

POOR INTEGRATION OF SCIENCE, TECHNOLOGY AND INNOVATION (STI): IMPLICATIONS FOR POOR ACHIEVEMENT OF THE MILLENNIUM DEVELOPMENT GOALS IN AFRICA

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Abstract

Poor rankings in development indices and poor achievement of MDGs characterize African countries in the mid-term assessment of MDGs in 2007/8. This study reviews the poor integration of STI in Africa and implicates it for the poor achievement of MDGs in the continent. To address the situation, it is recommended that African countries should build, establish, develop or upgrade their ICTs infrastructures, which contribute towards socio-economic sustainable development; embark on aggressive and massive creation of awareness for natural science and technology related careers from the basic to senior secondary education system, in order to have feeder student population for natural science and technology courses in tertiary institutions in African countries; and confront head-on and urgently some unfavourable African attitudes and environmental factors, including marginalizing women from science and technology-based professions, epileptic electricity power supply, immoral and corrupt uses of ICTs and other factors, which impede the integration of STI.

Introduction

The United Nations Millennium Summit in September 2000 established the Millennium Development Goals (MDGs), which are 8 time-bound and measurable quantitative benchmarks for combating extreme poverty within 15 years (2000-2015). The MDGs target reducing extreme poverty and hunger by half. They also target achieving universal primary education, as well as eliminating gender disparity. Again, they target reducing child mortality rates by two-thirds, as well as reducing maternal mortality rates by three-quarters. Besides, they target halting HIV/AIDS and Malaria and other major diseases, ensuring environmental sustainability, and developing a global partnership for development by 2015 (Eneh, 2008a, 2009a).

The period 2007/8 was the mid-term of the MDGs. Assessment of the progress of the MDGs conducted during this period showed that the goals pose daunting challenges for the STI-backward 53 African (and other developing) countries, while the STI-advanced countries are making great strides towards achieving the goals. Studies have shown that the integration of science, technology and innovation (STI) is an undisputable driver of national economic development and key contributor to poverty reduction, disease prevention, universal education, environmental conservation, and global partnerships, which form the focus of the MDGs. STI are prerequisites for development, and naturally underpin the MDGs. Investment in the integration of STI impacts quality of life and is

a march towards the realization of MDGs. Deliberate investment in STI is a crucial priority for any country to realize its short-term, medium-term and long-term development objectives. Meaningful strides towards the achievement of MDGs require STI-driven sustainable economic growth (Eneh, 2008a).

The link between STI and achievement of MDGs informs the object of this study, which reviews the poor integration of STI and implicates it for the poor achievement of MDGs in African countries, which was established in the mid-term assessment of countries towards the achievement of the MDGs. After this brief introduction, the rest of the paper is structured as follows: literature review, poor integration of STI in Africa, poor performance of MDGs in Africa, implications for development, recommendations, and summary and conclusion.

STI includes the information communications technologies (ICTs), which are those goods, applications and services that are used to produce, process and transform, and distribute information. They comprise diverse telecommunication, television and radio broadcasting equipment, computer hardware and software, computer services and electronic media. ICTs are available data storage, retrieval and transmission devices or knows-how for conveying information and signals in their meaningful or useable states to those who use them for research, policy action and decision-making. On its part, information notifies, stimulates, surprises, and reduces uncertainties. It creates energy in the recipient, and modifies for changes in behaviours and attitudes of the audience. Scholars use transmission devices for the reception of knowledge and intelligence, as well for research and development (R and D) (Mogu, 2006).

ICTs have become widespread and are powerful tools for social development. They help people access, store, share, transfer and apply information to human endeavours. They have the potential to improve the delivery of services, increase productivity, raise living

standards, transform economies and develop opportunities, as they may exist in education, governance, environmental and health management, financial services, and the private sector. They can influence or redress the imbalances in society by the way they are designed, produced and used, and may widen and deepen the gap between the information “haves” and “haves-not” as economies have become more and more information-based (Lawley, 1993; Epodoi, 2003; Huyer, 1997).

The prime ingredient of real development is information, which educates and transforms. STI, especially information communications technologies (ICTs), facilitate information dissemination and drive development to the extent of now making the world a global village with a global market system, in which the STI-backward countries or the information-haves-not are marginalized by the STI-advanced countries or the information-haves. ICTs are used to share educational information among people and countries for development purposes (Kombol, 2006).

According to Bhola (1983) and UNESCO and UNDP (1976), investment in education directly impacts socio-economic development, as:

- an educated labour force is a source of productivity;
- to be educated means enjoying good health, decent housing, psychological stability, cultural upliftment and fulfilment;
- educational attainment fetches a good job to enhance standard nutrition, good health system, and affordable shelter;
- it ensures the provision of education for one’s children, sustainable good living standard, and balanced development; and
- Education secures multidimensional development, which improves all aspects of people’s lives.

The role of ICTs in stimulating development is two-edged. It allows countries to:

1. leapfrog stages of economic growth by being able to modernize their production systems, and
2. Increase their competitiveness faster than in the past.

A good example is the case of the 5 Asian Tigers. Despite the 1998/9 financial crises in Hong Kong, Taiwan, Singapore, Malaysia and South Korea, which is unrelated to competitive performance and may be related, in fact, to the attractiveness of the booming Asian economies to global capital flows (Huyer and Sikoski, 2003).

For those economies unable to adapt to the new technological systems, their retardation becomes more pronounced. Furthermore, the ability to move into the Information Age depends on the capacity of the whole society to be educated, and to be able to assimilate and process complex information. This starts with the education system, from bottom up, from the primary school level to the university. And it relates as well to the overall process of cultural development, including the level of functional literacy, the localization of content of the media (instead of the globalization of the media content), and the diffusion of information within the population as a whole (Gorski, 2001, 2002).

ICTs, with their huge capacities to produce, transmit and store information within countries and across national borders, also have the capacity to allow people and organizations to share this wealth of knowledge in pursuance of development goals. ICTs, therefore, make it possible for those people who have access to these technologies, to share information to create a sustainable information society (Jensen, 2001).

Gorski (2002) states that the digital divide between the West and Africa seems to be narrowing for many northern and southern African countries, which are experiencing

tremendous growth in the use of computers, Internet connectivity, wireless communications and other related technologies. But Africa's LDCs still lag behind in terms of the level of basic telecommunications infrastructure, such as teledensity (the number of main telephone lines for every one hundred inhabitants in a country). Telecentres provide ICTs services, including telephone services (fixed or mobile lines), facsimile (fax), printing services, Internet services where available, electronic mail (e-mail) where available, photocopy services, library services, scanning and other shared-ICTs services for community development (Jensen, 2001).

With these advancements in technology, the developed world is able to achieve an information society in which messages are sent with ease and all stumbling blocks to communication are avoided. This puts such countries on one side of the "digital divide", while the information "have-nots" - disadvantaged countries in which communication is difficult and not easily achieved - occupy the other side. Methods of information and communications in the latter countries are archaic, as these developing countries wallow in lack, deprivation, "technophobia", lack of supporting infrastructure, insufficient skilled manpower, fear of the unknown, etc. (Kombol, 2006).

But, according to Huyer and Sikoski (2003), the benefits of ICTs are not evenly distributed among and within countries because of poor integration of STI in developing countries of Africa with deficiencies in access and knowledge base to optimize its use. The UNDP Human Development Report of 1999 shows that only 25% of all countries in the world have penetration level for fixed telephone lines, only 15% of the world's population have access to ICTs and their most popular tools, namely, computers, internet and e-mail; and that in addition to scarcity of fixed telephone lines in most parts of the world, other factors, such as income, education and literacy levels, race, ethnicity, and gender, impede

equity in distribution of these benefits. While many countries have experienced tremendous changes in their information communications sectors and consequently a transformation in

the quality of life of their people, some other countries lack access to such information communications facilities.

Poor Integration of STI in Africa

The state of STI in Nigeria, as the most populous African country, goes a long way to reflect the state of STI in Africa. Table 1.1

shows technology integration and creation in Nigeria side-by-side with the statistics for developed countries for 1990 and 2005.

Table 1.1: Technology integration and creation in Nigeria, 1990 and 2005

S/No	Technology integration and creation in Nigeria (per 1,000 people)	1990		2005	
		Nigeria	Advanced countries	Nigeria	Advanced countries
1.	Telephone mainlines	3	390	9	441
2.	Cellular subscribers	nil	10	141	785
3.	Internet users	nil	3	38	445

Source: UNDP (2007)

Telephone mainlines were available to 3 per 1,000 Nigerians, whereas they were available to 390 per 1,000 persons in a developed country in 1990. In 2005, the figures were 9 per 1,000 persons in Nigeria and 441 per 1,000 persons in an advanced country. Again, there was no cellular subscriber in Nigeria, whereas there were 10 cellular subscribers per 1,000 persons in a developed country in 1990. In 2005, there were 141 cellular subscribers per 1,000 persons in Nigeria, as against 785 cellular subscribers per 1,000 persons in a developed nation. Also, there was no internet user per 1,000 persons in Nigeria, whereas there were 3 internet users per 1,000 persons in an advanced country in 1990. In 2005, there were 38 internet users per 1,000 persons in Nigeria, as compared with 445 in a developed country.

homes and computers (Madu, 2006). According to Kombol (2006), Jensen (2001) and Tofojomo (2006), factors that hamper accessibility of ICTs are lack of infrastructures, huge costs, poor electricity supply, poor ICTs literacy and awareness, and immoral and corrupt uses of ICTs by the youth. These constraints limit ICTs integration in developing countries.

In agreement with these statistics, scholars (see UNIDO, 2002; Gorski, 2001, 2002; Mogu, 2006; Lawley, 1993; Epodoi, 2003; Huyer, 1997) have reported that technology diffusion is at the lowest ebb in Africa. Accessibility to ICTs is a major issue. Information technologies are yet to get to the rural areas of the country. Telephone lines (used by Internet service providers, ISPs) are in short supply to provide internet connections to

Besides, the diffusion of innovation (DOI) theory identifies the conditions, which enhance or impede the rate of adoption of an innovation. Rogers (1963) postulated the DOI theory, which explains the process of social change precipitated by the adoption of an innovation. The media and interpersonal contacts with opinion leaders influence the decisions of individuals on the adoption of innovations. With respect to the adoption of innovation, the society is divided as follows (Kombol, 2006):

- Innovators 2.5%
- Early adopters 13.5%
- Early adopters 34.0%
- Late adopters 34.0%
- Laggards 16.0%
- 100.0%

Furthermore, each adopter's willingness or ability to adopt an innovation largely depends on awareness, interest, evaluation, trial, and adoption. Product adoption follows the trend below (Kombol, 2006):

- Innovators - venturesome, educated, multiple information sources
- Early adopters - social leaders, popular, educated
- Early majority - deliberate, many informal social contacts
- Late majority - skeptical, traditional, lower socio-economic status
- Laggards - neighbours and friends are main information sources, fear of debt.

High level of poverty in Africa incapacitates the people and they lack the means to afford the ICTs adoption. Poor human capital formation informs the lack of the technical know-how to operate the gadget (ICTs literacy), even though there is expanding education (with diminishing learning) in most African countries. Absence of or dilapidating infrastructure (electricity and wireless connection) means serious impediment for STI adoption. The lack of knowledge of the importance of ICTs in uplifting social standards cushions Africans in lethargic ignorance, rather than spur them to join the global digital broadband race. Corruption and poor governance limit public will for investment in STI. And, unfavourable African attitudes hamper ICTs diffusion (Eneh, 2008 a, b, 2009a and 2010b). Thus, the majority of people in developing countries belong to the late majority group of ICTs adopters because they are skeptical, traditional, of lower economic status, and lack the supporting infrastructural facilities (Kombol, 2006; Gorski, 2002; Losh, 2003).

Mutula (2005) observes that one of the key catalysts in the attainment of MDGs is inclusive access to and effective use of ICTs. Hence, most African countries are adopting ICTs leapfrogging strategy for the upliftment of

their people. In the new ICTs policy in South Africa, ICTs are viewed as a means to aid South Africa leapfrog the information society and a developed status (SAD, 2001). A study by global growth consultancy, Frost and Amp, estimated that the worldwide Shared Services Outsourcing (SSO) market was worth 118 trillion Naira (US \$930 billion) in 2006. It also forecast a 15-% compound annual growth rate for the market by the end of 2009. Again, the study revealed that the market in Nigeria was set to reach a size of 181 trillion Naira (\$1,430 billion) by the end of 2009 (Nwachukwu, 2007).

Again, there is a reported rise in ICTs consumption in developing countries. The global e-readiness rankings of countries by the Economist Intelligence Unit placed South Africa 35th, Egypt 55th, Nigeria 60th, and Algeria 63rd, claiming that this was an indication that Africa was waking up to the broadband race. This increased acquisition of ICTs, especially cell phones, informed the World Bank report of fast narrowing digital divide between the information-rich and the information-poor countries (Gomez, et al., 2009; Nkamnebe, 2010; Mutula, 2005).

On the contrary, the Infostate gap of 8-225 among countries of the world shows that the gap between developed countries and the sub-Saharan African countries, in terms of quality of access to service and access to quality ICTs, is rather widening. This is so because the sub-Saharan African countries occupy the lowest rung (International Telecommunications Union, 2005). In support of this, Eneh (2010a), found that the ICTs literacy levels of secondary students in Nigeria were 49.1% for boys and 14.5% for girls.

One serious and worrisome indicator of poor integration of STI in Nigeria (and most other African countries) is the decline in the study of science, engineering and technology related courses among the secondary school students enrolling for the senior secondary school examinations conducted by the West African Examination Council (WAEC) and the

Nigeria's National Examinations Council (NECO), and for courses in tertiary institutions of learning. There is a general apathy for science-related careers among the youths, especially the girls. The prevailing learning environments, which are unprepared as a result of dilapidated or non-existent educational and ICTs facilities, do not help matters (Eneh, 2009b; Eneh and Owo, 2009).

To stimulate and encourage the study of natural science & technology related courses in tertiary institutions in Nigeria, Government had made a policy of 60:40 ratio for enrolment into natural sciences and humanities. This ratio has never been met, as most of the natural science and technology departments cannot find students to fill their quotas. The situation is

worse for female. Girls' low enrolment into natural science and technology courses in tertiary institutions in Nigeria continues to dwindle.

Some natural sciences and technology departments in the University are at the verge of closure for growing irrelevance and want of students to teach. In response to the bad situation, poorly qualified, ill-prepared and poorly endowed students are often admitted with inferior requisite qualifications. This increases the burden of lecturers in teaching such students, who are hardly able to complete their courses of study with success. Some of them come out with poor grades, some of them transfer to other departments, others drop out completely.

Poor achievement of MDGs in Africa

The mid-term (2007/8) assessment of the progress of the MDGs shows that they pose daunting challenges for the STI-backward 53 African (and other developing) countries, while the technologically advanced countries are making great strides towards achieving the goals. Twenty-two of the 25 poorest countries in the world are in Africa. Of the estimated 1.2 billion people in the world, who survive on less than US\$1 a day, 340 million (28%) live in the sub-Saharan Africa (SSA). This figure is higher than half the region's population and higher than the 331 million people who live in South America. Poverty in Africa is so chronic that it has become a catalyst for violent conflicts, displacement of large populations, and environmental degradation. And, as the poor are much more likely to be ill, poverty is also implicated in the spread and endemicity of diseases, such as HIV/AIDS, multi-drug resistant tuberculosis, malaria and vaccine-preventable childhood diseases (World Bank,

2001; ADB, 2002; UNDP, 2002; Nwuke, 2004). Africa is the only region with significantly increasing number of poor people, presently accounting for 30% of the poor in developing countries, as against 16% in the mid 1980s.

Table 1.2 shows the percentage of hospital/health centre-reported cases of children under 3 years in the 6 geo-political zones who experienced acute respiratory infection (ARI) or fever in year 2003. About a half the number of under-3 children were taken to hospital or health centre with ARI or fever in North-central zone, and more than a half in South-west zone. About one out of four of under-3 children were affected in South-south, while one out of five under-3 children were affected in North-east. One of three under-3 children was involved in North-west, and slightly higher fraction was involved in South-east. Two of five under-3 children were involved in urban areas, while the ratio is 28% for rural areas (NBS, 2007).

Table 1.2: % U-3 children with ARI by zone in Nigeria in 2003

Urban	Rural	North-central	North-east	North-west	South-east	South-west	South-south
40	28	50	20	33	37	53	25

Source: NBS (2007)

Similarly, high figures were recorded between 2003 and 2007 for reported cases of major diseases, such as cholera, diarrhoea, hepatitis, typhoid and paratyphoid, and snakebite (Table 1.3). As high as 58 million cases of pneumonia were reported in 2003 alone, and diarrhoea troubled a million children in 2007 alone (NBS, 2007).

Table 1.3: Reported cases of major diseases

Disease	2003	2004	2005	2006	2007
Cholera	11,933	13,522	10,785	20,526	12,194
Diarrhoea	673,692	732,728	682,828	800,611	1,069,133
Hepatitis	8,894	7,104	13,609	6,419	5,239
Typhoid & Paratyphoid	77,850	39,337	45,354	40,267	56,101
Pneumonia	58,009,484	269,327	269,017	268,929	374,191
Snake bite	1,807	1,142	1,342	1,947	1,857

Source: NBS, 2007

Equally high were reported death figures arising from these cases for the same period (Table 1.4). Diarrhoea topped the list each year with 2,368 in 2003, 2,116 in 2004, 4,190 in 2005, 2,093 in 2006, and 2,454 in 2007 (NBS, 2007).

Table 1.4: Reported deaths from major diseases, 2003-2007

Disease	2003	2004	2005	2006	2007
Cholera	112	235	284	387	180
Diarrhoea	2,368	2,116	4,190	2,093	2,454
Hepatitis	123	102	98	165	151
Typhoid & Paratyphoid	457	284	846	802	923
Pneumonia	1,132	1,227	849	907	1,123
Snake bite	161	103	180	111	119

Source: NBS (2007).

Africa lags behind other developing regions in social indicators. The crude death rate is 14.9 per 1,000 people, compared to 6.6 in South America and 7.7 for Asia. The infant mortality rate is 82.54 children per 1,000 live births, compared to the average of 58.3 for all low-income countries. About 26% of under-five children suffer from severe malnutrition and stunting. Only 62% of African population has access to health services, as compared to 80% average for developing countries. All African countries, but 4, came in the bottom half of the 177 countries assessed in 2006 for quality of life based on life expectancy, education and income levels. This human development index (HDI) estimate also revealed that all African countries, except 2, were among the worst 32 in the world (Eneh, 2008a).

Africa is not on track to meet the MDG for drinking water and sanitation, but rather heads for a continuous endemic water and sanitation crisis that debilitates and kills huge numbers of Africans, threatens the health of the workforce, stands in the way of economic growth, and limits access to education and, therefore, life opportunities. About one million Africans die annually from diseases related to unsafe drinking water, poor sanitation and poor hygiene. Of the nearly one billion Africans, only 602 million (60.2%) have access to improved drinking water sources and 360 million (36%) have access to improved sanitation facilities (Eneh, 2011a).

Two African countries (Nigeria and Egypt) are among the E-9 countries – a group of countries with very high number of

illiterates, who cannot read, write or communicate in any way (Abubakar, 2010).

Rwanda leads other African countries with 49% of parliamentary seats taken by women in politics. In Nigeria, only 2.8% of the senatorial seats were occupied by women in 1999, 3.7% in 2003 and 7.3% in 2007. For corresponding periods, 4.6%, 7% and 12.96% of the headship of National Assembly committees were held by women. In the State Assemblies, the corresponding figures were 2.42%, 4.14% and 5.66% for members and 2.13%, 3.61% and 6.0% for committee chairpersons. In the Local Government Councils, the corresponding figures were 1.8%, 1.8% and 2.87% for Councilors and 1.3%, % and 3.81% for committee chairpersons (Eneh, 2011b).

More women than men often participate in voting exercises, but women usually retain less than 2% of elective or appointive positions. During the first (1960-1965) and second (1979-1983) Republics, various political parties established viable women wings whose

function included, *inter alia*, mobilization and political education of women. The wings performed well in mobilizing women for voting *en mass*, but only for party candidates who were usually men. Traditional socialization, which emphasizes women's contributions in private, in exclusion of their public life, partly accounts for their low representation in decision and policy making bodies, leading to their sidelined interest, welfare and development (Hodges, 2001).

There is slow progress in halving the proportion of underweight children in sub-Saharan Africa. As one of the 3 best performing African countries, Ghana has under-five mortality rate of 110-120 deaths in every 1,000 live births. Other top countries are South Africa and Kenya. Pregnancy and childbirth lead to the death of increasing numbers of women in Malawi, Ghana and Zimbabwe. One in 16 sub-Saharan African women dies in childbirth in her lifetime, as against 1 in 3,800 in the developed world (Eneh, 2011b).

Implications for development

These low rankings in development indices and poor performance of MDGs underscore Africa's backwardness in integration of STI. The rise in ICTs consumption and rising educational enrolment notwithstanding, the Infostate gap and research findings show poor adoption and integration of STI in Africa. Since STIs underpin MDGs, poor achievements in MDGs, as signified by poor development indices obtained for African countries during the mid-term assessment of MDGs, can be said to be traceable to STI-backwardness. In the global information system we live in, there is a direct correlation between access to ICTs and socio-economic development. ICTs are no

longer the consequence of development. Rather, they are a necessary precondition for development.

The basic vicious circle of poverty and underdevelopment can be seen to stem from lack of or slow integration of STI, which leads to human capital deficiency (lack of or insufficient developed minds or people), which leads to under-exploitation of resources (human, material and natural), which leads to low level of real income, which leads to low level of demand and savings, which in turn, leads to low rate of investment and integration of STI (Fig.1.1).

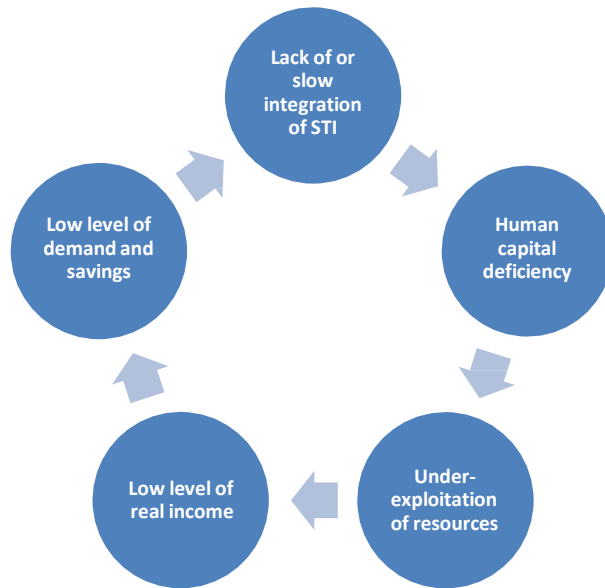


Fig. 1.1: *Vicious circle of poverty and underdevelopment driven by lack of or slow integration of STI*

The poor cannot afford education for selves and their children, cannot feed well, cannot afford good shelter, can neither save nor undertake investment, cannot demand effectively for essential commodities, etc. Lack of education and illiteracy begets wallowing in ignorance and chronic poverty. Malnutrition leads to disease attacks because of reduced immunity, lack of fund for healthcare, self-medication, premature deaths, and increasing number of orphans and homes headed by children. Ghettoes, slums and squalors often occupied by the poor predispose them to environmental and health hazards. Poverty leads to inability to save for investment. Poor investment leads poor income and low demand for necessities of

life, but alcoholism and drug addiction. These side-effects and end-results of poverty render the poor mentally, emotionally, psychologically and physically unfit for integration of STI, thereby jeopardizing their chances of getting out of the vicious circle of poverty of income, access, power and psyche (Eneh, 2007 and 2009c).

Again, ICTs provide a platform for information-sharing and information-storage towards sustainable development, thereby developing and building a global partnership for development, as enshrined in the MDGs. Poor ICTs integration can, therefore, be said to be responsible for poor involvement of African countries in global partnership.

RECOMMENDATIONS

Africa needs to be launched into multidimensional sustainable development, and its countries need to get on tack towards the actualization of MDGs in the emerging global market system. To this end, it is recommended that:

1. African countries should build STI culture and infrastructure because of

their contributions towards socio-economic development.

2. They need to enhance the integration of STI, which underpin the focus of MDGs.
3. They have to establish, develop or upgrade their ICTs infrastructure for the obvious important linkages and relationship with the concept of sustainable development.

4. Aggressive and massive creation of awareness for natural science and technology related careers should be mounted from the basic to senior secondary education system, in order to have feeder student population for natural science and technology courses in tertiary institutions in African countries; and
5. Some unfavourable African attitudes and environmental factors, including marginalizing women from science and technology-based professions, epileptic electricity power supply, immoral and corrupt uses of ICTs and other factors that impede the adoption of STI, must be confronted head-on and urgently in a courageous manner.

Summary and Conclusion

This review paper has attempted to highlight the shortcomings of African countries in the achievement of the MDGs, as well as the STI-backwardness in these countries. It has also implied that the latter is responsible for the former because one of the key catalysts in the attainment of MDGs is inclusive access to and effective use of ICTs.

Africa is not on track to meet the MDG for drinking water and sanitation, but rather heads for a continuous endemic water and sanitation crisis. Human development indicators revealed that all African countries, except 2, were among the worst 32 in the world. Chronic and widespread poverty in Africa begets violent conflicts, large population displacements, and environmental degradation, as well as endemicity of diseases.

Poor integration of STI in Nigeria (and most other African countries) manifest in many ways. For instance, there is serious decline in the study of science, engineering and technology related courses among the secondary school students enrolling for the senior secondary school examinations conducted by the West African Examination Council (WAEC) and the Nigeria's National Examinations Council (NECO), and for courses in tertiary institutions of learning. There is a general apathy for science-related careers among the youths, especially the girls. Some natural sciences and technology departments in the University are at the verge of closure because of poor student enrolment. The prevailing learning environments, which are unprepared as a result of dilapidated or non-

existent educational and ICTs facilities, do not help matters. Again, there are some unfavourable African attitudes and environmental factors, including marginalizing women from science and technology-based professions, epileptic electricity power supply, immoral and corrupt uses of ICTs and other factors that impede the integration of STI.

The Infostate gap of 8 to 225 among countries of the world, in which the sub-Saharan African countries occupy the lowest rung, shows that the gap between developed and developing countries in terms of quality of access to service and access to quality ICTs is rather widening than closing. The ICTs literacy levels of secondary students in Nigeria are low, and worse for girls. These findings contradict the reported rise in ICTs consumption in developing countries, the favourable e-readiness rankings for a few African countries, and the report on the worldwide Shared Services Outsourcing (SSO) market in Nigeria estimated to reach a size of 181 trillion Naira (\$1,430 billion) by the end of 2009.

High level of poverty dictates inability of Africans to afford ICTs integration. Poor human capital formation informs the lack of the technical know-how or ICTs literacy to operate the electrical and electronic gadgets. Even though education is expanding, there is diminishing functional learning, hence the galloping unemployment growth rate in most African countries. Ignorance of the importance of ICTs in uplifting social standards blinds the population to the global broadband race. Frequent power outages limit ICTS usage and

slow STI integration. Corruption and poor governance limit public will for investment in STI. Thus, the majority of people in developing countries belong to the late majority group of ICTs adopters because they are skeptical, traditional, of lower economic status, and lack the supporting infrastructural facilities.

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