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Information and Communication Technology in Technical Education

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Abstract

Technical education is sine qua non to the economic and industrial growth and development of any nation, Nigeria inclusive. Its primary objective is to provide its recipients functional and employable skills required in the world of work. Today's world of work is experiencing innovations as a result of technological advancement through the emergence of information and communication technologies (ICTs). These changes brought by ICTs have cut across all spheres of life including social interaction, business practices, healthcare, political engagement, media, education and knowledge dissemination. It is in light of the above that this paper examined. To tackle the issue of this innovation, this paper proposes the integration of ICT into technical education programmes in Nigeria. For technical education to take its rightful place in the era of information age, ICT should be enshrined effectively in the technical education curriculum. Constraints hindering the effective integration of ICT in technical education programmes were highlighted. The paper concluded that ICT skills are the key things that will enable technical education graduates face the challenges of the 21st century workplace. It was recommended that government should provide enough funds to equip schools with ICT tools, equipment and facilities for better delivery of instruction.

Keywords: information communication technology, technical education, curriculum

INTRODUCTION

One of the social problems faced by the Nigerian government is the large scale unemployment. Daily experiences reveal that a large percentage of Nigerian graduates are unemployed. This unemployment is to some extent traceable to the type of education students receive in schools. The nature of education which was operated in Nigeria up till 1960 when Nigeria got her independence never accorded the individuals any functional skills for self-reliance. Students generally received little or no training in skills useful for employment in the world of work. This was the reason for the revitalization of Nigeria educational system with the introduction of the national policy on education to give training and impact the necessary skills to individuals who shall be self-reliant economically (Federal Republic of Nigeria (FRN), 2013). To this end, Ifedi (2008) stated that one of the main causes of unemployment among school leavers is lack of employable skills. Many do not possess the necessary skills and competencies which the modern economy demands. Thus, the nation is faced with critical shortage of competent applicants and burdensome surpluses in terms of unemployable manpower. A sure way out of this unemployment and joblessness is the integration of information and communication technologies (ICTs) into technical education programmes.

The Federal Government of Nigeria for over three decades now set up one programme or the other aimed at increasing productivity, combating unemployment and improving the health

and well being of the population (Ekpenyong, 2004). The government has since 2002 either discarded the previous poverty eradication programmes, except the National Directorate of Employment or subsumed them under the National Poverty Eradication Programme (NAPEP). The most recent commendable stride to the government is the birth of National Economic Empowerment and Development Strategy (NEEDS) whose goal include employment generation, poverty reduction and value re-orientation. However, indications reveal that so far, the impact of these programmes is yet to be felt as social status; health and employment of most people in Nigeria still remain depressed. Tell Magazine March 21 (2014) reported that about 2,891,395 Nigerians (youths and adults) were unemployed as at January, 2014. The future is likely to rise even higher than this report. This scenario therefore shows that Nigeria's placement as the 26th poorest nation on the Human Development Index (HDI)

Employability in both public and private sectors of the Nigerian economy has grown tremendously and this has made the manpower production to be far in excess to demand. The problem faced by employers now is too many well qualified job applicants chasing very few job vacancies. The increasing complexity of competition in the Nigerian labour market requires greater efficiency of workforce. Technical Education has become very relevant in the Nigeria of today, where massive unemployment of both youths and adults is on the increase.

One of the objectives of Technical Education is to prepare individuals for gainful employment. Whether paid employment or self-employment, the emphasis is on exposure to and acquisition of knowledge, skills and attitudes relevant and adequate for employment in specific occupations. Thus, the value of any Technical Education programme could be determined in its ability to adequately prepare and equip appropriate individuals in such a manner that they could fit into specific jobs or establish their own business after graduation. The specific objectives of technical education at the tertiary level (Universities, Polytechnics, Monotechnics and Colleges of Education (Technical)) as stated by FRN (2013) in her national policy on education are:

1. Provide courses of instruction and training in engineering, other technologies, applied science, business and management, leading to the production of trained manpower;
2. Provide the technical knowledge and skills necessary for agricultural, industrial, commercial, and economic development of Nigeria;
3. Give training that impact the necessary skills for the production of technicians, technologists and other skilled personnel who shall be enterprising and self-reliant;
4. Train people who can apply scientific knowledge to solve environmental problems for the convenience of man; and
5. Give exposure on professional studies in the technologies.

Despite these laudable objectives of technical education in Nigeria, presently, Technical Education can be said to be at a cross road and described as a 'disaster' due to inadequate funding, chronic dearth of qualified teachers, inadequate facilities, inappropriate curriculum and students' population explosion. With the alarming of advancement in technology and the clarion call by experts for a change in Technical Education curriculum, there seems to be some attempts to remedy the ugly situation. Unfortunately, what is needed is a replacement of the existing structure and a summit to reposition Technical Education delivery system. According to Nwosu (2003), the already fast deteriorating state of Technical Education in by unprecedented advances in technology. Technical Education in almost all the institutions in Nigeria is indisputably very highly challenging. The need thus arises for a change in pattern of delivery of instruction in this form of educational programme. The resources and methods

chosen for instruction will bring about the intended learning outcomes in students (Nwachukwu, 2006). Such instructional resources are the ICTs which is currently a driving force economically, scientifically and technologically all over the world.

Nwosu (2003) opined that national growth and development is hinged on the acquisition of ICT skills and utilization of ICT opportunities. Presently, we are in an information society where those who can create, process, manipulate and manage these vast varieties of information will continue to dominate the economy and dictate the entire pace of development. ICT according to Tinio (2003) cited in Adomi & Kpangban (2010) is a diverse set of technological tools and resources used to communicate, create, disseminate, store and manage information. These technologies include radio and television (broadcasting technologies), computer and internet (digital technologies) and telephony. According to Ayelaagbe & Abidoye (2007), the most current ICTs can be grouped into: information techno logy, telecommunication technology, and networking technologies. (i) information technology: uses computers, which have become indispensable to modern societies to process data, save time and effort; (ii) telecommunication technology includes: telephony (with fax), televisions, often through satellites; (iii) networking technologies of which the best known is the internet, but which has extended to mobile phone technology, voice Over IP Telephony, satellite communications, and other forms of communication that are still in their infancy.

These arrays of technologies have been flaunted as potentially powerful enabling tools for educational change and reform when appropriately used. The purpose of ICT is to increase productivity and efficiency and speed up information processing for wealth creation. Therefore, its integration into Technical Education programmes will enable learners to possess relevant skills and competencies necessary for effective performance in the world of work.

Information and Communication Technology and the Curriculum

The needs, values, aspirations, trends and problems of any nation should be reflected in her curriculum. Curriculum changes can be approached by trying to give and receive advice and cooperation from other curriculum experts, by providing different visions, experiences, findings from researches and training strategies. Curriculum is the nucleus of all educational changes as it encompasses contents, process, and outcomes that imply permanent connections between the goals of education and everyday learning experiences in schools, colleges and universities.

Gavin (2006) in Adomi & Kpangban (2010) stated that ICT is committed to helping men and women develop skills and knowledge to pursue many opportunities on fields involving technology. ICT knowledge and skills can be used on some today's fast growing career fields such as electronics, web development, computer programming, networking and computer drafting and design. ICT tools enable students to work independently and collaboratively. As such, the role of ICT within the school curriculum is not only to enhance the learning experiences of students, but also to help them develop the essential skills needed to participate effectively in the 21st century workplace.

The Need for Information and Communication Technology in Technical Education

Technical education is one which is skill-based, work focused, and prepares its recipient for the world of work by equipping them with the necessary skills, attitudes and knowledge required to fit into the workplace for today and the future. The current situation in Nigeria is that technical education has no implicit focus (Adeniji, 2002) and curriculum specifications are inadequate and inappropriate (Nwosu, 2003). The programme is being faced with issues of inadequate funding (Aina, 2002), gross inadequacy of functional equipment and facilities

(Unwin, 2009); chronic dearth of qualified teachers (Aina, 2002). Lack of the required instructional equipment and facilities in schools implies that students will not have ample opportunities to see and manipulate them in order to acquire the needed skills and knowledge (Unwin, 2009) required in the 21st century work place. It therefore becomes imperative for these issues to addressed in order to enhance the quality of teaching and learning technical education programmes.

The conventional method of teaching in schools in many nations including Nigeria has failed to prepare recipients to adequately function and participate fully in this era of technologically driven society. The delivery system of implementing technical education undergraduate programmes seem no to meet the required standards of today's workplace. To this end, Aina (2002) asserted that the inability of technical education to achieve its objectives is due to poor implementation. Collaborating this view, Adeniji (2002) posited that many programmes and policies including technical education have fallen short of expectation in meeting the realities of our working environment, in reducing unemployment and moving Nigeria forward. To this end, Aina (2002) described the current status of technical education programmes as appalling and a disaster. This is as a result of the emergence of advancement in ICTs.

In almost every aspect of life information processing is used to increase productivity and improve efficiency. As new technology emerges, several skills are required to be successfully employed in the labour market for wealth creation. Such skills, according to O'Neil (1995), are technology related skills, interpersonal and communication skills. For instance, computer literacy is yardstick for employment opportunities in both public and private sectors of the economy. Technology related skills include: keyboarding, and document formatting, proof-reading, transcription, mechanical aptitude and computer knowledge. Interpersonal and communication skills include language, critical thinking and decision making, dependability, relating to others, maturity, ability to start and complete project, ability to keep an open mind and go with the flow.

The office environment has witnessed a great change and it will continue to change as a result of innovations occasioned by the ICTs (Okereke & Ndinechi, 2005). They added that the era of ICT has made it imperative that a hard look be taken at the Vocational education curriculum. It is disheartening to see vocational education graduates roaming the streets in search of jobs while the employers unsuccessfully look for ICT competencies from workers. Ejeka (2005) cited in Adomi & Kpangban (2010) lamented that in the present age the illiterates are no longer those who cannot read and write but those who cannot use the computer and harness the tools provided by ICT. In fact, technical education has been unmatched for the required technological breakthrough.

Therefore, there is urgent need for the effective inclusion of ICT related courses in the technical education curriculum. This is important because according to Oyedele (2001), the power centres have shifted from land and capital to data, information, judgments and decision making. ICT is the central nervous system of the society. To be able to produce teachers who are ICT compliant, there is urgent need to review the vocational education curriculum to adequately include ICT related courses and to provide the necessary equipment for the teaching and learning of the courses. The maximum use of ICT can foster the shift to a learner-centred environment. ICT transforms this environment by:

i. Facilitating the acquisition of skills: through drill and practice, the transmission of basic skills and concepts, and the foundation of higher order thinking skills and creativity can be facilitated.
ii. Motivating the students to learn: this can be achieved through the utilization of radios, video programmes that sing, dramatize and display comic performances. The interactions via gadgets compel students to pay attention and become involved in the on-going lessons.
iii. Enhancing teacher training: the production and retention of skilled and effective teachers is very vital in Technical Education. ICT plays the role of improving teacher effectiveness through provision of recorded instruction.
iv. Micro-learning: this is suitable for teacher training programmes and self improvement. Here, the student engages in relatively small units of learning activities, interacts with ICT facilities such as computers, televisions, and recorded tutorials to study and practice specific and small units of learning experiences. The purpose is to allow the teacher and students to rehearse, analyze and master such activities. It assists the teacher to sharpen his/her focus on performance objectives (Tino, 2002 in Nwosu, 2003).

Technical education is therefore faced with the challenge of keeping up with the changes taking place in the world of work. The real of ICT is one that is growing limitlessly. It becomes imperative for technical teachers and students to focus on making technological learning part of their own lives so that it can be integrated into their instructional delivery competencies. They need to learn how to think, create, work, and collaborate with new ideas and techniques in order to properly integrate the use of ICTs into the teaching and learning process to avoid being left behind.

Characteristics of Learner-centred Technical Education Environment

The learner-centred environment according to Thijs (2002) cited in Eze & Obeta (2008) has the following characteristics:

i. Active learning: learners learn as they do and wherever appropriate work on real life problems in-depth, making learning less abstract and more relevant to the learner's life situation. In this way and in contrast to memorization or rote-learning, ICT enhances learning and promotes increased learner engagement. The learner can choose what to learn and when to learn it.
ii. Collaborative learning: there is cooperation among students, teachers and experts regardless of individual differences and class. Apart from real-world interactions, ICT supported learning provides learners the opportunity to work with people from different cultures, thereby helping to enhance learners teaming and communicative skills as well as their global awareness.
iii. Creative learning: ICT supported learning promotes the manipulation of existing information and the creation of real world products rather than the regurgitation of received information. Technical Education is best nourished in a creative setting where learners are encouraged to innovate and invent ideas and concepts, as well as new utility programmes.
iv. Integrative learning: integrative learning is an approach that facilitates thematic, integrative and holistic approach to teaching and learning. It eliminates the artificial separation between the different disciplines and between theory and practice that characterizes the traditional settings.
v. Evaluative learning: learning in this setting is diagnostic. Since the setting is learner-centred, the learner is capable of discovering his/her strengths and weaknesses and

allowing him/her to choose between alternative approaches to solutions to learning problems.

Information and Communication Technology in Technical Education

ICT has made the world a global village. Every activity of man is driven by technology. For Technical Education to meet up with challenge of today or tomorrow there is need for a reform of the programme content that will incorporate new and interesting courses such as ICT. ICT will equip the programme beneficiaries' better to meet the challenge of our time. The impacts of ICT are manifested in all works of life and have changed activities of man. Ojukwu & Ojukwu (2002) in Okereke & Ndinechi (2005) posited that ICT is accelerating at very high rate and this demands a consistent monitoring by Technical Education educators with a view of restructuring Technical Education curricula to meet the challenges. Dimowo (1999) & Aluenyi (2000) supporting this view called for reform in Technical Education that will integrate information technology innovations.

In the world of work where new equipment and machines are constantly being introduced and developed, there is need for organizations to employ those having relevant skills and competencies required for performance in the labour market. There should be a reasonable degree of correlation between the knowledge and skills required by employers and the curriculum in use. This implies that whatever is taught in the classroom should be a replica of what is required in the labour market.

Integrating ICT into Technical Education programmes will therefore require a thorough training in the use of modern technology that will add new dimension to the equipment and facilities for Technical Education programme. It is sad to note that most of the institutions which offer Technical Education programmes do not have equipment that could compete favourably with those available in the world of work. For instance, Chuke (2003) posited that the computer remains the most widely used electronic device today. But surprisingly, this vital piece of instrument that has turned our world for the better is still a luxury in some schools offering Technical Education programmes. As such, many Technical Education educators and their students are not abreast with the technological development of their profession. They are therefore ill-equipped to face the challenges of the world. As large numbers of data are created, processed, stored, retrieved and disseminated daily as a result of technological innovations, there is need for new methods, new skills and concepts to be learned. Integrating ICT into Technical Education programmes will provide opportunity for individualized learning and instills confidence in the learners. The use of ICT in education and Technical Education particularly could be highly beneficial to students and the nation at large in the following ways:

1. Increases performance when interactivity is prominent. It enhances teacher-learner communication.
2. Improves attitude and confidence
3. Time is saved running from one classroom to the other. Teachers and students can also for books and other teaching and learning materials without moving from one place to another. It enables technical teachers to process information and performs specific tasks more quickly.
4. Provides instructional opportunities otherwise not available
5. Increase opportunities for students-constructed learning
6. It exposes technical teachers to new methodologies of subject delivery so as to improve quality instruction and reposition the students to the current trends of globalization
7. Increases mastery of technical and work force skills

8. It encourages a network research among technical educators
9. Prepare students for work when emphasized as a problem-solving tool.
10. Improves students problem-solving skills
11. Increases the preparation of students for most careers and vacations
12. Increase emphasis on individual instruction.

Other benefits as identified by Ohakwe (2001) are:

1. Records can be managed and accounting functions performed using electronic document. Information is now being processed, stored, retrieved and outputted at a far greater speed than the manual method. The secretarial student is able to carry out his/her duties with ease and at a faster rate than it is in the traditional office. Also, the technical or industrial students are able to perform their technical or engineering drawing activities using AUTOCAD faster than in the usual classroom arrangement.
2. ICT creates opportunities for learner to have access to libraries and database of other universities, research institutions, or government agencies to consult stored files of Technical Education papers, studies or reports. For example, users could subscribe to any of several electronic Technical Education journals, newsletter and periodicals published on internet.
3. It is used for communication between individuals. For example, through video conferencing, audio conferencing, voice mail, etc, technicians can dialogue over various issues without being in the same location.

ICT in Technical Education programmes can also promote gainful employment. Integrating ICT into Technical Education will provide the necessary tools and skills for gainful employment to its graduates if they are properly trained in school. Indispensable skills which are basic to the needs of the society are provided to its recipients who can avail themselves of the opportunities of setting up their own business centres and earn a living. Also, Technical Education graduates can be self-reliant by establishing and offering consultancy services to firms or the public at large.

Technical Education graduates who are ICT compliant can function effectively in any type of office because their horizon is widened through the skills acquired in the ICT compliant Technical Education programme. Their job opportunities are enhanced. They can now stay longer at his/her workplace as information and messages can easily be keyed and assessed. ICT complaint Technical Education graduates can use technology to enhance his/her ability to learn about the world of work. Technical Education graduates who are well trained can fit into any work environment. This is as a result of the fact that they are well trained and have acquired ICT skills.

Constraints to Entrenching ICT in Technical Education

There are a number of problems that hinder the effective integration of ICT in Technical Education programmes. They include:

1. Inadequate equipment and infrastructures: most educational institutions that offer Technical Education programmes do not have the relevant equipment to enable students to be conversant with the use of these equipment. Basic infrastructure such as electric power, appropriate school buildings and telecommunication lines are still needed in many districts in Nigeria. Internet is accessed through telephone lines requiring that all educational institutions have at least a telephone line. Most classroom blocks are still the very old and with leaking roofs. Classrooms to be used for ICT should be well equipped, properly ventilated with air-condition in a nation such as Nigeria

which is in the tropics. Most schools are not adequately furnished to house ICT tools and facilities.

2. Language: English language is a second and official language in Nigeria. ICT software and programmes are adequately available in English language but these are predominantly alien to the Nigerian culture and do not consider local languages and culture. There is need for software that would facilitate the teaching and learning of Nigerian cultural arts and technology using local languages. This can be done by establishing interconnected school network as is obtainable in nations like Paraguay, Ghana, South Africa, Thailand and so on. This will result in inter-language interaction, capacity sharing and cooperation among schools and learners.
3. Scarcity of curriculum developers: Etuk (2005) stated that Nigeria lacks curriculum experts in the various areas of Technical Education and information technology. As such, most of the curricular in Technical Education programmes are not based on Nigeria experience. Thus, it becomes a challenge to technical teacher educators to learn to develop Technical Education curricula that can meet the needs of the society. There is need to develop curriculum that will be technically standard in content, utility oriented and work focused.
4. Educational policy and planning: developing nations Nigeria inclusive, need to look at the extent to which their educational curricular is ICT adaptable and assess the need to shift their programmes to functional, utility and work focused programmes so as to tap the resources provided by the ICT paradigm. Technical Education is well suited for work focused programmes, as such; developing countries need to increase the population of citizens opting for Technical Education. These nations should also assess the status of their teachers in terms of training and retention, which are the functions of motivation, funding and living wages.
5. Impediments of power sector: the power (electricity) sector in Nigeria is highly epileptic in the supply of power and Technical Education programmes are actually in dire need of power for efficiency.
6. Inadequate manpower/personnel: this constraint applies to both secondary and tertiary institutions. The technical teacher according to Etuk (2005), should not only possess the knowledge, skills and attitudes that will make him/her a successful educator, he/she should also possess competencies required in one or more areas of Technical Education and management. This is usually not the case in Nigeria. It is not unusual to see interlopers who claim to be Technical Education educators deployed to teach specialized Technical Education subjects and courses.
7. Inadequate printed and non-printed instructional materials: there is scarcity of quality Technical Education and information technology textbooks and other teaching materials and this is hindering the development of Technical Education and information technology.
8. Resistance to change from traditional pedagogical methods of teaching technical education to more innovative and technology-based teaching and learning methods

Implications for Technical Education

Despite the challenges facing technical education in Nigeria, there is still copious room for improvement; as technical education is the surest way for sustainable economic emancipation and development. The production of employable and skilled human resources for the world of work is essential to a sound economic development and growth. The following suggestion if duly implemented will foster the future of technical education programmes in Nigeria:

i. **Funding:** Funding is fundamental if the use of ICTs in all ramifications and in the real sense of it, is to succeed (Adomi and Kpangban, 2010). Thus, there should be adequate and sustainable funding in a holistic manner for technical education programmes.
ii. **Policies:** the three tiers of government should adopt policies that would avail technical teachers and students easy and cheap access to ICT tools, packages and equipment. To this end, Thom-Otuya and Ubulom (2007) opined that the curriculum has to be redesigned to incorporate e-learning and e-teaching.
iii. **Infrastructure and facilities:** ICT tools, facilities, packages and equipment should be provided in sufficient number and quality. Government should ensure that there is regular supply of electricity in schools, offices and residential buildings to foster teaching, learning, administration and research in technical education.
iv. **Training:** the use of ICTs in all spheres of life technical education inclusive can only be possible if there is available and sufficient human resources in the right number, quality and mix, and they have to be trained and retrained to keep them abreast with current trends and technologies in technical education.

CONCLUSION AND RECOMMENDATIONS

For Technical Education to take its rightful place in this era of information age, ICT should be effectively integrated in the Technical Education curriculum. This is important because it will enable the Technical Education graduates to be well trained to face the challenges of this information age. This paper recommends that:

1. Government should allocate a sizeable part of her annual budget to ICT projects and equip the technical education workshops/laboratories in educational institutions, in order to hasten the pace of ICT development and enable the students to be conversant with the various modern office and industrial equipment being used in the world of work.
2. Educational programmes should be restructured to make it utility oriented and work focused so that students/learners may be attracted and retrained.
3. Technical educators should be sponsored to attend workshops, seminars, and conferences both locally and internationally. This will enable them to acquire skills needed in developing and implementing adequate curriculum for Technical Education programmes.
4. The government should endeavour to do a serious reform in the power (electricity) sector to enable them improve their services. This will go a long way in helping technical educators to make effective use of the gadgets available to them.
5. Government should develop ICT software that will be applicable to their indigenous cultures so as to make ICT more relevant to the local needs of the people.

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