

THE INTERNET - A SUPERHIGHWAY FOR THE THIRD MILLENNIUM

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1. INTRODUCTION

Many banks and other types of businesses in Nigeria have collapsed in the recent past due to the inability of our people to cope with the harsh business and economic climate prevalent in our times. It is not that the people manning such enterprises are not educated enough, rather, their knowledge is mismatched to current industrial and business realities due to a yawning technological gap, which is screaming for attention. The operators of many an ailing business in Nigeria today, and the vast majority of our people have not come to grips with the way Business, Administration, Management, Education and Government must be approached in this information driven age.

The on-going fusion between computer technology and telecommunications means that almost everything is coming and the world around us is becoming a "global village". People can easily get in touch, see, speak to one another, and exchange all kinds of information through the electronic media from any point on the globe to another, but Nigeria seem to be out of it all, sinking deeper into "papernet" in their information systems, while the world is driven by an automated network of networks towards a 'superless' third millennium. This technological gap must be overcome through a well-articulated programme of continuous Professional Development, Awareness Programmes and International Co-operation, in order to fine-tune our knowledge and methods to present day realities. This International Conference has therefore come at the right time to provide an excellent forum for all to put heads together to project the INTERNET as a bastion of support for the Information Revolution of the third millennium.

1.1 ORIGIN OF THE INTERNET

In 1957, the Soviet Union beat the US into space by launching the satellite Sputnik. It is generally believed that as part of her response, the US government set up the Advanced Research Project Agency (ARPA). It was in the Cold War days that the ARPANet was actually built for the US Department of Defense in 1969. The Cold War generated interest in a highly adaptive network in which data would still travel to its destination through alternative routes even if parts of the network were to be bombed by the enemy. The ARPANet was a packet-switching network, in which the information to be transmitted is first broken up into packets of data, each with the destination address. Computers on the network nodes then route each packet until it gets to the specified destination where all the packets comprising the message are assembled together. With this arrangement, multiple users can communicate across the interface simultaneously. Because

packets can take alternative routes through the network, intercommunication could be maintained even if parts of the network are not functioning or damaged by a bomb in time of war. The procedure for determining the addressing and the proper routing of Data Packets across the network is called the Internet Protocol (IP). Between 1970 and early 1980s, this Internet protocol was implemented on many different kinds of computers. ARPAnet grew as a result and by 1983 the number of interconnected host computers had grown to 562. There were only 4 interconnected universities in 1969 when ARPAnet was first started. A Transmission Control Protocol (TCP) was developed by ARPA in 1983 to replace her original network control protocol. TCP working together with IP made possible the interconnection of many networks to ARPAnet through devices called gateways. This internetworking of ARPAnet-centred network of networks is what gave rise to the term 'Internet'.

About 1986, the US National Science Foundation used the ARPA TCP/IP protocols to realize a computer network (NSFnet) which interconnected a much larger science research community and eventually was used to replace the ARPAnet as the framework for the Internet. ARPAnet was officially decommissioned in 1990. NSFnet backbone provided transmission rates of 45 million bits per second (Mbps) until 1995 when it was shut down.¹ Commercial network providers now carry Internet traffic rates of up to 622 Mbps and further speed improvements are still being expected.

2. USES OF THE INTERNET

It is not possible to present an exhaustive listing of all the possible uses of the Internet. However, this short-list of typical uses would be supplemented in later sections that deal with specialized applications.

1. E-Mail:

This is an Internet-based electronic substitute for the conventional post office. Any Internet user can send and receive letters to/from other users located anywhere in the world at electronic speeds. A single letter can be sent to a multitude of users simultaneously and at the same cost as that of sending the same letter to just one person.

2. Facsimile:

Internet users having a facsimile (or fax) machine can receive or send fax via the Internet. It is possible for a fax message to be converted to e-mail if the recipient has not a fax machine or prefers e-mail. It is also possible for non-Internet users that have fax machines to receive fax messages via the Internet provided the sender requested for this service.

3. Electronic Bulletin Boards:

The Internet public has several publicly accessible electronic bulletin boards, which are just like notice boards but now in electronic form.

Through such media, Internet users obtain up-to-date information, publicize events, and exchange ideas on several different topics and so on. Some bulletin boards are write protected. In this case, anyone can read messages from the bulletin board but only those with a password can post messages on it. There are also Read Protected Bulletin Boards for which one needs a password before one could access the information on it. This is ideal for use in co-operative research or Closed User Groups (CLUGs) such as members of an International Club or Society. A bulletin board can also be restricted to named users to function as a closed discussion arena. The bulletin boards, which are not protected at all, comprise exciting public arenas for discussions, and readers may comment on previous messages.

4. Databases:

Databases in which specialized information of commercial value is stored in an organized way can be exchanged via the Internet.

5. File Transfer:

Any kind of computer file can be sent via the Internet from one Internet user to another. Tables of Accounts on Spreadsheets, designs by graphic artists, music sound files etc, can all be exchanged in this way.

3. **Requirements for Joining the Super Highway**

To join the Internet requires a telephone line, a modem to link up the users' computers to the telephone line and a computer system. A recommended minimum specification for the computer system include:

Intel Pentium MMX CPU or equivalent, over 3 Gigabyte of Hard Disk Storage, at least 64 Megabyte RAM, socket 7 compatible, at least 64 Kilobyte Cache Memory, and a CPU speed of at least 266 MMX. One would then choose an Internet Service Provider (ISP) which is an organisation that provides full Internet access to those interested in addition to rendering other Internet related services. Often an expert advice is required in order to select the best modem computer system or ISP for one's needs.

1. **INFORMATION TECHNOLOGY AND THE LEARNING PROCESS**

The Internet has a historical connection with learning. The ARPAnet, which later transformed into the Internet, was an interconnection of 4 US University network modes. So, it was all about learning and research, the ARPAnet itself being the Advanced Research Project outfit.

2.1 **Multimedia-based Learning:**

'Multimedia' is a term used to imply that text, graphics, video and sound are all involved in the learning process. Learning is all about communication between the teacher and the taught. Now, the Internet provides a super highway with vast resources and multi media features to enhance this communication and therefore to facilitate learning.

In many countries of the world, while technology was advancing in quantum leaps, educational standards were galloping downwards in the opposite direction to technology. Recently however, the awareness that Information Technology (IT) can enhance learning, suggests a way to stem the tide of falling educational standards. If properly harnessed, IT, of which the Internet is a good representative, could make it possible for the millennium generation to know as much at 12 as they now know at age 21. The trend in those developed countries that are IT conscious shows that IT is a boost to learning at all levels.

People are becoming gradually aware that no country in the world has an education system fit for the millennium generation and Nigeria seems to be the worst hit in this respect as she is lagging far behind in the application of IT, and is therefore not contributing enough towards the evolution of the appropriate learning process for the future. It has been said² that the world has to re-invent education for the new climate of a global world. It has become pertinent to rethink what learning is all about and the skills people will need to be able to survive and thrive. Gone are the days when one is able to learn a trade that can see one through life, finish training early in life and then settle down and work till retirement. Today, people in work are finding themselves needing to be trained more and more often and actually having to go back into education to sustain employability². Otherwise, their knowledge would rapidly become mis-matched with current industrial, business and societal realities.

Internet gives one potential access to an unimaginably large library right from one's home or office. In addition, to this is the opportunity of access to people interested in any given subject including experts, enthusiasts and people with an opinion. A computerized library has many important advantages over the conventional library. It is easily accessible, richer in than any physical library and cheaper. Information in a computerized reference book is not fixed in the other in which it is physically presented in the book form. It can very readily be sorted and reshuffled into whichever order suits a line of enquiry best. When one requests for information about a topic, the search program finds all the related pages. So, the way one can access information is highly flexible.

Pupils are more enthusiastic learners as a result of using the Internet as a learning tool. Using the Internet forces them to think critically, to try to detect bias and exaggeration and opens up a tremendous range of learning resources at very little cost, if properly planned and managed. Each web screen (called a page) can contain not only words and pictures like a page in a book, but also animations and all kinds of sounds and music. All these facilitate communication and transfer of ideas and enables children to learn and grasp much more easily, subjects which are considered difficult when conventional techniques are used. There is therefore need to integrate IT across the board: including pre-primary, secondary and post secondary levels (Polytechnics, Colleges of Education and Universities). Using computers to learn in this way motivates some pupils for whom

most other teaching methods seem to have failed. There is a connection between rising crime wave and the rate of dropout from the school system. So, using Internet and Multimedia-based learning can greatly reduce the school dropout rate and indirectly help to check crime. It is also believed that is a connection the lack of real interest in the discipline students are studying and campus cultism. Many students who are unable to find admission into courses of real interest to them perhaps due to poor GCE or SSCE result) settle for whatever comes their way. It would therefore appear that many frustrated and disappointed fellows are looking for excitement elsewhere outside their curricula.

Many of these then fall into the trap of joining other bad ones to experiment with Satanism at an early stage. Even if this is not the main cause of campus or teenage cultism, learning on the Internet using Multimedia can turn kids away from cultism because of the excitement multimedia learning offers them.

2.2 New Roles for Teachers

No one is suggesting by any means that teachers would not be required if multimedia learning is introduced. That would be a bad mistake. Teachers need to apply their expertise in choosing the curriculum tasks, organizing each lesson in terms of multimedia based and non- multimedia-based activities, interacting with students and the class as a whole. There would of course be a pertinent need to re-train teachers in the use of IT for course delivery and in multimedia-based courseware development in their various specialist areas, for best results.

3.0 THE INTERNET DRAGNET

The good the bad and the ugly are all available on the Internet. Fortunately however, one has a choice very often as to what one wants. But sometimes, the Internet sends one the very ugly without warning.

1. Virus Infection:

Unscrupulous and criminally minded individuals exploit the Internet as an avenue through which they could perpetuate their evil intentions. One notable example is the deliberate distribution of computer virus by such dubious characters. A dangerous computer virus can wreck your database, information system, application packages and perhaps your entire installation. If you are an Internet user and you receive e-mail titled JOIN THE CREW, better not open that mail because the virus it contains can damage both your hardware and software. Also a friend of yours may send you e-mail from an infested system without being aware that his system is infested. The virus would be transmitted into your system when you open the mail. Therefore, effective and powerful antiviral software (or a hardware-based alternative) is a must for every Internet user.

2. Privacy:

Clever fraudsters and unscrupulous persons may intercept or monitor your correspondence without your knowledge. Certain confidential e-mail or credit card information may get into their hands in this way. One can minimize this risk by using data scrambling before transmission to hide its intelligence after transmission. Another effective means of keeping out hackers and insiders from your confidential information is via the use of Data Encryption and Decryption methods, which serve a similar purpose as data scrambling and unscrambling but reputed to be very effective.

3. **Morality:**

Sexual perverts are already in the habit of using the Internet to hunt for victims and many among the fallen were gotten that way. Also, much pornographic material are readily available on the Internet, and as "evil communication corrupts good manners", children should be guarded and properly guided in their use of the Internet so that they do not spend their time consuming filthy material. For much of the pornographic material however, one does have a choice to first demand each one before it is downloaded to one. So, the morally upright would therefore, naturally not demand such information.

4. **One-World Dictator:**

The Internet is a very powerful tool of brainwashing, monitoring and organizing effective attacks against individuals or groups. The One-World Dictator, the antichrist who is expected to highjack the world very soon and rule it for 42 months according to Christian Bible, will definitely find the Internet a very important asset. When this happens, he would disregard all rights to privacy of Internet users, and the whole world then would be in a tangled web from which no one can hide.

4.0 INTERNET IN NIGERIA

According to a recent survey in Enugu, a major city with two university campuses (ESUT and UNEC), two polytechnics (IMT and OSISATECH) and a lot of other establishments both government owned and privately owned, only about 20% of the literate population has Internet awareness. What the situation would be in less privileged cities, towns and villages is better imagined. Table 1 shows how far behind Nigeria as a whole is compared to other African countries in terms of Internet usage.

COUNTRY	POPULATION (MILLIONS)	NO OF INTERNET USERS	RATIO
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NIGERIA	100 Million	2000	1:50,000
GHANA	8 Million	20,000	1:400
SOUTH AFRICA	40 Million	600,000	1:70

TABLE 1: INTERNET AWARENESS IN SELECTED AFRICAN COUNTRIES

Not only is Nigeria's Internet situation pathetic, she has the additional problem that only very few of those who know can afford to get connected. Some of the reasons for this as revealed in a recent survey outlined in the next few sections.

1. **Poor Communication Systems Integrity:**

The reliability and speed of operation of Nigeria's telephone lines leaves much to be desired with respect to Internet usage. If and when one gets a connection, browsing the web is often unbearably slow and boring. On many occasions, Internet users fail to log on to Internet because of poor telephone line quality, and after much futile effort, one often becomes frustrated and discouraged.

2. **Internet ISPs:**

There are not enough competent Internet Service Providers (ISPs). Some of the ISPs are probably oversubscribed and therefore unable to provide quality services. A local ISP used to provide dial-up Internet access on a 19.2k link to UNNET backbone in the UK say, can have up to 800 subscribers. Some ISPs who are primary operators sublet some of their bandwidth to secondary operators resulting in a further deterioration in the quality of service to their Internet subscribers who then have to manage the remaining bandwidth. An ISP with about 50 incoming PSTN lines and an average of simultaneous users on a 19.2k link can only provide a bandwidth of 19,200/25 bits per second (bps) per user. This is equivalent to a data transfer rate at user site of only 96 bytes per second. With such a low speed, it would take over 5 minutes to download a simple 30 kbyte JPEG image that forms part of many web pages. One would then have to sit for several painful hours to download any sizeable volume of Internet data. This is a very bad situation.

3. **The Giant With a Snail Speed:**

According to International Telecommunication, Nigeria occupies one of the most unenviable positions in Internet Service Provision in Africa. In the African Telecommunications published in May 1998, Nigeria is not only the least developed in terms of Internet usage, but she is also at the bottom line in terms of

Internet hosts. Table 2 summarizes the number of hosts in selected African countries.

COUNTRY	NUMBER OF HOSTS
SOUTH AFRICA	122,025
MOROCCO	2,405
EGYPT	1,805
NAMIBIA	640
ZIMBABWE	599
BOTSWANA	550
KENYA	458
SWAZILAND	330
COTE D'VOIRE	253
GHANA	252
NIGERIA	0

TABLE 2: INTERNET HOSTS IN SELECTED AFRICAN COUNTRIES

4. **The Nigerian Government and the ISPs:**

Past administrators in Nigeria did not do enough to help Nigeria out of the doldrums in terms of Internet development. The Internet Service Providers (ISPs) in the not too distant past submitted a proposal to the Federal Government of Nigeria pointing out some of the obstacles and suggested how they could be tackled. The following suggestions were included in their submission:

- a drastic reduction to the barest minimum, in the cost of international link from NITEL to make cost comparable to what obtains in other countries.
- the removal of strict restriction put on the use of VSAT to permit individual ISPs to install and use it to increase their bandwidth and boost Internet Service delivery. Very Small Aperture Terminals (VSAT) offers a reasonably high bandwidth at a reduced cost.
- the curtailment of 'excesses' of NITEL in the area of service charges said to be exorbitant.

- the complete deregulation of the telecommunications sector, appointment of a second national carrier as promised and the immediate privatization of NITEL as a way of boosting the exposition of the telecommunications infrastructure.

It is very much hoped that these useful suggestions have either received or are receiving the urgent attention they need from the Government.

5.0 THE NEED FOR A NATIONAL BLUE PRINT ON INTERNET

It has been said earlier that while technology is advancing in leaps and bounds, the giant Nigeria is on a snail speed and of course left far behind. It has come to a point where the entire globe including fellow African nations, are definitely Information Technology inclined, but Nigeria seem poised to be a one-man island. This would never do and posterity would blame us if we do not do something about it.

Our systems take too long to react to swift changes on their own. Government intervention, in terms of a clearly defined High Technology objective for the nation and the infrastructural, moral and perhaps legislative support for its actualization, is an absolute necessity. The National Blue Print should evolve an effective way to use the Internet in Nigeria so that our people do not suddenly become second rate members of the globe. The following should be defined in the envisaged National Blue Print. Ways to:

- a. Harness New Technologies so as to raise educational standards,
- b. Create far-reaching opportunities for learning that would reach not only city dwellers but also, isolated local government areas and the disadvantaged.
- c. Provide high quality and varied multimedia courseware that would cater for the varied needs of a large and varied population.
- d. Use brain storming of ideas similar to the Delphi method of forecasting the future³ to determine the best approaches to Multi-media learning and IT application in Nigeria.
- e. The Blue Print should envision a consistent future IT direction for our people that should ensure that Nigeria would never again be a technical underdog even amidst African nations.

Broadly speaking, the Blue Print should

- Set targets and have deadlines for achieving stated milestones
- Stimulate learning for all categories of Nigerians, students, public/civil servants, the private sector and private individuals.
- Stimulate Industrial Growth, the use of Public Enlightenment and Continuous Awareness Campaigns in the mass media to highlight the business and manpower development potentials of computers and communications.
- Make it possible for all who would like to be introduced to Information Technology usage to find opportunity at an affordable and hopefully Government subsidized rates.

- Provide Linkage with new initiatives and provide for a thorough professional evaluation of emerging technologies and free public advice on how best to harness.
- Have an efficiently networked Industrial Information System to link up Research Establishments and Industry and to enhance collaborative research and co-operation among the various strata of our society.

REFERENCES

1. Stephen Pastan. 'Evolution of the Net' Emory University, School of Medicine, Atlanta Georgia GA 30308 USA (1997)
2. 'Computers Don't Bite'; BBC White City, 201 Wood Lane, London (1998)
3. Micheal J. Baker and Ronald McTavish. 'Product Policy and Management' pp 48 - 49, The Macmillan Press Ltd. (1976)