

INFORMATION COMMUNICATION TECHNOLOGY IN RURAL SCHOOLS OF NIGERIA: CASE STUDY ENUGU STATE, NIGERIA

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ABSTRACT

We live in an era of information explosion. Once there was want of information, today we are drowned in the surge of information. Without the basic computer literacy, one finds it almost difficult to function comfortably in society. I believe that countries like Nigeria must lead the way for new IT markets, and indeed attempt to gain such leadership if it is to have a sustainable presence in the Information and Communications Technology (ICT) field. The field research suggests that there is a huge untapped demand for computing in rural environments. However current solutions are not tailored for these markets, so the hardware and software industry will have to innovate and come up with appropriate solutions. Educational programs for the rural areas cannot by themselves reach out to all the communities under consideration. There has to be an existing or proposed infrastructure that would enable these programs to be conveyed. Although the aim is "education anytime anywhere for anyone," distributed learning programs cannot by themselves solve the access problem. For example, how can multiple distributed learning programs each find, enrol and support enough students (who could be anywhere)? How do potential students find, select and work with one or more such providers (who could be anywhere)? How can network and equipment access be assured for students? The dire need to bridge the digital divide and for Nigeria to effectively join the newly emerging global economy driven by information and communication technologies has provided the basis for research into the need to provide an effective communication infrastructure for the rural communities. Enugu State is predominantly a civil service state and has a variety of educational institutions. Enugu is situated in a hilly region and therefore incorporates a number of challenges for ICT services. This work highlights the plight of schools in rural areas where the lack of basic amenities is the order of the day. In order to provide ICT to rural areas the primary focus is rural education with the provision of running an Internet Service in an effort to become self-sustainable. This would in turn ensure the development of a critical mass of rural dwellers, enabling them to benefit from better IT driven education. These users would require remote access to a central site with connectivity to the internet. The key concern is to provide a solution which will aim at functionality, performance, scalability, availability, and security. The objective is link the access centre in Enugu to the Local Government Areas of the state via VSAT. From the LGA's a wireless point to point link using the IEEE 802.11 protocol would be deployed to link the rural areas, in this case secondary schools. Experts in education suggest that ICT will cause an even more dramatic prototype for E learning since learning over the Internet is neither time bound nor place bound.

INTRODUCTION

Addressing the ICT requirements of rural schools is a fundamentally distributed and suitable exercise that requires planned budgeting (David, 2009). A systematic effort to understand the needs of these schools and the physical constraints placed on them due to the lack of ICT awareness would be required in order to:

1. Make ICT more meaningful to schools in rural areas

2. Identify innovative methods for making provision for these schools to have access to ICT facilities.
3. Decrease wasteful expenses by avoiding models that apply to towns and cities.

The ICT capacity for developing education grows from the information processing and information sharing characteristics. ICT has become the most exciting set of technologies today, thanks to developments like Internet growth. The Internet has become the most efficient means for transferring of information and its impact on rural schools should be affordable with sufficient human resources and technical capacity to create and use applications to further education (David 2010).

However, the ability of rural population to improve their livelihood is not only limited by lack of access to ICTs and their applications in key sectors, but also by a complex web of constraints ranging from unresolved problems of governance and injustice at the local levels and the dynamics of the global economic system (Hewitt de Alcantara).

As we see in Table 1.1 the primary reasons for those who knew what the Internet was, but were not using it, was the lack of access to a personal computer and an absence of knowledge on how to use it.

Table 1.1 Reasons why those above 16 years know of the internet but do not use it

Country	I do not have access to a computer	I do not know how to use the computer	I do not want to use the internet	I have no one to e-mail	I do not have access to any internet facilities	cannot read/write	I cannot afford to use the internet
Benin	48.2%	49.7%	13.1%	10.9%	4.6%	4.3%	2.2%
Burkina Faso	23.1%	98.9%	2.3%	18.7%	0.6%	4.2%	11.5%
Cameroon	67.0%	66.7%	14.0%	16.5%	50.5%	1.7%	33.8%
Ivory Coast	61.3%	57.0%	3.3%	0.0%	20.1%	1.1%	8.5%
Ghana	49.9%	70.8%	6.3%	25.0%	25.9%	4.9%	7.8%
Kenya	35.0%	40.9%	24.7%	27.9%	37.8%	0.0%	2.2%
Nigeria	47.0%	48.4%	3.1%	15.5%	30.2%	0.6%	1.6%
Senegal	30.3%	54.1%	7.0%	11.7%	18.2%	43.0%	7.6%
South Africa	53.1%	25.4%	8.0%	10.0%	38.1%	0.5%	12.9%

EDUCATION DEVELOPMENT

The role of education in economic development is unquestionable. However, to suggest that Nigeria can learn from developed countries that have invested heavily in education and been economically successful is immature (David 2010). The reality is that Nigeria's education expenditure as a share of its gross national product (GNP) is only 0.75 (UNESCO, 2010). The urban/rural distribution of the Nigeria population is 47% / 53% (Worldbank, 2014), with a projected population growth rate of 2.38% (USCB, 2008). The population living in rural areas are dependent on disjointed subsistence and livestock farming. This subsistence market is subject to a variety of external shocks such as erratic rainfall, pests and disease and price fluctuations. Price fluctuations are caused due to poor infrastructure such as roads and communication and a number of intermediaries before their products get to the market. These people too are equally concerned with educating their children, maintaining their well-being and improving their skills in order to improve their income. This makes the focus on ICTs in rural areas critical.

The Internet is a driving force for much development and innovation in both developed and developing countries. Countries must be able to benefit from technological developments. To be

able to do so, a cadre of professionals has to be educated with sound ICT backgrounds, independent of specific computer platforms or software environments.

Africa accounts for less than 0.5% of the world's fixed-broadband subscriptions and despite double-digit growth over the last four years, penetration in Africa remains very low, at 0.4% by the end 2014 (ITU, 2014).

WHY ICT RESEARCH IN RURAL AREAS?

Countries like Nigeria must lead the way for new IT markets, and indeed, attempt to gain such leadership if it is to have a sustainable presence in the IT and Communications field. The field research suggests that there is a huge untapped demand for computing in rural environments. However current solutions are not tailored for these markets, so the hardware and software industry will have to innovate and come up with appropriate solutions.

ICT AWARENESS IN ENUGU STATE

Enugu State is predominantly a civil service state and has a variety of educational institutions. Enugu is situated in a hilly region and therefore incorporates a number of challenges for Information Communication Technology (ICT) services. In order to provide ICT for rural areas the primary focus is rural education with the provision of running an Internet Service in an effort to become self-sustainable.

Enugu State consists of 21 LGAs comprising of about 210 villages. As of 2009 there is no current communication infrastructure in place in the rural areas of Enugu State. No other state in Nigeria has implemented any communication infrastructure so there is no existing structure to follow, however, the Enugu state government is interested in rural communication (ENSG 2013). The communication infrastructure anticipated should cover all the LGAs thereby covering at least 75% of rural areas.

Table 1.2 Analysis of data collected, students answering yes to the questions (2012).

Percentage of students that answered YES to the following questions	village	town	city
Do you know what a computer is?	100	100	100
Have you used a computer before?	14	85	100
Do you have a computer lab in your school?	0	46	100
Does your lab have internet access?	0	15	68
Do you have access to the lab?	0	29	92
Do you do computer courses in your school?	47	75	100
Are the computers in your school sufficient?	0	0	0
Do you think the computer course is relevant?	61	89	100
Do you use the computer for entertainment?	0	70	100
Can you use navigate within windows?	0	27	74
Are you aware of the INTERNET?	17	68	100
Can you browse?	0	32	100
Can you use a search engine?	0	23	100
Do you use the internet for communication?	0	15	100
Do you use the internet for entertainment?	0	38	90
Do you use the internet for home work?	0	5	31
Can the internet educate people?	42	86	100
Have you heard of E-learning?	17	53	98
Can e-learning assist in education?	22	59	97

The focus of assessment was on the awareness/utilisation of ICT in secondary schools in Enugu State. The study design was cross sectional. The approach to collecting and analysing data was qualitative. Questionnaires were used for data acquisition and were distributed in secondary schools in villages, towns and the city in Enugu state. The demographic population surveyed was between the age group of 15 to 19 years. Based on the survey, the following results were achieved and are tabulated in table 1.2, while figures 1.1 - 1.4 graphically represent some vital issues highlighted from table 1.2.

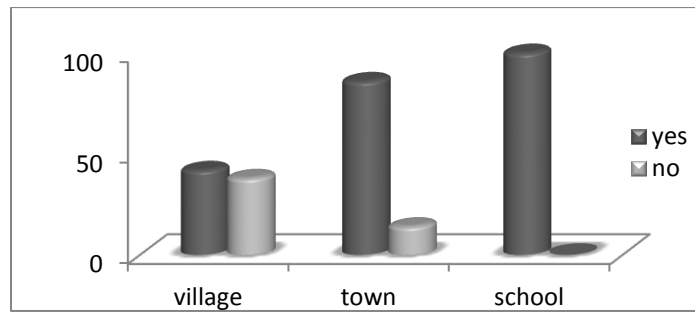


Figure 1.1 Percentage of students that have a computer lab in their schools

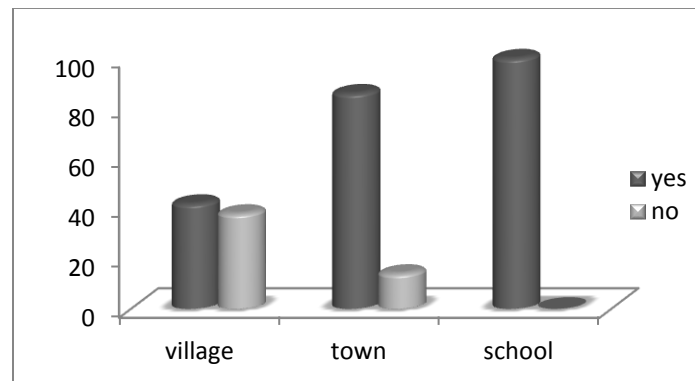


Figure 1.2 Percentage of students that said that their computer labs have internet access

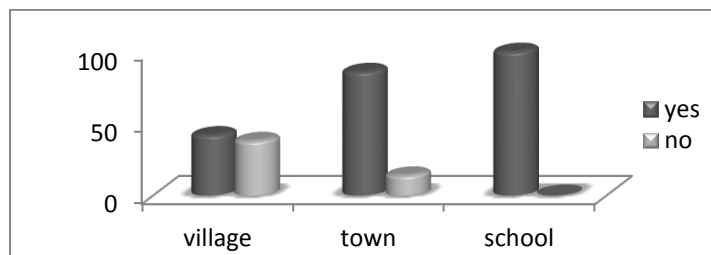


Figure 1.3 Percentage of students that think a course in ICT is relevant

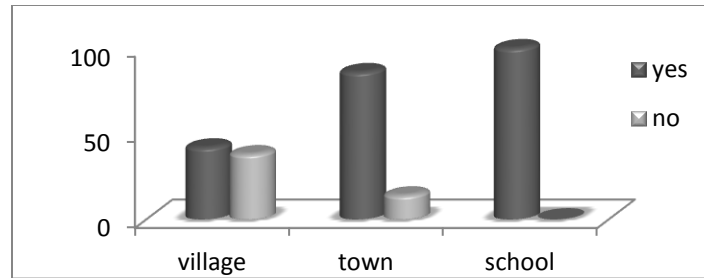


Figure 1.4 Percentage of students that think that the Internet can educate people

From the data in figures 1.1 to 1.4 it is clearly visible that it is important that a communication backbone for the rural communities be set up in order to bridge the digital divide and to provide access to the rural populace. This would provide Internet and ICT training for the students thus ensuring that ICT resources are readily available. It is obvious that the students in the city are more exposed to the world of ICT than those in the towns and villages and those in the towns are a little more exposed than those in the villages. The data therefore speaks for itself that the digital divide needs to be bridged as students in all the three areas feel that computers and computer courses are relevant in their education.

PROBLEMS BEING FACED IN RURAL AREAS OF ENUGU STATE?

Problems encountered in the rural areas of Enugu state are typical for ISPs in rural areas. They include:

- Lack of dependable leased line
- Lack of confidence in communication services since they're not reliable
- Daily power cuts giving rise to unreliable power supply
- Low bandwidth when browsing with GSM phones of less than 1 Kbps
- Complete dependence on GSM services for communication

Current projects at the Federal level have a strong focus on the needs of people who have not yet benefited from Internet and Communication Technologies. Nigeria started implementing its ICT policy in April 2001 after the Federal Executive Council approved it by establishing the National Information Technology Development Agency (NITDA) the implementing body. The policy empowers NITDA to enter into strategic alliances and joint ventures and to collaborate with the private sector to realise the specifics of the country's vision of, *"making Nigeria an IT capable country in Africa and a key player in the information society by the year 2005 through using IT as an engine for sustainable development and global competitiveness."* This vision is yet to be fulfilled.

RURAL ACCESS TECHNOLOGIES

Operators that need to provide communication in sub-urban and rural areas have three basic delivery options; traditional wire line connections, fibre or radio. While satellite has its place in serving the most isolated areas, it is generally not a viable option due to its prohibitive cost and technical issues such as circuit latency.

Problems with installation and maintenance of wire plant have prompted the widespread use of wireless systems in rural areas. Population density and size impact on the cost effectiveness of the technology employed and the rural environment imposes many constraints on the choice of the access technology. In order to solve the problem of investment in rural communications in addition to financing measures, different technologies and architecture models have to be considered in its implementation.

Traditionally, the term rural is applied to the countryside or any-thing related to it (Tugnayat et al 2012). Rural and remote (or just "rural") areas exhibit either the scarcity or absence of public facilities, technical personnel and low population density resulting in low per capita income. Difficult topographical conditions, e.g. lakes, rivers, hills, mountains or deserts, render the construction of wireline telecommunication networks very costly as well as severe climatic conditions that make critical demands on the equipment (ITU-D, 2010). All this results in very high calling rates per telephone line, reflecting the scarcity of telephone service and the fact that large numbers of people rely on a single telephone line. These characteristics make it difficult to provide public telecommunication services of acceptable quality by traditional means at affordable prices, while also achieving commercial viability for the service provider.

One of the challenges that hinder diffusion of IP-based services in rural areas of Nigeria is the lack or limited ICT infrastructure. The situation is led by the high cost of establishing ICT infrastructure especially to the rural areas (Sedoyeka et al, 2008). However at present IT operators have different options to provide ICT network facilities and services in the country though their business models are unfavourable to the rural areas due to high deployment and maintenance cost.

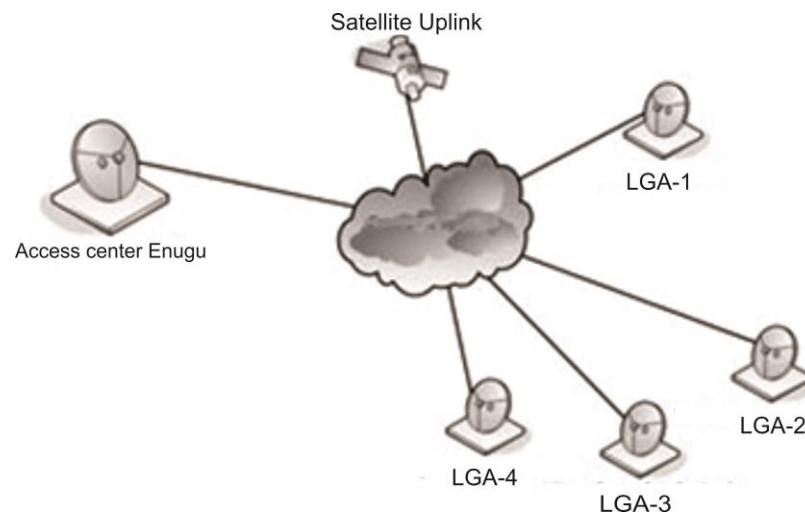


Figure 1.5 linking the city center with the LGA's (villages)

The objective is link the access centre in Enugu to the Local Government Areas of the state via VSAT as illustrated in figure 1.5. From the LGA's a wireless point to point link using the IEEE 802.11 protocol would be deployed to link the rural areas, in this case secondary schools. By providing a reasonably high bandwidth link between Enugu and the LGA's, all the centers could continue to function even if one of the LGA's is down. The maximum radius from a LGA to its villages in Enugu does not normally exceed 20 kilometers.

PLATFORM FOR COLLABORATIVE SHARING OF EDUCATIONAL CONTENT

Today there exists an irregularity between demand and supply for educational content. There is a huge demand for good quality education which is underserved due to the absence of enough good quality teachers. This problem becomes more acute as we proceed earlier in the education level (secondary school level compared to university level). For instance, well-qualified teachers are usually concentrated in cities and towns. Consequently students from rural areas (especially those from underprivileged socio-economic backgrounds) receive poor quality education and are not in a position to compete for opportunities with those in cities.

The goal of this paper is to highlight and find a way for mutual sharing of educational content, thereby producing free and equal access to education by bypassing barriers such as urban/rural

divide and economic and social disparities, by using internet as a means to deliver such materials.

The platform will help to improve the quality of teachers in rural areas as they can learn from say, lectures of more qualified teachers and also provide better resources to students from rural areas.

BENEFITS WITH INTERNET SERVICES IN THE RURAL AREAS?

The technologies to develop and deploy will ensure that the end user receives a minimum level of service even in adverse conditions. Examples of this would be:

E-Learning: E-Learning is the convergence of learning and the Internet done at a computer, usually connected to a network, giving us the opportunity to learn almost anytime, anywhere. It is the use of network technology to design, deliver, select, administer, and extend learning.

E-Learning provides faster learning at reduced costs, increased access to learning, and clear accountability for all participants in the learning process. It is not unlike any other form of education - and it is widely accepted that e-Learning can be as rich and as valuable as the classroom experience or even more so. With its unique features e-Learning is an experience that leads to comprehension and mastery of new skills and knowledge, just like its traditional counterpart. E-Learning is a valuable part of a well-planned and properly supported education and training environment.

Virtual classroom: A virtual classroom is a web-based environment that allows you to participate in live training events without the need to travel. You listen to lectures, participate in lab exercises, ask questions, and receive feedback just as you would do in a conventional classroom except you do it from the convenience of your desktop, laptop or anywhere you have an Internet and phone connection.

Distance education: The scope could also be extended to also establish distance education programs in the state so that schools in the rural areas could evolve their own non-formal educational program. How do we reach out to people with no or very poor internet connection? We can consider other means such as mobile phone network, cable television network or offline access using DVDs. To address the bandwidth constraints, we should make the same multimedia content available in multiple formats such as audio only, low quality video, and high quality video.

Email service: Store and forward abilities to ensure that the user is able to send email to a local server can be implemented. The user is not asked to wait to come back when the "internet is back again". The user would also be allowed to type, send email and ask questions.

Market Price Information: The buyer and seller could receive customized market data to allow them to make informed decisions.

Local content: Local content will be stored in a distributed architecture making it accessible to all kiosks in the area irrespective of problems with the leased lines.

Medical diagnostics / consultation: Linking the rural communities over a reasonably high bandwidth line is the first step in connecting primary health centers to the good medical facilities provided in the city.

CONCLUSION

The realisation of an equitable information society is often undermined by many countries' own policies and practices, market structures and institutional arrangements. Many jurisdictions continue to be characterised by administrative processes that are not transparent and participatory, and institutional arrangements that constrain the autonomy of regulatory agencies

and induce executive determinations. Together with the lack of capacity in regulatory agencies to regulate effectively, this has created, in many countries surveyed, telecommunication environments not conducive to the significant investment necessary to network extension and the competition needed to drive down prices and extend services.

Information is power. With the enabling environment, prices of IT equipment and services are going down considerably and will still continue to go down. This would make services and equipment available to more people as well as access to online information readily accessible.

Although ICTs are not a solution for development, they play an important catalytic role. It is however encouraging to note that ICTs are top priority on many governments' agendas. Given that government is one of the stakeholders of Education, the prioritization of ICTs has great impact on its performance.

A good IT structure has the ability to impact knowledge to people in the rural areas, where for a long time, means of conveying the knowledge of ICT has been difficult. Experts in education suggest that networks and digital communication technologies will cause an even more dramatic prototype for E learning since learning over the Internet is neither time bound nor place bound.

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