

Utilization of Information and Communication Technology in Technical, Vocational Education and Training: A Way Forward for Developing Competencies for 21st Century in Nigeria

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Abstract: ICTs are revolutionizing education by removing distance from education and making knowledge more accessible to every individual around the globe. Technology-enhanced learning will play a critical role in the development of a lifelong learning culture, and has the capacity to empower learners by providing them with multiple pathways that offer choices and channels to meet their education and training needs. It is not surprising, therefore, to see a growing interest in technology-based learning across the world. The automation of TVET workshop and machineries could be a turning point in educational system in Nigeria. The systematic approaches of using ICT-mediated learning in the classroom environment is to strengthening productivity, encourage self-employment for the youths and as well as contribute positively to the economic growth. Besides portraying the various ways in which the use of ICT promotes teaching and learning, it has become central to education in the 21st century. Unfortunately, TVET in Nigeria has been observed to be neglected and substandard due to non-utilization of ICT facilities to meet the need of modern day employers in the labour market. Thus the paper intends to examine the concept of ICT, utilization of ICT, concept of TVET, the necessity for utilization of ICT –mediated learning in TVET and what are competencies for 21st century? Additionally, the paper discussed the major challenges/barriers on the utilization of ICT in TVET, application of ICT in TVET institutions in Nigeria, the theory of Digital Natives that is very relevant to the paper and as well as enormous benefits of ICT in TVET. It was concluded that the use of ICT is globally recognized as a veritable tool that should be employ for teaching and learning processes in educational fields especially in TVET. It was also recommended amongst others, that Nigeria government should provide the necessary ICT facilities in TVET institutions, as well as conscious effort should be made for adequate planning, financing, monitoring and implementation of the vision, mission and objectives to achieve the ICT policy document on TVET through effective management of limited resources.

Keywords: Utilization, Information and Communication Technology, Technical, Vocational Education and Training (TVET), Competencies for 21st Century.

I. INTRODUCTION

Education shall continue to be highly rated in the national development plans because education is the most

important instrument for positive change of behaviour of the learner. Education is a powerful transformation and quality approaches for developing new ideas that focus on performance for individual development and capacity to manage their learning strategies (Latifa, 2018). Any fundamental change in the intellectual and social outlook of any society has to be proceeded by educational revolution. However, in this period of globalization, educational establishments ought to become more flexible, responsive and capable of adapting to changes in order to ensure its survival. Organizational transformation is the movement of an institute away from its present state and towards some desired future state to increase its effectiveness (Rasid-Bin, 2018). Institutions of learning are social establishment where the future citizens are shaped and developed through the process of teaching and learning. Thus, presenting a very strong demands in order to constantly adapt to existing organizational modifications, so as to creates an effective and efficient learning environments. However, institutions are expected to help all students to develop their inert potentials to the fullest level. They also should apply appropriate teaching methods that aims at helping and empowering all students to raise their overall learning outcomes. To achieve these expected outcomes, governments needed to play a very crucial role in supporting teaching and learning processes by providing information and communication technology (ICT) facilities and infrastructures to various schools.

ICT is an electric application of computing, communication, telecommunication and satellite technology. ICT also means computer-based tools and techniques for gathering and using information (Buabeng-Andoh, 2012). It is an umbrella term that comprises communication devices such as (radio, television, cellular phone, computer hardware, software, networking and satellite system) and services associated with them. It comprises electronic information in processing technologies such as computer and internet, as well as fixed-line telecommunication networks. New information and communication technologies (ICTs) have dramatically

changed the way we live, learn, and work, and even think about work. It has created new opportunities, new challenges and uncertainty. Many workers have been dislocated, while a significant number of young people are basically unemployed because of lack of ICTs skills. The information accessed through digital technologies could promote learning and innovation skills, increase productivity, life and career skills and could enrich the quality of life of the citizens.

ICT in education is wide-ranging, deep and rapidly growing field of study (Thomas, Alexander, Jackson & Abrami, 2013). ICT is becoming the lead artery in our international system which transfers information and knowledge in various fields of professional development. Therefore, education is the main valve which is responsible for dissemination of knowledge and information technologies. In line with the fast pace of ICTs development; all the TVET cadres should be furnished to meet the new culture of teaching and learning based for developing competencies in 21st century require educational technologies to produce and raise the number of knowledgeable and competent students who will lead the future economic development. (Chai, Tan, Deng, & Koh, 2017); (Göksün & Kurt, 2017). It is therefore necessary to utilize information and communication technology ICT to enhance education quality, expand learning opportunities and make education accessible to all.

Indisputably, ICT has imparted on the quality and quantity of teaching and learning, research in traditional and distance education institutions. Therefore, ICT could enhance teaching and learning processes through its dynamic, interactive, and engaging content; and it would provide real opportunities for individualized instruction. ICT has the potential to accelerate, enrich, and deepen skills; motivate and engage students in learning; helps to relate school experiences to work practices; helps to create economic viability for tomorrow's workers; contributes to radical changes in school; strengthens teaching, and provides opportunities for connection between the school and the world. Information and communication technology can make the school more efficient and productive, thereby causing a variety of tools to enhance and facilitate teachers' professional activities.

The purpose of TVET therefore, is for the student to acquire competencies for gainful employment, self-reliance and for lifelong professionalism. Also to acquire relevant skills of constructing, designing and repairs could be learnt in a well functional workshop-stocked with modern facilities. This ensures quality, dependable and sustainable abilities to contribute positively to the economic growth and development of the nation. Therefore, Federal Republic of Nigeria, FRN (2014) stated the purposes of ICT application as related to TVET. These are: to build a pool of information technology engineers, scientists, technicians, and software developers; to increase the number of qualified staff available; to offer appealing job opportunities; and to improve required information technology skills in different discipline especially technical and vocational education. TVET as a discipline,

have been acknowledged and embraced by developed nations as veritable instrument for attaining the much needed economic and technological growth. Furthermore, FRN (2014) perceived TVET as that aspect of educational processes involving the study of technologies and related sciences, as well as the acquisition of practical skills, attitudes, understandings and knowledge relating to the occupations in various sectors of the economic and social life. Thus, the value of any technical and vocational education programme could be determined in its ability to adequately prepare individuals in such a manner that they could fit into specific jobs or establish their own business after graduation. The field of technical and vocational education has not been unaffected by the penetrating influence of information and communication technology.

Yusuf (2015) stated that the most common problems associated with the effective use of ICT in TVET in Nigeria are: Lack of qualified ICT personnel, cost of equipment, management's attitudes, inconsistent electric power supply, non-inclusion of ICT programmes in teachers' training curricula. In the same way, the utilization of ICT into teaching and learning could be the high cost of internet bandwidth and it is clear that institutions do not have the technical ICT expertise to produce articulated strategies for the on-going development of their ICT infrastructures. Accordingly, Atureta (2011) identified five barriers related to the implementation of ICT-mediated learning in TVET, namely: content and curriculum, appropriateness. Richardson (2012) asserted the most common challenges faced by employers who have attempted to use ICTs for workplace learning. These are: lack of time, money and support; technological and systemic limitations; difficulty of using ICTs; no evaluation of outcomes; resistance to change; lack of planning; lack of communication; lack of leadership; and learner resistance. Therefore, these problems prompted the researcher to undertake this study to ensure adequate utilization of ICT-mediated learning in TVET institutions.

As a result of the pressing need to have a standardized and coordinated development and deployment of ICT in education, multi-sectorial approach was adopted in the development of a new policy, in 2010 involving the Federal Ministry of Education and its parastatals, States Ministries of Education, Information Technology Professional bodies, the private sector and non-Governmental Organization, The policy defines a broad vision for ICT integration (FRN, 2014). The policy objectives of ICT in education amongst others are:

- i) To facilitate the teaching and learning processes.
- ii) To promote problem-solving, critical thinking and innovative skills.
- iii) To promote life-long learning.
- iv) To enhance the various teaching and learning strategies required to meet the needs of the population.
- v) To foster research and development.

- vi) To support effective and efficient education administration.
- vii) To enhance universal access to information

The Vision, Mission and Objectives of ICT in TVET

The following are the vision, mission and objectives for ICT-mediated learning in TVET.

Vision

- To be a regional leader in developing and delivering open and flexible technical education, nationally and internationally.

Mission

- To be hands-on in providing quality, inclusive and cost effective open and flexible initial and continued education relevant to the needs and circumstances of the nation, region and widest possible range of learners.

Objectives

- To provide open and flexible courses, programmes, facilities and services that are responsive to demand, inclusive and provided at a reasonable cost.
- To serve group and individual needs, including those with special needs, by employing a variety of methods and media.
- To enable staff to keep abreast of developments in open and flexible learning and technology, and to recognize and reward endeavour in these areas.
- To assure quality in open and flexible learning through monitoring, evaluation, reflective practice and action research.
- To establish strategic alliances with other institutions, sectors and internationally for the purposes of information/resource sharing, collaborative course development and delivery, articulation, accreditation and credit transfer.

Statement of the problem

A cursory look at the TVET schools in Nigeria shows that many teachers in the system still depend on much on the traditional/conventional chalk and talk method of teaching rather than embracing the use of ICT. Richardson (2012) observed that the computer is not part of classroom technology in over 90% of public schools in Nigeria, hence, the chalkboard and textbooks continue to dominate classroom activities. The various ICT facilities used in the teaching and learning processes in schools include radio, television, computers, overhead projectors, tape recorders, fax machines, CD-ROM, Internet, electronic notice board, slides, digital multimedia, video/VCD machine and so on (Anikweze, 2013). Regrettably, most of these facilities are not sufficiently provided for teaching and learning process in the Nigerian technical and vocational education institutions. This might account for why most teachers are not making use of them in their teaching.

Accordingly, Apagu and Wakili, (2015) stated that ICT is generating a prodigious revolution and if any education sector does not join, it will not only be outdated but, in few years, it will be completely out of competition in the world market. Thus the new technology requires teachers' to apply new roles, new pedagogies, and new approaches in teaching and learning processes. The utilization of ICT particularly in TVET classroom would depend on the ability of technical teachers to restructure the learning environment in non-traditional ways. Also teachers should develop active socially tutorial room, develop innovative ways of using technologies, encourage technological literacy, and enhance knowledge deepening and knowledge creation. Therefore, the 21st century, teachers need to be in tune with the use of ICT in classrooms. This will eventually improve the productivity and self-employment among graduates.

According to Anikweze (2013) opined that there are several causes working contrary to the use of ICT full implementation in Nigeria, which include: inadequate computers, epileptic power supply, problems of internet network failure, lack of ICT operational competencies, and difficulty in integrating ICT into classroom instruction, scheduling computer time not enough, deficient peripheral devices, inadequate software and hardware, low access to basic ICT equipment, lack of qualified ICT personnel and cost of equipment. Furthermore, negative management attitudes, low participation in the development of ICT equipment and low involvement in software development. The use of obsolete facilities and equipment in workshop should be upgraded with modern technological devices as a matter of urgent of necessity. Most importantly, it is expected that the environment in which the learner is trained should be replica of the environment in which he must subsequently work. How this problem of low productivity rate of TVET graduates can be curb or totally eliminated. Thus to address this problem and for TVET graduates to live up to the challenges of today and the future. Therefore, the utilization of ICT for effective teaching and learning is now and a way forward for developing competencies in 21st century in Nigeria.

II. LITERATURE REVIEW

The Concept of ICT

ICT is the term used worldwide to describe new technologies which mainly apply to computers. ICTs includes any communication device or application such as network, hardware, software, radio, cellular phones, television, computer and, satellite systems (Oviawe & Oshio, 2011). Ghavifekr and Rosdy (2015) described ICT as a short hand for computers, software, networks, satellite links and related systems that allow people to access and share information and knowledge in a variety of forms. Apagu and Wakili (2015) acknowledged the various ICT facilities that could be used by students to enhance the learning activities such as radio, television, smartphone, Wi-Fi, computers, overhead projectors, optical fibers, fax machines, CD-ROM, internet,

electronic notice board, slide, digital multimedia, video/ VCD machine. ICT incorporates equipment such as machinery-computers, hardware, software, firmware, tools, methods, practices, processes, procedures, concepts, principles and the sciences that come into play in the conduct of the information activities: acquisition, representation, processing, presentation, security, interchange, transfer, management, organization, storage and retrieval of data and information. Instructors are perceived as critical players in using ICT in their regular classes and training students for the new digital age. This is because of ICT's capability to create an active and proactive teaching-learning environment (Arnseth & Hatlevik, 2012).

Thus the application of ICT could enhance the consistency, accessibility, and cost-effectiveness of instruction delivery to students. ICT is applied in numerous techniques to help teachers and students learn about their respective subject areas. Implementing ICT is not a single step, but it is an ongoing and continuous step that fully supports teaching and learning processes as well as information resources. Alternatively, students would benefit greatly from ICT incorporation because the curriculum or tools will not constrain them. In its place, in a technology-based course, practical exercises are designed to promote their comprehension of the subject. It could also help teachers design their lesson plans in a real-world, innovative and exciting approach that would result in students' active learning. Earlier research has shown that incorporating ICT into the classroom learning process may perhaps take full advantage of students' successful learning abilities.

Technology-based tools could help students learn almost any subject, starting with mathematics, science, languages, arts, humanities, technical education and other vital fields. Besides, computers' help to serve the purpose of learning aids to make abstract and concrete course simple. Hence, the application of ICT facilities are not intended to take the place of good teachers' tools; rather, they should be used in conjunction with better teaching and learning. The importance of ICT incorporation in education is critical since technology allows teaching and learning to occur in the classroom, though teachers and students are physically separated. However, the utilization of ICT can be a continuous learning process that could offers a proactive teaching and learning environment rather than a one-time learning process (Lawrence, 2015).

In research and development, ICT could provide opportunities for schools to communicate with one another through email, mailing lists, chat rooms, and so on. It could also offers quicker and easier access to more extensive and current information, and it could be used to do complex mathematical and statistical calculations. Furthermore, it could provide researchers with a steady avenue for the dissemination of research reports and findings.

Utilization of ICT

The utilization of ICT simply means using different types of ICT facilities in classroom and in dissimilar educational settings for the purpose of teaching and learning processes. Yusuf (2015) emphasized that, ICT utilization is the presentation and distribution of instructional content through web environment (e-teaching) or systems offering an integrated range of tools such as computer instruction and CD ROM to support learning and communication. Instructional service delivery has to do with teaching and learning activities that take place in the classrooms. Therefore, quality of instructional service delivery entails the extent of effectiveness to which the teachers carry their classroom teaching and learning processes. Thus issues like good course organization, effective class management, content creation, self-assessment, self-study collaborative learning, task oriented activities, and research activities will be enhanced by the use of ICT based technology. This new development is a robust indication that the era of teachers without ICT competencies are gone. Therefore, classroom teacher with adequate and professional skills in ICT will definitely have his students perform better in classroom learning. ICT has the potentials to accelerate, enrich, and deepen skill; to motivate and engage students in learning to help relate school experiences to work practices; to help create economic viability for tomorrow's workers, contribute to radical changes in school; to strengthen teaching and to provide opportunities for connection between the school and the world. Therefore, the futuristic of TVET could be conceivable through adequate utilization of ICT in teaching and learning.

The ICT technological devices are used for processing, analyzing, and synthesizing, sharing different varieties of information and information processing activities and tools that are essential to improve teaching and learning processes. These includes communication device such as: laptops, projectors, printers, photocopy machines, duplication, fax machines, and scanning machines, radio, television, android phones, hardware and software, satellite systems, as well as video conferencing internet access and other facilities that ensures student's active learning (Yusuf, 2015). Consequently with the utility of ICT, teachers could take students beyond traditional limits, could ensure their adequate participation in teaching and learning processes and may as well create dynamic environments to experiment and explore.

The use of ICT has really brought about rapid technological, social, political and economic transformation, which has eventuated in a network society organized around ICT. ICT has made a very deep and remarkable impact on the quality and quantity of teaching, learning and research in the educational institutions. ICT is an indispensable part of educational administration as its application makes institutions more efficient and productive, thereby engendering a variety of tools to enhance and facilitate

teachers' pedagogical activities (Thomas, Lexander, Jackson & Abrami, 2013). Furthermore, (Thomas et al., 2013) stated that ICT has provided both teachers and their students with opportunities to develop new learning experience and opportunities in the following ways:

- ICT help learners clarify difficult concepts motivate both teachers and their students.
- ICT saves both teachers and students time, make learners active, and simplify teaching
- ICTs are used as teaching tool; students are actively engaged in the learning process through simulation and discussion.
- ICTs in TVET has the capability to make available practical learning experiences that are needed for the instantaneous work situations.
- ICT could provide expansion and reinforcement of TVET by enhancing networking and knowledge sharing opportunities and would extremely curtail the supply of mechanically operated training hardware, thereby offering students individualize instruction even after school hours
- Used in developing economies where poverty, conflicts and health are still problems that are not yet determined.
- Those schools having greater ICT infrastructure perform more highly than those schools with less developed ICT infrastructure

The Concept of TVET

TVET as an educational training which encompasses knowledge, skills/competencies, structural activities, abilities and all other instructional experiences acquired through formal, on the job or off the job which is capable of enhancing recipients' opportunity for securing jobs in various sectors of the economy or even enabling person to be self-sufficient by being a job creator. Richardson (2012) described TVET as education given to an individual in order to enable him or her to develop the creative and scheming potentials inherent in him or her for the use of man. TVET is the type of education that emphasizes the application of skills, knowledge and attitudes required for gainful employment in a particular occupation. Eze and Okorafor (2012) affirmed that TVET is the type of education specially designed to meet the economic and social needs of young people who want to work, and of adults who want to acquire increased job competencies and thus raise performance standards in the workplace. Malgwi and Mbah (2012) opined that TVET is the industrial facility for creation of required technologist, specialists and professionals' factory for production of needed to turn the nation's economy around. Furthermore, it is a peculiar educational programme in the sense that it addresses the immediate needs of its host community. Its philosophy is built on imparting specialized skills and knowledge, as well as instilling social and political skills and behavior patterns essential for successful economic activities.

Consequently, TVET could be seen as mechanism for reducing extreme poverty in the society and the world at large. TVET aims at developing not only practical skills but also attitudes and habits that make the recipient a creative, innovative, self-employment and resourceful person as well as a medium of evolution for people to the world of work; by making individual to have a sense of belonging in their communities. The role of training in human capital development for economic growth cannot be overemphasized. Nowadays, work place training is recognized as highly important while previously vocational education is now relegated to the background (Chukwuedo & Igbinedion, 2014). However, there is strong argument that the skills needed in a developing country like Nigeria, especially in the development of indigenous products and in new processes, cannot be got through formal education, which further shows that TVET may be the primary contribution to poverty reduction and economic development efforts (Fien, Rupert & Man-Gon, 2019). TVET has the vision and missions to make its beneficiaries functionally citizens, who will always be flexible to adjust appropriately to the dynamic society through engagement in industrial activities, small business or subsistence work. The operational establishment of this development in any learner will be secured in proportion as the training is given on the real jobs and not on quasi jobs.

TVET is in a period of transition and re-orientation and there should be continuous efforts to provide individuals with certain basic skills and knowledge, make available the necessary tools to upsurge and update their knowledge through the life-long education processes. TVET is a recognized and effective process by which quality, up-to-date information literate and knowledgeable workers are prepared, trained or retrained worldwide. TVET will be efficient in proportion as the classroom environment in which the learner is trained is a replica of the industrial environment in which learner must subsequently work (Chukwuedo & Igbinedion (2014). This is true because effective technical and vocational education can only be given where the training jobs are carried on in the same way with the same operations, the same tools/equipment and the same machines as in the occupations itself. Eze and Okorafor (2012) opined that TVET would be effective and efficient in proportion as it trains the individual directly and specifically in the critical thinking, creative and innovative and the manipulative habits required in the job itself. It becomes necessary to apply cognitive apprenticeship, constructivism, experiential learning activities and digital natives' theories in order to facilitate the acquisition of appropriate TVET competencies needed for the 21st century for gainful employment and independence in a developing country like Nigeria.

What are Competencies for 21st Century?

Competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context. For example the ability to

communicate effectively is a competency that may draw on an individual's knowledge of language, practical IT skills and attitudes towards those with whom he or she is communicating (Anikweze & Kanu, 2018). Therefore, developing competencies for 21st century according to Chalkiadaki (2018) encompass a broad range of skill sets and professional attributes, including: creativity, divergent thinking, critical thinking, communication, team working, cognitive and interpersonal skills, social and civic competences, responsible national and global citizenship, consciousness of interdependence, acceptance and understanding of diversity, recognition and development of personal attributes, interactive use of tools, digital competence, sense of initiative and entrepreneurship, accountability, leadership, cultural awareness and expression, physical well-being.

21st century competencies is well-defined as learning activities that provides 21st century skills to students. 21st century learning is characterized by higher order thinking, meaningful inquiry-based learning, collaborative teamwork, effective communication, creativity and innovation, and digital literacy. The framework for 21st century learning proposed by the US-based partnership for 21st century learning (P21) highlights the '4Cs' (critical thinking/problem solving, communication, collaboration/teamwork and creativity/innovation) as a range of attributes that should be developed within the context of teaching core subject areas in the 21st century (Joynes, Rossignoli, Fenyiwa Amonoo & Kuofi, 2019). The '4Cs' model is based on the assertion that 21st century challenges will demand a broad set of skills emphasizing the individual's capabilities in core subject skills, social and cross-cultural skills, proficiency in languages, and an understanding of the economic and political forces that affect societies (Joynes et al., 2019).

The 21st century advocates the importance of deep meaning rather than surface meaning. Teachers have a crucial role to play in facilitating a teaching and learning programme that progresses from surface learning to deep learning. Surface learning involves recalling of information while deep learning requires learners to relate or extend ideas, to form judgments and think critically. Hence, deep learning enables the learners to construct knowledge by adding new information to existing knowledge. Deep learning is further enhanced through technology. The 21st century education classrooms presentations and materials are typically developed dynamically both inside and outside of class with students as primary developers. Also, the classroom activities often focusses on students as participants and agents and the teacher as guide or mentor. This new era is indicated by a few obvious practices in the teaching and learning context, which are compared to the existing or traditional context. Thus new era in the pedagogical arena, which exposes a new outlook and new elements to be injected into the education system. Classroom activities emphasizes discovery and application: finding, assessing, synthesizing, and utilizing information

(Ezenwafor, 2015). Access to course content is augmented by electronic sources and media, and access is often recursive, allowing students to return to context when and as often as they like. In addition to classroom access, students and teachers have access to one another through virtual means: online discussions, email, chat, social networking, and interdisciplinary connections are encouraged and disciplinary boundaries are seen as porous or even arbitrary (21st Century Education, 2013).

The Necessity for Utilization of ICTs in TVET in Nigeria

The world has become a global village and has moved from the industrial based society to an information-oriented one as a result of ICT which is the leading agent of the change. ICT skills, knowledge, and competencies are needed in almost all spheres of human life and its literacy is a prerequisite to effective participation in information-oriented society. For example, for any individual or student or researcher to succeed, ICT knowledge is a criterion. Assignments, seminars, projects, thesis, and term papers have to do with ICT facilities such as the computer and internet and students are expected to use the library to source for information. Agbetuyi and Oluwatayo (2012) stated that knowledge, skills and confidence with ICT are now an asset to those entering the competitive labour market.

TVET is one of the field of study that requires full deployment of ICTs, especially in the present age where the universe of work is quickly changing its prerequisite for workforces from skill based to an ICT fit (Aliyu, 2012). Olelewe and Amaka, (2011) opined that if ICT should properly be exploited in TVET programmes; it will improve the nature of instruction and training in different ways which incorporates empowering the securing of essential abilities, expanding students' inspiration and commitment and upgrading teacher training. The world of work is in continuous change as ICT itself, thus posing more challenges to the workers in the 21st century and the institutions responsible for their preparation. ICT skills, knowledge, and competencies are needed in almost all spheres of human life and its literacy is a prerequisite to effective participation in information-oriented society. For instance, for any individual or student or researcher to succeed, ICT knowledge is a criterion. Assignments, seminars, projects, thesis, and term papers have to do with ICT facilities such as the computer and internet and students are expected to use the library to source for information.

The use of ICT in TVET had change the entire focus of manpower needs in the world; from skilled-based to ICT-capable work force. Therefore, the demands of an effective ICT-based TVET is not a sweeping statement. TVET being one of the most notable fields of education right from Stone Age to the present era of industrial development, still maintain its tempo toward the infrastructural, industrial, human and material resources development. Therefore, an instant application of ICT facilities into the teaching and learning processes in TVET should be emphasized at all levels. These

distinctive features of TVET make ICTs application a mandatory component that can aid to achieve a sustainable and globally recognized workforce. ICTs could also facilitate the development and strengthening of TVET around the world by enhancing networking and knowledge sharing opportunities (Ezenwafor, 2015).

Accordingly, Agbetuyi and Oluwatayo (2012) specified that knowledge, skills and confidence with ICT are now an asset to those entering the competitive labour market. Employment will soon be given to only those possess ICT knowledge and this knowledge could be used as an perimeter over those without ICT knowledge. Anikweze and Kanu (2018) suggested that in today's world, proficiency in ICT skills is as critical as reading, writing and arithmetic. Furthermore, Anikweze and Kanu emphasized that today's business world is looking for skilled workers who want to continue to learn and meet organizational goals. How much skills an individual has is fast becoming a determining factor to securing a proper job and good pay and in a society such as Nigeria, ICT skills are most required and requested for in any kind of employment. The fact that ICT has moved into the society so rapidly, the need thus arises for everyone to quickly acquire basic ICT skills especially TVET students in order to pursue their career goals and function effectively in the society.

Alderete and Formichella (2017) posited that it is a complex thing today to secure professional jobs without demonstration of relevant ICT skills. ICT literacy cannot be avoided but must be embraced by technical and vocational education students. It should be seen as a tool of making an individual a good scholar, a prerequisite for good employment and a vehicle that can convey an individual and his/her messages round the world. In Nigeria, policy makers, public institutions and the grassroots movement are striving for broad ICT access and being able to use ICT facilities is a requirement for democracy and participation in the workforce. A lot of old employees in government ministries, companies, industries and educational institutions, etc. that are not automated live with the fear of possible retrenchment for lack of required skills to work in an ICT office environment.

Technological competencies can now be effectively delivered virtually through a well-organized ICT set up; gone are the days where practical skills are taught using hands-on learning only. Programmed instruction in form of software and interactive video made it easy for practical skills to be taught using ICTs. So also, job that requires only hands-on experiences are now possible through computer controlled programmes. As such, the need for ICTs integration in TVET remains a great challenge, considering the impact ICTs make in the world of work that 'needs a knowledgeable workers skilled in information technologies (Rojewski, 2019). By implication, the use of ICTs in the training, up-grading and re-training of workers is of paramount significance, and an essential aspect of teaching cultural toolkit in the 21st century, affording new and transformative models of development.

The recognition of ICT demands for its implementation by every institution as an obligatory course. Technical and vocational institutions should prepare students to be collaborative for manpower needs of the workstation and to equip learners for the new information technology world as well. Major concern should be to train all technical teachers who could use ICTs in the discharge of their responsibilities, writing lesson notes, searching information in the internet, preparation of vouchers, payment of wages/salaries, keying in words, transcribing storing and retrieving of information, communication. Technical institutions could be assessed through its ability to train and prepare students for the challenging needs of the society; its success could be attributed to the identification of the required competencies for 21st century (Laurillard, 2013). This could be attained through teaching the students how to live in a dynamic world and how to adapt to the changes.

The utilization of ICTs in the field of TVET is imperative and may not be exhausted by studies available in the knowledge based society. Barakabitze (2014) stressed that the importance of skill acquisition is the exposure to practical situations where these skills are displayed in similar environment as in the workplace. This could be possible as the teacher has had successful experience in the application of skills and knowledge to the operations and processes he undertakes to teach.

In summary, the effect of TVET in decreasing the danger of joblessness and reduction of poverty, these make it one of the fields of study that requires full utilization of ICTs. According to Bappa-Aliyu (2012), TVET programmes needs ICTs because of the present era where the world of work is rapidly changing its requirement for workers from skill based to ICT capable.

- ICT integration into TVET programmes eases the expansion and reinforcement by enhancing networking and knowledge sharing opportunities.
- ICTs promote equity in TVET programmes by providing educational opportunities to a greater number of citizens of all ages as well as those in rural and remote areas.
- The introduction of ICT to TVET delivery and assessment is an important tool for enhancing access and quality in TVET programme.
- If ICT is utilized properly in TVET programmes, it will undoubtedly improve the excellence of education and training in several e.g. increasing learner's motivation and engagement, making them life-long learners, facilitating acquisition of basic skills and enhancing teacher training.

III. THEATRICAL FRAMEWORK OF STUDY

Theory of Digital Natives

Prensky (2001) advocated educational theory of two new terms, coined as digital natives and digital immigrants.

According to Prensky (2001) explanation of digital natives are the children who have grown up into a world surrounded by and using computers, videogames, digital music players, video cams, cell phones and all the other modern technological toys and tools. Thus, a person who is indigenous to the digital world, has grown up with and uses a wide variety of available and continually evolving technology with an inborn, instinctive sense of how to communicate, record, understand and share in society. Prensky further states that they are the product of the new culture that has emerged as a result of the aggressive penetration of digital technology in the lives of young people born since the last two decades of the 20th century. Consequently, they have the skills for digital fluency. There are number of labels to describe the young people currently studying at school, college and university. They include the digital natives, the net generation, the Google generation or the millennial. In contrast, Prensky characterizes digital immigrants as people born before 1980 and therefore, when it comes to using technology they are in the process of learning a new language - a process that is typical of all immigrants in their new country.

Prensky (2001) claimed that the reasons why there was an apparent decline in education in the USA in the last decades of the 20th century lie primarily in the advent of digital technology which had been widely embraced by American students, the outside school, across all ages of learners, but not applied in the classroom. They assimilated technology because they grew up with it, using the new technology is as natural as breathing. To them technology is like the air. They learn, not simply by reading, writing and arithmetic, but with the assistance of online cameras, simulations, games, wikis, blogs that they create. They develop skills for digital fluency rather than skills in the developed with talk, chalk and board; paper, pencil and pen. Prensky justified this label with the explanation that they are all native speakers of the digital language of computers. For instance, they process information faster than the older generations and manage high-speed information better.

Teaching learners without a firm grasp of how they learn is like trying to erect a building on shifting sand. Another helpful analogy is that it is like embarking upon a long and detailed journey without a well-planned and articulated itinerary, some device like a smart phone, or a road map. For without a well-planned itinerary or road map, how do one know where one are going? And if one does not know where one is going, what chance do one have of getting there? These simplistic analogies serve to emphasize that an understanding of learning theories is crucial to effective teaching because theories help us to understand how learners make sense of what they come in contact with, how they construct new knowledge and apply what they have learnt to further their understanding of new ideas and concepts.

As a way of making school relevant and attractive to the digital natives, Tapscott (2009) advocates the dumping of the industrial age model of education and replacing it with a new

one that is responsive to the educational needs of the digital natives. To achieve this paradigm shift, Tapscott recommended, in summary, the following pedagogical strategies: Instead of focusing on the teacher, the education system should focus on the student, instead of lecturing, teachers should listen to students, hold conversations with them, and interact with them, instead of teaching students how to memorize information, teachers should teach their students critical thinking skills, instead of using the broadcast style of instruction, teachers should help their students to discover for themselves, instead of delivering a one-size-fits-all form of education, school should customize the education to fit each child's individual learning styles. Furthermore, instead of isolating students, the schools should encourage them to collaborate among themselves and with others outside the school. Provide training to the digital natives to enable them to think creatively, critically, problem solving and collaboratively to master the basics and excel in reading, writing, math, and science and information literacy.

Also, provide training that will enable them to respond to opportunities and challenges with speed, agility and innovation, teachers should use ICT and embed interactive, computer-mediated methodologies in their construction, teachers should introduce just-in-time teaching and learning strategies whereby the benefits of web-based assignments are combined with an active-learner classroom in which courses are customized to the particular needs of a class.

ICTs in Teaching and Learning in Nigeria

In Nigeria, as a developing country it is necessary to use ICTs to make education more relevant, responsible and effective not only for the school setting but also for lifelong learning. To successfully remain competitive in global economic environment, a highly skilled and educated workforce with aptitude and skills in the application of ICT is very important. This makes knowledge and inclusion of ICT is a central to education in the 21st century. People need to be effective and efficient in the use of ICT for success in today's rapidly changing and highly competitive globalized world that depends very much on knowledge economy and skills. Encourages all stakeholders in education in Nigeria to be concerned about how best to take advantage of the knowledge economy. Beyond the immediate educational goal is the question of how to provide the best education to form the next generation of competent leaders from community to the national and global levels, economic planners, scientists, artists, humanists and more generally informed citizens, especially in this fast paced, technology-prone and globalized world.

The introduction of ICT in the teaching and learning processes becomes imperative. Such issues like good course organization, effective class management, content creation, self-assessment, self-study, collaborative learning, task-oriented activities, and effective communication between the performers of teaching and learning processes and research activities will be heightened by using ICT-based technology.

Certainly, the procedure of teaching and learning has gone beyond the teacher standing in front of a group of pupils and disseminating information to them without the students' adequate participation (Bappa-Aliyu, 2012). With the support of computer-assisted instruction, teachers can take students beyond traditional limits, ensure their adequate participation in teaching and learning process and create vital environments for learners to experiment and explore. Stressing the importance of the application of ICT in schools for teaching and learning activities

The content of TVET and teaching and learning processes at all levels have to be similar with the demands of the 21st century. As changes keep on occurring, the future is unpredictable. Therefore, adequate preparation to equip the 21st century generation with knowledge, skills and values for lifelong learning is, hence, imperative. Thus, ICT has impacted on virtually every sector of humanity, it has also helped in re-engineering and repositioning TVET through various modern tools and techniques. The application of ICTs in teaching and learning include radio lessons, TV broadcast lessons, computer-assisted instruction (CAI), distance learning, video conferencing, management information systems, stock taking and simulations. In all of these applications, communication is involved whether or not the learner is in visual contact with the source of information. Anikweze and Kanu (2018) enumerated the effects of ICT in teaching and learning which are:

- It provides a more scientific basis for designing instruction in a sequential manner and utilizing adequate instructional materials and other reinforcement strategies.
- It makes instruction richer and more powerful in influencing learning through the application of new forms of communication and technology by which distant and remote events can be brought close into the learning situation, e.g. use of films (motion pictures), slides, photographs and filmstrips.
- ICT supports the delivery of educational resources, particularly course materials ranging from printed books and charts through radio and television to multimedia computers and internet.
- ICT could make education to become more productive by speeding up learning and enabling students to invest more time in the application of acquired knowledge and creativity which can lead to breakthroughs.
- It could simplify the task of the teacher in communicating abstract concepts to learners by helping to bridge the gap between theory and practice. Learners can study reality through computer simulation and the use of various media that are capable of bringing the world into the classroom.
- Today, the emphasis on technology has led to broadening of the academic curricula to include legitimate courses in vocational areas such as home

economics, journalism, accountancy, photography, environmental design, animal husbandry, television and broadcasting, engineering, electronics and puppetry.

- ICT has further led to individualized instruction thereby enabling learners to proceed at their own rates through the use of programmed instruction, learning packages and computer terminals.
- Besides improved access and equity in education by influencing open and distance learning, ICT has made it possible for instruction to be brought to individual homes through radio and T.V. broadcasts and through the internet. Even the handicapped and children with special learning problems could be provided with diversified learning environment employing appropriate technological devices that enable them to develop their potentials.
- Promotes Active Learning Procedures - The application of ICTs in the teaching and learning processes encourage active learning or maximum learner active participation in the lesson.
- Simulations Model and Animation -. The computer game is a simulation or an attempt to represent a real activity such as soccer or flying. One can also use simulation in the form of diagrammatic model to reflect the characteristics of a phenomenon, system, or process, often using a computer, in order to infer information or solve problems. Animation is the production of moving images by computer techniques, or the image produced.
- E-Mails - The information flow in the form of computer to computer communication is described as e-mail. It is a system that allows text-based messages to be exchanged electronically, between computers or cell phones. A communication sent by e-mail is called message and it is possible under distance learning system for a lecturer to send instruction to students through e-mail.
- Computer-Assisted Instruction/Learning - The computer can serve as a teaching machine to deliver programmed instruction to learners. For example, this could be adopted for regular instruction from pre-primary to university level in conjunction with text books, lectures, films and discussion; for enrichment of curriculum especially for students who want to pursue their interests outside scheduled class lessons; and for remedial instruction especially with slow learners who need corrective training.
- Electronic Learning - This is the acquisition of knowledge and skill using electronic technologies such as computer and internet-based courseware and local and wide area networks.
- Educational Networks - The entire world is indeed captivated in what has been described as the information era in which computerization and digitalization has become the order of the day. It is

expected that if we belong to this information age, then we must all be computer literate in order to exploit the benefits of educational networks. Through this, information could be shared among institutions that are far distant away from each other. Examples include the EDUNet, Schoolnet Nigeria, NUNet (NUC & Universities), OAUNet, NCCENet (Teachers Portal), Schoolnet of various African countries.

- Special Interactive Guidance Information - Teachers can organize special guidance and counseling services system through educational network. This implies that students could secure help from their teachers without physical contact with them for examples, Facebook, Twitter, Instagram, WhatsApp and YouTube.
- Chat/Communication - This includes teleconferences and video conferences by which persons within a country could confer with professional colleagues or development partners in other countries.
- Administrative Applications in Schools - These include using computers to prepare school plans, time tabling, forecasting, graphical representations and the management of educational resources including database. When data are systematically collected and arranged in the computer, they can be manipulated for different purposes and retrieval is automatic. The records that are so kept will be empirically meaningful, professionally realistic, sequentially and successively more manageable as well as being richly informative

Applications of ICT in TVET for Developing Competencies for 21st Century in Nigeria

Accordingly, UNESCO-UNEVOC and UNESCO-UIS (2015) pointed out, the principle original goal of TVET was to prepare participants directly for work. However, with globalization, the transition from the Industrial Age to the Knowledge Age and the revolutions and innovations in science and technology, there is now a need for new domains of knowledge and new disciplines in all levels of education and training. Beyond the immediate educational goal is the question of how to provide the best education to form the next generation of competent leaders from community to the national and global levels, economic planners, scientists, artists, humanists and more generally informed citizens, especially in this fast paced, technology-prone and globalized world. The world event in the 21st century has turned to information and communication technologies, the world will continue to move further whether nations across the world embrace its use or not (Buabeng-Andoh, 2012). In this regard, quite a good number of developed and developing countries around the globe believe that ICTs will continue to be a critical facilitator of effective teaching and learning. As such, the established academic institutions struggle to keep up with the new changes (Ntirandekura, 2017). Ntirandekura (2017)

postulated that, through ICT, educational needs have been met; it changes the needs of education as well as the potential processes. Indeed, ICT has been utilized in TVET in Nigeria to some extent. The researcher itemized possible ways in which ICT could be employed in TVET for developing competencies for 21st century in Nigeria.

- Supporting conventional classroom work; the teacher could ask his/her students to use ICT approach
- Helping in the design and development of learning materials. A lot of materials can be downloaded from the Internet. Such materials must however be adapted to suit the specific instructional objectives
- Accessing electronic teaching materials such as books, journals. These can be accessed, stored and analyzed by the use of ICT
- Accessing virtual library stocks electronic versions of books and journals
- Giving or providing access to the world of resources especially in electronic form
- Playing a key role in educational administration. Students' data, personnel administration, purchasing and supplies, advertisement, can be handled with ease using ICT
- Facilitating independent study and individual instruction especially on the open distance-learning programme.
- Making learning more vivid and engaging to the students.
- Assisting the teacher in assessment and testing
- Bringing a permanent solution to brain drain problems as we now live in a global village.
- 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.
- ICT create opportunities for learners to have access to libraries and databases of other universities, research institutions, or government agencies to consult stored files of TVE papers, studies or reports. For example, users could subscribe to any of several electronic TVE journals, newsletter and periodicals published on internet.
- 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.

Challenges/Barriers for Utilization ICTs in TVET in Nigeria

The governments of various nations, non-governmental organizations and academic institutions around the world have made significant investments in computer-based information technology to support teaching and learning process (Ntirandekura, 2017). Such investments made is toward enhancing the quality of education and learning that in turn gives the student a better chance to participate in the 21st century learning environment. Information and communication technologies (ICTs) are valuable tools for achieving excellence in the teaching and learning process (Bappa-Aliyu, 2012). Some of the persistent challenges of utilization ICTs in TVET includes; content and curriculum; aptness and effectiveness; worth and branding of ICT-mediated learning; stakeholders' resistance; lack of suitable software; the digital divide; the cognitive and copy right issues. Laurillard (2013) identified the institutional barriers associated with ICT-mediated learning which are:

- Lack of equipment and support;
- Difficulties in scheduling;
- Lack of adequate resources;
- High cost of programme development;
- Instructional difficulties;
- Difficulties in recruiting qualified instructors;
- Difficulties in maintaining reliable technical assistance and support
- Cost of equipment and access to technology;
- Lack of motivation and encouragement;
- Inadequate immediate feedback from instructors;
- Absence of adequate support and services; \
- Alienation and isolation;
- Shortage of ICT literacy skills;
- Dearth of skills in managing data and time.
- Low societal estimation of TVET. In view of the negative public perception of technical/vocational education, and the gross gender imbalance, there is constant need for creating public awareness, especially to attract women and girls (Oweh, 2012).

Also, TVET has an image problem in Nigeria. Employability of those graduating from the TVET system is currently very low due to the poor quality of instruction and a lack of training that matches the employers' requirements. No wonder, TVET institutions remain unpopular among the youth. It is a stigmatized part of the education system (Ghayur, 2015). The serious challenges lies in the possibility of ICT to additional physically trained specialist/instructors and training facilities. ICTs can only substitute a portion of hands-on experience where manual skills are necessary requirement in teaching and learning processes (Etuk & Asukwo, 2015). To address the problem, various measures are being made and efforts are exerted to transform educational system and thereby improve educational quality. However, ICT is crucial component that no training programme TVET

can afford to neglect, face-to face interaction among learners and between a learner and a teacher equally holds great promise. Study in South East Asian countries revealed that, the progress toward utilization of ICTs in education, especially TVET, require additional commitment from teachers (Paryono & Quito, 2010). Teacher training and retraining are also challenges for the incorporation of technology-based learning since for most teachers ICT has both invigorating in their potential and intimidating in the improbability created by the speed of change

Benefits of ICT in TVET

The numerous benefits of ICTs in the field of TVET cannot be exhausted by studies available in the knowledge-based society. Therefore, ICT has comprehensively imparted its benefits on every society as the utmost change agent of human development. ICTs within education are increasing exponentially because of the technological progression and social needs. Therefore, ICT represents a master key which could pave the way for the TVET globally to upgrade students' knowledge and abilities. Accordingly, Olelewe and Amaka (2011) stated that the use of ICT in TVET will be highly beneficial to students and the nation at large as listed below:

- Increases performance when interactivity is prominent;
- Improves attitude and confidence;
- Provides instructional opportunities otherwise not available;
- Increase opportunities for students-constructed learning;
- Increases mastery of technical and work force skills;
- Prepare students for work when emphasized as a problem-solving tool;
- Increases the preparation of students for most careers and vocations;
- Increase emphasis on individual instruction;
- ICT will provide flexibility and convenience;
- It will overcome some traditional barriers such as time and place;
- It helps students to study independently;
- Enhances the learning achievement levels of students,
- Enhance problem-solving skills of students;
- Fosters peer interaction; a student can take an instructor-led online class, which combines the benefits of self-study with those of more traditional classroom-based learning.
- Deliver all or part of the learning experiences to learners; supplement and extend content provided in different forms other than printed (hard copy); and provide a two-way channel of communication for exchange between tutors and students with their peers for feedback or for learning, problem-solving, advice, debate, and reports.

IV. CONCLUSION

The basis for any meaningful national and sustainable development in Nigeria would largely depend on how much the seriousness that is shown in the review study of technical, vocational education and Training. A major way to get through this predicament is the appropriate utilization of ICT in the teaching and learning processes in technical institutions. Therefore, adequate knowledge management and information technology cannot be separated. With this incorporation, the nature of the work at the work places are becoming more and more digitally based and multilateral in nature. The skills required in workplaces are therefore becoming wider and more complex, with the composition of both technical and non-technical competencies. Based on the discussions presented in this paper draws its conclusion on the fact that ICTs are globally recognized tools that needs to be fully incorporated into TVET. Thus considering the nature and sophisticated the field of TVET to the economic, industrial and human resources development, in public or private sector. The challenges in the use of ICTs in TVET have been identified from the paper and duly acknowledged. However, the ineffective utilization of ICTs in TVET was properly addressed through adequate planning, restructuring and management of ICT labouratories. Therefore, the availability, accessibility and utilization of ICT facilities and infrastructures in teaching and learning processes is now and a way forward for developing competencies for 21st century in Nigeria.

V. RECOMMENDATIONS

Based on the discussions, the followings recommendations were made:

1. Teachers should use the computer to enhance educational efficiency especially in the handling large classes of students. Teachers must possess the skill of using digital projectors and produced slides for teaching.
2. Teachers could also use the computer to enhance 21st century competencies such as critical thinking/problem-solving skills, communication skills, collaborative/teamwork skills, creative/innovation skills of the learners
3. TVET institutions should endeavour to introduce student and teachers to how computers could play the role of the tutor and present the learner with a variety of contents and symbolic modes. Thus, ICTs can be utilized for individualized learning in technical colleges and vocational centers in Nigeria
4. School principals should insist on using computers for administrative functions such as replacing the arduous exercise of filing papers in filing cabinets and shelves, assisting in budget planning, accounting for expenditure, writing correspondences and reports, assigning students to classes, reporting students'

- progress and testing students and scoring tests which help to reduce paper work
5. A committee involving all stakeholders and policy makers should be set up for the development of ICT labouratories that students could assess at their convenient time and the internet services should be extended to the school environment where the students are accommodated
6. Personal capacity building in acquiring adequate pedagogical ICT competencies for the teachers for effective and efficient teaching and learning processes.
7. Government should ensure steady supply of electricity in schools by providing standby generator in ICT labouratories
8. Government should make funds available to provide appropriate ICT facilities necessary to improve teaching and learning processes in schools.

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