on the other hand, has been doing better than South Africa and Botswana on telephony and PC penetration and is close to the level of Malaysia.
Key Issues in ICTs for Tanzania

- In 2003, Tanzania developed a cross-sectoral National ICT Policy (www.moct.go.tz/ict) that relates ICTs to relevant sectors such as education, manufacturing, health and tourism.
- Policy and legal and regulatory framework in telecoms is one that encourages private sector participation.
- Significant liberalization has taken place in various segments: private operators are providing basic, mobile, data, paging, internet, pay-phone and other value-added services.
- Cellular market is growing rapidly with five mobile operators (Zantel, Mobitel, Vodacom, Tritel and TTCL).
- Overall teledensity—fixed + mobile—has increased from 3.3 in 1995 to 17.1 per 1,000 in 2002.
- Tanzania Communication Commission has wide stakeholder participation.
- Moving ahead, Tanzania should continue to:
  - continue attracting investments by local and foreign entities
  - support the development rural telecommunications infrastructure
  - develop local content (i.e. in Swahili)
  - review and modernize telecom policies and regulations to generate fair competition and reduce high communication and operational costs.
3. Innovation System
Range of Issues: Innovation System

- Tapping into Global Knowledge
  - Trade, foreign investment, tech transfer,
  - Technical journals, travel, internet, conferences

- Creating and adapting knowledge
  - Public vs private R&D; Basic vs applied R&D
  - From specialized research institutions to production

- Disseminating Knowledge
  - Growth of more efficient enterprises
  - Suppliers of equipment, technical services and info
  - Extension services: agricultural

- Using knowledge
  - Depends on cost and benefits
  - Depends on education, skills, complementary inputs
  - Depends on economic and institutional regime

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Tanzania: Innovation Variables

Gross Foreign Direct Investment as % of GDP (1.30)

- (6.00) High-Tech exports as % of manuf. exports
- (0.03) Patent applications granted by the USPTO / mil pop.
- (1.00) Patent applications granted by the USPTO
- (2.79) Scientific and technical journal articles / mil. pop.
- (92.00) Scientific and technical journal articles
- (14.03) Manuf. Trade as % of GDP

Royalty and license fees payments ($ mil) (4.00)

- Royalty and license fees payments / mil. pop. (0.11)
- Royalty and license fees receipts ($ mil) (0.00)
- Royalty and license fees receipts / mil. pop. (0.00)

Science & engineering enrolment ratio (% of tertiary level students) (37.00)
Benchmarking Innovation for Tanzania

- Tanzania needs to do much more to strengthen its innovation system

- Needs to:
  - Tap into global knowledge
  - Attract more and diversified sources of FDI (currently mainly concentrated in the mining sector)
  - Disseminate lessons of local innovation efforts
  - Continue promoting Indigenous Knowledge (IK) initiatives
  - Strengthen the Center of Development and Transfer of Technology which aims to fund investors’ discoveries and innovations, and organize forums and technological exhibitions. But, the center lacks adequate resources, infrastructure, equipment and trained personnel so as to respond to the increased needs of the local entrepreneurial society.
Key Issues in Innovation for Tanzania

- Promote development of entrepreneurship (such as the Center of Development and Transfer of Technology)
- Establish a National Innovation Center with the aim of addressing poverty through development of innovation schemes.
- Expand technical and managerial training for managers and entrepreneurs
- Create a conducive environment for business start-ups (e.g., Banks should be risk takers, support business start-ups, build customer base)
- Reform education system to:
  - encourage creative and innovative thinking
  - promote risk-taking and a technical culture
- Promote R&D and IPR schemes by providing incentives through research grants, tax exemptions, and research funds
- Conduct national comprehensive innovation and R&D surveys to draw up a National Innovation Policy.
- Use Indigenous Knowledge (IK) for development (e.g., in Tanga, partnerships between local and international groups (NIH and GW University) brought together healers and hospitals to cooperate in health protection and preservation issues

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Challenges Ahead

- Tanzania finds itself in a very dynamic global situation with moving goalposts.
- Risk of increasing knowledge divide between the advanced countries and developing ones, especially in SSA, and also within countries.
- Tanzania should:
  - Raise awareness among policy makers, private sector and civil society on challenges and opportunities of the knowledge revolution.
  - Develop a coherent strategy to take advantage of opportunities and reduce adverse impact.
  - Learn from neighbors on what works/what doesn't (such as through K4D policy workshop for Ghana, Tanzania and Uganda, May-September 2002 with the ESRF (via GDLN). This workshop brought together 77 participants from government, private sector and civil society from Tanzania to share experiences with Ghana and Uganda on all four pillars of the KE (http://www1.worldbank.org/gdln/k4dafr.htm; login and PW: k4d).
The Way Forward

- Critical to go from analysis of challenges to concrete initiatives to improve overall performance and increase welfare.
- Successful reforms require creating stakeholder awareness (between government, private sector and civil society, and with donors).
- Consultation, discussion and participation (in PRSP, CAS, PRBS, MTEF) necessary to create stakeholder ownership.
- Monitorable goals and constant evaluation is key to improving performance.
- Rapid adjustment to strategy is needed in light of experience and changing circumstances.
Benchmarking Tanzania

a. Tanzania compared to the world (121 Countries); and with Kenya, Uganda, Botswana, and Malaysia

b. Tanzania compared to the Africa Region (22 countries)
Tanzania Compared to the World: Changes from 1995 to Present

Note: Discontinuous lines indicate unavailable data.
Tanzania compared with Kenya, Uganda (most recent)

Note: Tanzania (red), Uganda (green), Kenya (blue).
These are based on the most recent data for these countries.
Numbers in brackets correspond to Tanzania. Discontinuous lines indicate unavailable data.

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Tanzania compared with Botswana, Malaysia (most recent)

Note: Tanzania (red), Malaysia (green), Botswana (blue).
These are based on the most recent data for these countries.
Numbers in brackets correspond to Tanzania. Discontinuous lines indicate unavailable data.
Between 1995 and present, Tanzania has been improving its economic growth performance.

There has also been some notable progress in the economic and institutional regime in terms of regulatory quality and the rule of law. Uganda, Botswana and Malaysia, however, do better than Tanzania on this pillar.

In innovation, Kenya and Botswana outperform Tanzania.

In education, the picture is mixed. Literacy rates have improved since the mid-1990s, as have secondary and tertiary enrolment ratios, but overall levels have not yet caught up with Kenya or Botswana, not to mention Malaysia.

In ICTs, Tanzania is doing better than Uganda, and is catching up to Kenya, but has a ways to go to match the performance of Botswana or Malaysia.
Tanzania compared to the Africa Region: Changes from 1995 to Present

Note: Discontinuous lines indicate unavailable data. This figure shows the relative performance of Tanzania as compared to 22 countries that represent the Africa Region in the KAM.
When compared to the Africa region (rather than the world), a more positive picture begins to emerge for Tanzania.

The country has improved on its economic and institutional performance (regulatory quality and rule of law).

It has also made progress in strengthening its information infrastructure, especially telephones (fixed plus mobile), in line with the strong uptake and demand for mobile telephony that is spreading through the African continent, as well as on Internet users.