FACTORS MILITATING AGAINST THE INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES FOR EFFECTIVENESS OF TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

Prof. K. R. E. Okoye [1] and S. M. Nkanu[1*]

Corresponding Authors E-mail *emmanuelmartin99@gmail.com

[1]Department of Technology and Vocational Education, Nnamdi Azikiwe University, P.O box 5025 Awka, Anambra State, Nigeria.

Abstract

This study examined factors militating against the integration of information and communication technologies in effective teaching and learning of technical and vocational education and training (TVET). This study grew from the relevance and importance of technical and vocational education and training (TVET) programmes to the society. Undoubtedly, technical and vocational education and training (TVET) programmes involve practical skill acquisition and hands on experience, which has shown to be absent among present day graduates. However it is vital to examine the factors militating the integration of information and communication technology among TVET teachers. This study through related articles reviews information and communication technology as a positive tool to promote teaching and learning of technical and vocational education and training (TVET). As a result of this, related work on information and communication technology were reviewed, likewise proposed factors militating the integration of information and communication technology for TVET. The study found that information and communication technology integration in schools in order to provide tangible teaching solutions in the areas of TVET ought to be adopted. The study provide guide to the Federal Government through its Ministry of Education to see the need to integrate ICT and provide platform that will help pre-service teachers overcome difficulties faced during the use of ICT in their classrooms.

Keywords*:* Militating**,** Integration, Information and Communication Technology (ICT), Effectiveness, Technical and Vocational Education and Training (TVET)

1. Introduction

Teachers are individuals who bring learning to the classroom. Teachers' role presently and for the future is predicted as that of a learning facilitator, and as an expert in knowledge management and learning strategies. This requires

variety of skills and competencies which most in today's classroom teachers rarely possess. The emergence of new technologies (Information and Communication Technologies, ICTs) and methods in teaching and learning processes is gradually changing the role of the teacher. That is to say, with the evolution of information and communication technology (ICT), there has been a paradigm shift from mere classroom instruction to how ICT can be effectively used in teaching and learning to promote students' academic achievement.

According to [1], no technology can transform on its own. For technology to be impactful in education, teachers must integrate technology in the curriculum for easy alignment of the teaching process with students' learning goals. In the global society today, Information and Communication Technology (ICT) marks a second big bang in electronics. The emergence of new tools to handle repetitive work, but also supply for acquisition of certain high level human skills is part of humans everyday environment at work, home and in productive activities and at leisure. According to [2], the present era is marked by rapid changes in technology even that schools cannot remain indifferent. In education, ICT involves the introduction of new tools that gives opportunity to improve current practices and develop new solutions to meet present challenges. ICT if integrated in the teaching process could be an opportunity for all nations to seize a way out of a deadlock situation characterizing their educational system, and yet for other countries, to ease access and lower cost expertise of Nations.

Similarly, Information and Communication Technologies (ICTs) often spoken of in a particular context such as ICT in education, health care, sports, commerce and others provide the opportunity for educational institutions and other organizations to harness and use technology to complement and support the teaching and learning processes [3]. Furthermore, according to [4], ICTs are useful in numerous instances as they facilitate the development of various aspects of the current society in such areas as knowledge management, acquisition of knowledge, business, communication, entertainment, commerce

among others. [3] further stated that the past decade has witnessed a fundamental change in the way people communicate as well as do business. The new technologies have the potential of changing the face of education: where people learn; how learning takes place; the role of the teacher in the teaching process and the responsibilities of the learner in the learning process. This has nonetheless placed educational systems under increasing pressure to use ICTs to teach students the knowledge and skills they need to function in the 21st century [3].

Nevertheless, glaring challenges confronting the educational system today is due to the information that most teachers are still adopting the stereotyped way of instruction. This has in turn hider the smooth transition from the stereotyped way of instruction (traditional lecture method) to the integration of ICTs in already existing curriculum for better instruction. To buttress further, ICTs provide a motley of tools that may help in transforming the present often isolated teacher-centered and text-based classroom activities into a rich, student-focused multimedia and interactive knowledge environment [5]; [4]. Therefore, in order to resolve the challenges faced, the gap created has to be filled through institutions of learning accepting and integrating the new technologies and appropriate ICT tools for learning [3].

In furtherance, [6] posited that for institutions of learning to actually make an impact in the teaching and learning process then they must move towards the objective of transforming the traditional paradigm of teaching and learning. As a matter of fact, technology is said to be the driver of the new economy and human capital is its fuel. Therefore the significance of human capital in the new economy, is conceptualized as workers' knowledge that results in effective and efficient performance [7]. In this wise, the integration of ICT into teaching and learning will create a relationship between pedagogy (teaching tactics) and technology (ICT), this will in turn enhance acquisition of ICT skills which is not the only concern, but employing the acquired skills to improve teaching and

learning. According to [3], the infusion of ICT in pedagogy should be such that it tends to enhance learning through a new learner-centered culture. It also fosters enquiry and exploration, promotes collaboration, motivates, and engages learners. The use of ICTs does not only allow the move from reproductive model of teaching and learning but also allows an independent, autonomous learning model that promotes initiation, creativity and critical thinking with independent research [3].

The development and utilization of ICTs in technical and vocational education and training (TVET) have been one of the major area emphasized by [8], due to the fact that ICT tools are becoming inexpensive, reachable and highly interactive, in which their application into all levels of education is expected to be imperative in making educational results labour-market oriented, and in the transformation of contents, methodology, as well as promote information literacy is predicted as a basic to human survival [9], in an increasing digitalized world as it authorizes individuals in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals [8]. That is to say, information literacy which can be described in a lay mans term as the ability of knowing how to use ICT tools is the sustaining force of a knowledgeable society [9]. Therefore, to enhance quality of learning in classrooms using technology, there is need for teachers of technology in technical and vocational education and training to equip themselves with the required ICT skills, and make professional development for teachers a key issue in education.

Although, studies reiterating the advantages of ICTs in education cannot be exhausted in a dynamic knowledge and research based society, the literature on the integration of ICTs in teaching and learning of TVET is often not comparable to that of general education and has attracted only few scholars advocacy. This paper arises out of increased concern of more literature on the integration of ICTs in effective teaching and learning of TVET. Therefore this

study examined factors militating against the integration of information and communication technologies for effectiveness of technical and vocational education and training (TVET).

2. Related Work in Information and Communication Technology (ICT) and TVET

The term ICT integration according to [10] connotes a range of learning environments from a stand-alone computer in a classroom to a situation where the teaching is done by the computer through pre-packaged ‘teacher-proof courseware’. There is evidence to suggest that the term ‘integration’ is often used interchangeably with the more similar word ‘use’. According to [10], ICT integration is generally taken as a term to reflect a change in pedagogical approach to make ICT less peripheral to schooling and more central to student learning.

In some instances, and on a lighter note, ICT integration is seen as a set of typologies referring to how ICT is used in schools particularly when used to describe the introduction of ICTs as an integral component of broader curricular reforms that are changing not only how learning occurs but what is learned.

In this wise the usefulness of ICT goes beyond just helping learners learn better, but it can also help them learn better things. Better and improved learning will not be possible from finding ways for teachers to instruct, rather through providing the learners with better opportunities to think, analyze, and construct. To integrate is to seamlessly combine components, parts or elements into a complex but harmonious whole. Furthermore, the word seamlessness is implicit in the definition that ICT integration is the degree to which ICT vanishes into the background of the classroom.

Information and communication technology integration is a term and also a conglomeration of three domains, namely, Information Literacy, Information Policy, and Knowledge Management. The point of interest here is that integration speaks of processes rather than of hardware infrastructure and is

exclusive of operational ICT skills. It is interesting in its partial encompassing of the acceptable sequence of data-information knowledge. Similarly, integration is seen as a key outcome in any situation where a new activity or process is being introduced to foster activity. The assumption that teacher's would know how to integrate, points to one main area of support that is oftentimes overlooked, and that is concerning the actual integration for instructional purpose. Contextually, in the researchers view ICT integration is as a process of introducing information and communication technology gadgets in the teaching and learning process for classroom effectiveness.

Technical and Vocational Education and Training (TVET) is a recognized and effective training process by which quality up-to-date information, literate and knowledgeable workers are prepared, trained or retrained worldwide [11]. [12] defined TVET as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. In a nutshell, TVET prepares human resources for the ever changing world of work. In that, for effective participation in the world of work the study of technologies and related sciences as reflected in the definition is of paramount significance that can be realized with adequate information communication technology (ICT) arrangement in TVET institutions [11]. [11] further stated that practical skills can now be delivered virtually via 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.

As reflected in the definition, it is therefore of paramount significance that TVET goals can be realized with adequate ICT arrangement in TVET institutions. With this in place, teachers of technology can teach practical skills

through virtual means and organized ICT setting. The teaching of practical skills using traditional/conventional teaching method is now old fashioned, with its attendance passiveness and poor participation on the part of learners; the traditional method of instruction also encourage route learning, does not permit concretization of phenomena and tends to restrict the learning process of students in larger proportion.

Consequently, students memorize concepts taught in the classroom and are unable to retain their knowledge gained. However, some programmed instructions and other complex tasks inform of software and interactive video designed to ease of the teaching of practical skills. Also, jobs and skills that require only hands-on experiences are now possible via computer assisted instructional programmes. According to [13] who found that the need for ICTs integration in TVET remains vital, bearing in mind the impact ICTs make in the world of work which requires knowledgeable workers skilled in information technologies. [14] conducted a study and further buttressed that, 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, providing new and transformative models of development. Technical and vocational education and training (TVET) is aimed at preparing individuals for self-reliance, self-employed and to become a medium of evolution for the world of work; by grooming in them the prevailing skills needed for effectiveness in the current day knowledgeable economy.

Consequently, TVET as described by [15] is an instrument for reducing extreme poverty. This distinctive feature of TVET makes ICT application mandatory a component which can serve as a catalyst in achieving future reliable manpower workforce. Nevertheless they exists certain barriers to successful integration of ICT in teaching learning environments. Classification of barriers found in the literature is teacher-level barriers versus school-level barriers. [16] grouped the barriers according to whether they relate to the individual (teacher-level

barriers), such as lack of time, lack of confidence and resistance to change, or the institution (school-level barriers) such as lack of effective training in solving technical problems and lack of access to resources. The implication therefore is for TVET institutions to deploy and strengthen their commitment towards training and producing ICT-oriented individuals that will meet up and fit into the world of work. One of the possible means to achieve the training and production of ICT-oriented individuals that will fit into the world of work is to explore the enabling measures of integrating ICTs for effective TVET. This will in turn boost manpower development for the world of work.

In the current economy situation, information and communication technology are becoming ubiquitous. By the year 2020, virtually everybody living in industrialized countries will have access to multimedia services based on mobile or other terminals. [17] conducted a study on teacher preparedness in integrating information and communication technology in biology classroom in Uasin Gishu County, Kenya. [17] stated that improving teachers' integration of ICT in teaching has proved to be a difficult task for the education system. Research has identified several factors which can impact on the effectiveness of ICT training courses when assigned for teachers, including: individual differences among teachers, school culture and teacher interaction and follow-up and ongoing support provided to teachers when they try to implement their newly developed skills. Individual differences among teachers: ICT professional development courses should consider the fact that teachers are widely divergent regarding their knowledge about ICT [18]. Such considerations can prevent programmes from frustrating those teachers with little or no experience in using ICT, and at the same time avoid disappointing those teachers with better ICT knowledge and skills [16]. From the research findings, it revealed that the ongoing support for ICT integration in teaching and learning Biology makes it possible for teachers to upgrade their knowledge and skills thus teachers require ongoing professional development and support [16].

Consequently, the integration of ICTs for effectiveness of TVET will gear towards changing the focus of manpower needs in the world. This will range from training and transforming individuals on skilled-based to ICT-competent-based work force. Therefore, the demand for the integration of an effective ICT-based learning environment for TVET becomes imperative. Integration of ICTs for effectiveness of TVET will ease the expansion and reinforcement of TVET. This will be through growing networking and information dissemination opportunities and would extremely curtail further the supply of mechanically operated training hardware, thereby offering students individualize learning even after school hours. Furthermore, ICTs in TVET will propagate the ability to make available practical learning experiences that are needed to the instantaneous work situations, which in the interim would encourage students to reflect and articulate vital elements that are common across tasks. In that manner, students could increasingly vary the context in which their abilities would carry them in aptitude and skills acquisition.

3. Proposed Factors Militating the Integration of ICT in TVET

Integration of ICT in technical and vocational education programmes is a complex process and one that may encounter a number of difficulties in the present day economy. Empirical investigations conducted over the years highlighted amongst others glaring factors militating the integration of ICT in TVET as follows:

3.1 Teacher Training in ICT

Naturally, integrating ICT for instruction, i.e teaching, learning and managing educational institutions, just like any other innovations compels development of new set of skills, attitudes and pedagogical approach. This approach requires continuous training programs to build sufficient capacity among teachers, developers, educators and administrators. This implies that, while most schools (especially in developed countries, and relatively in urban areas of developing countries) are now equipped with computers, internet access, and occasionally

more sophisticated equipment such as interactive whiteboards and effective e-learning materials, they require far more than the mere introduction of hardware in the classroom [19]. In this wise, for these ICT equipment to mean anything, teachers must be conversant in utilizing them to implement an integrated approach in ICT use and new approaches.

Teacher training in ICT is a major factor militating against ICT integration. This is so because teachers are the main personnel when it comes to knowledge transfer. Therefore it becomes imperative to train teachers in line with ICTs introduced in schools. The issue of training is certainly complex because it is important to consider several components to ensure training effectiveness. These are, time for training, pedagogical training, skills training, and an ICT use in initial teachers training. Therefore the lack of training in digital literacy, lack of pedagogic and didactic training in how to use ICT in the classroom, and lack of training concerning the use of technologies in science specific areas are obstacles to using new technologies in classroom practice.

For effective practice of ICT integration, school administrators ought to organize training sessions and teachers must devout their time to become familiar and acquainted with ICT possibilities and new innovation. A major challenge for the use of ICT at university and other levels of education is the initial training of teachers. Due to lack of initial training, many teachers are afraid to integrate ICT in their teaching practice. The initial training of teachers in ICT enhances their practical know-how in the use of ICT in the teaching and learning processes. However, the acquisition of intermediate computer skills by teachers is also necessary to enable them benefit fully from ICT usage. Such skills which include evaluation of material found on websites; how to make educationally appropriate use of resource for learning, including how to develop visual literacy skills, adapt material, design differentiated activities using the same resources and develop material are compelling factors for mastery. Finally, due to constant changes in the educational and technological sector,

teachers need to be lifelong learners to keep themselves updated with the changes in ICTs.

3.2 Teachers' Attitude Toward ICT

Teachers' attitude exhibited in the use of computers and internet connections for teaching-learning purposes is another factor which tends to militate the integration of ICT for TVET. Unfortunately, whilst some have passionately integrated technology (such as computers), others have guardedly welcomed it whilst others have out rightly rejected it. The resistance in the acceptance of ICT in the classroom is oftentimes said to be primarily based on the risk of teachers losing influence over the values and directions of classroom activity. However, it is very important; to note that resistance to change is not necessarily a barrier in itself but could also be an indication of the presence of a much deeper problem. This deeper problem could be the lack of the necessary knowledge, skills and attitude to adapt to the changes which will necessarily be brought in education by technology. Thus, the motivation and confidence to stare integration of ICT for TVET could only come from having access and the right attitude to ICT equipment and possessing the required ICT skills for effective utilization. Therefore, the leadership role of individual schools will play an equally important part in shaping the attitude and responses of teachers to ICT innovation. This will in turn make school owners appropriate authorities to maintain cordial relationship with teachers for academic growth [20].

3.3 Poor Infrastructure

Apart from teachers' lack of capacity and attitude toward the use of ICT, poor and weak infrastructure remains a major obstacle in many developing countries. For instance, a survey in the United States of America by the National Centre for Education Statistics (NCES) in 2000 using the Fast Response Survey System (FRSS) revealed that 99% of full-time regular public school teachers had access to computers or the internet somewhere in their schools. Driving this home, this is still a dream in many developing countries such as Nigeria.

Nonetheless, many African countries have increased the number of computers in their schools in recent years or have plan in place to enable teachers acquire ICT education during their training programmes. This is all efforts to increase teachers' and learners' skills and access to computers during teaching and learning [20].

In some African countries, a formidable obstacle to the development and integration of ICT for TVET is infrastructural deficiencies with electricity as the major factor. Computer equipments are designed to function with other infrastructure such as electricity under controlled conditions. However, for the past fifteen years some African countries have been having difficulty providing stable and reliable electricity supply to every nook and cranny of the country. Currently, there is no part of the country, which can boast of electricity supply for 24 hours a day except probably areas where government officials reside and this has reduced the pace at which most activities are been carried out. Electricity as an infrastructure is a major need for the run of ICTs [20]. Most individuals need this infrastructure to drive/run certain businesses. The epileptic nature of power in some African countries has led to damage of electronic equipment such as radio, television, video recorder and even ICT equipment such as computers. When electricity supply is not constant, it becomes difficult to keep high-tech equipment such as computers functioning, especially under extreme weather conditions as obtained in some African countries. The high level of dust during the dry season in some African countries also damages obsolete ICT equipment.

In some rural areas in most African countries, most inhabitants do not have access to electricity, thereby depriving them and causing a great problem in trying to integrate ICTs in such locality. The few Internet access available in Nigeria is found in urban centers. These environmental realities are difficult to manage because ceiling fans, sealed rooms and stable electricity are lacking in many urban homes and rural areas. Another obstacle to ICT development and

integration in teaching and learning in some African countries is inadequate telecommunication facilities which are also ICT tools. The inception of the Global System of Mobile Communication (GSM) and many other ICT tools in most developing countries has fostered overall achievement even far better than many African countries. The crux of the matter is that integrating ICTs in teaching and learning processes requires adequate and up to date telecommunications facilities which are in short supply. Therefore, this calls for the need for the Federal Government of Nigeria through the Federal Ministry of Education to observe this situation and seeks for new ways of building necessary infrastructure to support ICT integration in teaching and learning.

4. Conclusion

The study found that information and communication technology integration in schools in order to provide tangible teaching solutions in the areas of TVET ought to be adopted. The establishment of disciplinary and educational principles and procedures, and distributing duties among teachers, teaching assistants, workshop attendants and students are crucial elements to establishing a well-managed ICT-integrated class.

By emphasizing these elements, learning process that is more likely to engage students in higher-order thinking and acquisition of hands-on-experience can be facilitated. Therefore, proper planning for ICT integration for TVET requires special understanding of specific hardware and software related to the TVET curriculum.

The study provides evident empirical investigations that the integration of ICT for effectiveness of TVET would guide the Federal Government through its Ministry of Education to see the need to integrate ICT and provide platform that will help pre-service teachers overcome difficulties faced during the use of ICT in their classrooms. The study also provide guide on the need for staff development, teacher training and re-training which are also paramount to supporting the curriculum with technology integration. Hence it was there for

concluded that TVET educators should understand that the ultimate objective of ICT integration is to promote and advance the teaching and learning process and foster acquisition of practical skills rather that replace it. With this idea beforehand TVET will be given a face lift and foster National development.

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Competing Interests

Authors have declared that no competing interests exist.

Authors' contribution

This work was carried out in collaboration between both authors. Author KREO designed the study and wrote the protocol. Author SMN wrote the first draft, managed the written protocol of the study and literature searches. Both authors read and approved the final manuscript.

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