THE IMPACT OF ICT IN RURAL EDUCATION: CASE STUDY - ENUGU STATE

By

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ABSTRACT

Rural areas are geographically dispersed and if educational programs for such rural areas are to provide equitable coverage, accessibility technological means must be considered. Indeed there has to be an existing or proposed infrastructure that would enable these programs to be conveyed. This paper looks into the information and communication needs for the vast majority of rural areas in Enugu State so as to build mechanisms to support ICT in order to increase the rate of development and economic growth. The paper shows, through data collected from Secondary schools in Enugu State, why there is a pressing need to primarily finance ICT projects focusing on the needs, aspirations, capacities and perspectives of the vast majority of people in rural areas. Choices for communication infrastructure are detailed.

1.0 INTRODUCTION

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

a. make ICTs more meaningful to those who need information and knowledge the most.
b. identify innovative methods for making provision for those who cannot afford access to them.
c. decrease wasteful expenses by avoiding transplanting methods that work only in towns and cities.

There is a growing consensus that addressing the investment in infrastructure, human capacity building, and applications in key development sectors is important for increasing economic growth of developing countries including that of Africa [1].

The ICT capacity for development grows from their information processing and information sharing characteristics; but these characteristics cut across all sectors. For example, Internet has become the most efficient means for communication, trading and delivery of services and goods influencing all human activities. Effective ICT deployment would improve basic services like education and health and boost revenue and job opportunities. For ICTs to make these impacts on the majority of the rural population there should be affordable access to it and sufficient human resources and technical capacity to create and use applications and content and an enabling policy environment that promotes free enterprise[2].

In addition, 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[3]. Over 40 percent of the population in Africa earns less than US$1 a day – below a poverty line drawn by the World Bank[4].

The Sub-Saharan Africa is the least developed area when it comes to ICT. Furthermore, there is a wide and uneven gap including social disparity in socio-economic status, age, gender, geographic location and ethnicity. Access to different technologies varies considerably – with broadcasting technology more diffused than ICT. Of the approximately 841 million people in Africa in 2003[5], it is estimated that only:-

- 1 in 4 had a radio (210m)
- 1 in 12 had a TV (71m)
- 1 in 33 had fixed line phones (25 m)
- 1 in 16 had a mobile phone (51m)
- 1 in 80 had access to a PC (10.3m)
- 1 in 70 had access to the Internet (12.3m)

From the data above, access to ICT should move closer to radio and telephones. However, this would incur higher costs because resources are required to build infrastructure to provide network access that would also include electrical infrastructure. Figure 1.1 shows a percentage per population of Internet users in some West African countries (2007 estimate).

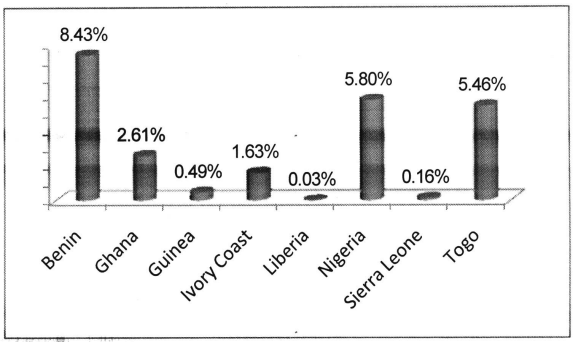


Figure 1.1: Percentage of Internet users in West Africa

Internet connectivity in West Africa did not follow the same growth pattern as telephones did. From the data in the graph above we can note that the number of internet users in Nigeria is about 8 million, resulting in a penetration rate of about 5.8%.

2.0 EDUCATION DEVELOPMENT

The role of education in economic development is unquestionable. However, to suggest that Nigeria can learn easily from developed countries that have invested heavily in education and been economically successful would be immature. The reality is that Nigeria's education expenditure as a share of gross national product (GNP) is only 0.7% (1999-2000) [6].

The urban/rural distribution of the Nigeria population is 48% / 52% (2006 estimate) with a projected population growth rate of 2.38% (2008 estimate) [7]. 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.

2.1 RURAL COMMUNITIES WITHOUT ESSENTIALS

In Nigeria, most users access the Internet through Internet Cafes and since the majority of Nigeria's population (52%) live in rural areas, the lack of Internet access would have huge implications for the economic development of the nation. Thus the challenge is how to use ICTs to improve delivery of services and the well-being of rural people [8]. It must be pointed out that most rural communities, especially villages along major highways, can receive a mobile phone signal. Needless to say, the other challenge is how communication infrastructure can be exploited in communities without electricity.

2.2 DISORGANIZED ICT INITIATIVES FROM LOCAL GOALS

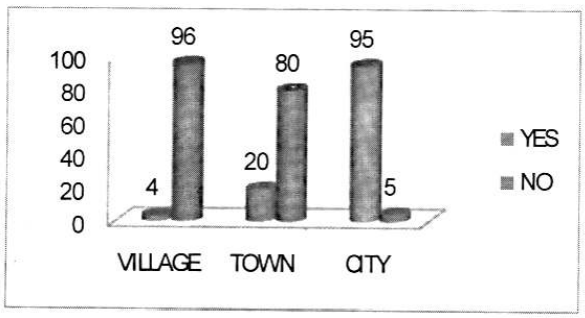
Development needs are goals a community sets for itself to achieve and these may involve "enhancing equity, quality and sharing instructional technology resources" [9]**.** It is important to differentiate development goals from development activities aimed at achieving these goals. ICTs can change how development activities are performed, and also accelerate the realisation of development goals. In a study conducted in Nigeria, Elijah and Ogunlade [10] report, "although little empirical evidence of the benefits of ICTs in Nigeria are found in literature, there are great potentials of ICTs as tools for enhancing people's daily lives whether by increasing access to information relevant to their economic livelihood, better access to other information sources; healthcare, transport, distance learning or in the strengthening of kinship". However, the alignment of development activities with development goals, and both integration and use of ICTs for development requires human skills. Research produces knowledge to conceive and develop structures in which development happens; teaching prepares experienced manpower that can link and realize development goals through proper activities.

3.0 ICT AWARENESS IN ENUGU STATE

Enugu State consists 0f 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. The communication infrastructure anticipated should cover all the LGAs thereby covering at least 75% of rural areas.

Current trends in ICT awareness in schools surveyed over a demographic population between 13 years and 19 years shows that the rural sector has little or no exposure to ICT. The survey conducted was between schools in the city, towns and villages. The statistical data collected is illustrated in the following graphical figures 1.2 to 1.5.

Figure 1.2 Percentage of students that have



a computer lab in their schools

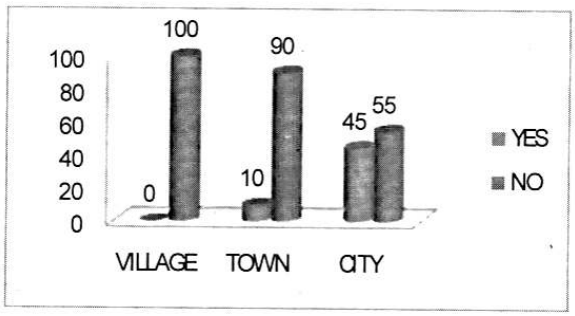


Figure 1.3 Percentage of students that said that their computer labs have internet access

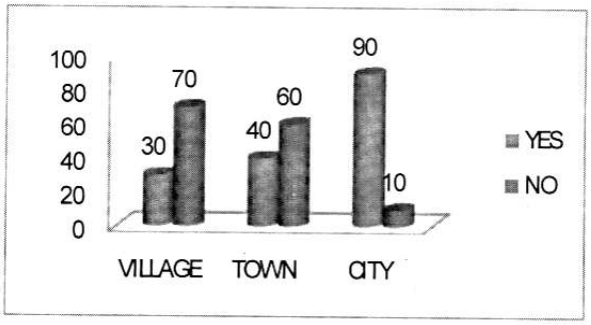


Figure 1.4 Percentage of students that think a course in ICT is relevant

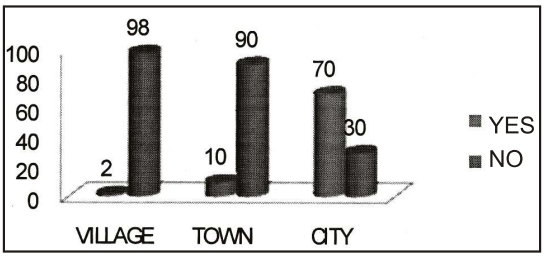


Figure 1.5 Percentage of students that think that the Internet can educate people

From the data in figures 1.2 to 1.5 it is clearly visible that it is of vital importance 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.

4.0 CHOICES FOR COMMUNICATION INFRASTRUCTURE

A variety of choices should be considered in selecting and building communication infrastructure in rural areas.

4.1 ***Telephone lines:*** Most of the efforts made by Nitel and Petroleum Trust Fund (PTF) in attempting to provide rural telecommunication service are concentrated on providing basic telephone service. There is no provision for other services such as data and internet, because services such as these require substantial transmission capacity which is lacking in most rural areas of Nigeria [11]. Universal connectivity in the sense of providing at least one telephone per village has not been achieved, primarily because the cost of extending a fixed line from the backbone to the village is very high and is not economically viable for the

telephone companies. However, mobile phones have indeed gone to the villages although overall rural connectivity is still rather low.

4.2 ***2.4GHz IP radios (WiFi):*** In an effort to bridge the digital divide between the urban and rural Nigeria, the country has to turn to the use of wireless technology for rural connectivity. Attempts must be made to extend the IEEE 802.11b Wireless Local Area Network (WLAN) to provide a mesh of such networks as a backbone, the so called back-haul, for rural connectivity. However Enugu state is made up of a vast, rugged, diverse terrain (hilly topography), which makes it impossible to set up hot spots for WiFi as line of sight for longer communications from a base station.

4.3 ***Mobile LAN:*** The Mobile LAN would be a locally made bus that has been converted into a mobile training centre. For illustration, a 57-seater MBO 800 Mercedes Benz bus could be stripped of its interior except the driver and the front passenger seat. The realised space could then be used to set up the LAN which is made up of 10 high-tech workstations all networked and connected to the Internet to facilitate access to several IT resources. The systems would be seated on wooden furniture which would be designed in such a way that the systems do not get damaged even on rough terrain by padding the edges that have contact with the systems.

A VSAT would be mounted on the roof of the bus for internet access via a satellite modem. The modem interfaces the LAN and controls the satellite transmission for the VSAT. A 1.2m dish is ideal for use in the actual implementation.

4.4 ***Frame Relay telecommunication circuits:*** Frame Relay is a high performance WAN encapsulation method that has become one of the most popular technologies in use. Frame Relay puts data in a variable size unit called a frame and leaves any necessary error correction up to the end-points. This provides for a high speed, low overhead, efficient network [12]. Frame Relay is a layer 2 (Data Link layer) connection-oriented protocol that creates virtual circuits, usually Permanent Virtual Circuits (PVCs) between the Frame Relay routers through a Frame Relay switch.

In the context of computer networking, frame relay consists of an efficient data transmission technique used to send digital information quickly and cheaply in a relay of frames to one or many destinations from one or many end-points. Network providers commonly implement frame relay for voice and data as an encapsulation technique, used between local area networks (LANs) over a wide area network (WAN). Each end-user gets a private line (or leased line) to a frame-relay node. The frame-relay network handles the transmission over a frequently-changing path transparent to all end-users. However many rural areas remain lacking in Digital Subscriber Lines (DSL) and cable modem services. In such cases the least expensive type of "always-on" connection remains a 128-kilobit frame-relay line. Thus a retail chain, for instance, may use frame relay for connecting rural stores into their corporate WAN [13].

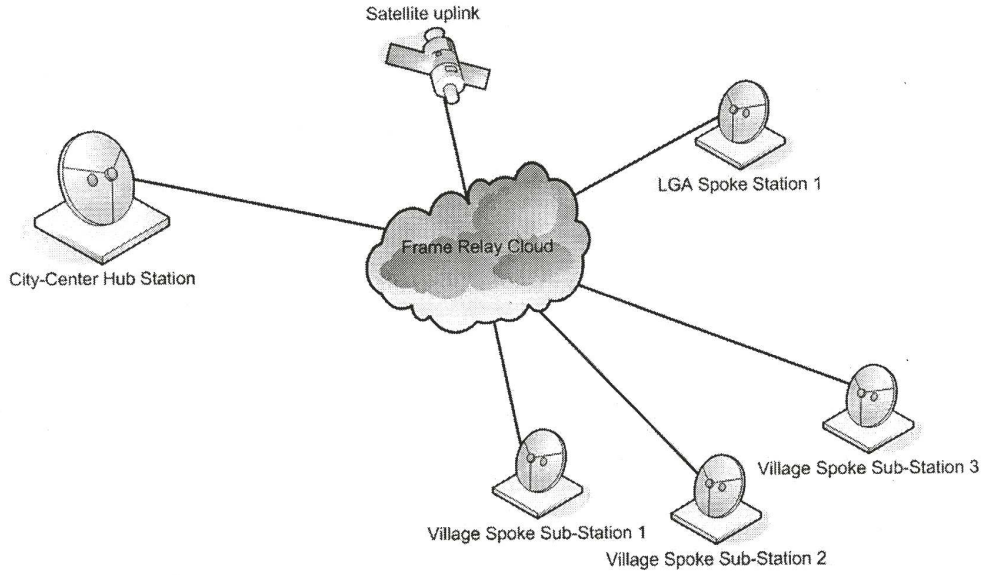


Figure 1.6 Frame relay network topology cloud

Frame relay network topology follows a hierarchical network design as shown in figure 1.6. The spoke and sub-spoke stations connect directly to the hub station while the hub station connects directly to the satellite uplink. The City-Center Hub and spoke stations of the frame-relay network connected to the satellite uplink are similar to server/client model in a LAN.

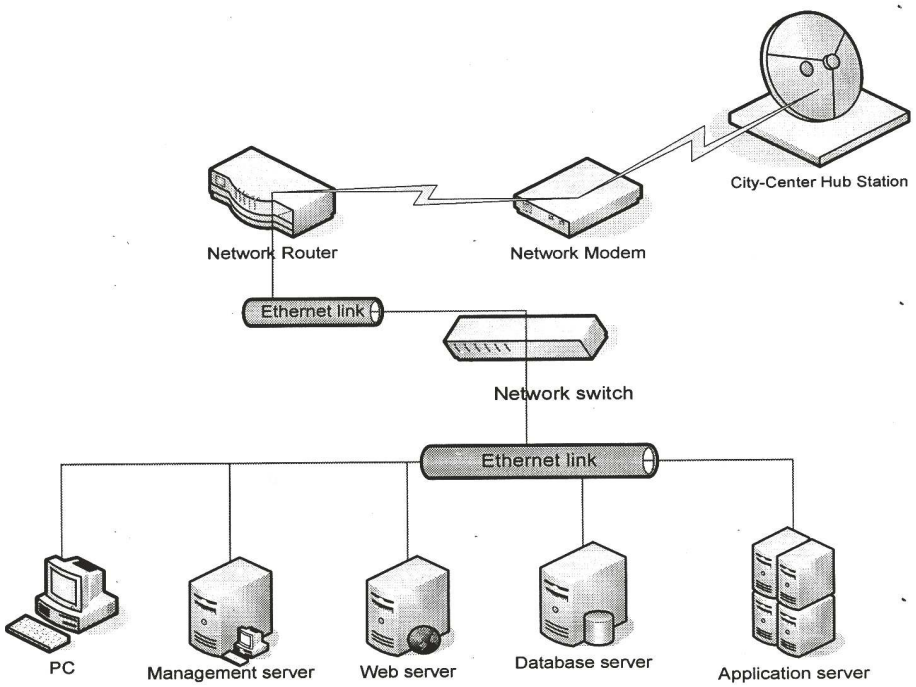


Figure 1.7 Frame relay network with servers illustrated

The spoke stations access the internet through the hub station at the main site. These spoke stations and sub-stations of the frame-relay network are connected to the satellite uplink. Village sub-stations could then access the internet and LAN through the LGA spoke stations. The city-center hub could be located in the Ministry of Education and would comprise of a VSAT, network modem and router, a switch and an Ethernet link. The various servers connected would hold management software, teaching applications, data etc. as illustrated in figure 1.7 for clarity.

5.0 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 is Internet-enabled learning. Components can include content delivery in multiple formats, management of the learning experience, and a networked community of learners, content developers and experts. E-Learning provides faster learning at reduced costs, increased access to learning, and clear accountability for all participants in the learning process. E-Learning 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.

6.0 COST

In the effective and successful implementation of any project, cost is an important determining factor. The aim or specified function of the project must be achieved at a highly cost-effective rate. The issue of minimizing cost doesn't warrant acquisition of substandard equipment; it should just be kept within range to enable the purchase of equipment just reliable enough to perform its function normally. Based on research, there are several cheap computing systems and ways of procuring them.

The WYSENET program developed systems that can't run individually but run from a single server. They are like workstations without a mind of their own, they just display the servers programs and anything input into them is processed on the server and displayed again on the systems. The 100 dollar PC developed and designed in the United States of America is also a highly innovative computer that was initiated by the OLPC (One Laptop Per Child) program. These laptops are relatively cheap because they perform minimal complex functions and therefore have very small memory and average speed processors.

7.0 CONCLUSION

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. Having briefly discussed a few technologies it could

be noted that the Frame Relay would provide a stable, more scalable, highly flexible and cost effective solution for rural communication. Frame Relay has become one of the most extensively-used WAN protocols. Its cheapness (compared to leased lines) provided one reason for its popularity. The extreme simplicity of configuring user equipment in a Frame Relay network offers another reason for Frame Relay's popularity.

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 prioritisation 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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