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Review article

THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN SUSTAINABLE DEVELOPMENT IN NIGERIA: ISSUES, CHALLENGES AND PROSPECTS

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ABSTRACT
Mankind is being confronted with a challenge of an unprecedented extent. The global challenges posed by climate change and water shortage, the loss of biodiversity, soil degradation and shortage of resources and energy are beginning to shape and redefine our path of existence. The quality of life of an individual is been questioned. Can the quality of life be maintained in industrialized countries and improved in emerging and newly industrialized countries? This challenge has obviously given rise to a new developmental model known as sustainable development (SD). That is, a development that takes into account how resources are used to meet the needs of the present without compromising the ability of the future generations to meet their own needs. One tool of development that can aid attaining this sustainability is known as Information and Communication Technology (ICT). ICT has become a key tool in effective service delivery and is having a revolutionary impact on how people see the world and live in it. This paper therefore presents issues of ICT and sustainable development, prospects of ICT and the role of ICT in sustainable development in Nigeria. The paper further pointed out the challenges confronting ICT usage in Nigeria to include among others: weak infrastructure (electricity supply); lack of favorable enabling environment; skilled personnel and high cost of purchasing equipments (appropriate technology) and recommends among others: revolutionizing the power supply system; getting appropriate technology (facilities) irrespective of cost and need for capacity development.

KEYWORDS: Sustainability, Environment and Information Technology

INTRODUCTION

Over the years, different economic activities: industrialization, deforestation, bush burning etc carried out by both the developed and developing countries in unfriendly environmental manners have become a threat to our eco-system and invariably the environment in which we live. These activities have given rise to some contending issues in today's world: air pollution, green house gases, climate change or global warming etc, with serious consequences. According to Michael and Schneider (2008) scientists have made many projections about how global warming will affect weather, glacial ice, sea levels, agriculture, wildlife, and human health. These are core issues to human existence. Based on these, series of international conferences have been organized by United Nations and other bodies: Brundtland commission (1987); United Nations Conference on Environment and Development (UNCED), 1992 in Rio de Janeiro, Brazil; the Kyōto conference, 1997 in Japan etc. The major thrust of these conferences is maintaining economic development without necessarily threatening the existing natural resources for future generation sake. This eventually gave rise to a new model of development known as sustainable development.Sustainable development (SD) according to World Commission on Environment and Development (WCED) (1987) in

Fasokun (2010) is defined as the development which meets the needs of the present without compromising the ability of future generation to meet their needs. While according to Tahir (2010) it is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present but even in the definite future as well. Thus, the goal is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generation. The United Nations have declared 2005 – 2014 as the decade for sustainable development in an effort to reverse this problem. One clear fact is that there is no "single route" to Sustainable development as a result of the different views or as envisioned by the different stakeholders: governments, business, educational institutions, media, youth etc. But one tool of development that could cuts across boundaries of different sectors/ stakeholders irrespective of their different views in attaining sustainability is a tool known as Information and Communication Technology (ICT).

Information and Communication Technology (ICT) has been defined as a broad based technology (including its methods, management and application) that supports the creation, storage, manipulation and communication of information (Nworgu, 2006). (ICT) is having a

revolutionary impact on how people see the world and live in it. This is because ICT has become a key tool in effective service delivery in several aspects of lives: social, economic, technology, business, labour, health, education, environment etc. The introduction of ICT in environmental related issues or sustainability according to Ekpo and Ubom (2010) has led to the development of environment friendly attitudes that promotes preservation, conservation and protection of environmental resources. This paper therefore seeks to present issues, challenges and prospects of ICT towards sustainable development in Nigeria.

The concepts of ICT

Information and Communication Technology (ICT) according to Nworgu (2006) is a broad based technology (including its methods, management and application) that supports the creation, storage, manipulation and communication of information. Ololube (2006) defined ICT as the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge. Basically, ICT involves the use of equipment such as; telephones, computers, radio, television, internets, microchips and other communication devices. Information and Communication Technology (ICT) is having a revolutionary impact on how people see the world and live in it.

The impact and acceptance of ICT are becoming more and more pronounced worldwide such that, rarely is anything mentioned in any area of human endeavour without reference to this technology. This is because ICT has become a key tool in effective service delivery in several aspects of lives: social, economic, technology, business, labour, health, education etc. ICT is relevant in providing social services: social interaction through internet; provision of health related information on the net; aids teaching and learning through e-learning tool and could help in promoting business ideas and economic development. ICT emergence has given rise to an information society which is melting off the physical boundaries that separated nations the world over, thus making the world a global village. But the digital divide between these nations i.e. inequality of access to information technology: the difference in opportunities available to people who have access to modern information technology and those who do not is still quite glaring, particularly Africa and the western world. Africa has a lot of catching up to do as far as the Information Society is concerned at least this will ensure the full realization of ICT potentials in the continent..

The concept of sustainable development

Sustainable development (SD) according to Fasokun (2010) first came into prominence in 1987 when the World Commission on Environment and Development (WCED) (the Brundtland commission) produced a report for the United Nations called "our common future'. Brundtland commission defined Sustainable development (SD) as the development which meets the needs of the present without compromising the ability of future generation to meet their needs, thus the goal is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generation.

In pursuing this thrust, a 1992 UN Conference on Environment and Development, also known as the Earth Summit was held in Rio de Janeiro, Brazil and attracted over 100 national leaders. Its major theme was sustainable economic development, meaning development that does not use up or destroy so many of the world's natural resources that it cannot be sustained over time. Thus, the term "Sustainable development" is centered round the two concepts of "environment" and "development". Here the concept of development takes into account: the economical and social development. Olosunde & Akinpelu (2010) explained that development in this context means the improvement of people's lifestyle through improved education, income, skills development, employment and everything that has to do with human life.

Thus harmonizing this, Sustainable development is anchored on three pillars or goals: economic, social and environment. Environmental challenges are global issues that need attention and as such sustainable development has emerged as the most acceptable approach to environmental problems (Richard, 2008). Sustainable development advocates policies that would allow for economic growth while at the same time minimizing damage to the environment. This is a new model of development.

ICT, Sustainable development and Prospects

The world bank definition of ICTs consist of the hardware, software, network and media for the collection, storage, processing transmission and presentation of information (voice, data, text, images) as well as related services (Madichie, 2006). While, according to Salau (2003), ICT is seen as the technologies used in collecting, storing, editing and passing of information in various forms. These include the use of communication satellite, radio, television, telephones, video, tapes, recorders, compact disc, floppy disc and the personal computer. These devices have made ICT instrument of dynamic and progressive change in our society and as such ICT has become indispensable in addressing most of the challenges in different sectors of man's endeavour: health; governance; human resources development; education, economic, social, environmental etc. Remarkably, the economic, social and environmental issues are the main goals or 'pillars' of sustainable development. The design and flexibility in usage of ICTs has made it accessible to all and sundry and this fact makes it indispensable in addressing the concept of sustainable development since sustainable development requires every citizen to be participatory (Richard, 2008).

At the end of the 1990s and the beginning of the 21st century many debates at international, national and regional levels concluded that access to information through ICT would aid sustainable development (Singh, 2008). The challenge here for developing countries is to leverage on this flexibility and provide the infrastructures in order to enable the citizens to gain access. To make ICT work for sustainable development, it needs both affordable, market-driven infrastructure and multi-stakeholder efforts at all levels to help citizens (mostly the

economically disadvantaged ones) use the whole range of ICT according to their priorities and demands.

Also workable ICT policies must be on ground. Most of the developing countries especially in Africa are yet to successfully put in place ICT policies and strategies. While some like Central African Republic, Ghana, Mali, Malawi and Uganda are in the process of completing their national policies (Sesan, 2004). There are also countries like Mozambique, Tanzania and Ethopia that have completed and are implementing the policies. Addressing these issues of infrastructure and workable ICT policies for developing countries, the prospects of ICT in sustainable development become very glaring and are not limited to the following:

- Capacity building through educational/vocational training (ICT usage & IT literacy programmes) which could enhance Job opportunities
- Provision of Jobs: IT related industries; as entrepreneurs and workers in cyber kiosk and other micro enterprises
- Increase access to market information and reduce transaction costs for poor farmers and traders
- Increase access of rural care-givers to specialist support and remote diagnosis
- Enhance delivery of basic and in-service training for health workers
- Increase monitoring and information-sharing on disease and famine
- Remote sensing technologies and communications networks permit more effective monitoring, resource management, mitigation of environmental risks
- Access information on alternative sources of fuel and best practices in handling environment issues.
- Access to information that promotes environmental sustainability e.g information that educate and sensitize people on the effects and possible remedies/control of deforestation, bush burning, erosion, flood, biodiversity loss, desertification, wild life extinction, water, land and air pollution, as well as the menace HIV/AIDS pandemic.

The Role of ICT in sustainable development in Nigeria
As earlier noted Sustainable development is focus on three main goals: environment, social and economic development. That is meeting the social and economic development of a people and the same time taking cognizant of the environmental/natural resources in order to sustain both the present and future generation. In other words it is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present but even in the definite future as well (Tahir, 2010). Development could mean different thing with respect to countries more especially in the light of developed and developing countries. In developing countries contending issues like: poverty, low level of industrialization, illiteracy, poor health etc are their main concern unlike the developed countries, where those issues are no longer their priorities but rather advanced development.

Most developing counties like Nigeria are faced with the problem of poverty and hunger, health challenges, provision of infrastructural facilities such as roads, electricity, water supply etc. and they are beginning to grapple with the realities of ICT and its implications in both social and economic development. According to Ololube (2006) ICT has become a key tool in effective service delivery in several aspects of lives: social, economic, technology, business, labour, health, education etc. Thus, ICT has a role to play in ensuring sustainable development in this country. Ndukwe (2007) posited that the economic development of a nation can be accelerated by improvements in a country's ICT infrastructure and no modern economy can thrive without an integral information technology and telecommunications infrastructure.

ICTs provide the veritable platform for development across economic and other sectors, if well harnessed. Ndukwe (2007) further reflected the position of United Nations General Assembly in this way, " We (----) declare our common desire and commitment to build a people-centred, inclusive and development-oriented information society, where everyone can create, access and share information and knowledge, enabling individuals, communities and people to achieve their full potential in promoting sustainable development and improving their quality of life". Olosunde & Akinpelu (2000) in a supporting view posited that one of the most important preconditions for the full and comprehensive implementations of sustainable development is the need for sustainable information society. That is a society which has well developed ICTs to share information for development and innovation. Developing Countries are yet to be fully part of this information society and as such will either have to establish, develop or upgrade their information and communications infrastructure for the obvious important linkages and relationship with the concept of sustainable development.

Nigeria will need to upgrade her information and communications infrastructure so as to fully realize the potentials of ICTs towards sustainable development. Basically among the roles played by ICT thus far towards achievement of sustainable development in Nigeria can be summarized as follows:

- ICT, through the telecommunication industry has created jobs for quite a good number of men and women in the country. Apart from the telecommunication industry, NGOs like Fantsuam Foundation an NGO based in Nigeria has also provided PC skills training that has enabled rural youth and adults to find jobs in urban areas.
- Also, relevant information on agricultural best practice (provision of food) can be obtained via internet.
- With the introduction of National Open University of Nigeria (NOUN), quality teachers can be adequately trained in order to meet the demands for the Universal basic education programmes and help to eradicate illiteracy in our system.
- ICT has empowered rural men and women For instance, Fantsuam Foundation has promoted rural community development and empowerment by

helping to increase access to information and communication technology (ICT) facilities in southern Kaduna area of Nigeria. These facilities were primarily used by community health workers and nurses, students and staff of health-training institutions, and local colleges. The project hoped to develop culturally relevant health content using a variety of media: the Internet, community radio, and reference textbooks in libraries. Specific activities undertaken include: Basic IT training for frontline health workers, students, and health trainers. This training has been designed to enable these different groups to adapt and/or translate health information from the Internet into information that is appropriate for local communities.

- The cybercafés and phone booths (pay phone centres) have been established which have economically empowered most young school leavers/graduates, thus keeping them out of the streets.
- Also accessing the internet facility provides information for the public with regards to many issues/areas of lives: health, educational research, economic etc which help them make informed decisions.
- Accessing the internet as exposed the populace on the dangers of mismanagement of environmental resources, both government officials and the governed. Adequate information on issues like: global warming, deforestation, ozone layer depletion etc has also made every citizen of this country to be aware of our individual roles in helping to sustain the environment.
- Some pilot programmes on the use of e-learning technology for delivering instructions are currently going on. E.g. the one PC per pupil/student programme in some secondary schools in FCT, Abuja-Nigeria.

Thus, the fact remains that ICT implementation is already on in the country but needs to be supported and sustained by tackling those challenges that could threaten its maximal utilization.

Challenges to the Use of ICT
In spite of the positive contributions of ICT, there are still several challenges to the successful use of ICT. These include among others:

- **Favorable Enabling Environment** (Legal, Regulatory and Policy): There should be continued favorable enabling environment in order to encourage stakeholders most especially the operators and providers of ICT facilities.
- **Cost**: The cost of appropriate technology (i.e. purchasing the right equipments: ICT components e.g Computers, copper, fiber, VSATs (Very Small Aperture Terminals), switches, hubs, modems, etc is high. This definitely affects the availability of these facilities and leads to the tendency of acquiring obsolete or inferior facilities (technology).
- **Development Time and Lack of Skilled Personnel**: ICT Software development and digital content creation take considerable amount of time and expertise to develop. There is also lack of human skills and knowledge that are prerequisite to the success and realization of the ICT dream. Nigeria needs trained personnel to install, maintain and support these systems.
- **Weak Infrastructure**: In Nigeria a formidable obstacle to ICT is infrastructure deficiencies. The country is seriously deficient in reliable electricity supply which is a necessity for sustaining ICT development.
- **Width and Limited Access to the Internet**: Inability of users (individuals, private, and government) to make use of large bandwidths makes the process of accessing and working with the net cumbersome. The greatest technological challenge in Nigeria is how to establish reliable cost effective Internet connectivity.

CONCLUSION
There is no gain saying that ICT can make a significant contribution to the processes of sustainable development of a nation by empowering people for environmental, social and economic development. Developing countries must leverage on this, if they must 'leapfrog' to the level of rich industrial countries at the same time maintaining the pure essence of sustainable development. That is, ensuring development for the present and future generation through proper management of natural/environmental resources. The challenge here is for every citizen to be on board by making all and sundry to have access to ICT. That is working towards an information society. This basically is plausible by addressing problems of: poor infrastructures, lack of workable ICT policies, skilled personnel and high cost of purchasing equipments (appropriate technology) and lack of favorable enabling environment.

RECOMMENDATIONS
The following are recommended among others in order to address the challenges confronting ICT in Nigeria.

- Implementation of workable ICT policy
- Government should as a matter of urgency revolutionize the power supply system (electricity supply) in order to encourage stakeholders in the maximal deployment of ICT.
- Though the cost of the right technology in terms of ICT facilities is high, the concern should be "Appropriate" technology and should never be traded for inferior or backward technology, but rather technology that will successfully take most of us fastest from the present to the future.
- In terms of both software and hardware development, thought should always be placed from the very beginning in ensuring that any aspect of ICT that is geared towards mass deployment must have a plan for early local assembly (at the very minimum) and local grounds-up manufacturing (at the very best) of the deployed technologies, with specifications for local content in material (hardware and software) and personnel.

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