Wearable Technology Maintenance Skill Needs of Technical College Students for Job Creation in Rivers State

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***Abstract*: This study which determined wearable technology maintenance skill needs of technical college students for job creation in Rivers State adopted a descriptive research survey design. The study was carried out in Rivers State. Three research questions were answered while corresponding null hypotheses were formulated and tested at 0.05 level of significance. The population of the study comprised of all electronic technicians in Rivers State and 49 electrical and electronic trades teachers in all the four Government Technical Colleges in Rivers State. Electrical/Electronic trades teachers were not sampled due to small population size while 170 electronic technicians were selected through accidental sampling technique. Hence, a total of 219 respondents was used as sample for the study. The instrument for data collection was a 105 item self-structured questionnaire titled: Wearable Technology Maintenance Skills for Job Creation. The reliability of the instrument was established as 0.80 using Cronbach's Alpha method of reliability. Data collected were analysed using mean with standard deviation statistical tools to answer the research questions while z-test was used to test the null hypotheses at 0.05 level of significance. Findings from the study revealed that the students need the ability to; disconnect the upper ribbon cable gently, check the sound balance in device settings among others. The study also revealed the challenges associated with technical college students in the use of modern tools and equipment for the maintenance of wearables. Based on the findings of the study. It was recommended among others that National Board for Technical Education should ensure that the curriculum developers integrate smartwatch and head mounted display maintenance skills into the curriculum of technical colleges for this will enable the graduates become self-reliance. Government at all levels should ensure the provision of modern tools and equipment to be used at the technical college workshops and laboratories for effective training of students.**

***Keywords*: Wearables, Technology, Maintenance, Skills, Job-creation, and Needs**

I. INTRODUCTION

The world is facing a worsening unemployment crisis: young people are three times more likely to be unemployed. Over 75 million youths worldwide are either unemployed or underemployed (International Labour Organization (ILO) 2020). National Bureau of Statistics (NBS) (2021) stated that youth unemployment in Nigeria is at 42.5 percent while youth underemployment is at 21 percent and that this figure is projected to increase further in 2022. Given the poverty and rising unemployment rate in Nigeria, with its attendant consequences and the reality that government cannot provide the needed jobs for the growing population, it becomes imperative for people to create jobs to stimulate growth and economic development (Akiri, Onoja, & Kunanzang, 2016).

Job creation either in the form of paid job or starting up a small business or large-scale business is a product of economic growth. Ayeni, Sani, Andeshi, Ibrahim, and Adamu (2021) defined job creation as a process of creating new jobs for the unemployed and the underemployed without necessarily displacing people already employed in other economic activities. Training technical college students for job creation has become one of the major problems that plagues Nigeria in its effort to produce competent manpower for economic development (Amede, 2020). This is because training offered in technical college exposes students to the acquisition of practical skills and basic scientific knowledge which enhances self-reliance.

It has been observed by the researchers that graduate of technical college who are train to be electronic technicians find it difficult to be employed or self-employed or create jobs for others as enshrined in Federal Republic of Nigeria National Policy on Education (FRN) (2013) due to inadequate technical skills. To overcome this challenge, United Nations (2013) stated that the education Nigeria needs is one that is skill-based, technologically grounded and globally competitive. That type of education is Technical and Vocational Education and Training (TVET). FRN (2013) stated that TVET is used as a comprehensive term referring to those aspects of educational processes involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. TVET's mission is to provide trained manpower in applied science, technology, and business particularly at craft, advance craft and technical levels.

The objectives of TVET according to FRN (2013) include, among others the training of students to become self-reliant economically and be able to employ others; the objectives can be achieved through technical and vocational institutions in Nigeria such as Technical Colleges. National Board for Technical Education [NBTE] (2011) stated that technical colleges are post primary institutions where students are giving full vocational training that will enable them to acquire relevant knowledge, skills, and attitude for paid or self-employment in various occupations in the world of work. The technical

training which includes modern maintenance practices is usually carried out in technical colleges by technical college teachers.

Technical college teachers are personnel trained in Colleges of Education (Technical), Polytechnics and Universities who specialize in one of the vocational trades and use a variety of teaching techniques to help students learn and develop skills related to a specific career or field of study (Okoro, 2010). They have the mandate of training the electronic technology students of technical colleges to acquire adequate practical skills and theoretical knowledge of the working principle of electronic devices. Skill according to Cranmer (2014) is an ability and capacity acquired through deliberate, systematic, and sustained effort to smoothly and adaptively carryout complex activities or job functions involving ideas (cognitive skill) things (technical skills) and/or people (interpersonal skills). Acquisition of practical skills by technical college students help in the possession of needed skills for the maintenance and repair of electronic devices.

The Nigerian Educational Research and Development Council (NERDC, 2015) define maintenance as any action taken on anything in order to keep it working or to restore it to a good working condition. If a device is not properly maintained, it may breakdown abruptly causing inconveniences and sometimes loss of life. NERDC further stated that maintenance skills are used for inspecting, diagnosing and solving problems with tools and machines. Maintenance skills help electronic technicians to perform basic and necessary repairs or take preventive measures to ensure the life and functioning of various types of appliances or devices to be prolonged. According to Pireli (2013), properly troubleshooting the origin of problems, monitoring and evaluation of the functionality of the various appliances and assessing damage to an appliance also help to detect possible faults that need to be corrected to prolong the life span of the device. To use some maintenance skills, technicians use different hand tools to accomplish tasks or jobs. Maintenance skills such as technical skills help the technician to repair and maintain electronic devices.

The following according to Pirelli (2013) are some of the types of maintenance to be done on appliances or devices.

*Preventive maintenance***:** This is aimed at catching and fixing problems before they happen, it is commonly carried out in the form of regular inspection. It involves checking carefully for all signs of wear, tear or imminent breakdown.

*Condition-based maintenance***:** This is done by observing the appliance running and identify variables that could affect functioning like temperature, vibration, the presence, or absence of moisture among others.

*Corrective maintenance***:** This is any task that corrects a problem or fault and returns the appliance to proper working condition. It is usually done when an issue has been detected when an appliance breaks down. One of the important maintenance practices that will lead to poverty reduction is the corrective maintenance, which can also be termed equipment repair maintenance or breakdown maintenance or simply repairs.

Repairs are carried out when there exist faults in an appliance. Hence, Pireli (2013) opined that repairs are services that are required or necessary when something on a system is not working properly or may have worn out to the extent that a replacement is required to maintain the performance of the system. Repairs involves the activities taken for the restoration of a broken, damaged, or failed component, device or appliance to an acceptable operating or stable state. If a device is not properly maintained, it may breakdown abruptly causing inconveniences and sometimes loss of life. Onoh and Onyebuenyi (2015) stated that the changes in the expected maintenance practices and repair in electronic devices is due to the various technological innovations in modern electronic industry. The sophisticated and delicate nature of the modern technological electronic devices made faults diagnosis, troubleshooting, and scanning among others to be more complex (Silas as cited in Alome, Ogumah & Uduafemhe, 2018).

In this vein, Lane (2019) asserted that technology can be described as the understanding of how knowledge is creatively applied to organized tasks involving people and machines that meet sustainable goals. Lane continued that understanding how people shape technology and how technology shapes people's interactions with each other and the natural world is important not only to those who research, develop, and implement new technologies but also to those organizations and people that have to use those technologies in their personal lives and workplaces. Organizations have seen wearables appearing more often in their workplaces hence, the need to consider leveraging these wearables to create a more productive and connected workplace.

The term wearable has a new meaning in today's digital world. Wearables are no longer just any item that can be worn or carried on the body. Nor any technology that can be worn is called a wearable technology (e.g., traditional watches). A device is wearable when not only it can be worn, but also has the capability of incorporating information technology in order to communicate autonomously and process information on the go (Wright & Keith, 2014).

Wright and Keith (2014) also define wearable technology as electronic and computers that are integrated into clothing and other accessories that can be worn comfortably on the body. Wearable is a category of electronic devices that can be worn as accessories, embedded in clothing, implanted in the user's body, or even tattooed on the skin (Walsh, 2016). The devices are hands-free gadgets with practical uses, powered by microprocessors and enhanced with the ability to send and receive data via the Internet. Such devices can take different forms, including jewelries, smartwatches, accessories, smart tattoos among others (Kalia, 2017). These devices not only perform many basic computing functions akin to laptops and smartphones but can also perform unique health-tracking services such as calorie tracking and sleep monitoring as a

result of being in contact with the user's body. According to Walsh (2016) and Kalia (2017) some of the wearable technology devices and their uses include;

*Smartwatches***:** Connecting a smartwatch to a smartphone enables the wearer to read and send messages from their watches. Apple Watch enable users to obtain an electrocardiogram heart reading without any additional accessories while the Matrix Power Watch Series 2 can charge from solar power and body heat in place of electricity.

*Smart Jewelry***:** Smart ring is one of the most prominent kinds of smart jewelry. Exemplified by brands such as Oura, smart rings are worn on the finger like standard rings and can obtain health-tracking data that the user can later review on a smartphone. Other unique iterations of smart jewelry exist, from bangles to bracelets.

*Smart Clothing***:** This enables advance tracking for both medical care and lifestyle improvement by contacting a larger portion of one's body. Siren smart socks can detect developing foot ulcers, Nadi smart pants is a yoga pant that vibrate to improve form during yoga exercises and Naviano smart swimsuits that provide alerts when the user should apply sunscreen. Tommy Hilfiger experimented with adding location-tracking functionality to its Tommy Jeans. This enabled the clothing to track how frequent the customer wore it, so Tommy Hilfiger could reward frequent wearers with more Tommy Hilfiger products. Smart clothing and textiles are special types of garments that comprise sensors and wireless devices. They resemble regular clothes but can transmit information such as heart rates and stress levels to the user's smartphone.

*Head-Mounted Displays***:** These are a bit bulkier than most wearable computing devices. They go on the head and provide a display in the user's field of view, such that the user can use the device without looking at the phone or smartwatch display. HMDs can function as monitors, provide information superimposed over reality via augmented reality (AR), or completely immerse the user in a virtual reality (VR) setting.

Lane (2019) stated that while these wearable technologies have creative uses in the regular education, there are also a lot of exciting implications for special education students as well. Students with autism, who may have difficulty communicating may find comfort in constant access to technology – like the Google Glass or smartwatches that allow them to view and communicate from behind a comfortable distance. These technologies also allow students to demonstrate their learning and understanding in deeper, more practical ways than traditional standardized tests or pen-and-paper responses.

Vailshery (2021) submitted that the number of connected wearable devices worldwide has doubled in the space of three years, increasing from 325 million in 2016 to 722 million in 2019 and that the number of wearables is forecast to reach more than one billion by this 2022 which signifies a huge market for maintenance personnel. Maintenance of these wearables are supposed to be done by well-trained and competent technical college graduates. But the incompetency associated with the maintenance skills acquired by technical college students, emanating from the inadequacy of the curriculum content in technical colleges have resulted to the production of unskilled electronic technicians who lack the needed competencies in carrying out the required maintenance in wearable technology devices (Allo & Uzor, 2013).

Electronic technicians are graduates of technical colleges that are trained to design, develop, test, manufacture, install, and maintain electrical and electronic devices and equipment such as communication equipment, medical monitoring devices, navigational equipment, computers among others (Alome, Ogumah & Uduafemhe, 2018). NBTE (2011) stated that electronic technology students at technical colleges should among others on graduation be able to inspect, identify problems, test, diagnose or troubleshoot, and completely repair any fault on electronic devices like television, digital video disk and even wearables.

These personnel that carry out maintenance activities out of ignorance make a minor fault to be complicated to cause further damages, due poor possession of theoretical and practical skills necessary for job creation. To buttress this point Uzoagulu (2010) stated that those certified to possess these skills, abilities and attributes were half-baked or ill-prepared. This is because Nigerian educational system is an expired one (Gamalier, 2018). Gamalier continued that technical college students are presently finding it hard to create jobs for themselves upon graduation because they have been trained with old and obsolete equipment which also resulted to skills mismatch. Skills gained from training with this old and outdated facilities are no longer enough for them to become self-reliance as well as employing others. This justifies the background to which this study is undertaken to determine the wearable technology maintenance skill need of technical college students for job creation in Rivers State.

II. STATEMENT OF THE PROBLEM

Federal Republic of Nigeria in her National Policy on Education (2013) stated that technical education should provide training and impart the necessary skills to individuals to become self-reliant economically and be able to employ others. However, graduates of technical colleges who are supposed to be job creators and employers of labour are now job seekers (Ehimen & Ezeora, 2018). Akpan and Etor (2013) also stated that the rate at which students graduate from technical colleges to seek for employment continuously outpaces the capacity of the economy to provide employment. This negates the objectives of technical education as there are cases where some technical college graduates lack employable and occupational skills which has stalled job creation and economic self-reliance (Akiri, Onoja, & Kunanzang, 2016).

This seems as a defect in the curriculum that prepares recipients with little job related skills. That is why Okoye (2013) aver that the technical college graduates cannot create jobs because the training they received while in school is no longer in consonance with the practice in modern day industry. This

implies that most modern electronic devices such as wearables will suffer disrepair (poor repairs) in the hands of these maintenance personnel who out of ignorance, minor faults are complicated to cause further damages. These among several other reasons call for wearable technology maintenance skills need of technical college students for job creation in Rivers State.

Purpose of the Study

The purpose of the study is to ascertain the wearable technology maintenance skill needs of technical college students for job creation in Rivers State. Specifically, the study sought to:

1. Determine the head-mounted display maintenance skills needed by technical college students for job creation in Rivers State.
2. Determine the smartwatch maintenances needed by technical college students for job creation in Rivers State.
3. Identify the challenges associated with technical college students in the use of modern tools and equipment for maintenance of wearables for job creation in Rivers State.

Research Questions

The following research questions were posed to guide the study.

1. What are the head-mounted display maintenance skills needed by technical college students for job creation in Rivers State?
2. What are the smartwatch maintenance skills needed by technical college students for job creation in Rivers State?
3. What are the challenges associated with technical college students in the use of modern tools and equipment for maintenance of wearables for job creation in Rivers State?

Hypothesis

The following null hypothesis were formulated and tested at 0.05 level of significance.

1. There is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the head-mounted display maintenance skills needed by technical college students for job creation in Rivers State.
2. There is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the smartwatch maintenance skills needed by technical college students for job creation in Rivers State.
3. There is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the challenges associated with technical college students in the use of modern tools and equipment for maintenance of wearables for job creation in Rivers State.

III. MATERIALS AND METHOD

This study which adopted descriptive survey design was carried out in Rivers State. Three research questions were answered while three hypotheses were formulated for the study. The population of the study consisted of 49 teachers of electrical and electronic trades in the four NBTE accredited Government Technical Colleges in Rivers State and all the electronic technicians in Rivers State. Accidental sampling technique was used to obtain 170 electronic technicians while all the 49 teachers of electrical and electronic trades were used making a total of 219 respondents. The instrument for data collection was a 105-item structured questionnaire titled "Wearable Technology Maintenance Skills for Job Creation (WMSFJC)" which was designed on a 5-point Likert scale of Strongly Agreed (SA), Agreed (A), Undecided (U), Disagreed (DA) and Strongly Disagreed (SD) having numerical values of 5,4,3,2 and 1 respectively. A total of 219 copies of the instrument were administered while 210 copies (Teachers = 49; Technicians = 161) were completely filled and successfully retrieved which was used for the study. The instrument was content validated by two experts. To test the reliability of the instrument, the instrument was given to electronic teachers in technical college in Akwa-Ibom State and a reliability coefficient of 0.80 was established using Cronbach Alpha reliability coefficient method. Data collected were analyzed using mean with standard deviation. Any item with a mean value of 3.00 and above was agreed while mean value below 3.00 was disagree. Standard deviation value close or wide apart was used to determine homogeneity and heterogeneity in the perception of the respondents. The hypotheses were tested at 0.05 level of significance using z-test statistics. For calculated value of zcal less than the critical value of zcrit, the hypothesis was accepted but for zcal equal to or greater than zcrit, the hypothesis was rejected. The data were analyzed with Statistical Package for Social Sciences (SPSS) version 13.0KM.

IV. RESULTS

The results of the study are presented below

*Research Question 1***:** What are the head-mounted display maintenance skills needed by technical college students for job creation in Rivers State?

Data gathered to provide answers to this research question are analyzed and presented in Table 1

Table 1: Mean and Standard Deviation of head-mounted display maintenance skills for job creation.

S/N	Head Mounted Display Maintenance Skills	Elect/Elect Teachers			Electronic Technicians		
	Maintenance Skills Include Ability to:	X_1	SD_1	RMK	X_2	SD_2	RMK_2
1	Inspect the wires for damage.	3.26	0.78	Needed	3.57	0.67	Needed
2	Check carefully for all signs of wear and tear	3.11	1.01	Needed	3.49	0.70	Needed
3	Assess damage to a device.	3.29	0.85	Needed	3.57	0.60	Needed
4	Identify variables that could affect normal functioning of the device	3.21	0.79	Needed	3.82	0.38	Needed
5	Identify the presence or absence of moisture among others	3.39	0.79	Needed	3.76	0.42	Needed
6	Monitor the device temperature and vibration.	3.00	0.83	Needed	3.31	0.83	Needed
7	Monitor and evaluate the functionality of the devices.	3.15	0.84	Needed	3.37	0.63	Needed
8	Identify the saucer panel.	2.92	0.85	Needed	3.29	0.80	Needed
9	Remove only the top saucer cover.	3.37	0.83	Needed	3.51	0.64	Needed
10	Carefully pull away the bottom saucer cover.	3.10	0.82	Needed	3.45	0.70	Needed
11	Disconnect the bottom ribbon cable gently.	3.05	0.89	Needed	3.65	0.55	Needed
12	Remove the silver plate by pinching it with two fingers.	3.20	0.43	Needed	3.53	0.29	Needed
13	Check the sound balance in device settings.	3.48	0.76	Needed	3.11	0.94	Needed
14	Identify problem with device headphone slot.	3.31	0.71	Needed	3.34	0.72	Needed
15	Identify faulty and improperly inserted jacks.	3.37	0.92	Needed	2.85	0.76	Needed
16	Identify faulty sockets and fix half point issues.	3.29	0.73	Needed	2.76	0.66	Needed
17	Periodically clean the earbuds, mesh, and any covers to remove dust and earwax.	3.15	0.90	Needed	3.57	0.57	Needed
18	Disconnect the upper ribbon cable gently.	3.42	0.78	Needed	3.59	0.53	Needed
19	Identify loosed wiring.	3.29	0.83	Needed	3.53	0.61	Needed
20	Identify problem with the sound settings.	3.21	0.77	Needed	3.63	0.66	Needed
	Grand Mean	**3.23**	**0.82**	**Needed**	**3.48**	**0.65**	**Needed**

Source: Researcher's Field Result; 2022

Data presented in Table 1 revealed that the electrical and electronic technology teachers had a mean range from 2.92-3.48, while the electronic technicians had a mean range of 2.76-3.85. These values are above the cut of point of 2.50 which indicated that both respondents agreed that the identified skills are needed for maintenance of head mounted display for job creation in Rivers State. Furthermore, the electrical and electronic technology teachers had a standard deviation ranging from 0.07-1.01 while the electronic technicians had a standard deviation ranging from 0.29-0.94 which showed that the respondents were homogeneous in their opinions.

*Research Question 2***:** What are the smartwatch maintenance skills needed by technical college students for job creation in Rivers State?

Data gathered to provide answers to this research question are analyzed and presented in Table 2

Table 2: Mean and Standard Deviation of smartwatch maintenance skills.

S/N	Smartwatch Maintenance Skills	Elect/Elect Teachers			Electronic Technicians		
	Maintenance Skills Include Ability to:	X_1	SD_1	RMK_1	X_2	SD_2	RMK_2
21	Avoid direct contact with perfume, insect repellent, oil or lotion.	3.57	0.70	Needed	3.15	1.06	Needed
22	Prevent the glasses from coming into contact with any alcohol or chemical solvents.	3.65	0.65	Needed	3.31	0.75	Needed
23	Use soft cotton cloth dipped in the screen detergent to clean the screen.	3.43	0.72	Needed	3.15	1.03	Needed
24	Identify defects/fault symptoms	3.86	0.40	Needed	3.26	0.76	Needed
25	Identify the presence or absence of moisture in the smart watch.	3.43	0.60	Needed	3.24	0.86	Needed
26	Monitor the smart watch temperature and vibration.	3.45	0.75	Needed	3.23	0.73	Needed
27	Monitor and evaluate the functionality of the smart watch.	3.37	0.79	Needed	3.31	1.00	Needed
28	Check carefully for all signs of wear, tear or imminent breakdown.	3.21	0.63	Needed	3.15	1.06	Needed

29	Detect possible faults as well as assess damage to the smart watch.	3.23	0.71	Needed	2.61	0.99	Needed
30	Take preventive measures to ensure proper functioning of the smart watch.	2.94	1.00	Needed	3.37	0.92	Needed
31	Properly troubleshoot the origin of problems.	3.75	0.62	Needed	3.76	0.51	Needed
32	Inspect and diagnose the smart watch for possible fault.	3.55	0.54	Needed	3.63	0.59	Needed
33	Use the fine-tipped tool to gently press the battery cable into the correct position.	3.43	0.72	Needed	3.10	0.87	Needed
34	Assemble the smart watch.	3.59	0.60	Needed	3.02	1.06	Needed
35	Widen the hole using a small paperclip or similar fine-tipped tool.	3.71	0.61	Needed	3.53	0.61	Needed
36	Remove the four 4.2mm screws with a Y00 screwdriver.	3.75	0.44	Needed	3.21	0.07	Needed
37	Set up ARC and HDMI control settings			Needed			Needed
38	Replace defective components with identical or recommended and appropriate ones.	3.32	0.80	Needed	3.53	0.67	Needed
39	Isolate circuits using specified testing procedures.	3.65	0.68	Needed	3.71	0.54	Needed
40	Check wiring and circuits using specified testing procedures.	3.34	1.02	Needed	3.78	0.57	Needed
41	Solder/mount repaired or replaced parts/components in accordance with the current industry standards.	3.26	0.57	Needed	3.65	0.71	Needed
42	Detach the three connectors on the motherboard..	3.27	0.83	Needed	3.47	0.70	Needed
43	Separate the motherboard and front screen assembly	3.15	0.80	Needed	3.47	0.75	Needed
44	Check control settings/adjustments in conformity with service-manual specifications.	3.24	0.71	Needed	3.55	0.67	Needed
45	Use troubleshooting techniques in accordance with safety procedures.	3.26	1.03	Needed	3.53	0.75	Needed
46	Place the watch crown under the faucet..	3.34	0.86	Needed	3.63	0.59	Needed
47	Remove and replace transistor.	3.55	0.67	Needed	3.86	0.49	Needed
48	Remove and replace diode, resistors.	3.45	0.93	Needed	3.60	0.61	Needed
49	Remove and replace integrated circuits.	3.23	0.71	Needed	3.29	0.71	Needed
50	Fix faults in USB compartment.	3.21	0.99	Needed	3.00	1.02	Needed
51	Pry lightly to open up the casing.	3.16	0.81	Needed	3.55	0.61	Needed
52	Disconnect the battery ribbon cable from bracket.	2.71	0.79	Needed	3.41	0.77	Needed
53	Disassemble the smartwatch.	2.50	0.97	Needed	3.57	0.57	Needed
54	Test capacitors, diodes and integrated circuits.	3.03	1.05	Needed	3.67	0.62	Needed
55	Replace damaged smartwatch screen.	3.32	0.74	Needed	3.78	0.50	Needed
56	Fix faults in Bluetooth sensitivity.	2.95	0.77	Needed	3.45	0.67	Needed
57	Fix wireless faults in speakers.	3.03	0.90	Needed	3.49	0.70	Needed
58	Separate the chassis from the motherboard.	3.48	0.78	Needed	3.39	0.75	Needed
59	Secure the battery and the motherboard with adhesive.	2.94	0.72	Needed	3.25	0.77	Needed
60	Separate the battery from the motherboard.	3.31	0.73	Needed	3.41	0.63	Needed
	Grand Mean	**3.32**	**0.73**	**Needed**	**3.37**	**0.75**	**Needed**

Source: Researcher's Field Result; 2022

Data presented in Table 2 revealed that electrical and electronic technology teachers had a mean range from 2.50- 3.86, while the electronic technicians had a mean range of 2.61-3.86. These values are above the cut of point of 2.50 which indicated that both respondents agreed that the identified skills are needed for maintenance of smartwatch for job creation in Rivers State. Furthermore, the electrical and electronic technology teachers had a standard deviation ranging from 0.40-1.05 while the electronic technicians had a standard deviation ranging from 0.07-1.06 which showed the homogeneity of the respondents' opinion.

*Research Question 3***:** What are the challenges associated with technical college students in the use of modern tools and equipment for the maintenance of wearable technology devices for job creation in Rivers State?

Data gathered to provide answers to this research question are analyzed and presented in Table 3

Table 3: Mean and Standard Deviation of the challenges associated with technical college students in the use of modern tools and equipment.

S/N	Challenges in the use of modern tools and equipment	Elect/Elect Teachers			Electronic Technicians		
		X_1	SD_1	RMK_1	X_2	SD_2	RMK_2
61	Technical college students have inadequate knowledge in the use of neodymium magnetic ink.	3.55	0.64	Agreed	3.26	0.78	Agreed
62	Technical college students have inadequate knowledge in the use of Y00 screwdriver.	2.78	1.10	Agreed	3.11	1.01	Agreed
63	Technical college students have inadequate knowledge in the use of metal spudger	3.22	0.90	Agreed	3.29	0.85	Agreed
64	Technical college students have inadequate knowledge in the use of jimmy the electronic opening tool repair.	3.55	0.75	Agreed	3.21	0.79	Agreed
65	Technical college students cannot use precision tweezer set tools properly.	3.33	0.81	Agreed	3.39	0.79	Agreed
66	Technical college students have inadequate knowledge in the use of soldering mat heat resistant.	3.63	0.59	Agreed	3.00	0.83	Agreed
67	Technical college students are not conversant with mako driver for electronic repair.	3.82	0.47	Agreed	3.15	0.84	Agreed
68	Technical college students have inadequate knowledge to use pry bar.	3.65	0.65	Agreed	2.92	0.85	Agreed
69	Technical college students have inadequate knowledge in the use of magnetic large silicone repair mat.	3.73	0.60	Agreed	3.37	0.83	Agreed
70	Technical college students have inadequate knowledge in the use of modern tools to read rating of faulty components wearables.	3.31	0.73	Agreed	3.10	0.82	Agreed
71	Technical college students are not conversant with the use of showpin smart phones suction cup tool.	3.24	0.86	Agreed	3.57	0.67	Agreed
72	Technical college students have inadequate knowledge in the use of heat insulation silicone repair mat.	3.00	0.67	Agreed	3.49	0.70	Agreed
73	Technical college students are more conversant with analogue meters than digital multi meters	3.57	0.60	Agreed	3.29	0.80	Agreed
74	Technical college students have inadequate knowledge of proper tools handling procedures for maintenance and repair of wearables.	3.82	0.38	Agreed	3.51	0.64	Agreed
75	Technical college students have inadequate knowledge of diagnostic trouble code (DTC)	3.76	0.42	Agreed	3.45	0.70	Agreed
76	Technical college students have inadequate knowledge to interpret readings on the digital meter.	3.31	0.83	Agreed	3.48	0.76	Agreed
77	Technical college students have challenges in identification and selections of appropriate tools for maintenance and repair of wearable.	3.37	0.63	Agreed	3.31	0.71	Agreed
78	Not all technical colleges have modern electronic tools that will enhance students' learning.	3.57	0.57	Agreed	3.29	0.73	Agreed
79	Teaching and learning in technical colleges are less likely to improve if the use of modern electronic tools are still based on traditional methods.	3.59	0.53	Agreed	3.15	0.90	Agreed
80	Some technical college instructors are unfamiliar with the new digital technologies.	3.53	0.61	Agreed	3.42	0.78	Agreed
81	Technical college students have inadequate knowledge in the use T5 Torx screwdriver.	3.63	0.66	Agreed	3.29	0.83	Agreed
82	Usage cost and keeping modern digital technology tools and equipment in good working order can be costly.	3.57	0.70	Agreed	3.21	0.57	Agreed
83	Epileptic power supply also prevents the smooth teaching and learning with modern electronic tools and equipment.	3.65	0.65	Agreed	3.11	0.94	Agreed
84	Technical college students have inadequate knowledge of how to use air blowing machine.	3.43	0.72	Agreed	3.34	0.72	Agreed
85	Technical college students have inadequate knowledge of how to use plastic card for scraping and spreading thermal paste.	3.86	0.40	Agreed	3.24	0.74	Agreed
86	Technical college students have inadequate knowledge of how to use anti-static brush for cleaning sensitive electronics.	3.43	0.60	Agreed	3.26	0.76	Agreed
87	Technical college students have inadequate knowledge of how to use detailing brush for cleaning water damage, corrosion, and solder prep.	3.45	0.75	Agreed	3.24	0.86	Agreed
88	Technical college students have inadequate knowledge of how to use probe and pick for soldering and prying.	3.15	1.06	Agreed	3.23	0.73	Agreed
89	Technical college students have challenge with the use of dust blower for cleaning of delicate circuits.	3.31	0.75	Agreed	3.31	1.00	Agreed
90	Technical college students have inadequate knowledge of how to use digital caliper for accurate measurement.	3.15	1.03	Agreed	3.23	0.71	Agreed

91	Technical college students have inadequate knowledge of how to use lead pocket loupe to hand inspect solder points.	3.75	0.62	Agreed	3.76	0.51	Agreed
92	Technical college students have inadequate knowledge of how to use button cell battery selector for identifying small battery and coin type battery.	3.55	0.54	Agreed	3.63	0.59	Agreed
93	Technical college students have inadequate knowledge of how to use IOpener for easy removal of clued electronic components.	3.43	0.72	Agreed	3.10	0.87	Agreed
94	Technical college students have inadequate knowledge of how to use flush cutter.	3.59	0.60	Agreed	3.02	1.06	Agreed
95	Technical college students have inadequate knowledge of how to use needle files.	3.71	0.61	Agreed	3.53	0.66	Agreed
96	Technical college students have inadequate knowledge of how to use wire stripper.	3.75	0.44	Agreed	3.76	0.51	Agreed
97	Technical college students have inadequate knowledge of how to use precision utility knife.	3.32	0.80	Agreed	3.53	0.67	Agreed
98	Technical college students have inadequate knowledge of how to use desoldering pump	3.65	0.68	Agreed	3.71	0.54	Agreed
99	Technical college students have inadequate knowledge of how to use heat gun to loosen adhesive.	3.34	1.02	Agreed	3.78	0.57	Agreed
100	Technical college students have inadequate knowledge of how to use micro fibre cleaning cloth.	3.26	0.57	Agreed	3.65	0.71	Agreed
101	Technical college students have inadequate knowledge of how to use flux pen.	3.27	0.83	Agreed	3.47	0.70	Agreed
102	Technical college students have inadequate knowledge of the use of small mini voltmeter to test chargers and charging functionality.	3.15	0.80	Agreed	3.47	0.75	Agreed
103	Technical college students have inadequate knowledge of the use test leads with alligator clip.	3.24	0.71	Agreed	3.55	0.67	Agree
104	Technical college students have inadequate knowledge in identification and handling of integrated circuits (I.C) of wearables.	3.26	1.03	Agreed	3.53	0.75	Agree
105	Technical college students have shortage of modern tools equipment.	3.34	0.86	Agreed	3.63	0.59	Agree
	Grand Mean	**3.44**	**0.71**	**Agreed**	**3.35**	**0.76**	**Agreed**

Source: Researcher's Field Result; 2022

Data presented in Table 3 revealed that electrical and electronic technology teachers had a mean range from 2.78- 3.86, while the electronic technicians had a mean range of 3.00-3.78. These values are above the cut of point of 2.50 which indicated that both respondents agreed to all the identified challenges associated to the use of modern tools and equipment for the maintenance of wearable technology devices for job creation in Rivers State. Furthermore, electrical and electronic technology teachers had a standard deviation ranging from 0.38-1.10 while the electronic technicians had a standard deviation ranging from 0.51-1.06 which showed the homogeneity of the respondents' opinion.

Statistical Test of Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

Hypothesis 1

There is no significant difference in the mean ratings of electrical/electronic trades teachers and electronic technicians on the head-mounted display maintenance skills needed by technical college students for job creation in Rivers State.

Table 4: z-Test Analysis on Head-Mounted Display Maintenance Skills Needed by Technical College Students for Job Creation in Rivers State.

Groups	Mean	SD	N	df	α	zcal	zcrit	Remark
Teachers	3.23	0.82	49					
				208	0.05	-1.87	1.96	Accepted
Technicians	3.48	0.65	161					

Source: Researcher's Field Result; 2022 Accept Ho if $z_{cal} \leq z_{crit}$; Otherwise Reject Ho.

Result in Table 4 revealed that zcal (-1.87) is less than zcrit (1.96) which indicates that the hypothesis stated was accepted. Therefore, there is no significant difference in the mean ratings of electrical and electronic trades teachers and electronic technicians on head-mounted display maintenance skills needed by technical college students for job creation in Rivers State.

Hypothesis 2

There is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the smartwatch maintenance skills needed by technical college students for job creation in Rivers State.

Table 5: z-Test Analysis on Smartwatch Maintenance Skills Needed by Technical College Students for Job Creation in Rivers State.

Groups	Mean	SD	N	df	α	zcal	zcrit	Remark
Teachers	3.32	0.73	49					
				208	0.05	-0.41	1.96	Accepted
Technicians	3.37	0.75	161					

Source: Researcher's Field Result; 2022 Accept Ho if $z_{cal} \leq z_{crit}$; Otherwise Reject Ho.

The data in Table 5 revealed that zcal (-0.41) is less than zcrit (1.96) which indicates that the hypothesis stated was accepted. Therefore, there is no significant difference in the mean ratings of electrical and electronic trades teachers and electronic technicians on smartwatch maintenance skills needed by technical college students for job creation in Rivers State.

Hypothesis 3

There is no significant difference in the mean ratings of technical college teachers and electronic technicians on the challenges associated with technical college students in the use of modern tools and equipment for the maintenance and repair of wearable technology devices for job creation in Rivers State.

Table 6: z-Test Analysis on Challenges Associated with Technical College Students in the Use of Modern Tools and Equipment for Maintenance and Repairs.

Groups	Mean	SD	N	df	α	zcal	zcrit	Remark
Teachers	3.44	0.71	49					
				208	0.05	0.76	1.96	Accepted
Technicians	3.35	0.76	161					

Source: Researcher's Field Result; 2022 Accept Ho if $z_{cal} \leq z_{crit}$; Otherwise Reject Ho.

Result from Table 6 revealed that zcal (0.76) is less than zcrit (1.96) which indicates that the hypothesis stated was accepted. Therefore, there is no significant difference in the mean ratings of electrical and electronic trades teachers and electronic technicians on the challenges associated with technical college students in the use of modern tools and equipment for the maintenance and repair of wearable technology devices for job creation in Rivers State.

V. DISCUSSION OF FINDINGS

Data presented in Table 1 revealed that among others that both respondents agreed that the students need the ability to; turn over the vive controller to face bottom saucer up, identify the saucer panel, use the nylon spudger to separate the top and bottom saucer covers all around the edges, remove the top saucer cover. This indicated that both respondents agreed that the identified head-mounted display maintenance skills are needed by technical college students for job creation in Rivers State. These findings are in agreement with NBTE (2011) which opined that the technical college students upon graduation should among others be able to inspect, identify problems, test, diagnose or troubleshoot, and completely repair any fault on electronic devices like television, digital video disk and even wearables. Result in Table 4 revealed that zcal (-1.94) is less than zcrit (1.96) which indicated that the hypothesis stated was accepted. Therefore, there is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the head-mounted display maintenance skills needed by technical college students for job creation in Rivers State. These findings are in accordance with the findings of Silas (as cited in Alome, Ogumah & Uduafemhe, 2018) that there is no significant difference between the mean responses of electronic teachers and electronic technicians on the competency needs by electronic technicians for effective maintenance and repairs of DVD player.

Result presented in Table 2 revealed that both respondents agreed that the students need the ability to; pop off the back plate, remove the wristband, peel out the battery with no tools, among others. This indicated that both respondents agreed that the identified smartwatch maintenance skills are needed by technical college students for job creation in Rivers State. These findings are in line with Alome, Ogumah and Uduafemhe (2018) who stated that the ability to fix faults in USB compartment fix wireless faults in speakers, assemble, and disassemble among others are the competencies required of technical college students for the maintenance of digital electronic devices. Data in Table 5 also revealed that zcal (-0.41) is less than zcrit (1.96) which indicated that the hypothesis stated was accepted. Therefore, there is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the smartwatch maintenance skills needed by technical college students for job creation in Rivers State. These findings are in accordance with the findings of Alome, Ogumah and Uduafemhe (2018) who find that there was no significant difference between the mean responses of electrical and electronic technology teachers and electronic technicians on the competency needs by electronic technicians for effective maintenance and repairs of DVD player.

Also, result from Table 3 revealed that the electrical and electronic trades teachers shows that technical college students have inadequate knowledge in the; use of neodymium magnetic ink, use of Y00 screwdriver, use of metal spudger and use of jimmy, the electronic opening tool repair, use of precision tweezer set tools among others are some of the challenges associated with technical college students in the use of modern

tools and equipment for maintenance of wearables. These findings are in agreement with Silas (as cited in Alome, Ogumah and Uduafemhe, 2018) who maintained that whereas faults in the conventional analogue appliances can be diagnosed by mere visual inspection, the digital devices require scanning equipment for their trouble shooting. The data in Table 6 revealed that zcal (0.76) is less than zcrit (1.96) which indicates that the hypothesis stated was accepted. Therefore, there is no significant difference in the mean ratings of electrical and electronic technology teachers and electronic technicians on the challenges associated with technical college students in the use of modern tools and equipment for the maintenance of wearables for job creation in Rivers State. This finding is in agreement with Okoye (2013), who found no significant difference between the mean responses of electronic teachers and electronic technicians on the challenges associated with electronic technicians in the use of modern tools and equipment in the maintenance of modern electronic devices.

VI. CONCLUSION

The study on wearable technology maintenance skills needs of technical college students for job creation in Rivers State is as a result of the increasing rate of unemployment among technical college graduates in Nigeria. Data analyzed and interpreted indicated that technical college students need the wearable maintenance skills for job creation. There are some challenges revealed by the study which are associated with the technical college students in the use of modern tools and equipment for the maintenance of wearables for job creation, among them are, lack of modern tools and equipment, inadequate knowledge in the use of neodymium magnetic ink and use of jimmy the electronic opening tool repair.

People with wearable devices in Rivers State hardly locate efficient technicians who can service and repair mal-functioned smartwatches, head mounted display among others. Wearable technicians that can maintain smartwatch, head mounted display among others are few compared to the number of wearable technology devices in Nigeria. Therefore, if the identified wearable technology maintenance skills are integrated into the curriculum of technical colleges, graduates of technical colleges will create jobs, become entrepreneurs and be able to employ others as enshrined in the National Policy on Education.

VII. RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

1. National Board for Technical Education should ensure that the curriculum developers integrate smartwatch and head mounted display maintenance skills into the curriculum of technical colleges for this will enable the graduates become self-reliance upon graduation.
2. Government at all levels should ensure the provision of modern tools and equipment to be used at the technical college workshops and laboratories for effective training of students.
3. Training courses and seminars should be organized at regular intervals to update the skills of technical college graduates on the areas of modern electronic devices as this will enable them become more proficient repairing and fixing modern electronic devices.

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