Effective maintenance of microphones and video cameras as functions of Technical Competency Development of Electronics Craftsmen in Akwa Ibom State

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ABSTRACT

This study was to assess the technical competency development needs of electronics craftsmen in Akwa Ibom State for effective maintenance of two electronic appliances; microphones and video cameras. The study used the survey research design and the area for the study was Akwa Ibom State. The Population of the study was made up of all the registered electronics craftsmen who maintain and repair electronic appliances and equipment in the informal sector of Akwa Ibom State. The sample size of 258 electronics craftsmen was selected through multi-stage stratified sampling technique from the three senatorial districts in the state namely Akwa Ibom North West, Akwa Ibom North East and Akwa Ibom North South West. The instrument for data collection was a questionnaire titled "Technical Competency Development Needs of Electronics Craftsmen Questionnaire (TCDNECQ). The Validation of the Instrument was subjected to face validity by three lecturers of the University of Uyo who experts in the field of vocational education, measurement and evaluation and electrical/electronic engineering. The Reliability of the Instrument was confirmed with the pilot test using 30 electronics craftsmen in Akwa Ibom State who were not used of the study. A Cronbach Alpha reliability coefficient of 0.88 was realized. The instrument was administered to the respondents with the help of two research assistants and the method of data analysis was mean and standard deviation for answering the research questions while the null hypotheses was tested with the t-test statistic at .05 probability level. From the study, it recommended that all training or retraining programme to be organized henceforth for the electronics craftsmen should emphasise the identified technical competency development needs.

KEYWORDS: Development Needs, Electronics Craftsmen, Microphone, Video Cameras and Maintenance

Introduction

Specifically, the last two decades have witnessed a significant revolution in the electronics industry all over the World. These advances are reflected in the trend of changes in the principle of operation of most electronics appliances which has shifted from analogue to digital electronics technology (Brewster, 2009). Elliott (2013) listed the following as some of the contemporary electronic appliances that have shaped the society and revolutionarised every facet of our life and which man's life would have been different without them. These include clocks, television, digital video disc (DVD) players, telephone, cell phones and cable or satellite boxes. Others are washing machines, microwave ovens, refrigerators, air-conditioners and the computer. In all these technological products, maintenance is an essential factor as it prolongs the service life of the appliances.

Maintenance is the sum total of all the functions and activities that are carried out every day in order to keep any item or engineering equipment in good operating condition as defined by (Makanjuola et al,1999). Maintenance of electronic appliances in Nigeria is done mostly by people in the informal sector of the economy called 'electronics craftsmen'. A craftsman is defined as a skilled worker in a particular occupation, trade craft who is able to apply a wide range of skills and a high degree of knowledge to basically non-receptive work with a minimum of direction and supervision (Ayonmike, 2010).

In view of the fact, the stock of electronic appliances with the old technology is fast depleting from the electronics market, the electronics craftsmen should be empowered to adjust to needs of the inevitable effects of the ever accelerating pace of technological advancement on the electronics industry. This could be achieved, among other ways, through the identification of their competency needs in order to improve their knowledge base. Selvi (2010) defined competencies as the knowledge, skills, attitudes, values, motivations and beliefs people needs in order to be successful in a job. Alio (2006) identified the important competencies required by electronics craftsmen as theoretical, managerial and technical competencies. He defined technical competencies as the ability to apply expertise relating to a method, process or procedures. Similarly, Oseni (2012) noted that technical competencies are occupation specific skills that can be acquired by an individual through one or a combination of learning types. In the context of this study, technical competencies of electronics craftsmen denote the specific technical skills required by electronics craftsmen that would enable them to demonstrate their individual capacity to perform their jobs effectively and safety such as using their senses and appropriate tools to troubleshoot, diagnose and repair faults in electronic appliances to keep them in good working condition.

It is obvious that the low level of technical competency of the electronics craftsmen could greatly hamper their productivity. This position is shared by Callebs (2000) who posited that the informal sector electronics craftsmen are perpetually struggling to keep up with the maintenance of the newer electronic appliances by adopting all possible strategies to keep the appliances in good working condition, including trial and error method which is sometimes risky as it could lead to further damage of the appliances they attempt to repair. Furthermore, Alio (2006) observed that the workshops of most electronics craftsmen in many towns and cities in Enugu state are being littered with many faulty electronic appliances most of which are beyond repairs. He noted that this could probably suggest inadequate technical competencies on the part of the electronic craftsmen. This situation is not limited to Enugu state as it is also a common feature in Akwa Ibom State where the piles of old electronic appliances often serve as 'sign boards' for most electronic workshops.

Statement of the Problem

As a result of their low level of technical competencies, the electronics craftsmen resort to trial and error method which is sometimes risky as it could lead to further damage of the appliances they may attempt to repair. This skills obsolescence of the electronics craftsmen in Akwa Ibom State constitutes an educational problem as technical education students are always posted to some of these establishments under the Supervised Industrial Work Experience Scheme (SIWES). It follows that if a student is sent to an establishment where the master craftsmen is not technically competent in his occupation, it vitiates one of the major principles of vocational education which states that vocational education will be effective in proportion as the instructor has had sufficient experience and exposure in the application of skills and knowledge to the operations and processes he undertakes to teach (Okoro, 1993). Obviously, this would not facilitate the achievement of the objectives of SIWES and of the

entire educational programme. This problem is more pronounced with newer digitalized models of electronic appliances such as microphones and video cameras.

Purpose of the Study

The main purpose of the study is to determine the technical competency development needs of electronic craftsmen in Akwa Ibom State for maintenance of selected electronic appliances. Specifically, the study is aimed at determining:

1. The technical competency development needs of electronic craftsmen in Akwa Ibom state for maintenance of microphones:
2. The technical competency development needs for electronic craftsmen in Akwa Ibom State for maintenance of video cameras.

Significance of the Study

The findings of the study, would be beneficial to students of electronics technology and related fields of study at all levels of the Nigerian education system as it will help them gain new knowledge on the specific technical competencies that they need to acquire during their training to facilitate their smooth transition to the world of work as well as ensure their career success as future workers in the electronics industry. Teachers and lecturers of electronics technology courses at all levels of the Nigerian education system will also benefit from the findings of the study as it would enable them to know the specific technical competencies that they need to inculcate in their students during their training. This will also enable them to adopt appropriate instructional strategies that would enable their students to develop the relevant technical competencies.

Research Question

The study sought to provide answers to the following research questions:

1. What are the technical competency development needs of electronic craftsmen in Akwa Ibom state for maintenance of microphones?
2. What are the technical competency development needs for electronic craftsmen in Akwa Ibom State for maintenance of video cameras?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 probability level:

1. There is no significant difference in the main responses of urban and rural based electronic craftsmen in Akwa Ibom state on theirtechnical competency development needs for maintenance of microphones.
2. There is no significant difference in the main responses of urban and rural based electronic craftsmen in Akwa Ibom state on theirtechnical competency development needs for maintenance of microphones.

Delimitations of the Study

The study is delimited to electronics craftsmen in the informal sector of Akwa Ibom State only. In addition, the study is delimited to the eight selected electronic appliances. These are microphones and video cameras.

Conceptual Review

Training and Operation of Electronic Craftsmen in Nigeria

Majority of the electronic craftsmen operating in Nigeria were trained through the apprenticeship system. Uwameiye and Iyamu (2010) defined apprenticeship as a contractual agreement undertaken by the master-craftsmen and the apprentice through which the apprentice is trained for the prescribed wok process through practical experience under the supervision of the master-craftsman. They maintain that it is a form of workplace learning, which enables the apprentice to have on-the-job training. They further noted that in most rural and urban areas, roadside small-scale enterprises such as tailoring institutes and mechanics' workshops are common sites in every street and for ages they have provided opportunities for training young apprentices in Nigeria.

Uwameiye and Iyamu (2010) also posited that the numerous indigenous small-scale establishments in urban cites are due to rural-urban migration of young people looking for employment are believed to be in abundance in urban areas. This source maintained that such unrealistic beliefs soon come to light, as the government establishments are unable to establish the migrants. Consequently, the young migrants soon find it convenient to attach themselves to apprenticeship workshops to acquire skills.

However, there seem to be numerous lapses in the indigenous roadside apprenticeship system. Uwameiye and Iyamu (2010) identified the following as some of these lapses:

1. The educational level of most master-craftsmen and journeymen is very low. In fact, majority of them are primary school-leaving certificate holders.
2. Most workshops do not have the required tools and machines. They are able to carry out repairs due to adaptations to tools and machinery.
3. The rudiments of teaching are essentially lacking in these master-craftsmen.
4. The apprenticeship system is largely unrecognized and unstructured.

However, these lapses cannot undermine the importance of apprenticeship to national economy. Therefore, the need to reform roadside apprenticeship along the lines of modern apprenticeship, which combines the learning of theory and practice, cannot be over-emphasized. The nature of the roadside indigenous apprenticeship calls for reform. A reform in this direction calls for high training on the part of the master craftsman to meet industrial needs, and deliver quality vocational education courses which are based on industry competency standards and involve workplace learning.

Adeyemi (1994) noted that apart from the apprenticeship system, some of the electronics craftsmen operating in Nigeria are products of the technical colleges. According to Ayonmike (2010), technical colleges are institutions where scientific knowledge and practical skills required for employment in specific trades as professionals, craftsmen, technicians and technologists are taught and imparted. In other words, technical colleges provide secondary level technical and vocational education for the production of skilled middle level technical manpower for Nigeria's emerging market economy (Ogwo & Oranu, 2006). Thus, they are regarded as the principal technical and vocational training institution in Nigeria since they give full vocational training intended to prepare students for employment in various occupations (Okoro, 1993). He added that technical colleges train craftsmen in several trades such as planning, building construction, carpentry ad joinery, welding, brick/block laying and radio and television repairs, among others.

In other words, the operation of craftsmen and technicians in the electronic industry is an aspect of vocational education since it involves skill acquisition. According to the Federal Republic of Nigeria (2004), Technical and Vocational Education is a comprehensive term referring to those aspects of the educational process 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. By the said policy, Technical and Vocational Education is further understood to be an integral part of general education and as a means of preparing individuals for occupational fields and for effective participation in the world of work.

The goals of technical and vocational education as contained in the National Policy on Education (FRN, 2004) include, among others, provision of trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical levels as well as giving training and imparting the necessary skills to individuals for economic self-reliance.

Technology of Microphones and its Common Faults

There are two main types of microphones: the cable and the wireless microphone. According to Home of Sound Solutions (2013), a conventional wired microphone converts sound waves into electrical audio signal that travels to the public address system through a cable while a wireless microphone goes one step further, and converts the audio signal created by the microphone to a radio signal (UHF/VHF) or an Infrared signal. It is explained that the transmitter then broadcasts that signal through an antenna. Wikipedia (2012d) stated that a wireless microphone, also known as radio microphone, is a microphone without a physical cable connecting it directly to the sound recording or amplifying equipment with which it is associated.

Home of Sound Solutions (2013) stated that a wireless microphone system is usually made up of three components. These are the microphone which could be either handheld or handfree, the transmitter is built into the microphone itself while in the handfree microphone, a short cable connects it to a body pack transmitter. Stuart (2013) explained that wireless microphones work by sending signals between a transmitter inside the microphone and a receiver on the output device. The wireless microphone can be built into a wireless headset, but it can also be a separate piece, such as a clip on. The microphone has an antenna built into the frame that sends the signal from the wireless transmitter in the microphone to the wireless receiver on the other end through electromagnetic waves or digital pulses. The wireless receiver collects the wave frequency or digital codes of 1s and 0s to translate them for the output source.

Technology of Video Camera and its Common Faults

A video camera is a high-end device for creating electronic moving images as opposed to a movie camera that records the images on film (Wikipedia, 2012e). It maintained that although they were originally developed for the use in television studios, they are now commonly used for corporate and educational videos, music videos and direct-to-video movies. It pointed out that there are two types of video cameras: High end potable, recording cameras (essentially, high-end tapeless camcorders) used for Electronic news gathering (ENG) and Electronic field production (EFP) image acquisition and television studio cameras which lack the recording capability of a camcorder and are often fixed on studio pedestals.

Potable professional cameras are generally much larger than consumer cameras and are designed to be carried on the shoulder.

According to Wikipedia (2012e), the latest design of video camera and recorder are called camcorder. It explained that camcorders are electronic devices that combine a video camera and a video recorder into one unit: typically for out-of studio consumer video recording. Wikipedia pointed out that although they are many devices that are capable of recording video such as camera phones and digital cameras primarily intended for still pictures, the term "camcorder" is often restricted to mean a portable, self-contained device having video capture and recording as its primary function. It further maintained that the earliest types were tape-based camcorders, which recorded analog signals onto videotapes cassettes but in the 21st century, digital recording became the norm, with tape being replaced with other storage media such as internal flash memory and SD card. As these little wonders have developed, two types of image sensoring technology standards have emerged. They are CCD (charge-coupled device.) cameras and CMOS (Complementary metal-oxide semiconductor) cameras.

Goldwasser (2010) listed the common faults in the video cameras as follows:

1. Cassette and tape loading problems
2. Play and record mechanical problems
3. Fast forward and rewind problems
4. Play and record control problems
5. Video play and record problems
6. Audio problems
7. General control problems
8. General system problems

By inferences, a technical competent electronics craftsman should be able to diagnose and completely repair the identified faults in the video camera. Thus, his technical competency needs for effective maintenance of the video camera should therefore include his ability to diagnose and completely repair the identified faults.

Methodology

A descriptive survey research design was used in the study. The area for the study was Akwa Ibom State. The Population of the study was made up of all the registered electronics craftsmen in the informal sector of Akwa Ibom State. The instrument for data collection was a questionnaire titled "Technical Competency Development Needs of Electronics Craftsmen Questionnaire (TCDNECQ). The Validation of the Instrument was subjected to face validity by three lecturers of the University of Uyo who experts in the field of vocational education, measurement and evaluation and electrical/electronic engineering. The Reliability of the Instrument was confirmed with the pilot test using 30 electronics craftsmen in Akwa Ibom State who were not used of the study. A Cronbach Alpha reliability coefficient of 0.88 was realized. The instrument was administered by hand on the respondents with the help of two research assistants and the method of data analysis was means and standard deviation used for answering the research questions while the null hypotheses was tested with the t-test statistic at .05 probability level.

Research Question 1

What are the technical competency development needs of electronic craftsmen in Akwa Ibom State for maintenance of microphones? The summary of data analysis related to research question 1 is presented in table 1

Table 1: Technical Competency Development Needs of Electronic Craftsmen in Akwa Ibom State for Maintenance of Microphones (N=258)

S/N	Technical Competency Development Items for maintenance of Microphones	X	SD	Rem.
1	Using cutters properly and safely to cut wire terminals in microphones	1.97	0.99	N
2	Using signal injectors to detect fault in microphones	3.61	1.03	N
3	Using tweezers properly and safely in microphones	3.43	1.16	N
4	Using digital ammeters properly and safely to measure Current, voltage and resistance in microphones	2.95	0.98	N
5	Using bench-type oscilloscope to detect fault in microphones	3.57	0.69	N
6	Repairing power supply problems in wireless microphones receivers	2.47	0.97	N
7	Repairing wireless microphone transmitter problems	2.24	0.94	N
10	Repairing antenna problems in wireless microphone receivers	2.67	0.94	NN
11	using capacitance meters properly and safely to measure capacitance in microphones	3.66	0.74	N

***N=Needed NN=Not Needed**

The result with respect to the technical competency development needs of electronics craftsmen for maintenance of microphones is presented in Table 1. Table 1 shows that four out of the nine listed items have mean responses above 3.00 while the other five items have mean responses below 3.00. This implies that the electronic craftsmen in Akwa Ibom State agreed that the four items are their technical competency development needs for maintenance of microphones while they disagreed on the five items. This indicates that the electronics craftsmen in Akwa Ibom State need additional training on the four listed items to facilitate their effective maintenance of microphones while they do not need additional training on the other five items.

Research Question 2

What are the technical competency development needs of electronics craftsmen in Akwa Ibom State for maintenance of video cameras? The summary of data analysis related to research question 2 is presented in Table 2.

Table 2: Technical Competency Development Needs of Electronic Craftsmen in Akwa Ibom State for Maintenance of Video Cameras (N=258)

S/N	Technical Competency Development Items for maintenance of Video Cameras	X	SD	Rem.
12	Using transistor testers to identify faulty transistors in Video cameras	3.54	0.82	N
13	Desoldering and removing components on a printed circuit board safely without destroying it	2.82	1.15	NN
14	Repairing cassette/disc loading and ejection problems in video cameras	4.00	0.98	N
15	Repairing video playback problems in video cameras	4.00	0.74	N
16	Repairing video recording problems in video cameras	4.08	0.96	N
17	Repairing problem of rainbow pattern in recordings	3.36	0.89	N
18	Using tweezers to remove debris from the cassette/disc transport mechanism	3.60	0.89	N
19	Diagnosing and repairing electronic shutter problems in video cameras	3.61	1.08	N
20	Using computerized multi-meter to diagnose and repair faults in video camera	3.54	1.04	N

***N=Needed NN=Not Needed**

Table 2 shows the responses of electronics craftsmen on their technical competency development needs for maintenance of video cameras. As Table 2 indicates, eight out of nine listed items have mean responses above 3.00 while only one item (item 83) has a mean below 3.00. This implies that the majority of the electronics craftsmen used in the study agreed that the eight items are their technical competency development needs for maintenance of video cameras while they disagreed on only one item. This indicates that the electronics craftsmen in Akwa Ibom State need additional training on the eight listed items to facilitate their effective maintenance of video cameras while they do not need additional training on item 83.

Testing Hypothesis

Hypothesis 1: There is no significant difference in the mean responses of urban and rural-based electronics craftsmen in Akwa Ibom State on their technical competency development needs for maintenance of microphones. The summary of results of t-test analysis for testing null hypothesis 1 is presented in Table 3.

Table 3: Test for Significant Difference between the Main Responses of Urban and Rural-Based Electronics Craftsmen in Akwa Ibom State on Their Technical Competency Development Needs for Maintenance of Microphones.

Group	N	Grand Mean X	SD	Std. Error (SE)	t	Df	Sig of t*
Urban Electronics Craftsmen	132	2.98	0.37	0.03	1.28	256	0.20
Rural Electronics Craftsmen	126	2.92	0.35	0.03			

***Not Significant at p ≤ 0.05**

Table 3 shows the result of the t-test analysis of the mean responses of urban and rural-based electronics craftsmen in Akwa Ibom State on their technical competency development needs for maintenance of microphones. As shown, the level of significance of t is higher than 0.05. This implies that the obtained value of t is not significant hence the null hypothesis is upheld.

Hypothesis 2: There is no significant difference in the mean responses of urban and rural-based electronics craftsmen in Akwa Ibom State on their technical competency development needs for maintenance of video cameras. The results of the t-test analysis for testing null hypothesis 2 is presented in Table 4.

Table 4: Test for Significant Difference between the Main Responses of Urban and Rural-Based Electronics Craftsmen in Akwa Ibom State on Their Technical Competency Development Needs for Maintenance of Video Cameras.

Group	N	Grand Mean X	SD	Std. Error (SE)	t	Df	Sig of t*
Urban Electronics Craftsmen	132	3.61	0.46	0.04	-0.14	256	0.89
Rural Electronics Craftsmen	126	3.62	0.58	0.05			

***Not Significant at p ≤ 0.05**

Table 4 shows a summary of the result of the t-test analysis of the mean responses of urban and rural-based electronics craftsmen in Akwa Ibom State on their technical competency development needs for maintenance of video cameras. As Table 4 indicates, the level of significance of t is higher than 0.05 implying that the obtained value of t is not significant at 0.05 level of significance hence the null hypothesis is upheld.

Conclusion

Based on the findings of the study, it was therefore concluded that location is not a significant factor in the technical competency development needs of urban and rural based electronics craftsmen in Akwa Ibom State for the maintenance of microphones and video cameras. Therefore any training programme for electronics craftsmen in the state on enhancing their technical competencies for the maintenance of microphones and video cameras should not be discriminated between urban and rural based electronics craftsmen as they will equally benefit from the same training package.

Recommendation

The following recommendations are made based on the findings of the study:

1. Since the master craftsmen are the major trainers of electronics craftsmen in Akwa Ibom state as well as students on SIWES, in enhancing their technical competencies, there is need to enhance their theoretical competencies as well. This is because most of them know "what" to do practically but do not know "why" they did it. Also, most of them cannot read and interpret electronic circuit diagrams and colour codes appropriately.

2. Teachers of electronic technology and related courses should endeavour to devise appropriate instructional strategies that will enable their students to acquire and develop the technical competencies identified in the study which are indispensible for their career success.

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