Introduction

Information and Communication Technologies (ICT) have become key tools and had a revolutionary impact of how we see the world and how we live. This phenomenon has given birth to the contemporary e-commerce, e-government, e-medicine and e-education- which is the primary focus of this paper.

ICT is having a revolutionary impact on educational methodology globally. However, this revolution is not widespread and needs to be strengthened to reach a large percentage of the population. What are the success factors in existing e-education programs and how can they replicated? What are inhibitors that prevent this revolution from becoming widespread and comprehensive in its social and economic impact? All stakeholders have a role to play must insist on the best standards and approaches to ensure effective ICT for education service delivery in institutions of learning.

The key assertion of this paper is that the effective use of ICT for education addresses, both the problem and solution to technology based learning holistically, seeking synergistic results that benefit all groups.

In a complex society, many factors affect more than one variable so an interdisciplinary and integrated approach is very necessary to ensure the successful development of Nigeria’s economy and society. It is not possible to consider every variable; however, there is a need to better design infrastructure as well as organizations so that they can better plan for unanticipated and unintended results. ICT has a key role to play as an enabler to help us better manage complex information flow and to integrate them towards effective policy formulation and planning towards the maximization of human capacity and potential. This includes the development of effective and integrated tools as well as training modules to enable their application and replication in the target areas discussed in this document.

The goal here is to address ICT in relation to education, and relate it to governance and health care, and explore the redesign of contemporary
socioeconomic systems to create a socially and economically sustainable society for Nigeria. If we succeed on this level, Nigeria can be a role model for effective utilization of ICT for education and sustainable development for not only African but also the world.

**Description of e-education**

e-Education is electronic mode of knowledge sharing and transmission, which may not necessarily involve physical contact between teacher and student\(^1\). The concepts computer-aided teaching and computer-aided learning have given birth to computer-aided instruction, which represents a combination of both teaching and learning\(^2\). Access to instruction through the internet is flexible, ensures broad viability and availability of educational opportunities. It is cost effective system of instruction and learning materials can be accessed irrespective of time and space. This includes an interdisciplinary approach that considers the impact that all fields and phenomenon with both human and non-human life have on each other. Hence the emphasis of this presentation does not focus only on memorization and learning but also on training the student so that he/she can effectively address any problems that he/she faces as an individual, while also maximizing their contribution to civil society, their communities and the institutions that they involves themselves in. This tool can be of great value to the young people of this generation! A major focus of this paper will also be on how to mitigate the impact of the current population explosion and poverty, which has amounted to massive unemployment in many developing countries by providing environments from which to enable students to engage proactively in finding solutions to the problems and challenges they learn about in the classroom.

**Challenges to e-Education in Nigeria**

Although ICT holds great potentials in supporting and augmenting existing educational as well as National development efforts in Nigeria, several challenges remain. If these challenges are not addressed the effectiveness of any ICT4D program will be reduced considerably and we will not be able to successfully replicate them at the national level. These challenges include:

1. Inadequate ICT infrastructure including computer hardware and software high, and bandwidth/access;

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2. Lack of skilled manpower, to manage available systems and inadequate training facilities for ICT education at the tertiary level;
3. Resistance to change from traditional pedagogical methods to more innovative, technology based teaching and learning methods, by both students and academics;
4. The overall educational system is under funded, therefore, available funds are used to solve more urgent and important survival needs by the institutions;
5. The over-dependence of educational institutions on government for everything has limited institutions ability to collaborate with the private sector or seek alternative funding sources for ICT educational initiatives.
6. Ineffective coordination of all the various ICT for education initiatives.

This list is not exhaustive but represents the major problems faced in the development of ICT for education in Nigeria. We believe that when adequately addressed, the chances that e-education will thrive in Nigeria will increase dramatically. We also believe that this will have larger, much desired impacts on development and modernization of Nigerian society.

**Educational Policy and Organizational Overview**

So that we can better understand the challenges and opportunities for e-education, let us explore the existing educational system and its history. The educational sector is guided by the National Policy on Education and several coordination mechanisms have been put in place to ensure that the highest standards are maintained in curriculum, infrastructure and manpower requirements. The Primary and secondary schools are directly under the ministry of education either at the state or federal level, the universities are under the National Universities commission (NUC), the polytechnics the National Board for vocational colleges and Technical education (NABTECH), and the National commission for colleges of education (NCCE) oversees the activities of the Colleges of Education.

The institutions under each of these coordinating mechanisms are enormous and diverse in many respects; however, for the purpose of classification, the following statistics would be necessary. There are 58 University Institutions, 48 Polytechnic Institutions and 67 Colleges of Education. Other institutions are 44,000 primary schools, 9,000 secondary schools, 3 specialist postgraduate institutions, 26 federal vocational colleges and schools, 15 University teaching hospitals and 61 research institutions.

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The Nigerian educational system has undergone major structure changes over the last 30 years:

1. In 1973, the educational system was updated to the 6-3-3-4 (6 years primary, 3 years junior secondary, 3 years of senior secondary and 4 years tertiary education).

2. In 19829 the first National Policy on education was developed and adopted, since this period, the educational system has witnessed a lot of changes and modifications at various levels.

3. The current phase of evolution is most relevant to this paper as it focuses on the transition from traditional pedagogical methodology to more sophisticated, but user friendly, technology based instructional methodology.

**e-Education in Nigeria: Present Initiatives**

Nigeria is a country of over 120 million people and it is considered a major hub for commerce, culture and education in Africa. Therefore, it is no surprise that Nigeria is leading the way in the development of ICT infrastructure and training. There are several ICT for education initiatives in Nigeria. These initiatives are either being undertaken by government, civil society or the private sector. It is very important that we develop programs that ensure coordination between government, nonprofit and private institutions towards policy reform and the development of effective national ICT4D policies for rapid replication of best practices. The Nigerians for Digital Development Initiative (mentioned in more detail below) is one opportunity for stakeholders in the various Nigerian communities to come together and implement an integrated framework for development that includes government, business and NGOs.

**Government e-education initiatives**

There are presently at least nine ICT for education initiatives at various stages of development being carried out by the education coordinating agencies of government and the ministry of education. They include:

1. The Nigerian Universities Network (NUNet) Project
2. The Polytechnics Network (PolyNet) Project
3. The School Net Project
4. The Nigerian Education, Academic and Research Network (NEARNet)
5. The Teachers Network (TeachNet) Project
7. National Virtual (Digital) Library (Ministry of Education/ NUC)
8. National Virtual Library (Ministry of Science and Technology/NITDA)

For the purpose of this presentation however, we will look at three: NUNet, NOU and the VLs.

National Universities Network (NUNet)

The origins of NUNet dates back to 1994 when it was realized that it was increasingly becoming necessary for Universities to be connected electronically at least through email. However, it was later realized that interconnectivity issues for institutions of higher learning were far greater than emails. Following this, several partnerships were built with various institutions and NUC staff were trained in various IT related skills.

In 1996, the NUC signed a MOU with the International Center for Theoretical Physics in Italy and secured 3 IDD and 9 telephone lines for NUNet, procured equipment, registered a domain name and introduced dial-up email services.

The objectives of NUNET are:
1. To end isolation of Nigerian academic staff and students from each other and from the global academic community;
2. To ameliorate staff shortages arising from the brain-drain, by providing the ICT facility required by our academic staff-in-Diaspora to make their contributions regardless of where they live or work;
3. To encourage the sharing of resources, foster academic and research collaborations among Nigerian Universities, and with their counterparts throughout the world;
4. To provide universities with access to electronic databases, journals and books many of which are increasingly available only in digital formats;
5. To serve as vehicle to expand access to education at minimal cost of capital building expenditure; and
6. To place Nigerian universities at the forefront of the information revolution, that they might serve their proper roles as foci for national development.

There are currently 52 university centers and colleges of education who have their domain names registered while 15 are active email users.

The National Open University (NOU) of Nigeria
The NOUN first began in 1983 but was suspended in 1985 by the then military government. The resuscitation of NOUN is part of the commitment of the present government towards Universal Basic Education. The justifications for the establishment of the Open University are clear; there are approximately 1.5 million applications per year for a place to attend university. However, the University system can only accommodate 20% of this number.\(^8\)

The course delivery will be through a combination of web-based modules, textual materials, audio and video tapes as well as CD ROMs. The university currently has 18 study centers and plans to have at least one study center in each of the 774 local governments of Nigeria. It runs programmes in education, arts and humanities, business and human resource management and science and technology.

**Virtual Library Initiatives**
In summary, the objectives of the national virtual library include: improving the quality of teaching and research institutions through the provision of current books, journal and other library resources; enhancing access of academic libraries to global library and information resources; enhancing scholarship and lifelong learning through the establishment of permanent access to shared digital archival collections; provision of guidance to academic libraries on ways of applying appropriate technologies for production of digital library resources; and to advance the use and usability of globally distributed networks library resources. Virtual library initiatives in Nigeria include:

- The National Virtual (Digital) Library Project\(^9\) of the Ministry of Education, which is supervised by the National Universities Commission\(^10\).
- The National Virtual Library Project of the Ministry of Science and Technology is supervised by the National IT Development Agency.
- An ongoing effort by UNESCO to develop a virtual Library for all Nigerian Higher Education Institutions in Nigeria.

**Civil Society (NGO led) e-Education Initiatives**
Globally we have seen a trend emerging as governments have retreated from many realms of public life new organizations and relationships are taking form. NGOs are the name of the organizations that are leading this movement. Therefore, we should fully understand that governance needs to be considered in the design of any effective e-education program.

In Nigeria, several NGOs have had a notable impact on the development of telecenters. Telecenters are places that usually have rudimentary ICT

\(^8\) Ibid
\(^9\) The portal for the Nigerian Virtual Library is [www.nigerianvirtuallibrary.com](http://www.nigerianvirtuallibrary.com)
\(^10\) The virtual library Project at the NUC is currently undergoing a review and we anticipate this will lead to the upgrading and improvement of the VL.
facilities design to acquaint people with these technologies and to begin educational programs to teach people in marginalized regions about how to use them. The focus is often on the youth because they represent the hope for the future and are open to new ideas.

There are several examples of telecenters in Nigeria:
1. Community Teaching and Learning Centers
2. Lagos Digital Village by Junior Achievement Nigeria
3. Owerri Digital Village by Youth for Technology Foundation
4. Computer Literacy for Older Persons Programme by Mercy Mission

For the purpose of this paper, concentration will be on Community Teaching and learning Centers and the Owerri Digital Village.

**Community Teaching and Learning Centers Overview**

CTLCs are locally run and managed places strategically placed in or close to schools and businesses in order to serve as local, practical education centers. CTLC is an initiative of Teachers Without Borders (TWB). TWB is an international US based NGO that seeks to connect teachers globally, to each other and to resources through “high teach, high tech and high touch solutions.”

The centers currently exist in various parts of Nigeria and comprise online and offline rooms. At each center, the community provides space and labor for the CTLC, while TWB provides equipment, technology and training. CTLCs provide education where none existed before and improves learning by using technology to access and share latest knowledge.

Programmes at the CTLC run at the CTLCs include Early Childhood education, HIV/AIDS training, literacy and teacher education- leading to the award of certificate of Teaching Mastery.

**Owerri Digital Village**

One example of a CTLC is the Owerri Digital Village. ODV was launched in September 2001 by the Youth for Technology Foundation (YTF) - an international non-profit organization based in the United States and Nigeria. The mission of ODV is to promote rural community development by providing technical, educational and entrepreneurship skills training to disadvantaged individuals in the effort to create social and economic opportunities that can change people’s lives and transform communities.

ODV is a community Technology and Learning Center that offers IT skills development and training for Nigerian youth in an effort to develop entrepreneurial spirit and passion for technology. The Owerri Digital Village

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currently runs four programmes: Tech Kids, Tech Teens, Tech Communities and Tech Enhancement.

**Forward looking strategies and prospects for e-education in Nigeria**

The core of the recommendations contained in this paper point to how policy makers and government can work with civil society and the private sector to mainstream ICT in the overall educational development process. Although this paper is focused on e-education in Nigeria, its implications will apply in many developing countries, as the challenges faced in the deployment of ICT for educational purposes are largely similar and can be addressed using cross cutting recommendations and strategies.

The following key points maybe considered as recommendations for the development of e-education in Nigeria:

1. e-Education has great potentials to assist achieve Nigeria’s goal to achieve education for all by the year 2015 and therefore should be maximally harnessed by every possible avenue;
2. IT education should be included in the educational curriculum including the provision of necessary infrastructural support and massive training and deployment of skilled manpower into both secondary and tertiary institutions;
3. Young software developers should be trained and supported with the necessary equipment to develop nationally usable e-education software;
4. The various government education coordinating agencies should work together to develop an integrated broad-based model/strategy for e-education with a definitive timeline for its completion;
5. Government should increase funding for the entire educational sector with particular emphasis on ICT;
6. Government should work with the private sector and civil society to ensure affordable and sustainable access to ICT infrastructure;
7. A policy environment which encourages investment in ICT should be put in place including tariffs on import of ICT infrastructure, in order to promote affordability and wide range usage at all levels of the educational system;
8. The importance of youth participation in ICT decision-making processes cannot be over emphasized; therefore, their participation in ICT policy-making processes at the national and other levels should be encouraged and supported by all stakeholders.

“If ever there was an area where young people were the leaders, not only of the future, but also of today, it is in the emerging information society.”

**Youth Participation in ICT for Education**

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To address many of the above points, young people have begun mobilizing and carrying out initiatives that support the efforts to move ICT aided education forward not only in Nigeria but all over the developing world and the developed world as well. The Youth ICT movement is highly organized and very agile being led by the World Summit on the Information Society Youth Caucus. Youth activism in the ICT4D movement is also tied to concerns about major challenges such as AIDS. Global income inequality, transparency, accountability, and ecological decline. Through Africa the youth are mobilizing around these issues, e-education has a key role to play in this process. The Port Harcourt Student Leaders IT Conference is notable, because it shows how the youth in Nigeria are organizing and taking ownership of their lives.

The Port Harcourt Student Leaders IT Conference

"We the student Union Leaders..." These were the introductory words to the declaration made by Student Leaders who came together from various institutions in Port Harcourt, Nigeria, for the student leaders IT Conference. Apparently worried that the potentials of ICT in the effective delivery of educational services are not being maximally harnessed, the young leaders made several commitments and called on all stakeholders to ensure that they play their roles in the process to integrate IT into the educational system. The student leaders sought to identify and harness possible complimentary roles that they can play in the effective delivery of ICT for education initiatives of various government agencies and in the creation of sustainable and affordable access to ICT infrastructure within their institutions.

The outcome of the conference was summarized in two documents; Student Leaders IT Conference Declaration and Student Leaders IT Conference Statement. They recommended that effective ICT4D initiatives in Nigeria should include:

- ICT related courses in the school curriculum at all levels
- Development of ICT infrastructure at institutional level
- Participation of young leaders in IT policy making
- Utilization of virtual teaching and learning opportunities/environments
- Prioritization of access to ICT infrastructure at the institutional level

The leaders plan to follow up on the conference by developing a web portal where information, resources, research findings and profiles of their institutions can be posted and regularly updated. Their concluding statement was that “...as young Nigerians and heads of our various campus organizations, we have committed ourselves to ensuring that we work with our mentors at the higher levels to ensure the actualization of the e-

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13 Student Leaders IT Conference (Harbour Road) Declaration; Students Without Borders Nigeria
education integration initiatives and goals, for the good of our today and tomorrow.”

Nigerians for Digital Development

For any ICT e-education program to work as intended it must address the process of how to effectively bring people together through social networks and achieve results. We will go into this in more detail below outlining how the NDD program will integrated the above

Nigerians for Digital Development (NDD) is an initiative that calls out for the attention, participation and investment from Nigerians and their friends throughout the world into the development of Information and communication technology in Nigeria. The building strength of the NDD is the economic and creative leadership of Nigerians in building the New Nigeria. NDD application services touch every aspect of society including, finance, entrepreneurship, cultural preservation, ecological solutions, health care and many others.

The goal of NDD in education is to address the educational needs of Nigerians from early childhood through life long learning programmes for adults. Development Partnership International and One Village Foundation are currently working on the NDD model that involves the development of what we call Unity Centers. These centers perform educational, consultancy services in a variety of areas focusing on sustainable economic development and ICT augmentation programs. These approaches in addition to behavioral modification and health care are key tools that are vitally needed to address the core problem areas that promote the spread of AIDS.

Unity Centers

We want to create a setting that encourages people to come together from all parts of the world to develop a sustainable development program that is whole systems oriented and relevant to the needs and realities of local people in Nigeria as well as other similar locations. These centers will be unique, but also practical representations of the ideals of the sustainability and ICT4D movements. Through the whole systems approach, we intend to demonstrate that we can do more with less thus showing how sustainably designed communities can develop locally based economies that are not only ecologically and socially sustainable but also become economically viable alternative to existing resource intensive development models.

The NDD initiative by focusing on developing a prototype CTLC (Unity Center), will integrate already existing best practices in Nigeria as well as other parts of the world, to ensure rapid development of effective ICT4D solutions. These will include the collection of best practices that will be evaluated externally through field agent research and through onsite experimentation. Included in this will be programs in e-education as well as in other areas. As part of the integrated approach to education, Unity Centers
will foster an environment that encourages not only the improved
development of knowledge collection and dissimulation techniques but also
promotes the development of more collaborative and effective social
networks.

The NDD aspires to serve as model of how ICT can be deployed to serve
community and support development through an integrated program of
collecting best practices through not only the ICT augmentation of existing
system but their. Implementation of NDD will focus on several dimensions:
policy, content, capacity building and the incorporation of existing best
practices into a more integrated approach to sustainable development. We
see the establishment of Unity Centers in Nigeria as helping to support on-
going national infrastructural development efforts. This includes designing
these Centers to serve as training hubs for development specialists so that
they can acquire the technological, organizational and development skills
needed to effectively build capacity in Nigeria. One component of this
program is to facilitate involvement by private sector organizations interested
in investment in ICT to support capacity building for AIDS orphans and
Positive people.