



## Information and Communication Technologies (ICTs) As Veritable Tools for Instructional Delivery in Technical Vocational Education and Training (TVET)

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### ABSTRACT

The study sought to know the relevance, contributions and roles of Information and Communication Technologies (ICTs) in instructional delivery in Technical Vocational Education and Training (TVET). Survey research method was adopted with the population of 300 made up of lecturers and students from Modibbo Adama University of Technology (MAUTECH), Yola, and National Open University of Nigeria (NOUN), Yola Centre. A structured questionnaire of 61 items on the relevance, contributions and roles of ICTs in instructional delivery in TVET was developed. The instrument was designed on a five Likert rating scale weighted as follows: Very Greatly Relevant (VGL = 5); Greatly Relevant (GR = 4); Relevant (R = 3); Slightly Relevant (SR = 2, and Not Relevant (NR = 1). The instrument consisted of Section 'A' – 'D' Section 'A' contained demographic information of the respondents while Section 'B' - 'D' sought information on the Relevance, Contribution and Role of ICT Hardware technologies, ICT Software technologies and ICT networking technologies in instructional delivery in TVET. The instrument was face-validated by three experts. A reliability test was established using Cronbach's Alpha reliability test. Data collected was analyzed using mean and standard deviation to answer the three research questions. The null hypothesis was tested using t-test statistic. The analysis was computer based, with the help of Statistical Package for Social Sciences (SPSS). The result obtained showed that there was no significant difference between the mean responses of TVET instructors and TVET (clientele) students on the relevance and contribution of ICTs in instructional delivery in TVET. The study recommended among other things that Technical Vocational Education and Training (TVET) should be established alongside other conventional school programs to offer recipients long life educational opportunities and training; both states and federal budgets should be raised to at least 30% of the total annual budgets to enable all federal and state schools procure and acquire different ICT hardware technologies, software technologies and networking technologies needed for all school programmes; hardware, software and networking engineering should be integrated into the national school curriculum from primary to tertiary institutions.

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### INTRODUCTION

The world has, in recent times, witnessed tremendous and dramatic changes cum revolutions in almost every sphere of human endeavor; in industries, trade and commerce, engineering and architecture, space travel and exploration, weather forecast, medicine, and education in general; and particularly in Technical Vocational Education and Training (TVET). Central to this change and revolution is the Information and Communication Technology (ICT). According to Wikipedia,

Information and Communication Technology (ICT) is often used as an extended synonym for Information Technology (IT), but is a more specific term that stresses the role of unified communication and the integration of telecommunication (telephone links and wireless signals), computers as well as necessary enterprise software, middleware, storage and audio-visual systems which enable users to access, store, transmit and manipulate information.

Information and Communication Technology (ICT) as posited by Womboh (2008), is a

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composite term which embodies three important concepts; and to understand ICT, one must understand all the three concepts. Information, the author further posits is processed data, or that which aids decision makings. Womhoh sees information as abstract which could also be visualized as well as a commodity which could be bought or sold. In the views of deWatteville and Gilbert (2000), information could be seen as a potential and useful fact, quantity or value that can be expressed uniquely with exactness. deWatteville and Gilbert further posit that whatever is capable of causing a human mind to change its opinion about the current state of the real world is communication. Womhoh further stated that communication refers to the transfer or exchange of information from person to person or from one place to another. When action produces a reaction, whether positive or negative, communication has taken place, James, et al, (2004). Communication, therefore, is “a process which involves the passing of messages through the use of symbols which all parties in the communication encounter understand. It involves the exchange of ideas, facts, opinions, attitudes and beliefs between people. It is not a one way affair. There must be a sender who transmits the message and the receiver to make appropriate decision or how the rest of the exchange should continue”, James, et al, (2004). Technology, on the other hand, refers to the use of scientific knowledge to invent tools that assist human beings in their efforts to overcome environmental hazards and impediments to comfort. In this regard, technology refers to things like the computer, telephone, cell phone, GSM handsets, television, tape records, flop disks, compound disk, among others.

The Canadian Technology Stocks and Startups see technology as “the application of knowledge to the practical aims of human life or to changing and manipulating the human environment. Technology includes the use of materials, tools, techniques, and sources of power to make life easier or more pleasant and work more productive. Whereas science is concerned with how and why things happen, technology focuses on making things happen. Put together, therefore, Information and Communication Technology (ICT) can be said to be the acquisition, analysis, manipulation, storage and distribution of information; and the design and provision of equipment and software for these purposes (Womhoh, 2008). In the view of Ajayi

(2003) information revolution started a number of years ago, with its tremendous impacts felt all over the world on almost all spheres of human endeavours including education, and in particular Technical Vocational Education and Training (TVET), where Business Education belongs.

Technical Vocational Education and Training (TVET) is a concept that encompasses a diverse array of programmes and activities, emphasizing both education and training and extends beyond schools, post-school institutions and work-place enterprises, to community-based non-formal education system. There is also variety in its target clientele who, not only represent a diverse age range-child to adult, but also have different response capacities and socio-economic and cultural backgrounds (Night and Sabot, 2009). In order to address the diverse needs of these clients, TVET offers a considerable range of programmes across countries as well as within them. The extreme diversity of TVET programme is reflected in their forms, structures, educational technologies, curricula, pedagogy, management and funding.

Technical and Vocational Education and Training (TVET) is seen as a deliberate intervention for bringing about learning which would make people more productive (or simply adequately productive), in designated areas of economic activities. This is the distinctive purpose of TVET (Hyland 2009). TVET is also said to be a comprehensive term referring to those aspects of educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitude, understanding and knowledge related to occupations in various sectors of economic and social life (UNESCO, 2002).

Technical Vocational Education and Training (TVET) programme is conducted in a variety of institutions, and the choice of location depends mainly on the goals that the programmes are intended to achieve.

Osinem and Nwoji (2010) posited that there are at least three distinct institutional settings. First, is the school based TVET programme which include initiatives such as the diversification of the whole secondary school system; the *vocationalization* of the school curriculum and instruction of TVET stream and schools parallel to the dominant academic models. Secondly, there are post-school TVET institutional programmes which provide pre-

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vocational market orientated training courses to secondary school graduates. Thirdly, there is the work-based TVET programme, epitomized historically in apprenticeship system and undergoing transformation in the postindustrial era. This type of TVET is found in many countries, but is particularly popular in western nations where there is substantial degree of industrial economy (Osinem and Nwoji, 2010).

The educational needs of these three groups of TVET learners can adequately be catered for with the use of ICTs; whose evolution and development has resulted in a paradigm shift in the educational system. Information and Communication Technologies are changing the way people learn, offering new alternatives to the traditional classroom. Haddad and Draxler (2002) posit that in this new economy, it is essential for learners to have access to education anytime and anywhere. They further stated that lifelong learning and training for the work place cannot be confined to the traditional classroom, since it is unrealistic and unaffordable to continue to ask learners to come to a designated place every time they have to engage in learning". ICTs allow the delivery of education to adapt to an individual needs, as opposed to having the individual adapt to how the education is delivered. Education, Haddad and Draxler further argued, "will not be confined to the four walls of a classroom, but to wherever and whenever the learners deem appropriate; it will not be a location anymore, but an activity; a teaching/learning activity. ICTs have the capability of providing personalized, just-in-time, up-to-date, and user-centered education activities"

Similarly, Information and Communication Technologies (ICTs), as noted by the Industry Canada (2007), are revolutionizing education by removing distance from education and making knowledge more accessible to all. Technology-enhanced learning will play a crucial 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 (Human Resources Development Canada, (HRDC) 2008). It is not surprising therefore to see a growing interest in Technology-Based Learning (TBL) across the world. Technology-Based Learning (TBL) may be defined as the array of hardware and software used in the teaching and learning that include computer-based

training systems, multimedia systems, electronic performance support systems, telecommunications systems, as well as the Internet with World Wide Web systems. HRDC (2008) asserts that the rate at which the Internet is being accessed keeps increasing at lightning speed. TBL can enhance teaching and learning; it has the potential to become cost-effective as it offers greater flexibility regarding time and location of training delivery (Furst-Bowe, 2006). Additionally, technology also provides greater flexibility to adapt teaching and learning to meet learners' cognitive and learning styles (Lafreniere, 2007).

Aside their potential to providing education to anyone, anytime and anywhere, ICTs have encouraged new research and development in teaching and learning techniques. Dean (2000) stated that educational institutions must adopt a new way of teaching; arguing that students learn better through experimental and emotional learning rather than through memorizing names and dates, and thus educators must simulate real world environment. Technologies can be used to facilitate these types of environment. An example, Dean (2002) further posited is using flight simulators to train novice pilots. This view is corroborated by Cheong, Charleson and Jolliffe (2000) when they noted that:

*The Singapore Polytechnic Virtual College relies on Intranet/Internet Technology to deliver its programmes. The Virtual College operates and administers a large collection of interactive, online learning modules. It promotes flexible learning where students can log on the Polytechnic Networks from a computer on-or off-campus using the Internet. The two major goals of this college are to provide continuing education and Lifelong learning for graduates and professional in industry and to Supplement conventional lectures and improve teaching and learning Information Technology for full-time students.*

According to Cheong et al (2000) the virtual college caters for two sets of learners: working professionals and on-campus students. By using the Internet, working professionals can re-train themselves in different areas whenever they feel the need to do so. On campus student can use the Virtual College as a resource to supplement the

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conventional learning environment. They can use online materials to reinforce concepts and retrieve lecture information that they may have missed. Cheong (2000) further asserted that eighty percent of students surveyed found the Virtual College useful for “supplementing their course work, revision, remedial learning and making up missed lectures”

There are a variety of different ICT technologies that can be used in TVET; and each of these technologies has its own redeeming qualities and limitations and different situation call for different technologies. These can be broken into three; namely hardware technologies which include the computer, interactive television, satellite, overhead projectors, simulators, modern, and compact disks flash drives, radio, and tape-recorder among others. The second group of technologies relevant to instructional delivery in TVET is the software technologies. Application software is used to accomplish specific task. These include the Microsoft word, desktop publishing, Power-Point presentation, database, World Wide Web. Computer Aided Design CAD), Computer Aided Instruction (CAI); while the third group falls under the networking. Computer networking is the connectivity that links one computer to the other which allows sharing of files. Instances are Wide Area Network (WAN), Local Area Network (LAN), Metropolitan Area Network (MAN) Broadband, and Home Automation Network (HAN) among others. Each and every one of these technologies can be seen as a veritable educational tool very helpful in instructional delivery in TVET especially in the Open and Distance Learning, the Post School TVET Institutional Programme and the Work-Based TVET Programme,

Some 14 years ago, between 5<sup>th</sup> – 9<sup>th</sup> March 1990, more than 119 countries gathered at Jomtien in Thailand, in a world conference coordinated by the United Nation Educational, Scientific and Cultural Organization (UNESCO). What dominated the world conference was the discourse on how to meet the learning needs of all children, youth and adults by the year 2015. The outcome of the conference was a declaration tagged Education for All (EFA). Nigeria was a signatory to that document. This was followed by another world Education Conference between 26<sup>th</sup> – 28<sup>th</sup> April 2000, in Dakar, Senegal. The aim of this conference was to evaluate and assess the progress of Jomtien declaration. Member countries were

assessed individually and reports obtained were given at six regional conferences in 2000, thus: Region 1: Sub-Saharan Conference on EFA; Region 2: Asia and Pacific Conference on EFA...; Region 3: The Arab Regional Conference on EFA...; Region 4: The Third Inter-Ministerial Review Meeting of the E-9 countries; Region 5: Conference on Education for all Europe and North America; Region 6: Regional Education for All Conference, UNESCO (2000).

The report noted that although many national governments were committed to the World Declaration and the Framework for Action, they are still far from achieving EFA goals and targets.

It stated particularly:

*That more than 113 million children have no access to primary education, 880 million adults are illiterate, and gender discrimination continues to permeate Education system, and the quality of learning and the acquisition of human Values and skills fall far short of the aspiration and needs of individuals and societies. Youth and adults are denied access to the skills and knowledge necessary for gainful employment and full participation in their societies. Without accelerated progress towards education for all, nationally and internationally agreed targets for poverty reduction will be missed, and Inequalities between countries and within societies will widen (UNESCO, 2000).*

The above report has made it imperative for some education experts to call for a total restructuring of educational system to cater for the needs of all. Stern, Marley & Merritt (2006) noted that an analysis of recent international initiatives identified the four underlying principles of effective school-to-work programme: new curricula should be created that integrate vocational and academic studies, occupational and educational performance standards should be explicitly related to each other; initial education and training should include a certain amount of work-based learning for all students; employers and educators, including both vocational and academic educators, must share both responsibility and power in new school-to-work systems, Haddad and Draxler (2002), noted that it is going to be very difficult if not impossible for countries to meet the objective learning for all

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anywhere, anytime. The inability to meet this challenge, Hadded and Draxler further observed, is self-inflicted because we tend to think the linear scaling; that is using the same model of education (a school constrained by space and time), but more of it and on a larger scale. They authors asserted that what really needs to be done is to think differently and radically. They posited that the education model developed for the Industrial Age cannot achieve educational empowerment effectively in the Information Age, and that with ICT tools; we should be able to evolve the components of the conventional model into the corresponding components of the new model.

They therefore asserted that if Education for All should be a dream to be realized in the nearest future, TVET system should introduce more-friendly training, delivered at their doorsteps at times convenient to them through appropriate mode of training.

This may take the form of mobile training; distance training, strengthening training by master craftsmen and such other innovative modes of training delivery, which ICT has been considered most appropriate.

#### **Purpose of the Study**

The study sought to know the relevance, contributions and roles of Information and Communication Technologies (ICTs) in instructional delivery in Technical Vocational Education and Training (TVET).

Specifically the study sought to:

1. Determine the extent to which ICT hardware technologies are relevant in instructional delivery in TVET
2. Determine the extent to which ICT software technologies are relevant in instructional delivery in TVET
3. Determine the extent can ICT networking technologies can contribute in instructional delivery in TVET.

#### **Research Questions**

1. What is the relevance of ICT hardware technologies in instructional delivery in TVET?
2. What are the contributions of ICT software technologies in instructional delivery in TVET?
3. What are the roles of ICT networking technologies in instructional delivery in TVET?

#### **Hypothesis**

H<sub>01</sub>: There is no significant difference between the mean responses of TVET instructors and TVET clientele (students) on the relevance of Information and Communication Technologies (ICTs) in instructional delivery in Technical Vocational Education and Training (TVET).

#### **METHODOLOGY**

The study adopted survey research method. The population was 300, made up of lecturers (25) and students (250) from Modibo Adama University of Technology (MAUTECH) and National Open University of Nigeria (NOUN) Yola study centre. A structured questionnaire of 61 items on the relevance, contribution and role of ICTs in instructional delivery in TVET was developed. The instrument was designed on a five Likert rating scale weighted as follows: Very Greatly Relevant (VGL = 5); Greatly Relevant (GR = 4); Relevant (R = 3) Slightly Relevant (SR = 2) and Not Relevant (NR = 1).

The instrument consisted of Sections 'A' – 'D'. Section 'A' contained demographic information of the respondents while Sections 'B' to 'D' sought information on the Relevance, Contribution and Role of ICT Hardware technologies, ICT software technologies and ICT networking technologies in instructional delivery in TVET. The instrument was face-validated by three experts. One, from the Measurement and Evaluation, Science Education Department, Modibo Adama University of Technology (MAUTECH), Yola. One, from the Department of Information and Communication Technology, MAUTECH, Yola and one from the National Open University (NOUN), Yola, study centre. A reliability test was established using Cronbach Alpha reliability test. The instrument for data collection was administered to the respondents and retrieved by the researcher himself. Data collected was analyzed using mean and standard deviation to answer the three research questions. The null hypothesis was tested using t-test statistic. The analysis was computer based with the help of Statistical Package for Social Sciences (SPSS). Items with mean values of 4.56 and standard deviation of 0.57; 3.69 with standard deviation of 0.93; 3.21 and standard deviation of 0.55; 2.14 and standard deviation of 0.21 were accepted as Greatly Relevant, Relevant, Slightly Relevant, and not Relevant, respectively. In testing the hypothesis, the decision





rule was that any p value greater than level of significance, the hypothesis will be accepted or if less, the hypothesis will be rejected.

**RESULTS:**

**Research Question 1:** What is the relevance of ICT hardware technologies in instructional delivery in Technical Vocational Education and Training (TVET)?

Table 1: Mean and Standard Deviation of respondents on the relevance of ICT hardware technologies in instructional delivery in TVET.

S/No.	Items	SD		Decision
1	The Computer	4.56	0.57	VGR
2	Overhead Projector	3.21	0.55	R
3	Video Projector	3.27	0.56	R
4.	Digital Cameras	3.21	0.61	R
5	Scanners	3.19	0.58	R
6	Telephone	2.14	0.41	SR
7	Radio	2.09	0.37	SR
8	Tape Recorder	2.09	0.30	SR
9	CD player	3.35	0.62	R
10	Slide Projector	3.35	0.58	R
11	Film strip projector	3.33	0.47	R
12	Simulators	3.23	0.53	R
13	Electronic Board	4.20	0.93	GR
14	Satellite	4.22	1.00	GR
15	Interactive television	3.76	0.56	GR
16	Modern	3.73	0.60	GR
17	Broadcast radio	3.86	0.34	GR
18	Cellular radio	3.85	0.48	GR
19	Communication Satellites	3.91	0.29	GR
20	Global positioning system	3.69	0.55	GR
21	Floppy disk	2.14	0.38	SR
22	Optical disk (CDs & DVD)	2.93	0.94	R
23	Magnetic Tape	2.84	0.97	R
24	Smart card	2.89	0.97	R
25	Flash memory	2.99	1.00	R
	<b>Cluster</b>	<b>3.28</b>	<b>0.21</b>	<b>R</b>

Result in Table 1 showed that the mean ratings and standard deviation of respondents on relevance of ICT hardware technologies in instructional delivery in TVET. Result showed that computer with a mean rating of 4.56 and a standard deviation of 0.57, was rated Very Greatly Relevant by the respondents; while items 13 – 20 were rated greatly relevant with mean rating of 4.20, 4.22, 3.76, 3.73, 3.86, 3.85, 3.91, 3.69 with standard deviations of 0.93, 1.00, 0.60, 0.34, 0.48, 0.29 and 0.55 respectively. This means that Electronic board, Satellite, Interactive television, Modem, Broadcast radio, Cellular radio, Communication satellite and Global Positioning System are greatly relevant ICT hardware technologies in instructional delivery in TVET. Furthermore, Overhead; projector, Video

Projector, Digital Cameras, Scanners, CD Players, Slide projector and Flash memory, were rated Relevant by the respondents with mean ratings of 3.21, 3.27, 3.21, 3.19, 3.35, 3.35, 3.33, 3.23, 2.93, 2.84, 2.89 and 2.99 and standard deviation of 0.55, 0.56, 0.61, 0.58, 0.62, 0.58, 0.47, 0.53, 0.94, 0.97, 0.97, 1.00 respectively. However, Telephone, Radio, Tape recorder, Floppy disk were rated slightly relevant with mean of 2.14, 2.09, 2.09 and 2.14 respectively. The cluster mean of 3.28 with a standard deviation of 0.21 showed that ICT hardware technologies are relevant in instructional delivery in Technical Vocational Education and Training (TVET).

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**Research Question 2:** What are the contributions of TVET? ICT software technologies in instructional delivery in

**Table 2:** Mean and standard deviation of respondents on the contributions of ICT software technologies in instructional delivery in TVET.

S/No.	Items	SD		Decision
26	Presentation graphic software	4.07	0.98	GR
27	Web CT	4.29	0.84	GR
28	www based multimedia	4.17	0.94	GR
29	Web based training	4.27	0.87	GR
30	Word Processing	4.43	0.84	GR
31	Spread sheet	4.35	0.83	GR
32	Database	4.23	0.95	GR
33	Graphics and multimedia	4.34	0.81	GR
34	Desktop publishing	4.27	0.70	GR
35	Educational entertainment and reference	3.29	0.86	R
36	Accounting and personal finance software	2.80	0.92	R
37	Computer aided design	4.27	0.70	GR
38	Project management and collaboration software	4.28	0.77	GR
39	Note taking and personal planning	4.37	0.85	GR
40	Computer aided instruction	4.31	0.79	GR
<b>Cluster Mean</b>		<b>4.11</b>	<b>0.45</b>	<b>GR</b>

Result in table 2 showed the mean ratings and standard deviation of respondents on the contributions of ICT software technologies in instructional delivery in TVET. Result showed that Presentation graphic software, Web CT, www based multimedia, Web based training, Word processing Spread sheet, Database, Graphics and multimedia, Desktop publishing, Computer aided design, Project management and collaboration software, Note taking and personnel planning and Computer aided instruction with mean ratings of 4.07, 4.29, 4.17, 4.27, 4.43, 4.35, 4.23, 4.34, 4.27, 4.27, 4.28, 4.37 and 4.31 with standard deviation of 0.98, 0.84, 0.94, 0.87, 0.84, 0.83, 0.95, 0.81, 0.70, 0.70, 0.77, 0.85 and 0.79 respectively were rated greatly relevant ICT

software technologies in instructional delivery in TVET, while Educational entertainment and reference and Accounting and personal finance software with mean of 3.29 and 2.89 respectively were Relevant ICT software technologies in instructional delivery in TVET.

The cluster mean of 4.11 and a standard deviation of 0.45 showed that the ICT software technologies are greatly relevant in instructional delivery in TVET.

**Research Question 3:** What are the roles of ICT networking technologies in instructional delivery in TVET?

**Table 3:** Mean and standard deviation of respondents on the roles of ICT networking technologies in instructional delivery in TVET

S/No.	Items	SD		Decision
41.	Wide Area Network (WAN)	4.20	0.82	GR
42	Metropolitan Area Network	4.35	0.73	GR
43.	Local Area Network (LAN)	4.21	0.75	GR
44.	Home Area Network	3.97	0.94	GR
45	Personal Area Network	4.07	0.94	GR
46	Home Automatic Network	4.26	0.85	GR
47	Client/Server Network	2.68	0.92	GR
48	Peer-peer Network	3.27	0.60	GR

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49	Intranets	3.45	0.55	R
50	Extranets	3.20	0.57	R
51	Virtual Private Network	3.21	0.66	R
52	Bus Networks	3.39	0.65	R
53	Ring Network	2.10	0.30	SR
54	Star Network	2.09	0.29	SR
55	Ethernet	2.05	0.26	SR
56	Token Ring	3.29	0.64	R
57	Narrow-band	3.21	0.64	R
58	Broadband	3.51	0.62	GR
59	Wireless Application Protocol	3.42	0.67	R
60	Infrared Wireless Transmission	3.33	0.76	R
61	Micro Wave	2.08	0.30	SR
<b>Cluster Mean</b>		<b>3.36</b>	<b>0.25</b>	<b>R</b>

Result in table 3 showed the mean ratings and standard deviation of respondents on the roles of ICT networking technologies in instructional delivery in TVET. Result showed that Wide Area Network (WAN), Metropolitan Area Network (MEN), Local Area Network (LAN) Home Area Network (HAN), Personal Area Network PAN), Broadband with mean ratings of 4.20, 4.35, 4.21, 3.97, 4.07, 4.26 and 3.51 respectively were rated greatly relevant by the respondents, while Client/Server Network, Peep-to-peer Network, Intranets, Extranets, Virtual Private Network, Bus Network, Token Ring, Narrow-band, Wireless Application Protocol and Infrared Wireless Transmission with mean ratings of 2.68, 3.27, 3.45, 3.20, 3.21, 3.39, 3.29, 3.21, 3.42 and 3.33

respectively were rated Relevant. However, Ring Network, Star Network, Ethernet and Micro Wave with mean ratings of 2.10, 2.09, 2.05 and 2.08 respectively were rated slightly relevant. The cluster mean of 3.36 with a standard deviation of 0.25 showed that the role of ICT networking technologies in instructional delivery in TVET is relevant.

**Hypothesis:** There is no significant difference between the mean responses of TVET instructors and TVET cliental students on the relevance and contribution of Information and Communication Technologies (ICTs) in instructional delivery in Technical Vocational Education and Training (TVET).

**Table 4:** t-test analysis of the difference between the mean responses of TVET instructors and TVET clientele students on the relevance and contribution of (ICTs) in instructional delivery in TVET.

Group	SD	t-cal	df	Sig.	Remark
TVET Instructors	3.54	0.49	148	.63	NS
TVET Clientele	3.51	0.25			

Result in table 4 shows that there was no significant difference between the mean responses of TVET instructors and TVET clientele students on the relevance and contribution of ICTs in instructional delivery in TVET. The calculated t-value was 0.49 with a degree of freedom of 148 and the probability value of .62. Since the probability value of .62 is greater than 0.05 level of significance set as bench mark, the null hypothesis of significant difference between the mean responses of TVET instructors and TVET clientele students on the relevance and contribution of Information and Communication Technologies (ICTs) in instructional

delivery in Technical Vocational Education and Training (TVET) is therefore not rejected. Inference drawn, therefore, is that the TVET instructors and TVET clientele students did not differ in their opinion on the relevance and contribution of information and communication technologies (ICTs) in instructional delivery in Technical Vocational Education and Training (TVET).

#### DISCUSSIONS OF FINDINGS

The study sought to establish the relevance, contribution and roles of Information and Communication Technologies (ICTSs) in instructional

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delivery in Technical Vocational Education and Training (TVET). The results obtained showed the mean ratings and standard deviation of respondents on the relevance of ICT hardware technologies in instructional delivery. The computer with a mean rating of 4.56 and standard deviation of 0.57 was rated very greatly relevant by the respondents, while items 13 – 20 were rated greatly relevant with the mean rating of 4.20, 4.22, 3.76, 3.73, 3.86, 3.85, and 3.69 with standard deviation of 0.93, 1.00, 0.60, 0.34, 0.48, 0.29 and 0.55 respectively. This means that electronic board, satellite, interactive television, modem, broadcast radio, cellular, communication satellite, and global Positioning System (GPS) are greatly relevant ICT hardware technologies in instructional delivery in TVET.

The second research question was what are the contributions of ICT software technologies in instructional delivery in TVET? Results obtained showed that presentation graphic software, web CT, www based multimedia, web based training, word processing, spread sheet, database, graphic and multimedia, desktop publishing, computer aided design, project management and collaboration software, note taking and personnel planning and computer aided instruction with mean rating of 4.07, 4.29, 4.17, 4.27, 4.43, 4.35, 4.23, 4.34, 4.27, 4.27, 4.28, 4.37 and 4.31 with standard deviation of 0.98, 0.84, 0.94, 0.87, 0.84, 0.83, 0.95, 0.81, 0.70, 0.70, 0.77, 0.85 and 0.79 respectively were rated greatly relevant ICT software technologies in instructional delivery in TVET, while educational entertainment and reference and accounting and personal finance software with means of 3.29, and 2.89 respectively were rated as relevant ICT software technologies in instructional delivery in TVET.

Also on the ICT networking, result obtained showed that Wide Area Network (WAN), Metropolitan Area Network (MEN), Local Area Network (LAN), Home Area Network (HAN), Personal Area Network (PAN), Broadband with a mean rating of 4.20, 4.35, 4.21, 3.97, 4.07, 4.26 and 3.51 respectively were very greatly rated by the respondent as playing significant roles in instructional delivery in TVET; while client/server network, peep-to-peep network, intranets, extranets, virtual private network, bus network, token ring, narrowband, wireless application protocol and infrared wireless transmission with mean rating of 2.68, 3.27, 3.45, 3.20, 3.21, 3.39,

3.29, 3.21, 3.42 and 3.33 respectively were rated significantly relevant.

From the above, it can be seen that the relevance, roles and contributions of ICT technologies in instructional delivery in TVET is very crucial. This is in congruence with the view of Wonacott (2001) who noted that “the increased use of ICTs has resulted in the major paradigm shift, from a total dependence on the objectivist paradigm to a growing adherence to the cognitive and constructivist paradigms. For examples the use of ICTs in distance education has resulted in a pedagogy, which is constructivist, collaborative and interactive” Also Industry Canada (1997) observed that ICTs are revolutionizing education by removing distance from education and making knowledge more accessible to all.

## RECOMMENDATIONS

Based on the findings, Technical Vocational Education and Training (TVET) should be established alongside other conventional school programs to offer recipients long life educational opportunities and training.

1. Both states and federal budgets should be raised to at least 30% of the total annual budgets to enable all federal and state schools procure and acquire different ICT hardware technologies, software technologies and networking technologies needed for all school programmes.
2. Hardware, software and networking engineering should be integrated into the national school curriculum from primary to tertiary institutions.

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