

# A Survey on the Use of Computers and Internet in Conducting Research and Training in a Developing Country.

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## ABSTRACT

This paper presents the Nigerian situation on the use of the Internet and computer-based educational/research processes at the university level. It is always interesting to know the problems teachers and researchers are confronted with in education, training, and research, while making clear distinctions between them. A survey was conducted to find out how computer literature students and faculty/staff of engineering departments in tertiary institutions were utilizing these resources. The survey results may help people who are interested in comparing the use of computers and the Internet in conducting research and training between institutions in developed and developing countries. Questionnaires and interview techniques were used to collect data for this study using stratified random sampling. Statistic analyses were employed in the examination of data. Specific discussions on engineering curriculum are also presented. Some specific Internet and/or computer-based applications dedicated especially to engineering curricula are presented. Due to the existing gap between technological assets and their actual use and inaccessibility, the authors present some recommendations to reduce the time necessary to deal with actual situations. Recommendations for improving the use of computers and the Internet in conducting engineering research and training are also presented. The paper considers the benefits that the studied country will gain, supposing that all the proposed recommendations are achieved. Achievements in terms of human skills, knowledge, and integration in the Nigerian economic life are considered also.

(Keywords: engineering curriculum, computers, internet, university teaching, education)

## INTRODUCTION

For decades, there have been major changes in technology, which are having impacts upon performance and service delivery in educational/research processes at the university level (Huang and Alessi, 1996; Kemp and Jones, 2007). Of these changes, one of the most significant that is occurring in information technology brought about by advances in computers and networking (Huang and Alessi, 1996; Falaki, 2002; Ajibola, 2000).

Communication is now faster, more accessible, and across more media than ever before (Huang and Alessi, 1996). The potential of these advances, however, brings unanticipated difficulties as the speed and dispersion of information increases. University teachers are now faced with an overwhelming set of new information demands and information sources including computerized student records, databases of research, and other examples.

The Internet is one particular example of such an information challenge (Huang and Alessi, 1996; Kemp and Jones, 2007; Chukwudebe, 2002). This network of computers serves as a tool for instant communication of complex information between millions of people all over the world, and it also has some serious impacts (Conradson and Hernandez-Ramos, 2004). These impacts include the frequent discussion of engineering data and theories in the popular press (Huang and Alessi, 1996). In engineering, stakeholders are faced with calls from researchers who want engineering data, educators who want engineering experience, and government regulators who want documentation of engineering expertise. Thus, there is need to utilize information management tools like the

Internet to answer this demand (Huang and Aleesi, 1996).

It is known that in research, the Internet is capable of dramatically shortening steps between the creation of a manuscript and its subsequent publication. The Internet can also bring breakthroughs in engineering advances to the attention of the researchers sooner than before. In spite of these advantages and numerous other benefits of computer and Internet usage in research and training in engineering disciplines, actual study on computer and Internet use among students and faculty/staff of engineering in tertiary institutions in Nigeria has not been extensively reported in the literature. This paper is motivated to bridge this important gap.

In this paper, a survey was conducted to find out how computer literate students and faculty/staff of engineering departments in tertiary institutions are making use of these tools. This information may be of primary interest to people who wish to compare the use of computers and the Internet in conducting research and training between developed and developing countries. The remainder of this paper consists of three sections. Some important aspects of computers and the Internet are discussed in section two. Section three discusses the pedagogical aspects of the educational process. Section four deals with the survey results on the use of computers and the Internet in conducting engineering research and training. The paper is concluded with recommendations for improving the use of computers and internet in conducting engineering research and training.

## **SOME IMPORTANT ASPECTS OF COMPUTERS AND INTERNET**

### **Computer Educational Training**

In developed countries, computers are used as an educational tool in the classroom and made available to students at remote terminals for solving individual assignment problems, conducting tutorials/drill programs, laboratory simulations, and in carrying out examinations (Akinyokun, 1999; Gonah, 2001). Our research revealed that although computers are extensively used by computer science and engineering students, very few opportunities are given to individual engineering students in learning and

utilizing high-level computer skills as they relate to engineering training.

### **E-mail**

Learning and the general contribution to knowledge in engineering is greatly enhanced by e-mail exchanges in the submission of assignments by students to their teachers/supervisor, or in the submission and review of technical papers for academics. Thus, e-mail provides a cheap, fast, and efficient means of sending electronic messages around the world.

Facilities are available for the attachment of files to e-mails in form of texts, audio, or video clips. Information resources such as WAIS, Gopher, Veronica, Archie, and the World-Wide Web are ways of storing and accessing data on the internet. There are several search engines that could be useful to engineering students, faculty, and staff, which include AltaVista<sup>®</sup>, Inforseek<sup>®</sup>, Lycos<sup>®</sup>, and Hotbot<sup>®</sup>.

## **PEDAGOGICAL ASPECTS OF THE EDUCATIONAL PROCESS**

### **Pedagogical Aspects**

In the training of engineering students, development of lesson plans, which should contain the subject, topic, class, date, duration, aims, contents, and previous knowledge expected, audiovisual materials, instructional procedure, evaluation and assignment, is given significant attention, particularly for new courses for which material could be obtained on the internet (Anyikwa, 2007).

### **The Study Sites**

This study was conducted at tertiary institutions in order to determine how computer literate students and faculty/staff of engineering departments in Nigerian universities were utilizing these tools.

Nigerian universities started with the University of Ibadan in 1948, and other universities at Ife (Obafemi Awolowo University), Benin (University of Benin), Lagos (University of Lagos, Zaria (Ahmadu Bello University) sprang up to be referred to as the first generation universities. Other universities (2<sup>nd</sup> generation and above) were later instituted to contribute to teaching,

research, and community service activities in Nigeria.

In carrying out this survey, questionnaires were administered and followed up by personal interviews in order to obtain the necessary facts that would assist in making a sound judgments based on the data collected. The classified questionnaire contains details relevant to the use of computers and the Internet in education, research, and training. The distribution of the questionnaire was to both students and faculty/staff of engineering schools in order to capture their opinions. Responses were rated on a Likert-type rating scale with the highest point value being 5 and the lowest value being 0. The obtained data was analyzed using percentages and mean rating scores.

## STUDY RESULTS

### Categories of Respondents

There are seven main information segments captured in this survey. The first relates to the category of people captured in the sample (Table 1). This category is categorized by age, ranging from 18-61 years, and academic or non-academic staff. A total of 60% of the sampled respondents are students in their undergraduate years and some postgraduate students who are pursuing a 1-2-year professional or M.S. degree program. Most of the Ph.D. students are in the 31-50 year old category.

A large proportion of undergraduates in the survey browsed the Internet. There is a possibility that a sizeable proportion of these students browse the internet on personal issues unrelated to academic activities such as chatting with friends. However, many students also visited the centers to seek information on their careers or to support academic assignments.

### Information technology amongst staff and students of faculties/schools of Engineering of tertiary institutions

The second category of questions relates to finding out if the respondent was computer literature or not. The question probes if the respondent has gone for computer training or not and the source of training (Table 2).

It was observed that the highest category relates to those who have gone to one computer training program or the other (88%). A low percentage (8%) are computer-illiterates who seek to be educated and trained on computers and internet technology.

**Table 1:** Demographic Characteristics of Respondents.

Age	Response (%)
61 and above	0
51 – 59	6
41 - 50	12
31 – 40	22
18 – 30	60
Category of respondents	Response (%)
Academic Staff	24
Senior Administrative Staff	18
Students	40
Junior Staff	18

**Table 2:** Information Technology Amongst Staff and Students of Schools of Engineering (Tertiary Institutions).

Information technology	Response (%)
Computer literate	94
Non computer literate	8
Computer literate who went through a computer literacy course	88
Did not undergo any course	12
Trained in the library through courses organized by the computer, internet committee	56
Had their training elsewhere	44

### Use of computer laboratory and Internet services

On the question of whether respondents have used either a computer laboratory or the Internet, 96% responded in the affirmative; the remaining 4% respond negatively. A total of 46% used the laboratory only and 38% used only the Internet (Table 3). Together, 16% had used both services/facilities. This indicates that the laboratory was more widely used than the Internet. This is due to the fact that a person intending to use the Internet unassisted had to be computer literate.

**Table 3:** Use of a Computer Lab and Internet Facilities.

Computer and Internet Facilities	Response (%)
Have used either computer lab on the internet	96
Have never used it	4
Internet only	38
Computer lab only	46
Both	16

### Frequency of Utilization

This study surveyed the frequency of utilization of computer laboratory and Internet facilities by respondents per week. From Table 4, those who used them 1-2 week times were 44%. Those who used them 3-4 times were 36%. Those who used them 5-6 times and more than 7 times per week were 16% and 4%, respectively.

**Table 4:** Frequency of Utilization per Week.

Times of Use of the Facility per week	Response (%)
1 - 2	44
3 - 4	36
5 - 6	16
More than 7	4

### Prices Charged on Internet Facilities

The computer laboratory is used free of charge. The respondents were asked about their attitude to the fees presently collected for internet services. A total of 28% of the respondents signified that it was rather high, 40% said it was adequate, 4% said it was low, and 28% did not respond.

**Table 5:** Suitability of Price Charged.

Suitability of Prices Charged	Response (%)
High	28
Adequate	40
Low	4
No comment	28

### Activity mostly performed on the Internet

As shown in Table 6, 100% of respondents performed e-mail activity on the Internet. A total of 6% of the respondents also reported using the Internet for shopping on line; while 10% used it for general browsing to acquire general information; and 15% used it for literature searching.

**Table 6:** Activity Performed on Internet.

Activity performed on Internet	Response (%)
E-mail	100
Shopping online	6
General browsing to acquire general information	10
Literature search	15

### Problems that Cause Under-Utilization of Computer and Internet Facilities in Engineering Research and Training

The following nine problems were isolated for study:

1. Lack of knowledge on the use of computers and the Internet
2. High cost of Internet connectivity and software
3. Computer vendor monopoly in procurement, installation, and maintenance culture
4. Inaccessibility of the engineering personnel to computers and the Internet
5. Inadequate security for computer and internet facilities
6. Irregular power supply
7. Poor computer and internet facilities
8. Poor and inadequate telecoms facilities
9. Minimum involvement of academic institutions in network building

The analysis of these rating show that inaccessibility of the engineering personnel to computers and the Internet has the highest mean rating while inadequate security for computer and internet facilities rated the lowest (see Table 7).

All nine problems are rated as having some negative effect on the utilization of computer and Internet facilities in organizations. The problems whose mean ratings fell within the high-medium severity bracket were inaccessibility of the

**Table 7:** Distribution of Rating of Problems causing Under-Utilization of computing facilities and Internet in Nigerian organisations

S/N	Problems	Mean Rating Score	Relative Ranking
1	Lack of knowledge on the use of computers and the internet	4.21	3 <sup>rd</sup>
2	High cost of the internet connectivity and software	4.05	4 <sup>th</sup>
3	Inadequate security for computer and internet facilities		5 <sup>th</sup>
4	Inaccessibility of the students and staff to computer and internet	4.63	1 <sup>st</sup>
5	Irregular power supply	4.35	2 <sup>nd</sup>
6	Computer vendor monopoly in procurement, installation, and maintenance culture.	3.52	7 <sup>th</sup>
7	Poor computer and internet facilities	3.70	6 <sup>th</sup>
8	Poor and inadequate telecom facilities	3.32	8 <sup>th</sup>
9	Minimum involvement of institutions in network building	3.00	9 <sup>th</sup>

students and staff to computers and the Internet; irregular power supply; lack of knowledge on the use of computers and internet; the high cost of Internet connectivity; inadequate security to computers and Internet facilities; computer vendors' monopoly in installation and maintenance culture; software; poor computer and internet facilities.

Knowledge on the use of computers and the Internet are very important for engineering students, researchers, and personnel, as it would enable them to have required expertise and competence to use computer and the Internet for their research and training work. Computer literacy programs through courses, seminars, conferences, and workshops should be mounted for the engineering students and staff of engineering schools with a view to forging computers awareness, appreciation and use.

Computer and Internet facilities are highly expensive to acquire and maintain. The plague of inflation, which is manifested in high exchange rates, has not helped matters. The markets in the country are fast becoming dumping grounds for obsolete computers and Internet facilities. The scenario poses harmful economic implications on the country.

Many computerized engineering institutions have failed to function due to frequent interruptions of their power supply. More often than not people use their private generating sets, as primary source of power while the power supplied by the National Electric Power Authority (NEPA) now

becomes a backup source. Schools cannot even provide enough computer facilities with reliable power supplies to go around the entire student population.

Some computer vendors that were not computer experts/professionals often provide the establishment, operation and maintenance of computer and Internet facilities. These vendors were always on call in case of any failure at the client site. This lead to huge bills, which at times, put the management staff of the clients off on further support of the computer and internet facilities (8).

Enabling software is scarce and highly expensive. This has led to massive copying of software with the attendant problem of computers virus. It has resulted in Nigerian institutions' poor computer orientation and culture. Insufficient security and personnel is yet another important factor hindering the acquisition of computers and Internet skills. Institutions worry that others will invade their computer systems for espionage or sabotage purposes.

The Internet is becoming more secure, but there is a continuous race between the pace of new security measures and code-breaking measures. Moreover, the computer in Internet facilities and their peripherals are capable of being stolen; the reason being that they are handy. Instead of increasing the numbers of existing system units, institutions are faced with the problems of replacing stolen systems.



The staffing in computer laboratories is not extensive enough to guide the students during practical exercises. Today, the telecom and information technology sectors in Nigeria are expanding rapidly. Nigerian libraries should avail themselves of this opportunity. Information technology will assist libraries in coping with current demands and increased demands of the future.

## CONCLUSIONS

Numerous studies have been conducted over the years in which comparative analyses are made between developed and developing countries. This gives information that could be useful for developmental purposes. Unfortunately, the literature is sparse concerning information on computers and Internet usage for students and college faculty/staff within the engineering fields in developing countries. Thus, this important gap is addressed in the current paper through a survey conducted in fifteen higher institutions in Nigeria in order to assess the problems teachers/researchers are confronted with in education, training, and research. From the survey, it is concluded that very little use of computers and the Internet are made relative to the engineering curricula development requirements. Thus, efforts should be focused in bridging this important gap.

Based on the survey results, the following recommendations are made for improvement.

1. Engineering curricula should be reviewed to reflect the impact of Internet technology on the practice of engineering and training. Term papers and assignment should be given that would compel students to visit the internet for reference sources. For faculty/staff, the requirement of publishing papers in international journals should be maintained. However, Internet facilities to aid these goals should be provided for staff and students. Computer technology courses should be well-integrated into the curriculum. This may be achieved through practical sessions which would require submission of reports in soft copies, and the adequate utilization of computer programs in problem analysis. Engineering students should be required to demonstrate competence in Visual Basic, C, Pascal, are other common computer programs, before graduation. In addition, submission of assignments and laboratory reports could be encouraged through e-mail attachments.

In some universities, a course, usually designated as "Special course in the engineering discipline" should be encouraged to treat aspects of virtual class video conferencing and their relationship and impacts to the particular engineering discipline concerned.

2. Although, the use of AutoCAD and other drafting packages are extensively utilized in Architectural programs in Nigeria, and in engineering companies, particularly multinationals, the survey did not track its adequate usage in any Nigerian universities. This may be due to the inadequacy of computer resources. Thus, universities should collaborate with the industry, and obtain necessary assistance to equip their computer laboratories. Thus, emphasis could then be placed on the use of drafting packages in the processing of engineering assignments and home works.

3. Inadequacy and irregularity of electricity power supply is an important problem to tackle. The usual experience is that much idleness is caused by power failures. The result is that as power is restored, the backlog of administrative matters are first treated, leaving very little time for personal research on the computer and internet. Thus, adequacy and regularity of power supply must be ensured by the government and institutional authorities in universities.

4. Since a 100% computer literate faculty/staff is desirable, universities should embark on train-the-trainers program in order to increase computer literacy among engineering teachers. This will indirectly affect teachers' productivity and should impact on the students' performance also since many formula and mathematical approaches could now be given to students as assignments and supervised confidently.

5. In the current digital age, universities should establish digital online libraries and services for the publication of research results. This is important so that more users would have access to such materials, thereby promoting scholarship and contributing to the extension of the frontier of knowledge.

If the recommendations made above are implemented, the following benefits would likely be derived:

1. High quality graduate outputs: If the levels of graduates (Bachelor's, Master's and Ph.D.s) are

fully empowered to utilize the computer and Internet facilities provided by the school authorities, it is likely that an improved quality of graduates would emerge from the various universities.

2. Another benefit that would be derived if all the recommendations above are adopted is that industry would have more confidence in the quality of service delivery by the university. If university lecturers publish their work internationally, there would be greater respect given to them from both the students and their immediate environment (industries).

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