
An Assessment of Technical Competency Development Needs of Electronics Artisan in Akwa Ibom State for Maintenance of Audio Cassette Players and Audio Amplifiers

BY

Edidiong Isonguyo SILAS, *Ph.D*

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**Ntiedo Asuabanga UDOM
Department of Technical Education
Electrical-Electronic Unit
College of Education, Afaha Nsit**

ABSTRACT

This study was to assess the technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio cassette players and audio amplifiers. 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 artisans in the informal sector of Akwa Ibom State. The instrument for data collection was a questionnaire titled "Technical Competency Development Needs of Electronics Artisans 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 artisans 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. Based on the finding the study it was concluded that electronics artisans in Akwa Ibom State need several technical competencies to enable them maintain the audio cassette players and audio amplifiers effectively. Based on the study the recommended that the state and federal ministries of education should ensure that advances electronic testing tools/instruments as well as currents models of electronic audio cassette players and audio amplifiers are supplied to technical colleges to enable students to be conversant with the technology and use of these modern equipment and appliances.

KEYWORDS: Technical Competency Development Needs, Electronics Artisans, Audio Cassette Players, Audio Amplifiers, Akwa Ibom State

Introduction

The accelerating pace of technological advancement, which characterized the present era has resulted in the invention of new equipment and appliances meant to provide man with more comfort and luxury, thus enhancing his standard of living. It has also brought about immense transformations, innovations, modifications and improvements in the design and operating principles of many technological products, including electronic appliances. The term electronic appliances refer to those equipment with electrical circuits that involve active

electronic components such as vacuum tubes, transistors, diodes, capacitors, inductors and integrated circuits as well as associated passive interconnection technologies that are widely used in information processing, telecommunications and signal processing (Wikipedia, 2012a).

According to Alio (2004), the informal sector electronics artisans have thrived in the servicing of the conventional electronic appliances over the years. Thus, they play major roles in prolonging the service life of the electronic appliances. They are therefore regarded as the major stakeholders in the servicing and maintenance of electronics appliances in Nigeria since many Nigerians do not patronize the formal sector electronics technicians due to their proximity and exorbitantly high charges, which is mostly beyond the reach of the common man (Adeyemi, 1994).

Adeyemi (1994) noted that majority of the electronics artisans operating in Nigeria were trained through the apprenticeship system while very few are products of the technical colleges. Alio (2004) also noted the electronics craft programme in technical colleges, which is titled “Electronics work”, is aimed at providing trainees with the knowledge of audio cassette player, audio amplifiers and other types of electronics appliance. In a nutshell, the electronics artisans are expected to identify causes of products’ failure and then restore them to proper condition (Alio, 2006). Alio also stressed on the need for electronic artisans to have adequate knowledge of electronics theory and possess relevant skills that would enable them to diagnose faults and repair appliances brought to them by their customers. Similarly, Umunadi’s (2010) noted that training and retraining of workers is necessary because of the changes occasioned by technological development worldwide. He maintained that this great change obviously demands a commensurate skill and competencies adjustment to enable the workers cope with the innovation in technology and to keep them abreast with the contemporary practices in their areas of specialization. Thus, the presence of new technologies in the electronics industry demands skills upgrading of the electronics artisans in Akwa Ibom State for their effective maintenance of electronic appliances.

Statement of the problem

Recent development in the electronics industry, particularly the shift from analogue to digital electronics technology, has created some skills gap, which need to be bridged by enhancing the technical of the competencies of the electronic artisans in Akwa Ibom State. It is observed that most of the electronic artisans in Akwa Ibom State who were trained through the apprenticeship system, with the conventional analogue appliances encounter problems when attempting to repair electronics appliances different from those used during their training. This is more pounced with newer digitalized models of electronic appliances such as audio cassette players and audio amplifiers. Thus, the study sought to assess the extent of technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio cassette players and audio amplifiers.

Objective of the study

1. To examine the technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio cassette players.
2. To find out the technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio amplifiers

Research question

1. What are the technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio cassette players.
2. What are the technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio amplifiers

Hypotheses

Ho₁: There is no significant difference in the means responses of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio cassette players.

Ho₂: There is no significant difference in the means responses of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio amplifiers.

Conceptual Review

Technology of Audio Cassette Player and its Common Faults

An audio cassette player, according to Goldwasser (2009b), is made up of the following parts:

1. Supply reel table
2. Take-up reel table
3. Idler - assembly
4. Idler tire
5. Capsten
6. Pinch roller.
7. Tape heads
8. Various other guide posts
9. Belts.

Goldwasser (2009b) listed the following as common problems with audio tape players:

1. Tape transport problems such as No movement in PLAY or REC, Tape eating and FF and/or REW being inoperative or sluggish
2. Intermittent power and/or sound
3. Distorted or erratic recording
4. Erratic auto-reverse
5. Auto-reverse audio not correct for either or both direction
6. Tape speed problems
7. Tape deck problems

By inference, a competent electronics craftsman should be able to diagnose and completely repair the identified faults in the audio cassette player hence his technical competency needs of for effective maintenance of the audio cassette player should therefore include his ability to diagnose and completely repair the identified faults.

Technology of Audio Amplifier and its Common Faults

An audio amplifier can be made of vacuum tubes or transistors. According to Wikipedia (2011), a valve amplifier of tube amplifier is a type of electronic amplifier that makes use of vacuum tubes to increase the amplitude of a signal. They maintained that valve amplifiers are used for applications such as guitar amplifiers, satellite transponders such as DirecTV and GPS, audiophile stereo amplifiers, military applications (such as radar) and very high-power radio and UHF television transmitters.

Wikipedia, (2011) further stated that in audio applications, valves continue to be highly desired by most professional users, particularly in recording studios' equipment and guitar amplifiers because tube amplifiers produce a "warmer" or more "natural" valve sound. Moreover, many professional guitar players use 'tube amps' because of their renowned 'tone' in this usage is referring to timbre or pitch color and can be a very subjective quality to qualify. Most audio technicians and scientists theorize that the even harmonic distortion produced by valve tubes sounds more pleasing to the ear than transistors, regardless of styles. Many of the musicians who use solid state amplification technology do so for its portability low cost and high reliability not its 'tone'. It is the tonal characteristics of valve tubes that have sustained them as the industry standard for guitars and studio microphone pre-amplification. In addition, tube amplifiers respond differently from transistor amplifiers when signal levels approach and reach the point of clipping.

The audio amplifiers found in small radios, portable cassette recorders, and other low power devices are often single chips with few external components. Larger audio amplifiers may use ICs (up to 10 or 20 W) or hybrid modules (up to 100 W per channel and beyond). Hybrid modules (called 'blocks' or 'bricks' by some) may be totally self-contained requiring just power and line level inputs or may be just the final stage in an overall system including external amplifier circuitry which is effectively a power op amp – high gain with negative feedback. Failure of these bricks is quite common. (Goldwasser, 2009b)

The common problems of audio amplifiers as identified by Goldwasser (2009b) include

1. Power supply problems
2. Noise problems
3. Problem of intermittent switches or controls
4. Amplifier clicking and shutting down on music peaks
5. Speaker output not coming up or shutting off immediately
6. Dead channels on front-end audio components
7. Faulty headphone plugs/cables
8. Problem of interference

The technical competency needs of electronics craftsman for effective maintenance of audio amplifiers should thus include their ability to diagnose and completely repair the faults listed above.

Methods

A descriptive survey research design was used in the study. The area for the study was Akwa Ibom State. The Population of the study made up of all the registered electronics artisans in the informal sector of Akwa Ibom State. The instrument for data collection was a questionnaire titled "TECHNICAL COMPETENCY DEVELOPMENT NEEDS OF

ELECTRONICS ARTISANS 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 artisans 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.

Result and Discussion

Research Question one

The research question sought to find out what technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio cassette players. See table 1.

Table 1: Technical Competency Development Needs of Electronics Artisans in Akwa Ibom State for Maintenance of Audio Cassette Players (N=258)

S/N	Technical Competency Development Items for Maintenance of Audio Cassette Players	X	SD	Remark
1	Using signal generator to detect faulty components in audio cassette players	3.28	0.72	N
2	Using soldering iron to solder wire terminals properly and neatly in audio cassette players	1.60	0.59	NN
3	Repairing play head problems in audio cassette players	1.94	0.92	NN
4	Repairing power supply problems in audio cassette players	2.27	0.48	NN
5	Repairing tape or cassette deck problems in audio cassette players	2.31	0.63	NN
6	Repairing auto reverse problems in audio cassette players	2.33	0.50	NN
7	Repairing distorted or erratic recording problem in audio cassette players	2.30	0.62	NN
8	Repairing intermittent sound problems in audio cassette players	2.16	0.67	NN
9	Using audio signal tracer to trace audio problems in audio cassette players	3.66	0.71	N
10	Using spectrum analyzer to detect faulty component in audio cassette players.	3.69	0.89	N

*N = Needed; NN = Not Needed

The responses of electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio cassette players are shown in Table 1. The table reveals that the mean responses of the respondents on three items are above the cutoff point of 3.00 while seven items have mean responses below 3.00. This implies that electronics artisans in Akwa Ibom State agreed on the three items as being their competency development needs for maintenance of audio cassette players while they disagreed on the seven items. This indicates that the electronics artisans in Akwa Ibom State need additional training on the three listed items to facilitate their effective maintenance of audio cassette players while they do not need additional training on the seven items.

Research Question Two

The research question sought to find out the technical competency development needs of electronics artisans in Akwa Ibom State for maintenance of audio amplifiers. See table 2

Table 2: Technical Competency Development Needs of Electronics Artisans in Akwa Ibom State for Maintenance of Audio Amplifiers (N = 258)

S/N	Technical Competency Development Items for Maintenance of Audio Amplifiers	X	SD	Remark
1	Using signal generator to detect faulty components in Audio Amplifiers	3.58	0.91	N
2	Using high-tech function generators to detect faulty components in audio amplifiers	3.77	0.77	N
3	Repairing power supply problems in audio amplifiers	1.85	0.70	NN
4	Repairing interference problems in audio amplifiers	1.80	0.67	NN
5	Using capacitance meter to detect leaky capacitors in audio amplifiers	3.94	0.83	N
6	Repairing problems of intermittent operation in audio amplifiers	2.22	0.50	NN
7	Rectifying headphone/microphone plugs and cable problem in audio amplifiers	1.81	0.70	NN
8	Using spectrums analyzer to measure channel power and testing electrical and magnetics field strength in audio amplifiers	3.51	0.80	N
9	Swapping components between a working and dead channel in audio amplifiers	2.06	0.83	NN
10	Using manuals and troubleshooting charts to detect faulty components in audio amplifiers	3.64	0.89	N

* N = Needed; NN = Not Needed

Table 2 shows the responses of electronics artisans on their technical competency development needs for maintenance of audio amplifiers. The table shows that five out of the ten items have mean responses above 3.00 while the mean responses of the other five items are below 3.00. This implies that electronics artisans in Akwa Ibom State agreed on the five items whose mean responses are above the cut-off point as being their technical competency development needs for maintenance of audio amplifiers while they disagreed on the other five items whose means responses fell below the cut-off point.

Hypotheses Testing

Hypotheses one

The null hypothesis states that there is no significant difference in the means responses of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio cassette players. In order to answer the research hypothesis, t-test analysis was performed on the data see table 3.

Table 3: Test for Significant Difference Between the Mean Responses of Urban and Rural-Based Electronics Artisans in Akwa Ibom State on Their Technical Competency Development Needs for Maintenance of Cassette Players

Group	N	Grand Mean X	SD	Std Error (SE)	T	Df	Sig of t*
Urban Electronics Artisans	132	2.56	0.24	0.02	0.61	256	0.54
Rural- Electronics Artisans	126	2.54	2.25	0.02			

* Not Significant at $P \leq 0.05$

Table 3 shows the result of the t-test analysis of the mean responses of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio cassette players. Table 3 shows that the level of significance of t is higher than 0.05. This implies that the obtained value of t is significant hence, the null hypothesis is upheld.

Hypotheses Two

There is no significant difference in the means responses of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio amplifiers. In order to answer the research hypothesis, t-test analysis was performed on the data see table 4.

Table 4: Test for Significant Difference Between the Mean Responses of Urban and Rural-Based Electronics Artisans in Akwa Ibom State on Their Technical Competency Development Needs for Maintenance of Audio Amplifiers

Group	N	Grand Mean X	SD	Std Error (SE)	T	Df	Sig of t*
Urban Electronics Artisans	132	2.78	0.24	0.02	-2.78	256	0.01*
Rural- Electronics Artisans	126	2.86	2.25	0.02			

* Not Significant at $P \leq 0.05$

Tables 4 shows a summary of t-test analysis of the mean responses of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio amplifiers. The table reveals that the level of significance of t is lower than 0.05. This implies that the obtained value of t is significant at 0.05 level of significance hence the null hypothesis is rejected meaning that there is a significant difference in the mean rating of urban and rural-based electronics artisans in Akwa Ibom State on their technical competency development needs for maintenance of audio amplifiers.

Discussion of the Findings

The outstanding finding of the study as showed in table 1 and in table 3 is the identification of three items as the technical competency development needs of electronics artisans for maintenance of audio cassette players. These were using signal generator to detect faulty components in audio cassette players, using audio signal tracer to trace audio problems in audio cassette players and using spectrum analyzer to detect faulty components in audio cassette player. Remarkably, these three items centred on the use of advanced electronic testing tools. Indeed, using spectrum analyzer to detect faulty component in audio cassette players has the highest mean response of 3.69 closely followed by using audio signal tracer to track audio problems with mean response of 3.66. This finding is a clear indication that the electronic artisans in Akwa Ibom State are not very familiar with these instruments hence they are not technically competent in using them in the repair and maintenance of electronic appliances such as audio cassette players. Umunadi's (2010) view that changes occasioned by technological development demand training and retraining of workers for commensurate skill and competencies adjustment to enable them cope with the innovation in technology and to keep them abreast with the contemporary practices in their areas of specialization. Thus, the presence of new tools like signal generator, audio signal tracer and spectrum analyzer in the electronics industry demands skills upgrading of the electronics artisans in Akwa Ibom State of facilitate their effective maintenance of electronic appliances.

Another salient finding of the study in table 2 and in table 4 is that five items were found as the technical competency development needs of electronics artisans for maintenance of audio amplifiers. These were using signal generators to diagnose faulty components in audio amplifiers, using high-tech function generators to detect leaky capacitors in audio amplifiers. Others were using spectrum analyzer to measure channel power and testing of electrical and magnetic field strength in audio amplifiers and using manuals and troubleshooting charts to detect faulty components in audio amplifiers. The first three items indicate that the electronic artisans are not very familiar with the use of advanced electronic testing tools such as signal generators, high-tech function generators and spectrum analyzer hence they need additional training on these items to make them technically competent in using the advanced electronic testing tools in the repair and maintenance of electronic appliances such as audio amplifiers. With respect to using manuals and troubleshooting charts to detect faulty components in audio amplifiers, this finding supports the view of Okoro (1999) and Alio (2006) who stressed the need for electronic artisans to have adequate theoretical knowledge in the use of data books and technical manuals as well as ability to interpret circuit diagrams, identify colour codes and other component descriptors as well.

Conclusion

Based on the study the following conclusion was made:

Electronics artisans in Akwa Ibom State need several technical competencies to enable them maintain the audio cassette players and audio amplifiers effectively. The technical competency development needs of urban and rural based electronics artisans in Akwa Ibom State for the maintenance of electronic appliances namely audio cassette player, except for the electronic appliances (audio amplifiers).

Recommendation

Based on the study the recommended that:

1. The state and federal ministries of education should ensure that advances electronic testing tools/instruments as well as currents models of electronic audio cassette players and audio amplifiers are supplied to technical colleges to enable students to be conversant with the technology and use of these modern equipment and appliances.
2. The sate ministry of commerce and industry should organize training programmes regularly in form of workshops, seminars and conferences for electronics artisans in Akwa Ibom State.

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