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Keynote Address

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DEVELOPING KNOWLEDGE FOR ECONOMIC ADVANCEMENT IN AFRICA

Keynote address

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Delivered at the 2nd International Conference on African Digital Libraries and Archives (ICADLA-2), University of the Witwatersrand, Johannesburg, South Africa, 14th-18th November 2011

"My people are destroyed for lack of knowledge …" (Hosea 4:6a)

Creating, sharing and using knowledge and information are key factors of economic growth and essential for our competitiveness. This driving force can ensure better quality of life and work, sustainable employment, access costs, and digital literacy for all to avoid social exclusion.
(Erkki Liikanen, Member of the European Commission responsible for Enterprise and the Information Society)

Knowledge increasingly defines the line between wealth and poverty, between capability and powerlessness and between human fulfillment and frustration. A country able to mobilize and diffuse knowledge can rapidly raise its level of development, help all its citizens to grow and flourish and take its proper place on the 21st century global stage.
(Rima Khalaf Hunaidi, former Regional Director, Arab States, UNDP)

Abstract
From 1995 to 2008, Africa's average economic growth was 5% per annum. In 2008 GDP growth in Africa was 5.5% against 6.5% in 2007, representing the fifth consecutive year when growth exceeded 5.5%. This has largely been attributed generally as the dividend of the reforms embarked upon by most African countries during the period. However, the impact of the global economic and financial crisis slashed growth rates to 3.1% in 2009, just half of the average growth rate achieved during the previous five years. Africa's economic growth recovered in 2010 to 4.9% but has been projected to slide to 3.7% in 2011 due to the "revolution effect" in Tunisia, Egypt and Libya and the "Cote D'Ivoire conflict effect". If the political situation stabilizes, Africa is projected to accelerate to around 5.8% in 2012 but this is still not sufficient to meet the MDG targets. In addition, increases in real GDP growth have not translated into equal benefits for the African population given persistent inequality. Latest data indicate Africa's

income inequality measured by Gini index is high at 45 (on a scale of 0 to 100) – only slightly better than in 1980. A key result of high inequality is that economic growth delivers much less in terms of poverty reduction. Available data indicate, for example, that in Sub-Saharan Africa, the $1.25 a day poverty rate has shown no sustained decline over the whole period since 1981, starting and ending at 50%. In absolute terms, the number of poor people nearly doubled from 200 million in 1981 to 390 million in 2005. Africa's economic growth has also failed to deliver jobs, especially for graduates and youths. Africa is less competitive than other regions. And in spite of some recent improvements in other measures of well-being, Africa lags its comparators and developed regions in key social indicators.

Knowledge is a prerequisite for rapid economic advancement in today's global knowledge economy. Any nation that fails to position itself properly in this global, knowledge-based market place, will be increasingly unable to compete and harness the power of knowledge. For African countries, this has created new challenges as well as new windows of opportunity. In this paper, we discuss how Africa can transform itself into a knowledge-based economy for accelerating its economic advancement. We first take a snapshot of the concept of knowledge and its role in economic advancement. Second, we examine the state of knowledge in the continent with a view to identifying the key constraints. Using data on the knowledge economy index as a whole, Africa does not compare well with other regions and countries in advanced countries. With respect to the knowledge index, Africa is not only trumped by other regions but also its overall score fell between 2000 and 2009 (indicating lost ground). In terms of the three pillars of the knowledge index (education, innovation, and ICT), Africa's performance is not only poor but declining. However, we find that knowledge (and the knowledge economy) index is a good predictor of GDP per capita/economic growth and human development. Third, we outline the ways to create the relevant knowledge not only to close the knowledge gap but also to spur economic advancement and social welfare. These will include developing educated and skilled workers (especially through scientific research and technological development), creating an efficient innovation system, and building a dynamic information infrastructure. However, strengthening the economic and institutional regime is a *sine qua non* in stimulating the most effective use of resources in these three broad domains, permitting their deployment to the most productive uses, and allowing entrepreneurial activity to flourish to contribute better to Africa's economic advancement.

Introduction

Mr. Chairman,
H. E. Dr. Joseph Phaahla, Deputy Minister for Arts and Culture Ministry, South Africa,
Professor Loyiso Nongxa, Vice-Chancellor, University of the Witwatersrand, South Africa,
Distinguished participants,
Ladies and Gentlemen,
Good morning!

Let me start by thanking the members of the African Digital Libraries and Archives and in particular the Facilitators of ICADLA-2, Felix Ubogu and Abraham Azubuike, for their kind invitation to give a keynote address in this very important conference. I am very pleased to be here in the midst of a very august gathering.

My address this morning will consist of four parts:

I will first present brief stylized facts on Africa's economic performance. Following this, I will present a snapshot of the concept of knowledge and its role in economic advancement. Third, I will examine the state of knowledge in the continent with a view to identifying the key constraints. Finally, I would like to propose an agenda on how to create the relevant knowledge not only to close the knowledge gap but also to spur economic advancement and social welfare in Africa. Essentially, the proposal is focused on how Africa can transform itself into a knowledge-driven economic advancement by tapping into a number of existing socioeconomic advantages.
Let me take you on this journey for the next 30 minutes.

Brief stylized facts on Africa's economic performance

From 1995 to 2008, Africa's average economic growth was 5% per annum. In 2008 GDP growth in Africa was 5.5% against 6.5% in 2007, representing the fifth consecutive year when growth exceeded 5.5%. This has largely been attributed generally as the dividend of the reforms embarked upon by most African countries during the period. However, the impact of the global economic and financial crisis slashed growth rates to 3.1% in 2009 (Figure 1), just half of the average growth rate achieved during the previous five years. Africa's economic growth recovered in 2010 to 4.9% but has been projected to slide to 3.4% in 2011 due to the "revolution effect" in Tunisia, Egypt and Libya and the "Cote D'Ivoire conflict effect". If the political situation stabilizes, Africa is projected to accelerate to around 5.8% in 2012 but this is still not sufficient to meet the Millennium Development Goal (MDG) targets.

In addition, increases in real GDP growth have not translated into equal benefits for the African population, given persistent inequality. Latest data indicate Africa's income inequality measured by Gini index is high at 45 (on a scale of 0 to 100) – only slightly better than in 1980. A key result of high inequality is that economic growth delivers much less in terms of poverty reduction. Available data indicate, for example, that in Sub-Saharan Africa, the $1.25 a day poverty rate has shown no sustained decline over the whole period since 1981, starting and ending at 50% (Figure 2). In absolute terms, the number of poor people nearly doubled from 200 million in 1981 to 390 million in 2005 (Figure 3). Africa's economic growth has also failed to deliver jobs, especially for graduates and youths. Though Africa's inflation has returned to single digits overall, the scourge of drought and food insecurity in the Horn of Africa has led to rapid increase in inflation, in some cases, over 20% in some countries in that sub-region. Fiscal deficits remain above 3% while current account balance has returned to the negative territory.

Africa is also less competitive than other regions (Tables 1 and 2). And in spite of some recent improvements in other measures of well-being, Africa lags its comparators and developed regions in key social indicators (Table 3). Knowledge is an essential part of the solution.

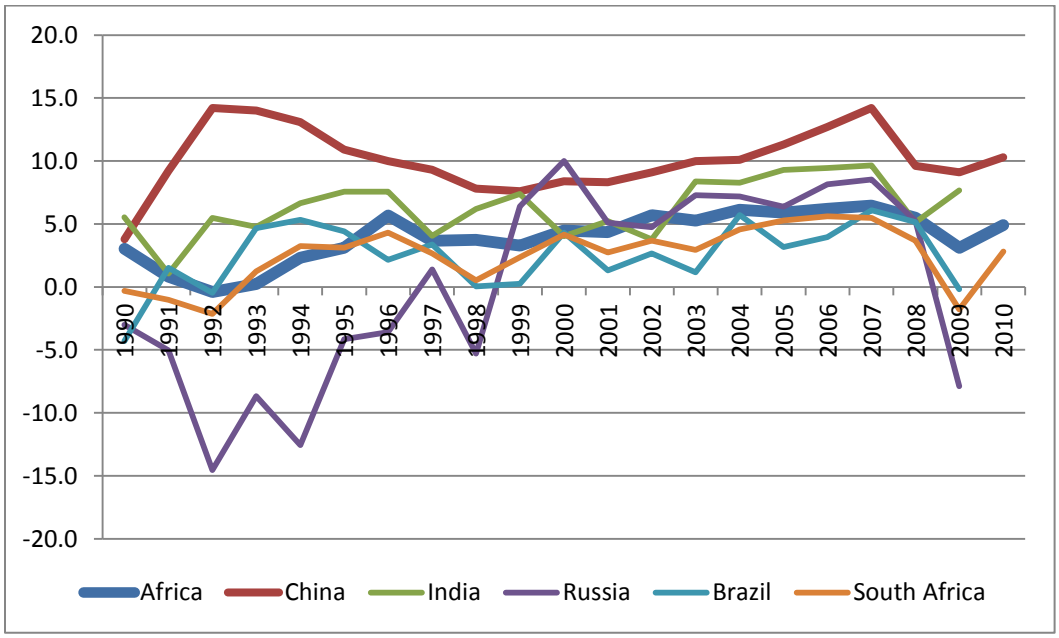


Figure 2: Regional Breakdown of Headcount Index for International Poverty Line of US$1.25 a day, 1981-2005

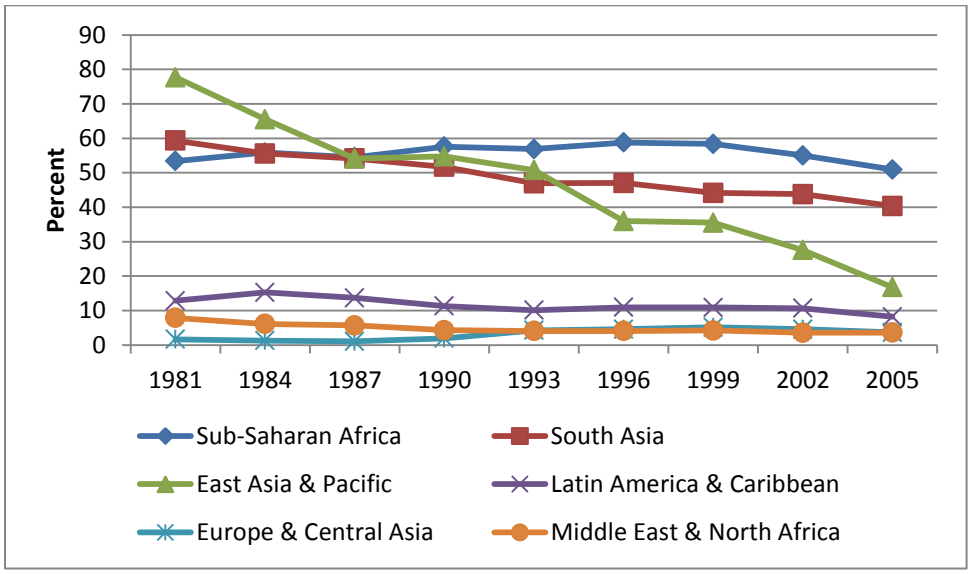


Figure 3: Regional Breakdown of Number of Poor (Millions) for International Poverty Line of US$1.25 a day, 1981-2005

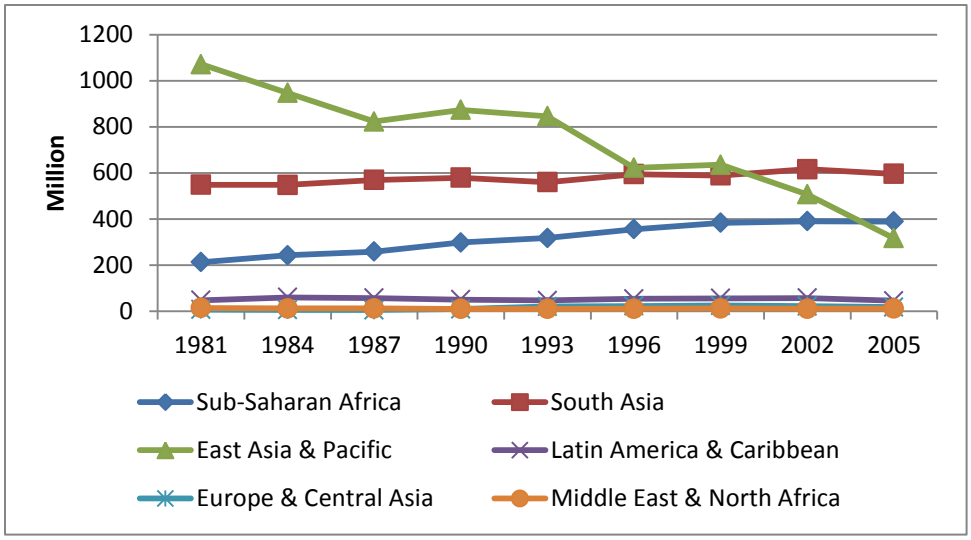


Table 1: Comparative Global Competitiveness Index (GCI) Performance on Broad Indices, 2010/2011

		SUBINDEXES		
	GCI 2010-2011	**Basic requirements**	**Efficiency enhancers**	**Innovation and sophistication factors**
Economy	Score	Score	Score	Score
North Africa	**4.1**	**4.5**	**3.7**	**3.3**
Sub-Saharan Africa	**3.5**	**3.7**	**3.4**	**3.1**
BRICs	**4.4**	**4.6**	**4.4**	**3.9**
Latin America & Caribbean	**4.0**	**4.3**	**3.9**	**3.4**
Southeast Asia	**4.3**	**4.6**	**4.2**	**3.7**

Source: WEF, WB and AfDB (2011)

Table 2: Global Competitiveness Index: Comparative Scores, 2010/2011

	1. Institutions	2. Infrastructure	3. Macroeconomic environment	4. Health and primary education	5. Higher education and training	6. Goods market efficiency	7. Labor market efficiency	8. Financial market development	9. Technological readiness	10. Market size	11. Business sophistication	12. Innovation
Economy	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Africa	**3.8**	**2.9**	**4.1**	**4.3**	**3.1**	**3.8**	**4.2**	**3.7**	**2.9**	**2.9**	**3.4**	**2.9**
BRICs	**3.8**	**4.1**	**4.8**	**5.7**	**4.2**	**4.0**	**4.4**	**4.2**	**3.6**	**6.0**	**4.2**	**3.6**
Latin America & Caribbean	**3.6**	**3.7**	**4.4**	**5.6**	**4.0**	**3.9**	**4.0**	**4.1**	**3.6**	**3.6**	**3.8**	**2.9**

Southeast Asia	**4.1**	**3.9**	**5.0**	**5.5**	**4.0**	**4.4**	**4.7**	**4.3**	**3.6**	**3.9**	**4.1**	**3.4**
OECD	**4.9**	**5.2**	**4.9**	**6.3**	**5.2**	**4.7**	**4.7**	**4.6**	**5.0**	**4.8**	**4.9**	**4.3**

Source: WEF, WB and AfDB (2011)

Table 3: Comparative Basic and Social Indicators				
Indicator	**Year**	**Africa**	**Developing Countries**	**Developed Countries**
Basic Indicators				
Area ('000 Km²)		30322.57	80975.97	54658.39
Total Population (millions)	2010	1031.47	5628.53	1068.73
Urban Population (% of Total)	2010	40.04	44.76	77.66
Population Density (per Km²)	2010	3.40	66.60	23.10
GNI per Capita (US $)	2009	1525.42	2780.29	39688.06
Demographic Indicators				
Dependency Ratio (%)	2010	78.12	52.80	..
Life Expectancy at Birth - Total (years)	2010	56.02	65.68	79.81
Infant Mortality Rate (per 1,000)	2010	77.95	53.09	5.75
Child Mortality Rate (per 1,000)	2010	127.22	51.38	6.30
Total Fertility Rate (per woman)	2010	4.44	2.67	1.77
Maternal Mortality Rate (per 100,000)	2008	530.21	440.00	10.00
Health & Nutrition Indicators				
Physicians (per 100,000 people)	2007	46.71	77.00	287.00
Access to Safe Water (% of Population)	2008	64.93	83.99	99.58
Access to Health Services (% of Population)	2000	65.32	80.00	100.00
Access to Sanitation (% of Population)	2008	40.82	54.60	99.85
Percent. of Adults (aged 15-49) Living with HIV/AIDS	2007	4.56	161.86	14.14
Child Immunization Against Tuberculosis (%)	2008	85.05	89.00	99.00
Child Immunization Against Measles (%)	2008	83.72	76.00	92.62
Daily Calorie Supply per Capita	2007	2461.74	2675.20	3284.70
Public Expenditure on Health (as % of GDP)	2008	2.41	4.00	6.87
Education Indicators				
Primary School – Total	2009	102.51252	106	101.4997
Secondary School – Total	2005	36.827545	62.31893	100.28181
Adult Literacy Rate - Total (%)	2006	64.796857	19.02674	..
Percentage of GDP Spent on Education	2008	4.563138	..	5.41659
Sources : ADB Statistics Department Databases; World Bank: World Development Indicators UNAIDS; UNSD; WHO, UNICEF, WRI, UNDP; Country Reports.				
Note : … : Data Not Available.				

A snapshot of the concept of knowledge and its role in economic advancement

The concept and components of knowledge

Mr. Chairman, Honorable Minister, Vice-Chancellor, Distinguished Participants,

What do we mean by knowledge?

Knowledge is a multi-dimensional concept, consisting of ideas, facts, mental constructs, information, stories, pictures, data, instructions, and the sum total of symbolic structures possessed by individuals, institutions, and societies, which guide behaviour in all walks of life and in all spheres of public and private activity. It may be acquired through formal education and experiences learned from work and life. Knowledge may be explicit (documented or recorded), oral or implicit (such as spontaneous behavioural prescriptions). Knowledge has distinguishable characteristics: it proliferates with consumption and hence is non-perishable; it is non-spatial for it can traverse distances and borders at high speed, especially when digitized; it is durable since it can exist endlessly without any need for further production – though it can become obsolete. However, knowledge is useless until it becomes "effective", that is widely disseminated, absorbed and used (Newman and Conrad, 1999; Lord, 2008).

It is important to note that, societally, knowledge can be classified into two: "knowledge wealth" and "knowledge capital". Knowledge wealth has been described as the sum total of knowledge assets, or symbolic structures in society, while knowledge capital is that part of knowledge wealth used in producing new knowledge, which in turn leads to the further growth of knowledge wealth (Lord, 2008).

Related concepts of knowledge are knowledge flows, knowledge artefacts, and knowledge agents. Knowledge flows include knowledge creation, retention, transfer and utilization (Figure 4). Knowledge artefacts relate to documents, files, papers, conversations, pictures, thoughts, software, databases, e-mail messages, data sets, winks and nods, and whatever else can be used to represent meaning and understanding. These could be explicit (articulated, codified, and stored, making it easily transferrable), implicit (inferred) or tacit (person-bound and requires face-to-face contact to be transferred), technical and societal. Knowledge agents can be individuals (people), organizations, and/or technology (automated) (Newman and Conrad, 1999). The ways in which knowledge of both forms can be acquired by third parties are summarized in Table 4.

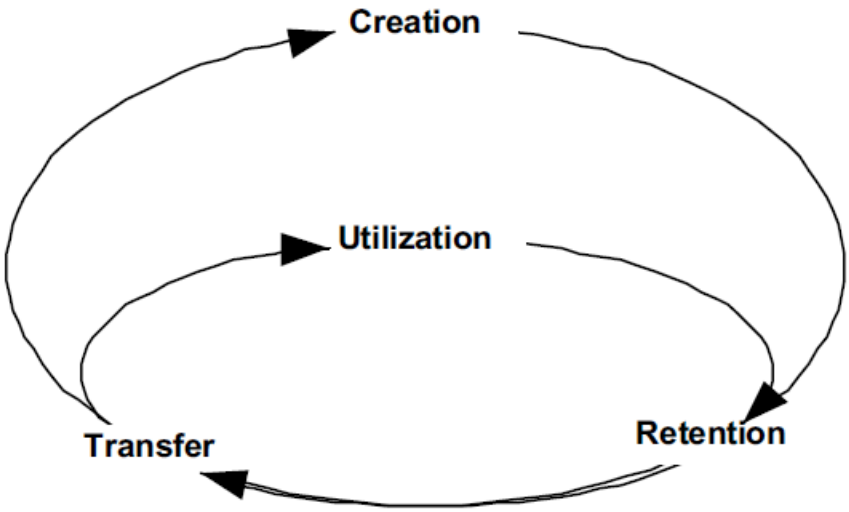
Table 4: Forms of knowledge and ways of their acquisition

	Explicit knowledge as a		**Implicit/Tacit knowledge**
	Public good	Private good	
On-market	-	-Purchase of patents,	-Hiring and service

acquisition		licenses, software - Contracted research	contracts with carriers of implicit knowledge
Off-market acquisition	-Apprenticeship in public institutions -Learning through texts and software	Spillover in the form of: - Reverse engineering - Learning-by-watching - Learning on basis of patent documentation	Spillover in the form of: -Learning-by-doing -Learning-by-watching -Learning-by-interacting

Source: Kober (2009).

Figure 4: The General Knowledge Model



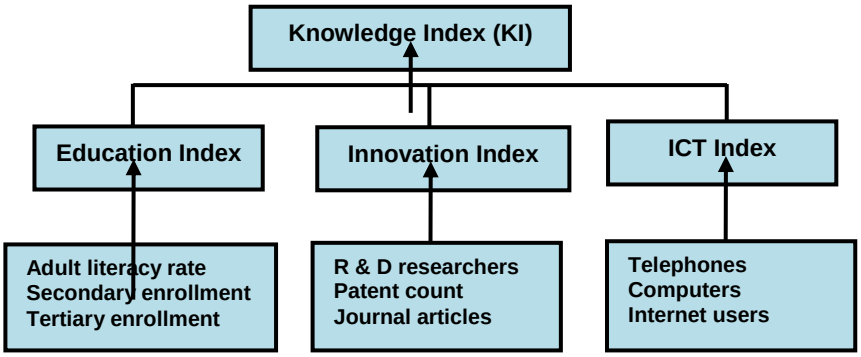
Source: Newman and Conrad (1999)

As a first step to articulate a strategy for moving forward, we use the World Bank Institute's Knowledge Index (KI), disaggregated into three functional areas (Figure 6):

- Education: an educated and skilled population that can create and use knowledge;
- Innovation: an effective national innovation and enterprise upgrading system: a system of research centres, universities, think tanks, consulting firms, and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge; and
- ICT: a dynamic information infrastructure that can facilitate the effective processing, communication, and dissemination of information (Aubert and Reiffers, 2003; World Bank Institute, 2007; Kuznetsov and Dahlman, 2008).

The World Bank Institute Knowledge Economy Index (KEI) includes a fourth pillar - an economic incentive and institutional regime that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship (Figure 7). Thus, a knowledge-based economy is "one that encourages its organizations and people to acquire, create, disseminate and use (codified and tacit) knowledge more effectively for greater economic and social development" (Dahlman and Andersson, 2000; see also Dahlman and Utz, 2005; World Bank Institute, 2007). This shows the increasing dependence of economies on the effective creation, acquisition, distribution and use of knowledge.

Figure 6: Relationships of Knowledge Index and Indicators

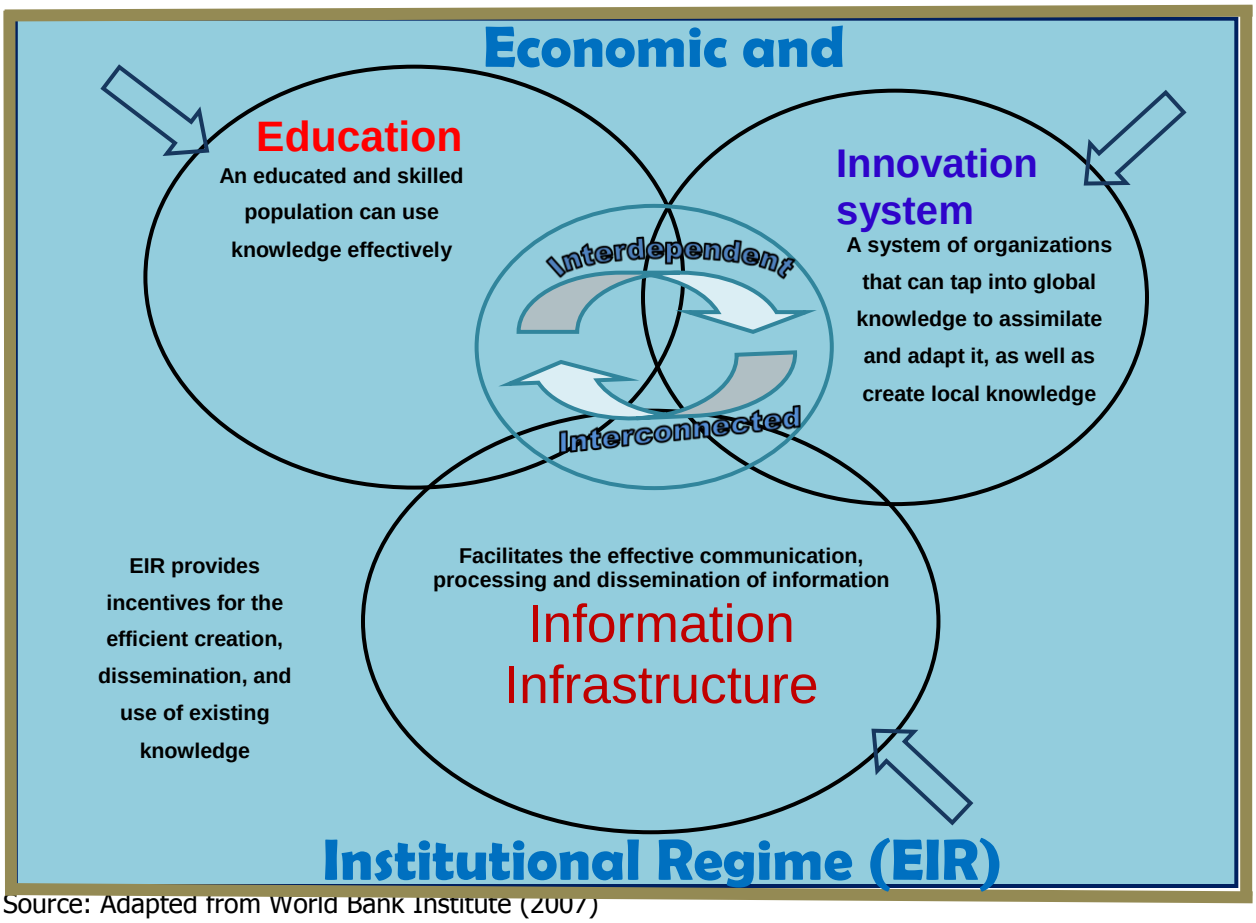


Source: Adapted from World Bank Institute (2007)

The role of knowledge in economic advancement

We are living in an age of "knowledge revolution", given the incredible speed with which knowledge is created, shared, and applied in all parts of the economy and society. This knowledge revolution is being driven by the rapid application of new information and communications technologies (ICT), and the application of scientific discoveries to production in every sector of the economy. This has created massive opportunities for countries to dramatically increase their competitiveness and to achieve rapid growth. Indeed, the revolution is mainly because knowledge and talent are prerequisites for success in today's global knowledge economy. Consequently, the global economy is now dominated by knowledge-driven supply chains and markets. Any nation that fails to position itself properly in this global, knowledge-based market place will be increasingly unable to compete. For African countries, this increasing importance of knowledge and its productive application has created new challenges as well as new windows of opportunity.

Figure 7: The Three Interactive Pillars of the Knowledge Interacting with Economic and Institution Regime (EIR)



Source: Adapted from World Bank Institute (2007)

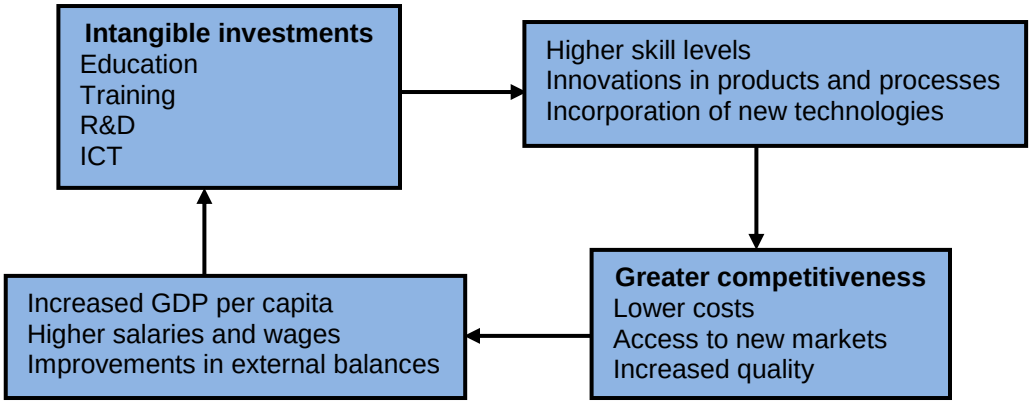
Knowledge acquisition, absorption and production are a means of achieving human development, since these enable people to enlarge their capabilities and widen their horizon of choice, thus driving social and economic advancement. Knowledge can liberate individuals and societies from human poverty, expand the frontiers of human potential; it serves as a means to enlarge the scope of human freedoms and to guarantee those freedoms through good governance and the promotion of equity and human fulfillment. Knowledge will thus serve the loftier goals of freedom, justice and human dignity.

Knowledge is a prerequisite for rapid economic advancement in today's global knowledge economy. Indeed, knowledge has been described as both the foundation and the heart and mind of economic advancement. Any nation that fails to position itself properly in this global, knowledge-based market place will be increasingly unable to compete and harness the power of knowledge. For African countries, this has created new challenges as well as new windows of

opportunity. In this paper, we discuss how Africa can transform itself into a knowledge-based economy for accelerating its economic advancement.

Knowledge contributes to social and economic advancement in many ways. It is the driver of competitiveness, economic growth and productivity through investments in education, training, R&D, and ICTs—all known as "intangible" investments (Figure 8). Knowledge nurtures (as in improving nutrition through green revolution); cures (as through the treatment of river blindness in much of sub-Saharan Africa, SSA); and protects against natural disasters (through effective satellite and early alert radio systems it is a facilitator of welfare and environmental stewardship); and it is an enabler of institutions and governance. Knowledge can help nations and the global community face the triple crises of finance, food and fuel; global imbalances; non-inclusive growth (poverty and inequality, high unemployment, especially of youth); low socio-economic development; unsustainable urbanization; HIV/AIDS; wars and state fragility; and climate change. Knowledge is accepted as a crucial input for inducing innovation.

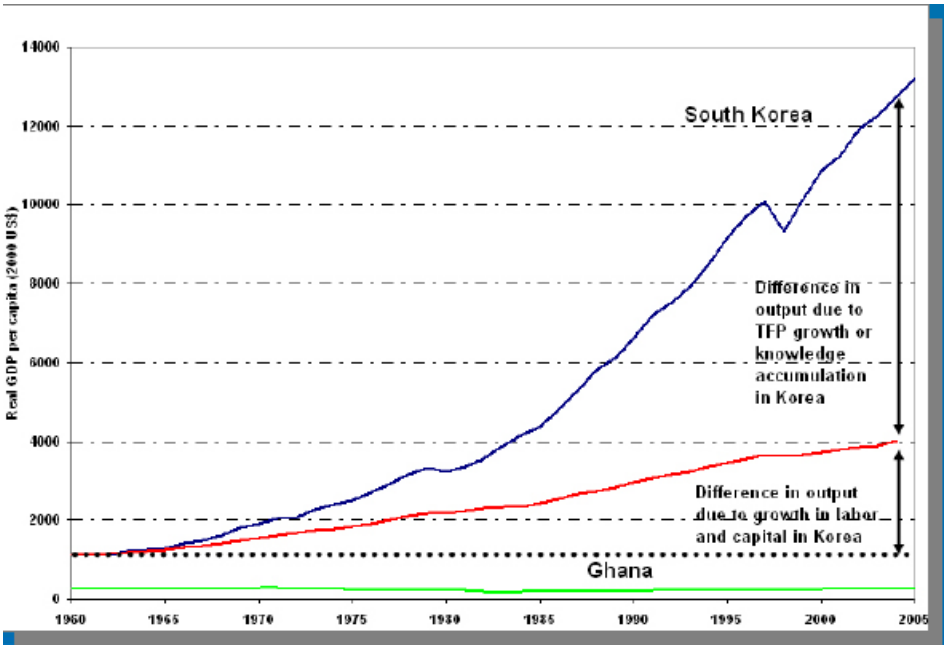
Figure 8: Effects of knowledge on competitiveness and economic advancement



Source: Adapted from World Bank Institute (2007)

It has been estimated that close to two-thirds of the differences between the per capita gross domestic product (GDP) growth of Ghana and South Korea over the past half-century were attributable not to the accumulation of physical capital and labour but to other sources of growth and productivity in which knowledge was crucial (Figure 9) (World Bank 1999; World Bank Institute and Korea Development Institute, 2007). This clearly illustrates the dramatic role that knowledge plays in the economic advancement process. Lately, we have also seen how knowledge transmitted through the internet using social media can transform power relations in a very dramatic and speedy manner, as exemplified in the so-called Arab Spring and "revolutions" sweeping through North Africa and the Middle East.

Figure 9: Illustration of knowledge as the foundation of economic advancement: South Korea vs Ghana



Source: World Bank Institute (2007)

The state of knowledge in Africa

Sub-par knowledge performance: extent, trends, commonalities and differences

My speech provides a broad assessment of Africa's readiness to join the global knowledge economy, which emphasizes the importance of education and institutional reform, and of creating an environment that is conducive to innovation. This section of my speech therefore focuses on the condition of knowledge aimed at revealing its most significant deficits and to inform recommendations to help close the gap for Africa's economic advancement.

A sobering picture: Africa's knowledge performance relative to other regions

From data on the knowledge economy index as a whole, Africa does not compare well with other regions and countries in advanced countries. With respect to the knowledge index, Africa is trumped by other regions (Figures 9, 10 and 11).

Figure 9: Knowlege Index Scores by Regions and Income Groups, 2009

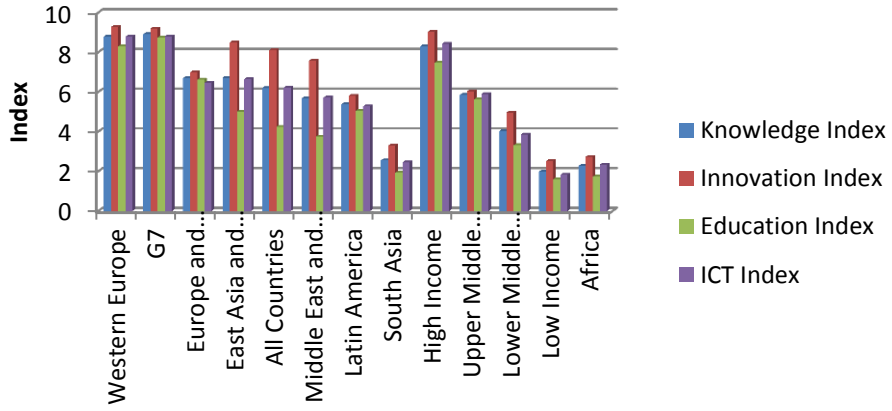


Figure 10: Africa's Knowledge Scorecard (2009) is Abysmally Poor

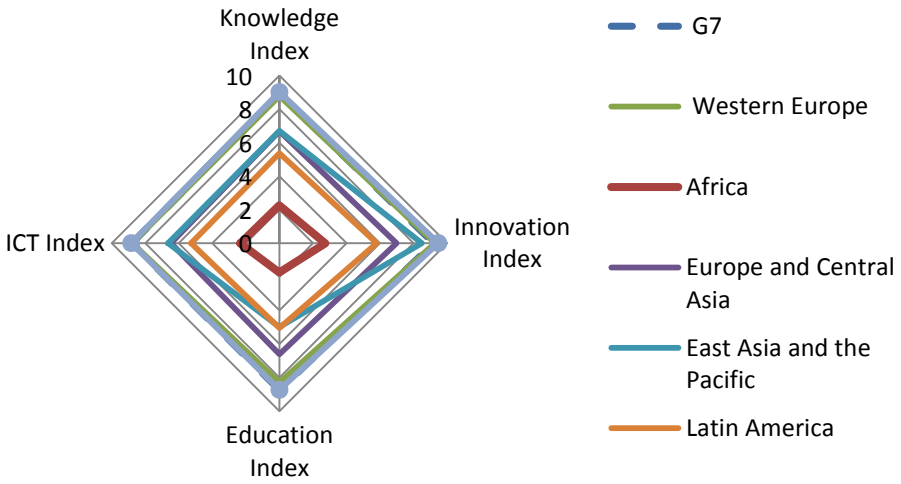
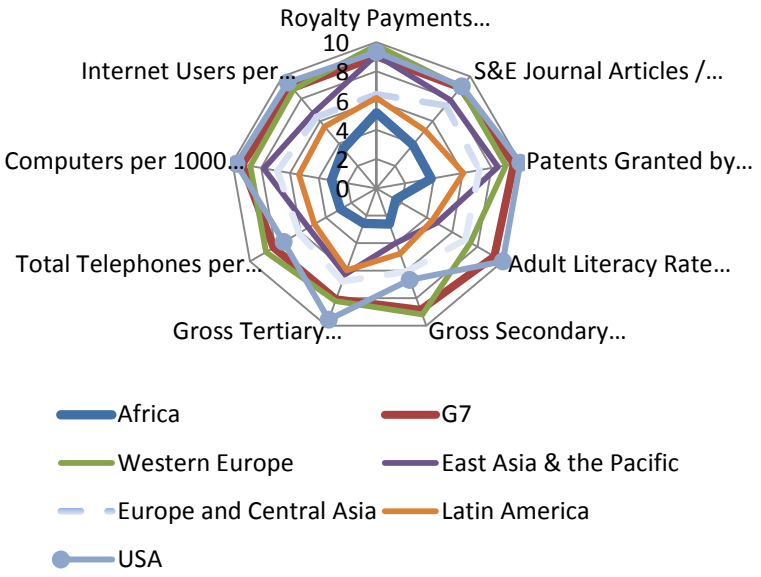


Figure 11: Africa is Lagging on All Components of Knowledge



From the available indicators, knowledge in Africa today appears to be on the retreat. Indeed, Africa's overall score in the knowledge index fell between 2000 and 2009 (indicating lost ground), ironically, particularly due to poorer ICT (Figures 12 to 14).

Figure 12: Declining Knowledge in Africa

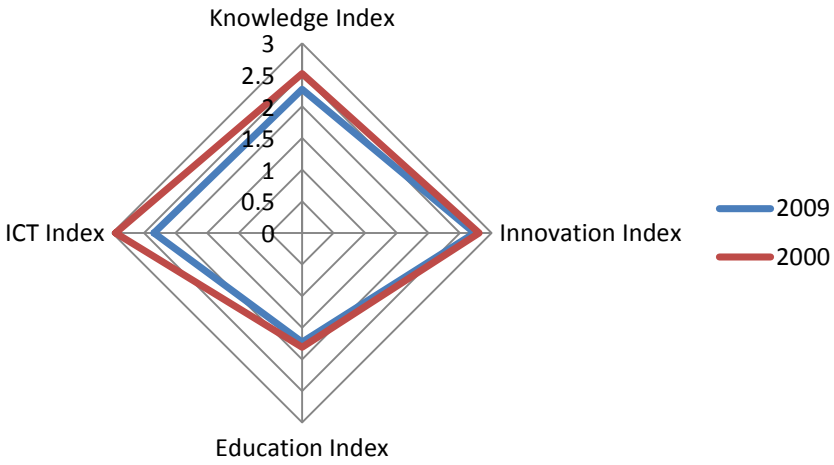


Figure 13: Retreating knowledge in Africa

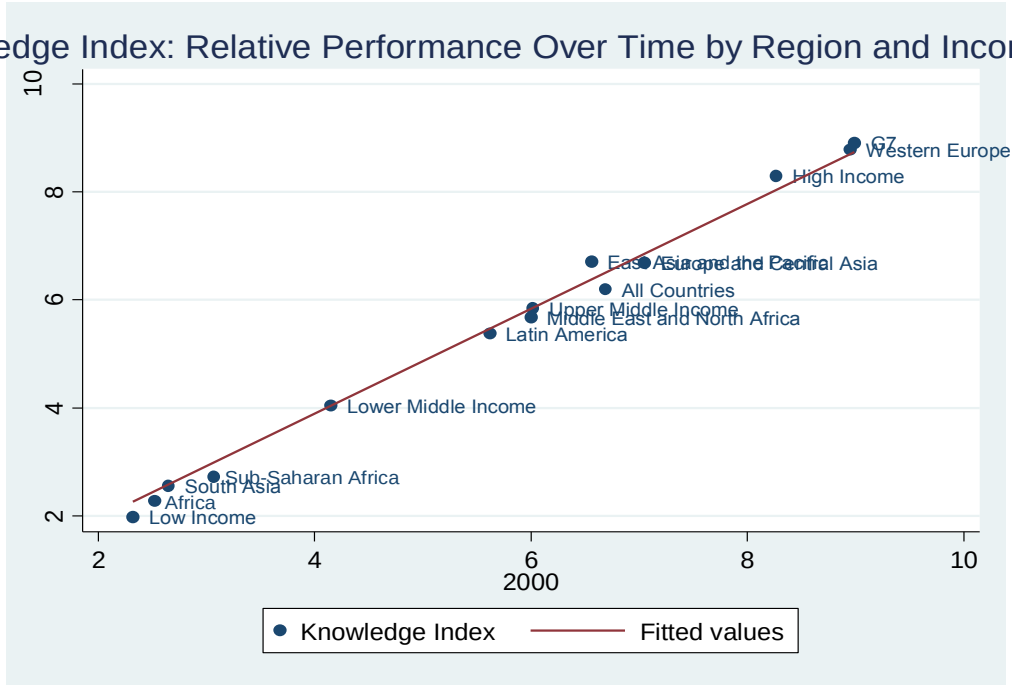
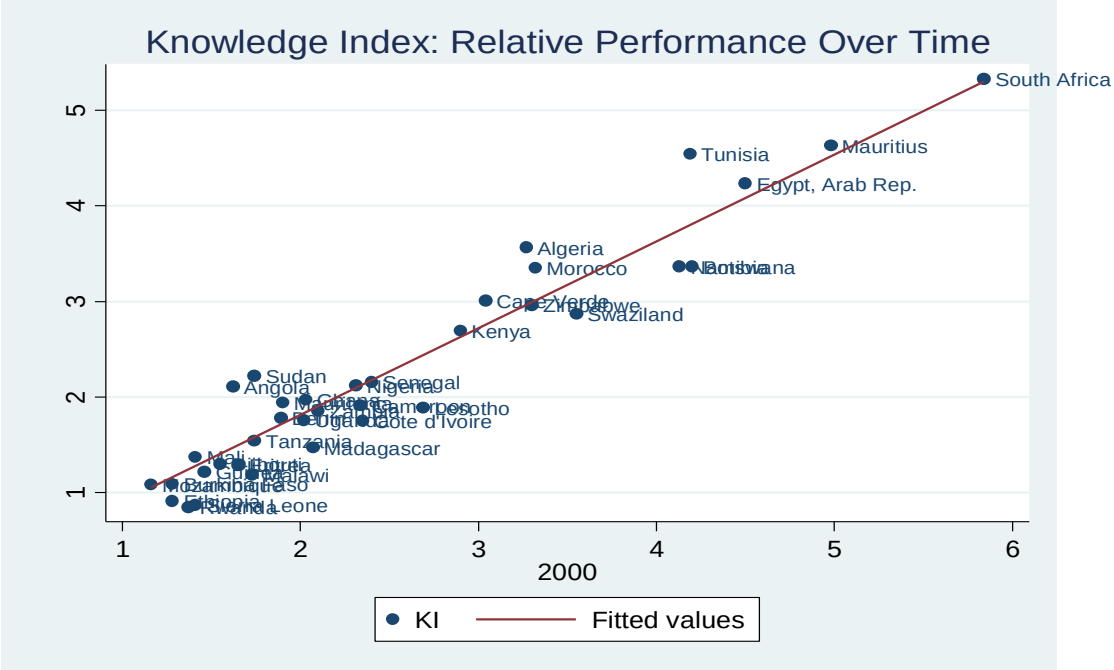


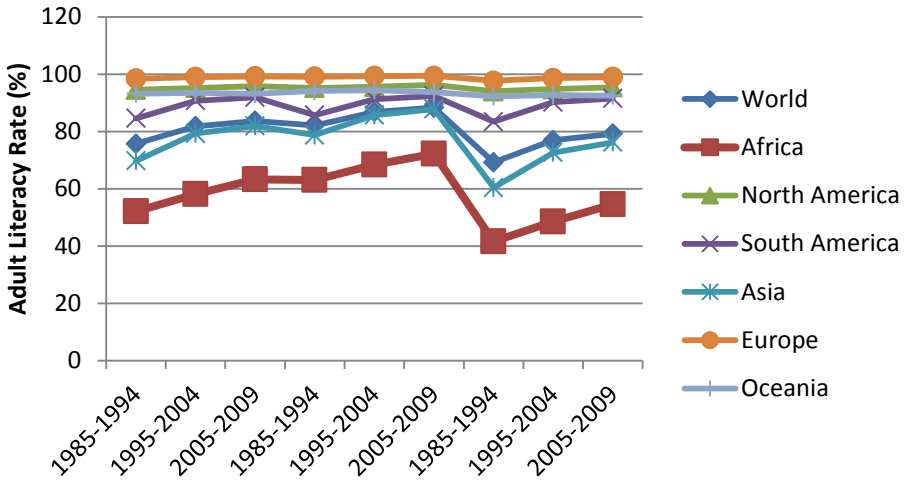
Figure 14: Retreating Knowledge by Country

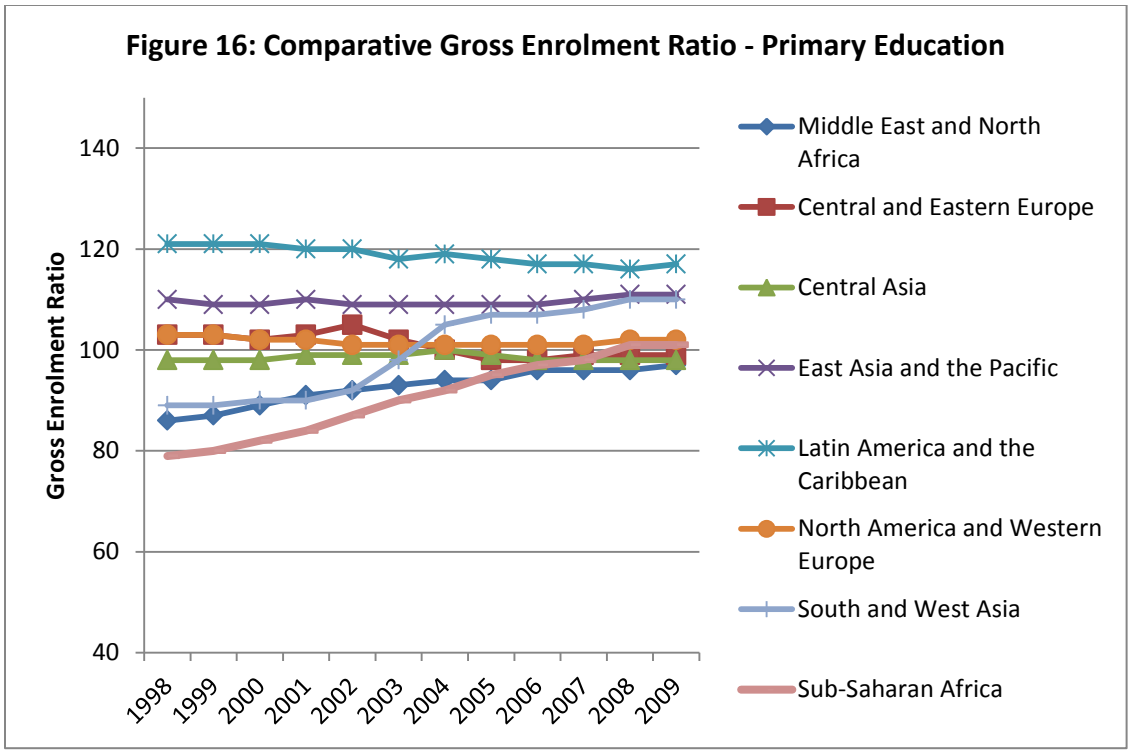


In terms of the three pillars of the knowledge index, Africa's performance is as follows:

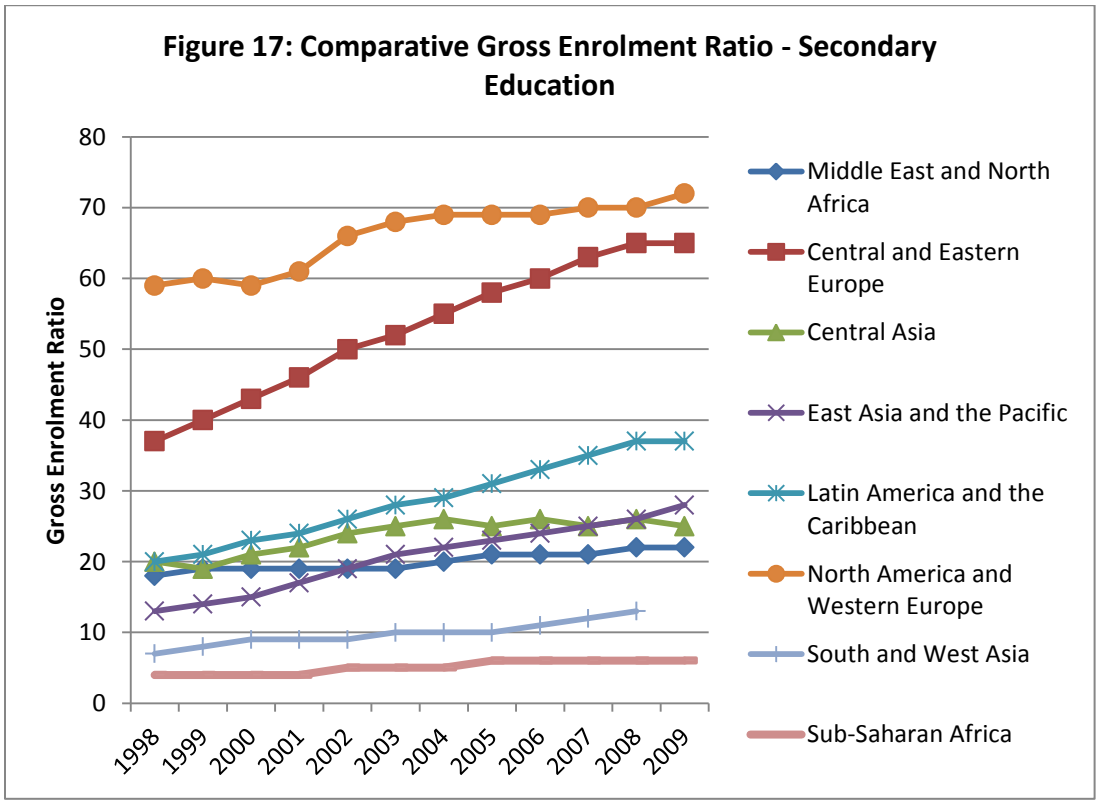
- **Education**: This is the weakest pillar (especially the adult literacy rate), reflecting poor access and quality, and lagging behind comparators and advanced economies. Indeed, high illiteracy rates among adult Africans are intolerable (Figure 15). Interestingly Figure 16 shows that sub-Saharan Africa has caught up with key Western regions recently in primary school enrolment. This shows the extent of the efforts of African governments in promoting primary education, as it increased from 80% in 1999 to 101% in 2009. However, fewer than 50% of children in Africa master basic numerical and reading at the end of primary school.

Figure 15: Comparative Adult Literacy Rate (%)



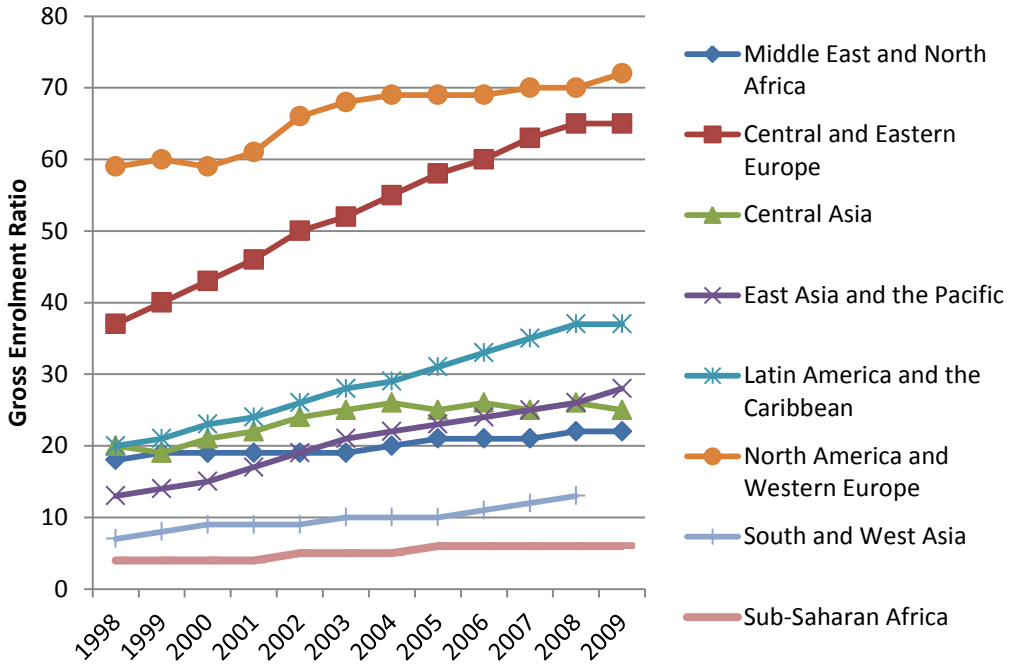


On the other hand, Figure 17 below shows that sub-Saharan Africa trails behind all the regions of the world on secondary school enrolment.



With respect to tertiary education, from Figure 18 below, it can be observed again that sub-Saharan Africa trails below the rest of the regions in terms of tertiary education enrolment which is deemed critical for the development of the knowledge economy. Tertiary enrolment enrollment is not only abysmal but it has grown only very slowly in a decade from 4% to 6%. In addition, only 20 % of the higher education students in Africa opt for science, engineering and technology subjects compared to 50% in Asia.

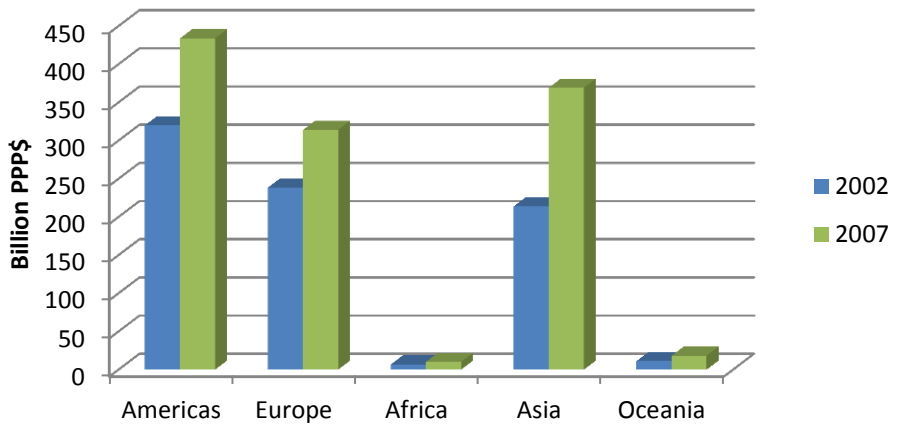
Figure 18: Comparative Gross Enrolment Ratio - Tertiary Education



- **Innovation**: This is the best African indicator, using the innovation index; nevertheless its 2009 performance level is less than its year 2000 performance: Africa is lagging behind comparators and advanced economies. For African economies to remain competitive in the knowledge economy, their innovation systems should be able to convert the R&D investments in these investments and their educational capacities into industrial and export strengths in the high technology sectors (Dahlman et al., 2005, 2006). This conversion could be illustrated through the number of patent applications, the high technology share of total exports, and through the publication of scientific and technical articles.

  Unfortunately, as shown earlier in Figure 11, Africa produces the lowest number of scientific and technical journal articles in relation to the other regions in the world. As Figures 19 and 20 show, Africa lags other regions by a wide margin in terms of research and development (R&D) investment. SSA also has relatively the lowest levels in terms of the number of researchers in R&D per million people (Figure 21).

Figure 19: Comparative R& D Expenditure (in billion PPP$)



- **ICT**: This is also a weak pillar, with especially poor performance in total telephones per 1000 people: Africa lags behind comparators and advanced economies. This shows that the world as a whole made a much more significant improvement in ICT than Africa over the period.

Figure 20: Comparative R&D Per Capita (in PPP$)

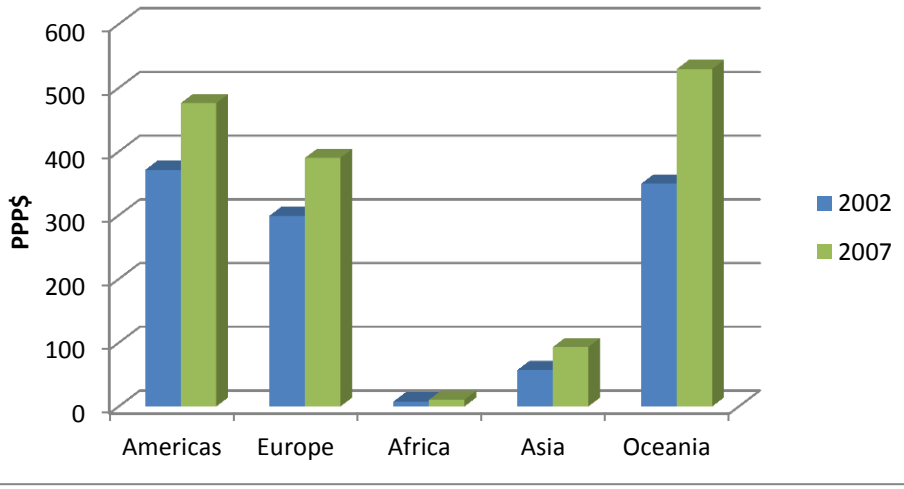
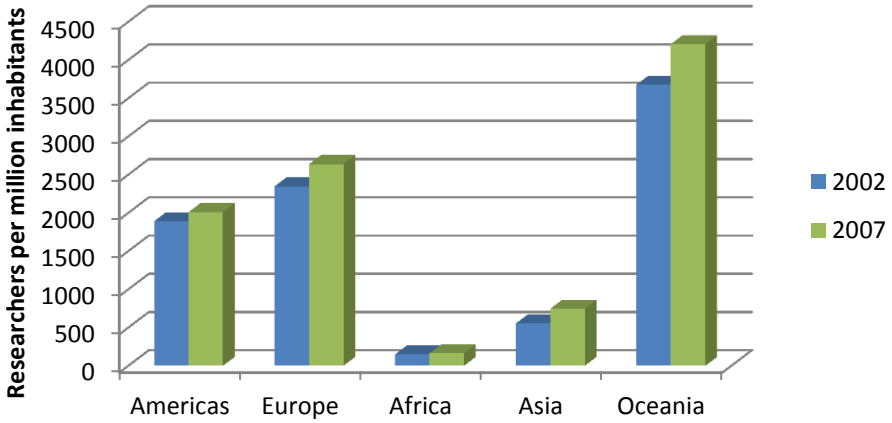


Figure 21: Comparative Number of Researchers Per Million Inhabitants



For African countries to integrate with the knowledge economy they require a modern and adequate information infrastructure which is aimed at facilitating effective communication, dissemination and processing of information and knowledge. This is because ICTs play a significant role in the knowledge economies through the reduction of time, distance and transaction costs as well as the widening of the market base for country products. Indeed, the ability to store, share and analyze knowledge through networks and communities using ICTs allows economic agents to exploit the unique properties of knowledge to gain competitive advantage.

In spite of recent significant increases in mobile technology penetration in Africa, the continent still lags behind East Asia, Latin America and the Caribbean regions. For example, the 2010/2011 networked readiness index (NRI) shows that SSA continues to have disappointing results with a score of only 3.3 against 3.8 for East Asia and the Pacific and 3.9 global average for 138 countries, The majority of SSA sub-region is lagging in the bottom half of the NRI rankings, except for Mauritius (47th) and South Africa (61st). This poor performance has been attributed to underdeveloped infrastructure, inefficient markets, opaque regulatory environments, inadequate educational standards, and widespread poverty, thus hindering a more extensive and efficient use of new technologies for increased development and prosperity in the sub-region.

In Africa, mobile cellular penetration rates will reach an estimated 41% at the end of 2010 (compared to 76% globally) leaving a significant potential for growth. By the end of 2010, internet user penetration in Africa will reach 9.6%, far behind both the world average (30%) and the developing country average (21%). Africa still lags behind when it comes to fixed (wired) broadband. Although subscriptions are increasing, a penetration rate of less than 1% illustrates the challenges that persist in increasing access to high-speed, high-capacity internet access in the region (ITU, 2011).

Figure 22a: Mobile Cellular Subscriptions (Per 100 Inhabitants)

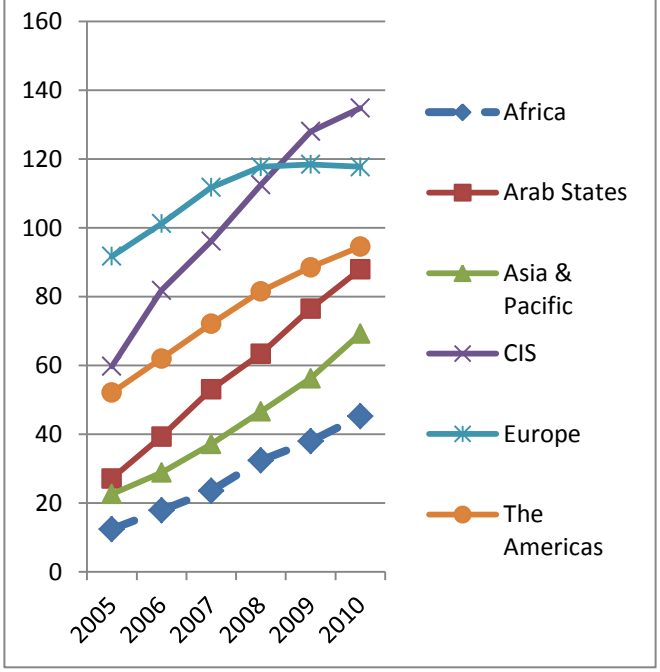
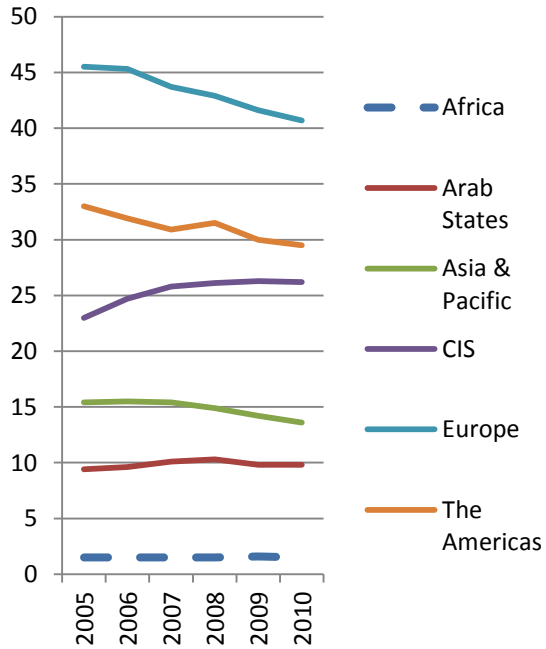


Figure 22b: Fixed Telephone Lines (Per 100 Inhabitants) by Region



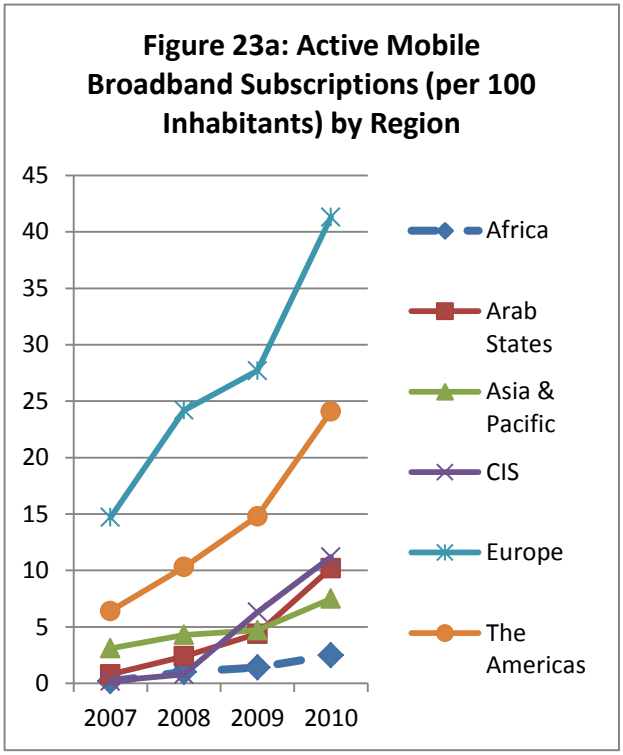


Figure 23a: Active Mobile Broadband Subscriptions (per 100 Inhabitants) by Region
45
40
35
30
25
20
15
10
5
0
2007
2008
2009
2010
Africa
Arab States
Asia & Pacific
CIS
Europe
The Americas

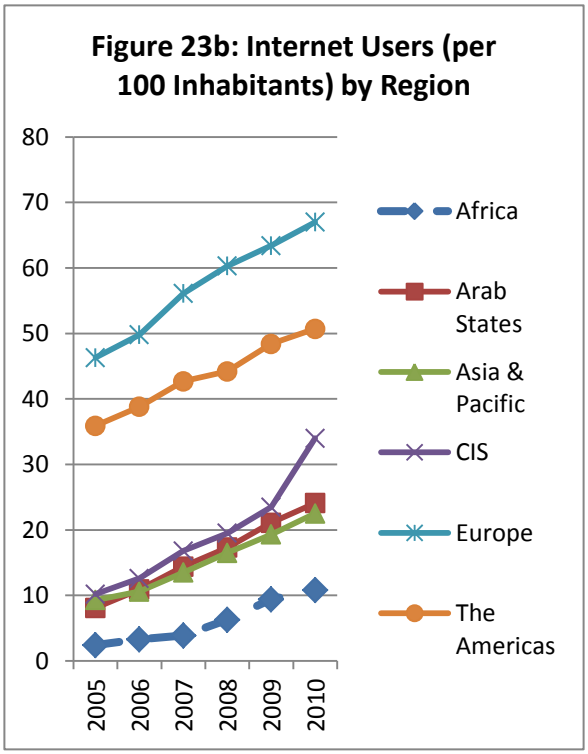
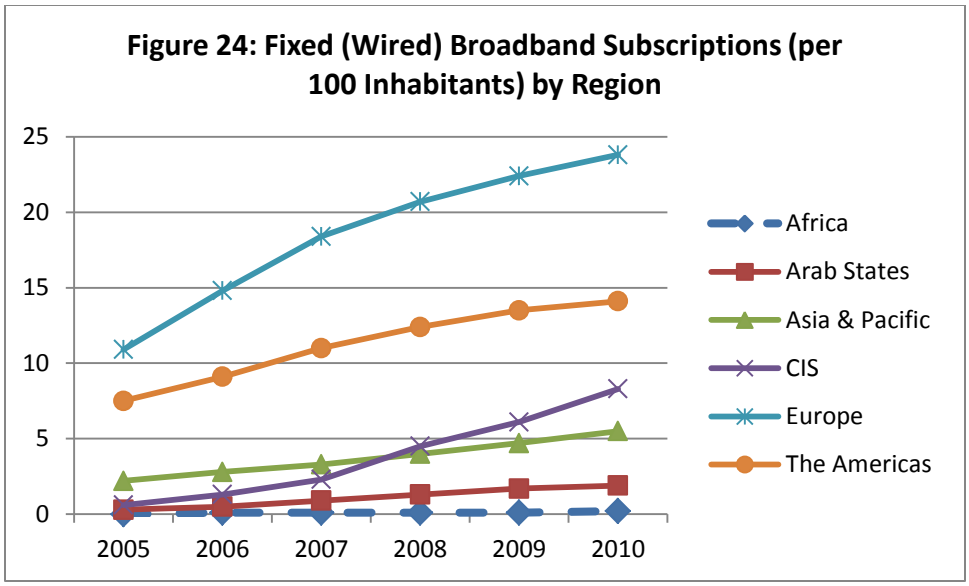


Figure 23b: Internet Users (per 100 Inhabitants) by Region
80
70
60
50
40
30
20
10
0
2005
2006
2007
2008
2009
2010
Africa
Arab States
Asia & Pacific
CIS
Europe
The Americas



Knowledge and Africa's economic advancement: some evidence

Mr. Chairman, Honourable Minister, Distinguished Participants

Clearly, the knowledge index (KI) is a good predictor of economic growth and human development performance. Figures 26 and 27 show the close correlation between the KI and GDP per capita while Figure 28 illustrates KI's close correlation with economic growth. Figure 29 also shows that knowledge is closely correlated with human development in Africa.

Figure 26: Knowledge and Current Global Economic Performance

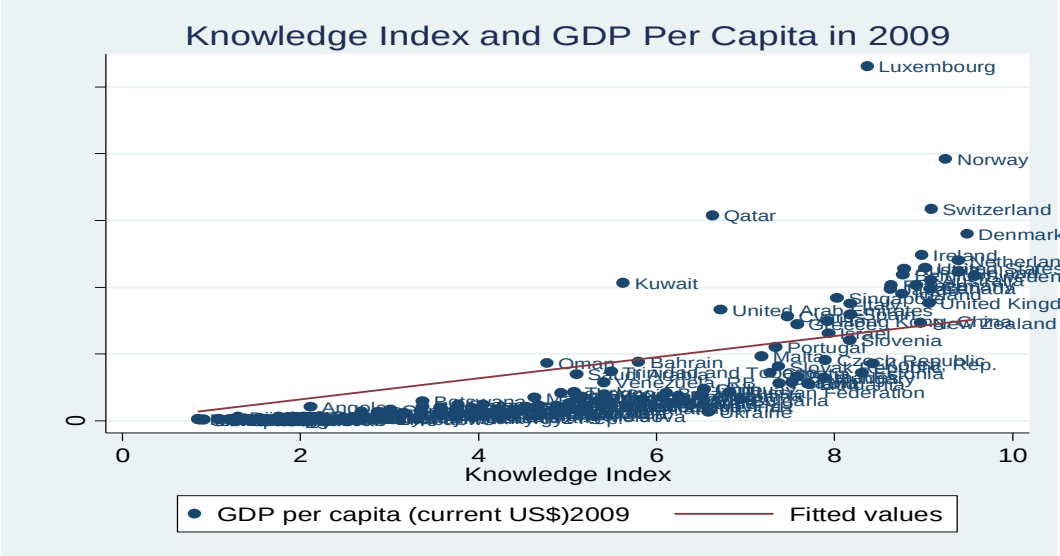


Figure 27: Knowledge and Current African Economic Performance

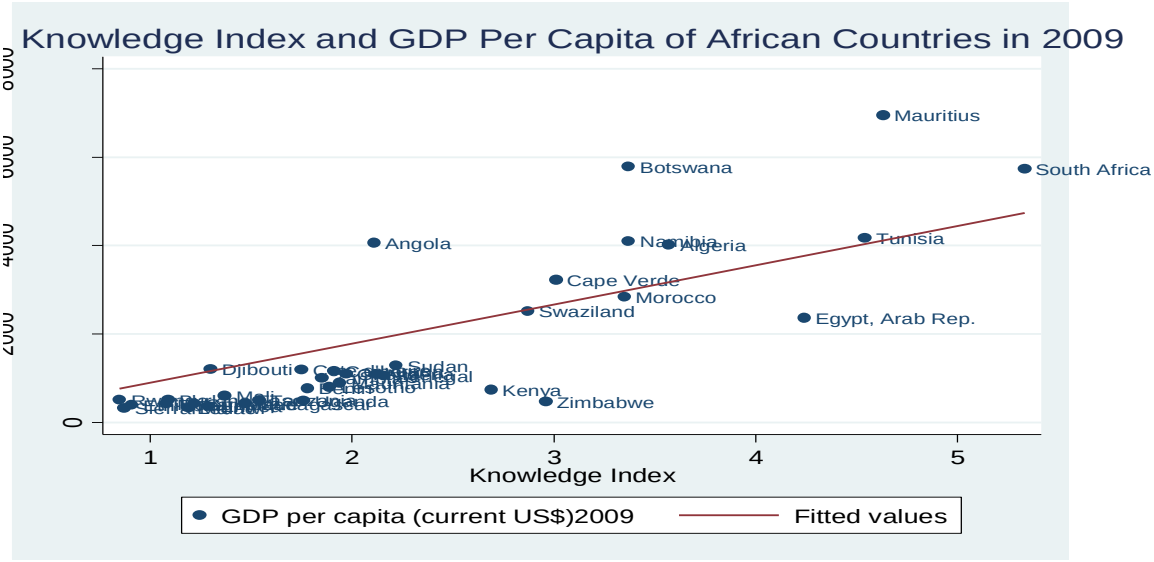


Figure 28: Knowledge and Africa's Current Economic Growth Africa

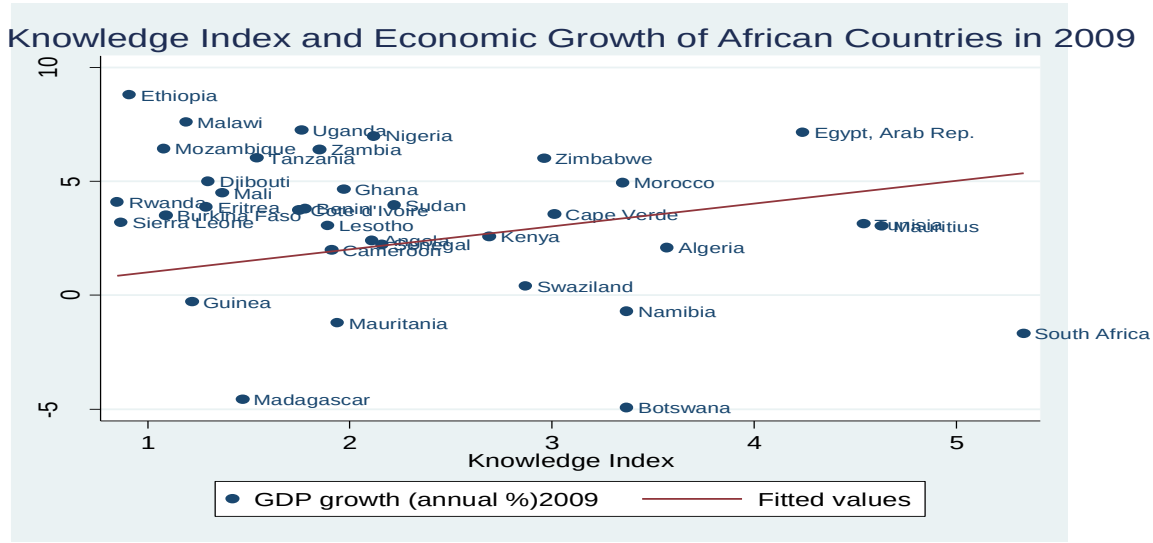
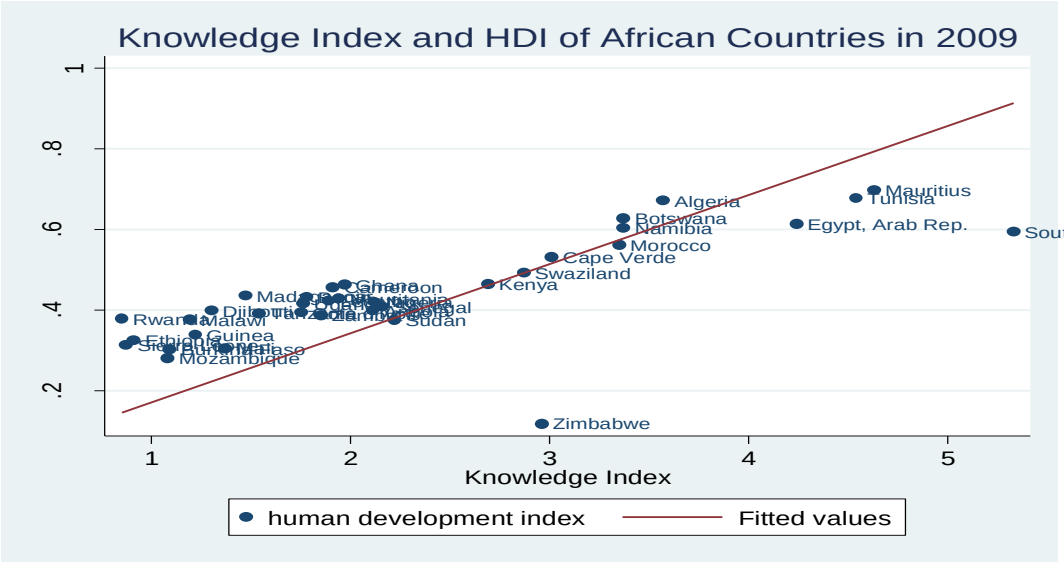
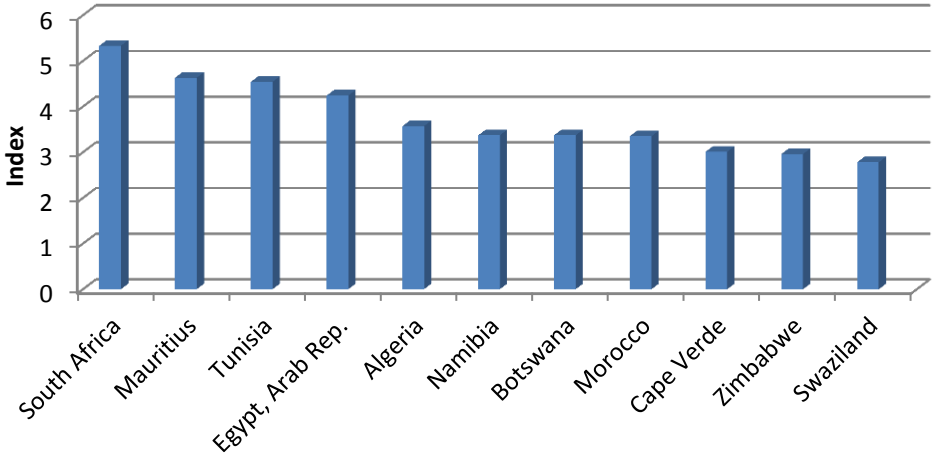


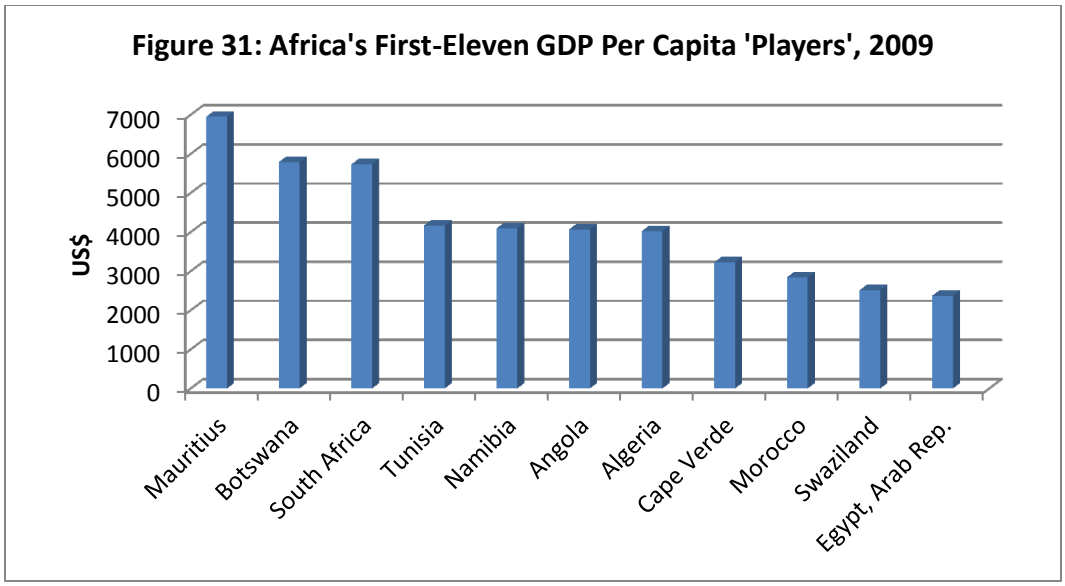
Figure 29: Knowledge and Current Human Development in Africa



In particular, the correlation between knowledge accumulation, as measured by the knowledge index (KI) in 2000, and levels of per capita GDP in 2009 is 82% (Figure 32). African countries that score higher on the Knowledge Index have higher levels of economic development (Figures 30 and 31).

Figure 30: Africa's First-11 Knowledge Index 'players', 2009





In fact, simple econometric tests we performed reveal a *statistically significant* causal relationship running from the level of knowledge accumulation as measured by the KI to future GDP per capita. The relation between country KI values and the average future GDP per capita is illustrated in Figure 32. The horizontal axis plots African country scores for the KI for 2000 while the vertical axis plots per capita GDP, averaged over the years 2005–2009. It is clear, therefore, that higher KI values are associated with higher rates of future per capita GDP, if other factors are held constant. This suggests that higher levels of knowledge in a country do indeed lead to higher levels of economic growth - and consequently to higher levels of economic advancement. Table 5 presents the regression results when we include other variables in the estimation. It shows that a one-unit improvement in the KI leads to an increase of 0.90 percentage point in per capita GDP.

Figure 32: Effect of knowledge on future per capita GDP

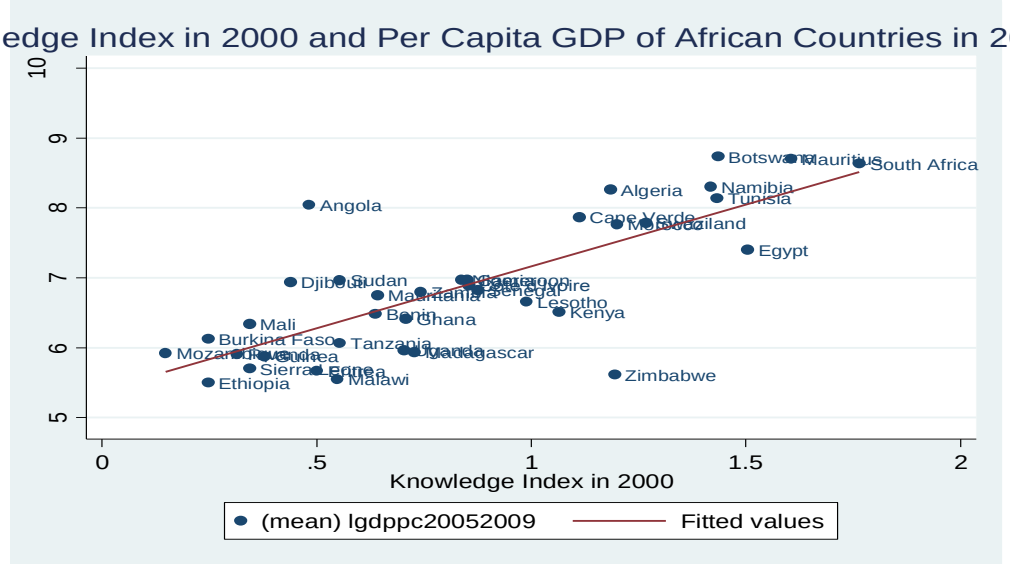


Table 5: Simple regression of the effect of knowledge on future per capita GDP, Dependent Variable is per capita GDFP in 2005-2009

Variable	Coefficient
KI2000	**0.899**
	(2.76)**
Investment rate	0.872
	(1.87*)
Trade openness	0.366
	(1.33)
Share of urban population	0.516
	(2.54**)
Inflation rate	0.032
	(0.26)
Constant	0.426
	(0.29)

** Significant at 5% significant level; * significant at 10% significant level.

Recommendations and next steps

Mr. Chairman, Honourable Minister, Distinguished Participants

What needs to happen—and why?

In this section, I outline some of the ways to create relevant knowledge not only to close the knowledge gap but also to spur economic advancement and social welfare in Africa. These will include developing educated and skilled workers, creating an efficient innovation system and building a dynamic information infrastructure. However, strengthening the economic and

institutional regime is a *sine qua non* in stimulating the most effective use of resources in these three broad domains, permitting their deployment to the most productive uses, and allowing entrepreneurial activity to flourish in order to contribute better to Africa's economic advancement. I now turn to proposing some concrete suggestions in these four priority areas:

Developing educated and skilled workers

Education is the basis for creating, acquiring, adapting, disseminating, sharing and using knowledge. Thus, if knowledge is to be acquired for economic advancement, African countries will have to undertake deep and serious reform of their educational systems. The most fundamental driver of that process, on the individual or the societal levels, is learning. Individual and collective learning are two of the most important capabilities for building knowledge capital. Opportunities for lifelong learning are also essential. Creating a culture of continuous learning and openness to new ideas is critical for creating a knowledge-based economy in Africa. Since learning on the job is insufficient, learning in multiple environments (at home, at school, at Churches and at work) must be fostered through continuing education courses, self-learning on the internet, and computer-assisted instruction.

Given the high level of adult illiteracy in Africa, it has become urgent that the public and private sectors as well as NGOs come together to set up a computer-based functional literacy (CBFL) programme in both rural and peri-urban areas to help resolve this adult illiteracy problem in a very short time.

To address the serious problem of poor quality education, Africa must expand and modernize its education system by investing in hiring more qualified teachers and improved pupil-teacher ratios in schools. In addition, in order to create a sustained cadre of "knowledge workers," African countries will need to develop a more relevant educational system and reorient classroom teaching and learning objectives, starting from primary school. Such a new system would focus on learning, rather than on schooling, and promote creativity. This would also go a long way towards improving the quality of tertiary education and would provide opportunities for lifelong learning.

African higher education requires drastic upgrading. Though African countries generally spend relatively large proportions of their national resources on education, higher education enrolment remains extremely low by international standards. Worse still, the areas of higher education undertaken by the majority of African students are not in the fields of science, engineering technology and business, as is the case in rapidly growing economies such as Korea and China, but more in social sciences and the humanities. The result is a skills mismatch – university graduates remain unemployed, while African countries continue to face shortages of skilled labour. Addressing this in the short term will require improved training programmes and closer links between tertiary and vocational educational institutions on the one hand, and the private sector on the other. Training programmes should include on-the-job initiatives targeting those already working, as well as graduates with a general education who lack specific work skills.

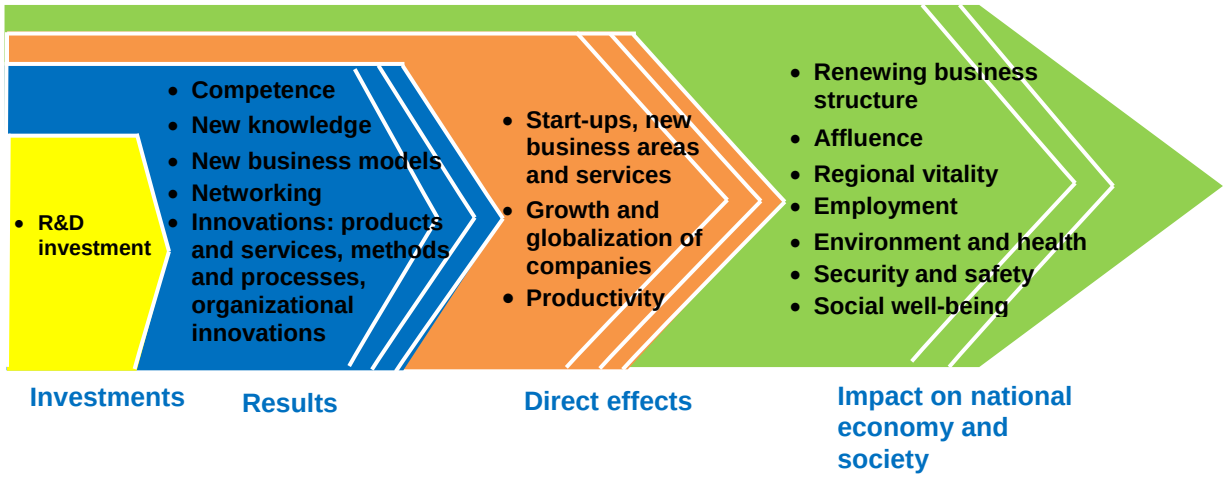
Stronger university-industry linkages are essential. This can be achieved by including private sector representatives in national education and training policy bodies and on academic boards involved in curriculum development. This would no doubt also facilitate private sector funding for research, scholarships, internships and apprenticeships.

Involving the private sector, missions and NGOs is critical. A study to determine why 10-year-olds in Nigeria are often illiterate found that it was because their teachers were illiterate. On the other hand, in Tanzania, the average working day for a teacher is 1 hour 20 minutes. In these conditions it is impossible to produce an educated workforce. What might a country do under such circumstances? It has been suggested that it may be easier to make use of organizations that are already highly motivated than to turn around motivation in extremely dysfunctional institutions. One option is to provide education services through those organizations outside the public sector that have solved the problem of motivation, such as churches, missions, NGOs and similar bodies (Collier, 2011).

Creating an efficient innovation system

Urgent measures are required to strengthen the R&D infrastructure of African countries, developing technological innovations and altering the mind-set of people toward better creation, acquisition, and use of technology. Innovation policies and increased R&D investments are needed in each country in addition to regional strategies. Science and Technology Councils are necessary at the Presidency or Prime Minister level in order to place the agenda high in both public and corporate decisions. As shown in Figure 33, high R&D investments are critical for innovation and hence high economic advancement.

Figure 33: Creation of New Knowledge through R&D is Necessary for Economic Advancement of African Economies

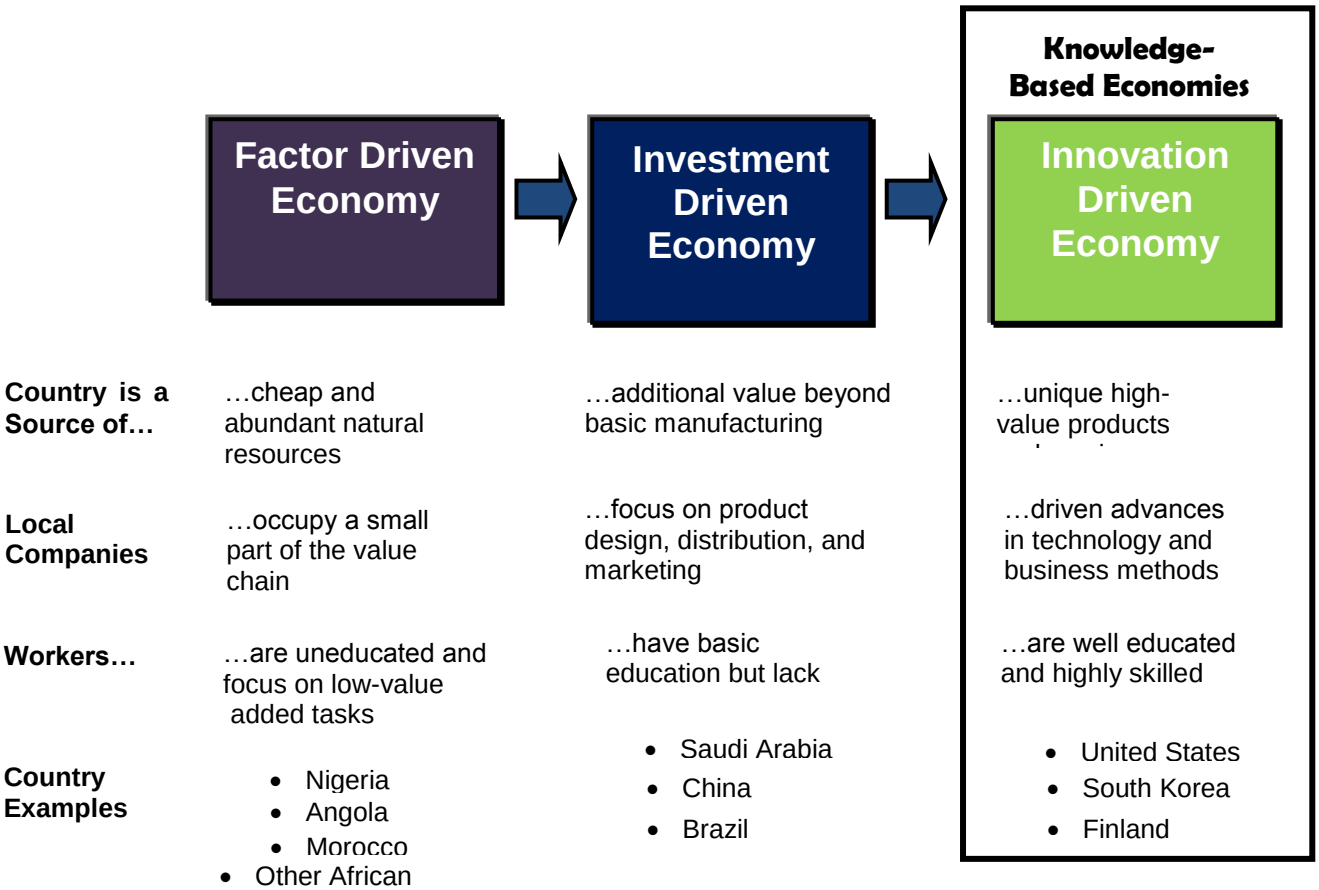


Source: Adapted from Routti (2009)

To bridge the innovation divide between Africa and the world's developed knowledge economies, mere progress will be insufficient. Rather, a path of exponential growth is necessary in order to create a knowledge-based and innovation-driven economy, and widely enjoyed and inclusive economic advancement, in Africa (Figure 34).

Collaboration and linkages among local firms, universities, and research institutes and the worldwide R&D network of multinationals will help integrate African countries into global technology development. This will also help to inculcate a commercial culture among scientists, and aid them to apply knowledge for productive ends. Leveraging abundant African Diaspora knowledge is imperative. Indeed, African governments should develop policies to encourage the Diaspora to contribute to innovative activities by, for example, appointing them to technology management boards as well as establishing laboratories to undertake R&D activities on a contract basis on the continent.

Figure 34: Path to Knowledge-Based Economy: African Countries Need to Leap-Frog to Reach the Knowledge-Based and Innovation-Driven Economy Stage Soon



Source: Adapted from SAGIA (2009)

Africa also needs to improve the efficiency of public R&D and increase private R&D and, as noted earlier, encourage greater university-industry linkages and collaboration through, for example, the establishment of science and technology parks. In order to have access to funding for creative ideas and innovations, African governments should encourage venture capital development and "angel funding" on the continent. In addition, African governments in partnership with the private sector need to develop communication and other infrastructure for R&D, and create an attractive environment to motivate R&D investments, including favourable tax and other incentives.

Measures to attract more foreign direct investment (FDI), given its importance in the generation and dissemination of global knowledge and the role that it plays in driving domestic R&D, should include removing regulations on FDI; encouraging FDI in R&D on the continent; improving governance; eliminating socio-political violence; modernizing and upgrading government institutions; and improving the quality of domestic financial systems (Anyanwu, 2006; 2011).

In the long run, increasing the supply of human capital and skills and improving innovation would involve changing the way students are trained, a process that would require changes in the education system, labour markets, government policies, and the interaction amongst all three. Education systems across Africa would benefit from shifting their focus towards science, technology, engineering, and mathematics. Promoting teaching through problem-solving and discovery, over rote-learning, would also contribute to producing graduates better prepared for the demands of the private sector and would result in the higher economic advancement of the continent. Local education authorities should be given the freedom to collaborate with the private sector to provide on-the-job training and seek funding from alternative sources as well as establish incubators to spur innovative applications adapted to local needs.

At both national and regional levels, innovation prizes need to be instituted not only to recognize but to incentivize best African innovators who produce ideas and products that can be commercialized. In this regard, the recent establishment of the Innovation Prize for Africa jointly by the African Innovation Foundation (AIF) and the UNECA is commendable, and an effort in the right direction. The prize, worth US$100,000 will be awarded for the first time in February 2012 to the best innovators in ICT, green technologies, and health and food security.

Building a dynamic information infrastructure

Africa needs to join the ICT revolution much more decisively since it enables and drives basic services and livelihoods as well as overall economic advancement. This is more so for digitization, which is changing our world on an almost daily basis, with profound yet unknown significance for all aspects of our lives, from media to health, from warfare to global poverty, and from banking to governance.

Africa's telecommunications sector (especially mobile telephony) has registered rapid growth in recent years, spurred by reforms to open markets, and has introduced more competition. Many domestic and international private sector entrants are now providing consumers with high quality services at low prices. While Africa's progress has been very impressive, the rest of the world is also advancing rapidly, and so even greater efforts should be made to make information technologies available to more people throughout Africa.

Africa's ICT development and the extensive use of new technologies for the increased development and prosperity of the continent are however plagued by underdeveloped infrastructure, inefficient markets, opaque regulatory environments, inadequate educational standards and widespread poverty. Africa is generally characterized by:

- The absence of a sophisticated business sector, which is at the forefront of ICT leveraging;
- Very weak individual preparation and uptake of ICT due to poor educational standards, especially in science and mathematics. Low uptake is also the result of very high access costs to ICT (for example, in South Africa);
- Poor government readiness in promoting ICT, notably in improving the efficiency of its operations, providing adequate e-services for citizen access to basic services, and of the quality of basic services.

In Africa, national and regional ICT Plans (including broadband plans) with a digital agenda are urgently needed where they do not exist, to ensure and speed up high capacity internet access and the associated networks, devices, content, and applications. This is necessary especially because of the role of the internet in the 21st century as a general purpose technology that has the potential to spread through the economy and bring about generalized productivity gains, improved education, healthcare, energy efficiency, public safety, and the delivery of government services.

In addition, given the poor ICT, especially broadband, development in Africa, African governments can intervene to promote ICT/broadband by:

- Improving the overall environment for innovation and ICT, including market conditions, regulatory framework, and infrastructure (both physical and human);
- Establishing an innovation-friendly environment and setting the ICT vision for the future where all national stakeholders are involved in the definition and implementation of the vision to achieve optimal networked readiness;
- Providing firms and consumers with incentives to extract value from the use of broadband, particularly in sectors that further national purposes, such as education, healthcare, energy efficiency, public safety, and the delivery of government services;
- Efficiently allocating assets that the public sector controls or influences (such as the spectrum and public infrastructure);

- Encouraging the deployment, adoption, and use of broadband in areas where the market alone is not enough (such as areas where the cost of deployment is too high to earn a return on private capital or where households cannot afford to connect);
- Ensuring robust competition in telecommunications, including digital democracy, thus increasing better service offerings and customer care as well as reduced prices and subscription charges; and
- Ensuring robust competition (including privatization) in the power sector given that electricity generation, distribution and access pose tremendous obstacles to ICT development on the continent.

Strengthening the economic and institutional regime

Strengthening the economic and institutional regime in African countries is a *sine qua non* in stimulating the most effective use of resources in the above three broad domains, permitting their deployment to the most productive uses, and allowing entrepreneurial activity to flourish to contribute better to Africa's economic advancement. African countries, therefore, have little choice but to pursue deep reforms in their social and economic structures.

Strengthening the economic, institutional, and incentive regime, which comprises both macro- and micro-policies, remains a priority for African countries. A number of African countries have made improvements in this area since the mid-1990s (Figures 35 and 36 below), and continuing progress is important in order to support reform in innovation and education which are the drivers of the knowledge interface and are essential in the creation of a climate conducive to investment.

Important measures in this regard include: consolidating macroeconomic stability; strengthening banking systems to enhance domestic resource mobilization; and developing capital markets by improving the regulatory framework, reforming labour market practices, accelerating the pace of privatization and broadening the domestic investor base. Such measures would need to be complemented by efforts to attract larger volumes of foreign private capital inflows. These are essential for augmenting domestic savings and investment and to accelerate growth rates. In particular, efforts have to be invested in reforming and strengthening judicial and legal systems and putting in place effective and transparent regulatory frameworks. In addition, physical infrastructure (including ICT infrastructure) across Africa is under stress. Modern, cost-effective, reliable and affordable infrastructure services are critical for sustainable development, hence the urgent need to close the infrastructural gap in the continent.

Figure 35: African Countries' Economic and Institutional Performance in 2009

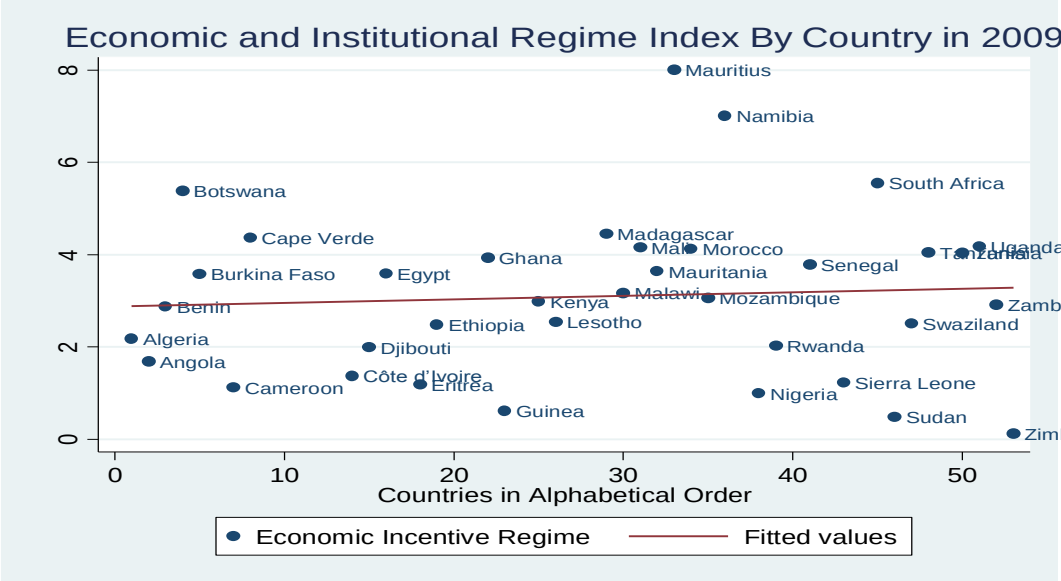
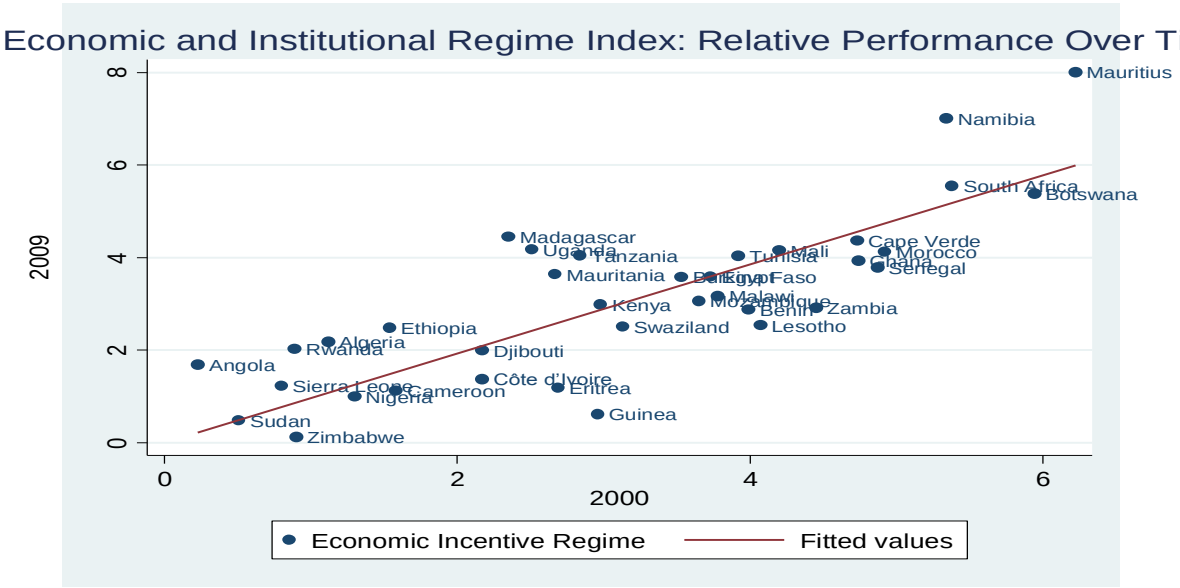


Figure 36: African Countries' Economic and Institutional Performance between 2000 and 2009



African countries need to intensify efforts to strengthen governance through the development of participatory decision-making processes that are inclusive of civil society and the private sector as well as local communities. They need to introduce decentralized governance structures as part of the efforts to broaden public participation and involvement in policy

processes and implementation. They also need to improve public service delivery, strengthening capacity and ensuring greater accountability and transparency in public administration.

Conclusion

Mr. Chairman, Honourable Minister, Vice-Chancellor, ladies and gentlemen, participants –

One billion-dollar question one might ask is: how will African countries raise the money that is required to achieve all the above, especially in the face of vanishing foreign aid, lean domestic resources and serious debt crisis in Europe and budget crises in the US? The good news is that a major part of what is required is not money. What are required are the political commitment, transparency and accountability; the collaborative spirit to formulate the requisite policies, strategies, plans and collective action; and the institutional changes needed for leapfrogging to a knowledge-based and innovation-driven economy for the economic advancement of Africa.

In addition, African countries need to redouble their efforts to mobilize domestic revenues, which in 2008 represented 10 times the total volume of aid flowing to the continent. To do this, African countries need fair and efficient tax systems, improved tax administration, a deeper tax-base, a diversified tax mix and encouragement for investment by the private sector, including foreign investors.

Emerging partners like the BRICs are redefining international cooperation, especially with Africa. For example, some emerging partners (China and to a lesser extent India, Brazil and Turkey) have grown to exert regional and global influence on development cooperation. Apart from increased trade that had reached about US$150 billion in 2011, it has been estimated that between 2005 and 2010, about 14% of Chinese overseas investments went to sub-Saharan Africa (SSA). Forecasts suggest that investments from China into SSA are likely to hit US$50 billion by 2015, an increase of 70% from 2009. While a large proportion of these investments are going to help build roads, rails, and ports, some could be tapped for knowledge development, including knowledge infrastructure development.

Mr. Chairman,

Permit me to say a few words on the specific focus of this conference, digitization: the conversion of analog information in any form to digital form with suitable electronic devices so that the information can be processed, stored, preserved and accessed, shared and transmitted through digital circuits, equipment, and networks. The theme could not have been more timely because we are living in extraordinary times when libraries over the world are experiencing great increases in demand and usage but are at the same time facing reductions in financial resources, which threaten their survival. In your deliberations in the next two days, I challenge you to come up with answers to the following key questions:

- How has the digital revolution transformed African libraries?
- How can Africa conquer the digital divide?
- Which innovative practices can be applied in Africa?

- Which new and emerging technologies can Africa apply?
- Which are the key policies and legal issues?
- How has digitization shaped the incentives for creating and diffusing knowledge?
- How has intellectual property protection, such as copyright, patents, trade secrets, trademarks and database protection shaped digitization?
- Libraries are well aware that the future is digital, but how do we get there in these times of shrinking budgets and staffs?
- What are the financial implications of digitization for African institutions?

To conclude, permit me to state that, in spite of her challenges, Africa is on the move: there is currently a born-again Africa with a new face. The continent is at a turning point, with a new story replacing the old, outdated one characterized by a helpless victim dependent on goodwill and largesse of its richer partners around the world. This new story is one characterized by robust economic growth, currently driven in part by its abundant natural resources, better economic management, and a redefined relationship with emerging partners. When these are combined with improved knowledge development, the continent will be ready for an accelerated, sustainable, green and climate-resilient inclusive economy, advanced knowledge-based and innovation-driven.

Thank you for your kind attention.

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