

ANALYZING THE NETWORK READINESS OF COUNTRIES OF THE WORLD FROM 2009 TO 2016: COMPARISON BETWEEN AFRICA AND OTHER CONTINENTS

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ABSTRACT

Information Technology (IT) is now globally recognized as a very strong tool for economic development and is being used by many countries to spur economic growth and to create jobs. In an attempt to objectively measure the progress of Africa in IT development over the last decade, this paper critically analyzes the Global IT Reports of three specific years during the last decade – 2009, 2012 and 2015. This is done by getting the lowest common denominators of indicators present in all the three (3) years and making an analysis on the basis of these common indicators for the countries of the world. When countries are grouped into their continents and a comparison is made of the averages of the NRI indicators for different continents, the results can be used to show how well Africa is doing with respect to other continents and what African countries need to do in order to use ICT to enhance the economic development of their countries.

Keywords: Global IT Report (GITR), Network Readiness Index (NRI), Information Technology (IT), Africa

INTRODUCTION

Information Technology (IT) is now globally recognized as a very strong tool for economic development and is being used by many countries to spur economic growth and to create jobs (ITU, 2011) (Batchelor & Scott, 2005). As explained in NRI (2009), its “revolutionary power as a critical enabler of growth, development, and modernization” makes it an important tool for developed countries to use in “innovating in their processes and products ... [to] ... maintain their competitive advantage” and developing countries to “leapfrog to higher stages of development...” All countries, therefore, have to formulate and adopt appropriate policies that would make them more competitive in the emerging knowledge society. It is interesting to note that, as explained in ADB (2014), the impact of IT on economic growth is greater in developing countries than in developed economies. This is why several developing countries have aggressively pursued and implemented policies that have allowed them to reap enormous economic benefits that have propelled their national development agendas (Sridhar & Sridhar, 2007). Many African countries, in particular, have pursued vigorous ICT policies that have enhanced their economic development (Yonazi et al., 2012) (Blanke et al., 2013). Countries generally need data with which to measure the progress that they are making across time, especially with respect to other countries, in order to appraise the impact of policies and actions meant to bring about socio-economic development. Since 2001, the World Economic Forum (WEF) and INSEAD Business School have been jointly producing

the annual Global Information Technology Report (GITR) that has become “a unique tool for policymakers and all relevant stakeholders ...to follow the progress of their country over time and vis-à-vis relevant comparators ...”

While the overall NRI rankings are very helpful in showing how each country is faring in the different pillars, they are more useful in comparing countries against one other in any given year than in showing the progress that a particular country has made over a given period of time. This is because the computation of the overall NRI index changes almost every year as indicators and sub-indicators are added or removed and, in particular, sub-indicators are moved from one indicator to another. In an attempt to objectively measure the progress of Africa in IT development over the last decade, this paper critically analyzes the Global IT Reports of three specific years during the last decade – 2009, 2012 and 2015. This is done by getting the lowest common denominators of indicators present in all the three (3) years and making an analysis on the basis of these common indicators for the countries of the world. When countries are grouped into their continents and a comparison is made of the averages of the NRI indicators for different continents, the results can be used to show how well Africa is doing with respect to other continents and what African countries need to do in order to use ICT to enhance the economic development of their countries.

Literature Review/Related Work

The impact on ICTs on the economic growth of countries all over the world is substantial. As discussed in Kramer et al. (2007), because they reduce transaction and offer much cheaper substitutes for traditional means of communicating and transacting business, they have an impact on the conventional factors of production just as they also have a life of their own when they are viewed from the context of the general services they offer. As further explained in Bilbao-Osario et al. (2013) and Dutta et al. (2015), “it is clear that ICTs offer higher benefit-to-cost ratios in all sectors of production, while simultaneously offering new ways to create value by better and more efficiently organizing the use of natural, financial and human resources” and overall, “digitization—the mass adoption of connected digital services by consumers, enterprises, and governments—has emerged in recent years as a key economic driver that accelerates growth and facilitates job creation.”

In order for countries to make the best use of ICT to promote economic development and foster economic growth, they need to formulate strong policies, carefully plan and aggressively implement such policies. They must also constantly evaluate their

progress against their vision and set objectives as well as compared to other nations in the world. Clearly, there is therefore the need for collecting and analyzing data on various aspects of the ICT environment in such countries. Several organizations, such as the World Bank and the United Nations collect and analyze data on various pertinent indicators from different countries of the world. Previous reports on social indicators such as the UN Handbook on Social Indicators by DIE&SA (1989) did not have any statistics on ICT. More recently, ICT has become a very important factor to reckon with and, inevitably, newer reports always have ICT statistics amongst the key development indicators [Internet Use, Mobile subscribers etc]. Amongst all the reports on ICT indicators for countries across the world, the most recognized has been the Global Information Technology Report which, since 2001, has been covering on an annual basis the network readiness indicators for all countries of the world. These reports contain large amounts of valuable data which have not been sufficiently analyzed. The current research may be a one of its kind in analyzing the Network Readiness Index (NRI) reports in an objective way so as to compare how the different continents are faring in their ICT development efforts.

METHODOLOGY

The major aim of the study was to use the Network Readiness Index (NRI) reports for the years 2009, 2012 and 2015 to analyze the progress that Africa, as a region, has made in terms of IT development over the last decade and to identify the most important factors that have led to such development. The methodology used was as follows:

- 1) Get all the indicators that are present in the NRI 2009, 2012 and 2015.
- 2) Select the countries that are present in the 3 years (2009, 2012 and 2015)
- 3) Extract all the indicators for the selected countries for the 3 years and calculate the sub-indices and the NRI on the basis of these selected indicators.
- 4) Put them in a large Excel worksheet and group them according to continents
- 5) Make a general examination of the data in the worksheet.
- 6) Get continental averages for each indicator, each year.
- 7) Analyze the trend /slope for each indicator
- 8) Discuss the results and make relevant observations and conclusions

The details of the methodology used are explained below:

Calculation of the NRI

The NRI every year is a composite indicator made up of a number of categories with each category further divided into subcategories. It was a simple average of three sub-indices (Environment, Readiness and Usage) while each – but a fourth (Impact) has been added – with each sub-index itself as a simple average of the indicators it is made up of. Majority of the indicators are derived from the World Economic Forum’s Executive Opinion Survey but some come from external sources. Each indicator is transformed into a 1-to-7 scale for the calculation of the NRI. Unfortunately, over the years, the categories as well as the subcategories have been changing. This makes it very difficult to compare across the years.

Harmonization of Categories and Subcategories

In order to make a proper comparison for the years 2009, 2012 and 2015, all the subcategories that are not present in each of the

3 years are removed leaving only those that are present in all the 3 years. For convenience, the selected subcategories are placed according to the way they are arranged in the 2009 Global IT Report (GITR). Table 1 below shows the breakdown of the numbers of indicators for each of the 4 sub-indices namely environment, readiness, usage and impact. In all, a total of 31 indicators were used in this research as shown in Table 1.

Table 1: The Breakdown of Number of Indicators in the Computation of NRI for 2009, 2012 and 2015

Year	Environment		Readiness			Usage			Impact	
	Political	Market	Infr	Individual	Business	Govt	Indiv	Buss	Govt	
2009	9	14	7	9	10	4	5	5	5	
2012	9	9	9	5	3	4	7	5	3	4
	Political	Market		Infr	Afford	Skills	Indiv	Buss	Govt	Econ
2015	9	9		4	3	4	7	6	4	4
	No of indicators Used	7	6	3	3	2	1	4	3	3

Selection of Countries and Categorization into Continents

The Global IT Report (GITR) for each year tries to get the NRI ratings for all countries of the world. Every year, some countries are left out mainly because it is not possible to get the requisite data from them as a result of war or some form of political instability. For the years 2009, 2012 and 2015, there were 134, 142 and 143 countries respectively. There are 134 countries that appear in each of the 3 years and they are the ones used in this study.

The countries that are covered in the three global IT reports are classified into one of four continents – Africa, America, Asia and Europe. The countries in the Middle East as well as in the Arabian Gulf are placed in Asia but Arab countries in North Africa are considered part of Africa. New Zealand and Australia, in spite of the fact that they are continents in themselves, are put in Asia.

Analysis of the Data

The analysis includes a general examination of the data for each of the years under consideration as well as a specific study of the overall trend of each of the indicators over the period 2009 to 2015, with particular reference to the years 2009, 2012 and 2015. The general examination is carried out using such functions as average, maximum, minimum and standard deviation so as to get the overall characteristics of the data. In particular, the ratio of each continent’s average score against the average score for all countries of the world is analyzed for the various indicators for each year in order to measure the relative progress made by Africa compared to other continents in each of the various indicators that make the NRI.

The specific study is to find out the progress made by each of the indicators making up the NRI over the period under study. Since the analysis is being made using the Global IT Reports (GITRs) of 2009, 2012 and 2015, the SLOPE function is used to find the gradient of the best straight line from the 3 points of the data set for each indicator. It is assumed that the more positive the gradient, the greater the relative progress made on that indicator over the period 2009 to 2015.

RESULTS AND DISCUSSION

Out of the 134 countries with NRI ratings, 37 are in Africa, 25 in America, 37 in Asia and 41 in Europe.

Single Year Analysis

Some of the general characteristics/statistical data on the NRI for the different continents for 2009 are shown in Table 2 below:

Table 2: General Characteristics of the NRI Data for 2009

	NRI	STD-DEV	MAX	MIN	MIN RANK	MAX RANK
ALL COUNTRIES	3.7	0.8	5.7	2.3	1	133
AFRICA	3.1	0.4	4.1	2.3	36	133
AMERICA	3.4	0.7	5.5	2.5	5	130
ASIA	3.9	0.8	5.6	2.4	3	132
EUROPE	4.2	0.8	5.7	2.8	1	119

As expected, African countries have the lowest average (3.1) while the average for European countries is the highest (4.2). The averages for America (3.4) and Asia (3.9) are in between. It is interesting to note that the standard deviation for the NRI values of African countries is 0.4 compared with 0.7 to 0.8 for other continents showing that majority of the NRI values of African countries are clustered together while they are more scattered for other continents. This suggests that most African countries are at the same poor level. This is further illustrated when it is observed that the best African country is at the 36th position and indeed majority of the African countries are on the second half of the list. The NRI, as earlier stated, is actually an average of three indicators; environment, readiness and usage. Looking at each of these indicators gives a better picture of the real performance of each country. African countries perform poorly in all the 3 indicators but it is interesting to note that they do slightly better in the readiness sub-indicator where the average value for African countries (3.5) is 90% of the average value for all countries of the world but for the environment and usage sub-indices, the African averages are 80% of the worldly averages.

Table 3: Values of NRI as well as Environment, Readiness and Usage Indicators for 2009

	Environment	Readiness	Usage	NRI
ALL COUNTRIES	3.7	4.0	3.5	3.7
AFRICA	3.1	3.5	2.6	3.1
AMERICA	3.4	3.6	3.3	3.4
ASIA	3.8	4.3	3.6	3.9
EUROPE	4.2	4.3	4.0	4.2

What is responsible for the better performance of African countries in the readiness sub-index? The answer can be seen when one looks at the individual pillars that make each of the sub-indices. It is easy to see that, for both the environment and usage sub-indices, there are some pillars where African countries do extremely poorly. In particular, it is seen that African countries do fairly badly in the infrastructure pillar where the average score (1.2) is barely 50% of the average value (2.2) of countries of the world. In the same way, African countries do equally badly in the individual usage pillar where the average value for African countries (1.4) is again only 50% of the worldly average (2.7). For 2012, the general and specific characteristics of the NRI data are not substantially different especially for the African continent. As shown in Table 4, the average NRI value for African countries remains at 3.1 just as that of European countries stays at 4.2. Those of America (3.4 to 3.5) and Asia (3.9 to 4.0) observe some small gains.

Table 4: Values of the Environment, Readiness and Usage Indicators as well as overall NRI for 2012

	Environment	Readiness	Usage	NRI
ALL COUNTRIES	3.6	4.0	3.6	3.7
AFRICA	3.1	3.5	2.5	3.1
AMERICA	3.4	3.8	3.4	3.5
ASIA	3.7	4.3	3.8	4.0
EUROPE	4.1	4.3	4.2	4.2

When the specific sub-indicators are studied, it is observed that there is an improvement in the environment sub-index where it is now at par with the readiness sub-index with the African continental average in each case representing 90% of the worldly averages. For the usage sub-index however, African countries perform poorly and the African continental average (2.5) is barely 70% of the worldly average. Even though there is an improvement in the environment sub-index, it is worth noting that there is no remarkable progress made in the infrastructure pillar because the African continental average (1.2) is still only 60% of the worldly average.

For 2015 again, the general and specific characteristics of the NRI data are not substantially different especially for the African continent. As shown in Table 5, the average NRI value for African countries remains at 3.1 but that of European countries increases to 4.3. Those of America (3.5 to 3.6) and Asia (4.0 to 4.1) also observe some small gains. This suggests that compared to other continents which recorded small gains in their NRI averages, Africa slid down. It is interesting to note that the gains recorded in the NRI averages for 2015 is as a result of the fact that all the continents made substantial gains in the usage sub-index including Africa. However, as shown in Table 5, those of America (3.4 to 3.8), Asia (3.8 to 4.2) and Europe (4.2 to 4.6) are higher than that of Africa (2.5 to 2.8).

Going into the individual pillars that make up the usage sub-index, it is interesting to note that all the continents make appreciable gains in the individual usage and business usage pillars including Africa. However, the continents generally experience declines in the government usage pillar but to various extents. Europe remains at the same level (2.8) while Asia (3.0 to 2.9) and America (2.5 to 2.4) slide down by 0.1 points. Africa, on the other hand, goes down considerably from 2.1 to 1.7.

Table 5: Values of the Environment, Readiness and Usage Indicators as well as overall NRI for 2015

	Environment	Readiness	Usage	NRI
ALL COUNTRIES	3.6	4.1	4.0	3.9
AFRICA	3.2	3.6	2.9	3.2
AMERICA	3.4	3.8	3.8	3.7
ASIA	3.8	4.4	4.3	4.1
EUROPE	4.0	4.3	4.6	4.3

Entire Period

In order to see the overall trend in the NRI, over the period 2009 to 2015, it is best to measure the slope of the best line through the values of NRI for the 3 years under study; 2009, 2012 and 2015. As shown in Table 6, it is interesting to note that the slope for African countries (0.02) is less than the slopes for America (0.03) and Asia (0.03) but better than that of Europe (0.01). A more positive slope suggests more improvement showing that Asia and Europe progressed more than Africa in the given period. Looking at the slopes of the sub-indices (environment, readiness

and usage) that make up the NRI, it can be seen that the slopes of America and Asia are better than those of Africa for all the 3 sub-indices. In the case of Europe, the slope of its usage sub-index (0.09) is higher than those of Africa (0.04) and America (0.06) but lower than that of Asia (10%). However, the slopes of its environment (-0.03) and readiness (-0.03) are lower than those of all the other continents.

Table 6: Slopes of the Environment, Readiness and Usage Indicators as well as overall NRI for 2009, 2012 and 2015

	Environment	Readiness	Usage	NRI
ALL COUNTRIES	-0.01	0.00	0.08	0.02
AFRICA	0.01	0.01	0.04	0.02
AMERICA	0.01	0.01	0.06	0.03
ASIA	0.00	0.00	0.10	0.03
EUROPE	-0.03	-0.03	0.09	0.01

It is interesting to note that, from the values of the slopes of the various sub-indices, it can be inferred that all the continents made appreciable progress in the usage sub-index (from 4% to 10%) but negative or very little improvements (-3% to 1%) in the environment and readiness sub-indices. Looking deeper into the slopes of the individual pillars that make up the sub-indices, it can be seen that the greatest progress was made in the individual usage pillar where all the continents made substantial progress, from 12% to 18%, followed by the business usage pillar where again all the continents progressed, from 2% to 5%. On the other hand, in the government usage pillar, there were mixed results. Europe had the highest slope of 0.11 followed by Asia with 0.09. America had a flat slope (0.00) and Africa trailed behind with a negative slope of -0.03.

In the readiness sub-index, it is interesting to note that Africa does very well in the individual readiness pillar (0.05), performing better than all other continents. In fact the other continents perform relatively poorly with America (0.00), Asia (-0.01) and Europe (-0.06). In the business readiness pillar, Africa, America and Asia all have slopes of 0.03 showing moderate progress but Europe has a flat slope of 0.00. However, in the government readiness sub-index, all continents seem to have done badly over the period. Africa is the worst (0.05) followed by Asia and Europe, (-0.03), and America (-0.01).

Table 7: Table showing the Slopes of the Pillars Making Up the Environment, Readiness and Usage Sub-Indices for the Period 2009 to 2015

	Polit Envmt	Market Envmt	Infr	Indiv Rdns	Bus Rdns	Govt Rdns	Indiv Usage	Bus Usage	Govt Usage	Envmt Rdns	Usage	
ALL COUNTRIES	0.00	-0.01	-0.01	0.05	0.02	-0.03	0.14	0.03	-0.02	-0.01	0.01	0.08
AFRICA	0.01	0.00	0.01	0.05	0.03	-0.05	0.12	0.03	-0.04	0.01	0.01	0.05
AMERICA	0.02	0.01	-0.02	0.07	0.03	-0.01	0.14	0.05	-0.04	0.00	0.03	0.08
ASIA	0.01	0.00	-0.01	0.05	0.03	-0.03	0.18	0.05	-0.01	0.00	0.02	0.11
EUROPE	-0.03	-0.02	-0.02	0.03	0.00	-0.03	0.12	0.02	-0.02	-0.03	0.00	0.09

In the environment sub-index, in the political environment pillar, America does much better than the other continents with a positive slope of 0.04. Africa and Asia come next with slopes of 0.01 while Europe does poorly with a negative slope of 0.03. On the other hand, in the market environment pillar, Africa, America and Asia all have flat lines (0.00) with Europe performing even

worse (-0.02). However, in the infrastructure pillar, Africa does better than all other continents with a positive slope of 0.01. America and Asia have negative slopes of 0.01 while Europe does even worse with a negative slope of 0.02.

Breaking the Period into Two: 2009 to 2012 and 2012 to 2015

From the slope of the curve of the overall NRI over the three years – 2009, 2012 and 2015 – and the subsequent analysis of the NRI components at the sub-indices and pillars levels, it is clear that the African continent did not do very well compared to other continents. It is however interesting to note that if this period is broken down into two sub-periods, 2009 to 2012 and 2012 to 2015, it appears that Africa, compared to other continents, did relatively poorly from 2009 to 2012 but much better from 2012 to 2015. Looking at the overall NRI figure, for example, from 2009 to 2012, the slope for Africa is flat at 0.00 together with that of Europe compared to 0.02 for Asia and 0.03 for America. For the period 2012 to 2015, however, Africa and Asia with slopes of 0.04 do better than America and Asia with slopes of 0.02.

Table 8: Comparing Between the Slopes for 2009 to 2012 and 2012 to 2015 for the Environment, Readiness and Usage Sub-Indices for the NRI

		Environment	Readiness	Usage	NRI
2009 -2012	ALL COUNTRIES	-0.02	0.01	0.04	0.01
	AFRICA	0.00	0.01	-0.02	0.00
	AMERICA	0.01	0.04	0.04	0.03
	ASIA	-0.02	0.02	0.06	0.02
	EUROPE	-0.05	-0.03	0.06	0.00
2012 - 2015	ALL COUNTRIES	0.01	-0.01	0.11	0.04
	AFRICA	0.02	0.01	0.10	0.04
	AMERICA	0.01	-0.03	0.09	0.02
	ASIA	0.02	-0.02	0.14	0.04
	EUROPE	-0.01	-0.03	0.11	0.02

When the slopes for the curves of the subindices (environment, readiness and usage) that make the NRI are studied for the period 2012 to 2015, it is seen that the African continent does well in all of them. In the environment subindex, the slope is 0.02 (together with Asia) compared to 0.01 for America and 0.01 for Europe. Again, in the readiness subindex, the slope is 0.01 much better than that for Asia (-0.02) as well as those for America (-0.03) and Europe (-0.03). However, in the usage subindex, the slope of 0.10 for Africa, remarkable as it is, is lower than those of Europe (0.11) and Asia (0.14) but higher than that of America (0.09). Clearly all these figures for 2012 to 2015 are much better than the corresponding figures for the period 2009 to 2012 where Africa generally lags behind its counterparts.

In order to fully understand the real situation, it is important to study the slopes of the pillars that make the individual subindices. Looking at the environment subindex, it is interesting to note that the African continent has made very remarkable progress (0.04) in the infrastructure pillar which is way above those of other continents namely Asia (0.01), America and Europe (0.00). With respect to the political environment pillar, Africa's slope of -0.01 shows a decline but it is still better than America (-0.02) and Europe (-0.02) with only Asia (0.00) having a better performance. In the market environment pillar, the situation is not markedly different with Africa's slope of 0.03 better than that of Europe but worse than those of America (0.04) and Asia (0.04).

Table 7: Table showing the Slopes of the Pillars Making Up the Environment, Readiness and Usage Sub-Indices for the Period 2009 to 2012

	Polit Envmt	Market Envmt	Infr	Indiv Rdms	Bus Rdms	Govt Rdms	Indiv Usage	Bus Usage	Govt Usage	Envmt	Rdms	Usage
ALL COUNTRIES	-0.01	0.00	-0.03	0.06	0.02	-0.06	0.19	0.00	-0.01	-0.02	0.01	0.04
AFRICA	0.00	0.00	-0.01	0.07	0.05	-0.09	0.11	-0.03	-0.03	0.00	0.01	-0.02
AMERICA	0.04	0.02	-0.02	0.09	0.05	-0.01	0.20	0.01	0.00	0.01	0.04	0.04
ASIA	-0.01	-0.01	-0.03	0.08	0.01	-0.04	0.23	0.00	0.00	-0.02	0.02	0.06
EUROPE	-0.06	-0.02	-0.05	0.02	-0.02	-0.09	0.20	0.02	-0.01	-0.05	-0.03	0.06

Table 7: Table showing the Slopes of the Pillars Making Up the Environment, Readiness and Usage Sub-Indices for the Period 2012 to 2015

	Polit Envmt	Market Envmt	Infr	Indiv Rdms	Bus Rdms	Govt Rdms	Indiv Usage	Bus Usage	Govt Usage	Envmt	Rdms	Usage
ALL COUNTRIES	-0.01	-0.01	-0.01	0.05	0.02	-0.03	0.14	0.03	-0.02	-0.01	0.01	0.08
AFRICA	-0.01	0.00	0.01	0.05	0.03	-0.05	0.12	0.03	-0.04	0.01	0.01	0.05
AMERICA	0.00	0.01	-0.02	0.07	0.03	-0.01	0.14	0.05	-0.04	0.00	0.03	0.08
ASIA	0.00	0.00	-0.01	0.05	0.03	-0.03	0.18	0.05	-0.01	0.00	0.02	0.11
EUROPE	-0.02	-0.02	-0.02	0.03	0.00	-0.03	0.12	0.02	-0.02	-0.03	0.00	0.09

5.0 Extracting Best Practices and Lessons for African Countries

From the results presented in the previous section, it is clear that Africa is behind in most of the pillars of the NRI framework. However, it is encouraging to note that in some of these pillars, Africa has made some appreciable progress over the period under consideration. In this section, each of these major pillars of the NRI is analyzed.

- 1. Political and Regulatory Environment:** It is well known that one of the most important factors necessary for the successful use of ICTs for economic development is the availability of an enabling environment for the rapid development and use of ICTs. In most cases, the responsibility for this lies with governments. Overall, during the period under review, Africa does fairly well in the political environment pillar with a positive slope of 0.01. Clearly, however, there is the need for African countries to do better.
- 2. Business and Innovation Environment:** A conducive business environment is particularly crucial for the economic development of any nation. For the period under review, Africa records a flat curve indicating that there has not been any substantial improvement in the business and innovation environment. However, if the period is divided into two, it is seen that Africa recorded some progress between 2012 and 2015 with a positive slope of 0.03.
- 3. Infrastructure:** The availability of infrastructure is key to the successful use of ICTs to promote economic development. Studies have clearly shown the relationship between infrastructure and economic growth. For the period under review, Africa does better than all other continents in the infrastructure pillar with a positive slope of 0.01. The performance is even better, if the period 2012 to 2015 is considered, where Africa has a positive slope of 0.04 in the

infrastructure pillar, better than all other continents. In spite of these impressive achievements, African countries must continue to invest heavily in the provision of ICT infrastructure, especially broadband/fiber optic networks which have been found to be directly related to GDP.

- 4. Individual Readiness:** The level of education and skills of a given population have a direct relationship with the level of adoption of ICT which in turn affects economic growth. During the period under review, Africa does very well in the individual readiness pillar (0.05), performing better than all other continents. In spite of this impressive performance, African countries must continue to invest heavily in educating their young ones so as to get a very skilled workforce that is so vital in today's knowledge society. It is important to note that while the private sector can contribute to the education sector, it is primarily a government affair.
- 5. Business Readiness:** The business readiness pillar measures to what extent business organizations, large and small, are ready with respect to the use of ICT to promote their business operations. If businesses are extensively using ICT for their operations, it is obvious that this will have a positive effect on economic growth. During the period under review, Africa does fairly well with a positive slope of 0.03 which is better than Europe and Asia but not as good as that of Europe. African countries will do well to continue to improve their business readiness as this will spur ICT growth. This is something that needs to be done largely by the businesses themselves but it may depend on the availability of requisite infrastructure.
- 6. Government Readiness:** The government readiness pillar measures the extent to which government organizations use ICT for their services and operations. Extensive use of ICT by government departments will be sure to have an impact on economic development because of the positive effect it would have on ICT businesses. For the period under review, Africa did very poorly on this pillar with a negative slope of -0.05 which was worse than those of all the other continents. Clearly, the governments of African countries must take concrete measures to step up the use of ICT in their operations as this will definitely have a multiplier effect on the use of ICT by individuals and businesses.
- 7. Individual Usage:** The percentage of a country's population that effectively uses ICT devices is a good indicator of the country's potential for using ICT to bring about economic development. All the continents recorded appreciable progress in the individual usage pillar during the period under review. In particular, Africa had a positive slope of 0.12 which, even though lower than those of America (0.15) and Asia (0.18), is impressive. While many African countries may not be able to attain the high standards of living of the advanced countries, they must nevertheless work hard to increase individual usage of ICT devices and services in their countries.

8. **Government Usage:** The usage by government of ICT services is a strong driver for economic development because it brings about efficiency in government services which in turn often promotes economic growth. During the period under review, Africa does very poorly in the government usage pillar with a negative slope of -0.03. However, when the period is broken into two, it is seen that Africa does better in the period 2012 to 2015 with a positive slope of 0.08. Clearly, it is important for the governments of African countries to invest heavily in the use of IT in improving the delivery of their services as this would bring about a multiplier effect on several areas including provision of infrastructure, ICT skills acquisition and business usage of ICT ultimately resulting in economic development.
9. **Business Usage:** Many studies have shown, as explained in OECD (2004,) the close correlation between use of ICT in businesses and economic development. Indeed, in many countries, business usage of ICT is likely to exceed government usage because of the desire of businesses to remain competitive and be innovative in adopting new technologies. During the period under review, Africa made a fairly impressive performance in the business usage pillar with a positive slope of 0.03. The performance was much better for the period between 2012 and 2015 where the slope was 0.08. In spite of this impressive performance, African businesses need to increase their usage of ICT as this will.

Conclusion

In this paper, an attempt is made to objectively measure the progress of Africa in IT development over the last decade in comparison with other continents. This is done by critically analyzing the Global IT Reports of three specific years during the last decade – 2009, 2012 and 2015. A general examination of the data indicates that African nations have the lowest rankings, compared to countries of other continents, in the overall NRI and in virtually all the sub-indices and indicators that make the NRI for the years under consideration. Further analysis of the data, however, shows that African countries are making appreciable progress in many of the indicators. In 6 out of the 9 indicators making up the NRI, the progress of African countries is better than or equal to the average of all the countries of the world. It is interesting to note that the progress from 2012 to 2015 where African countries do well in 7 indicators is better than that from 2009 to 2012 where they perform well in only 5 indicators. If African countries continue to make appreciable progress in a majority of the indicators, it is likely that they will soon catch up with other continents in the NRI ratings and in other economic indices as there is a direct correlation between ICT development and economic growth.

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