TROUBLESHOOTING OF FAULTS IN LIQUID CRYSTAL DISPLAY (LCD) TELEVISIONS BY ELECTRONIC TECHNICIANS

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Abstract

The study was carried out to determine Troubleshooting of Faults in Liquid Crystal Display (LCD) Televisions by electronic technicians in Anambra State. In carrying out the research, five research questions and five null hypotheses were formulated for the study. The population for the study was 3209 persons. This consists of 11 electronic teachers in 10 Government Technical Colleges in Anambra State as well as 3198 electronic technicians in Anambra State. All the 11 electronic technology teachers in 10 Government technical Colleges in Anambra State were used for study as well as 155 electronic technicians selected by simple random sampling. Questionnaire was the instrument used for data collection. This consists of 32 questions (items) developed from the reviewed literature and used to elicit responses from electronic technology teachers and electronic technicians regarding the research questions. Copies of the questionnaire were distributed by the researcher with the help of six research assistants. 95 % of the copies of the questionnaire were returned. Data collected were analyzed using mean while t-test for independent sample was used to test the five null hypotheses at 0.05 level of significance. After carrying out necessary analysis, possible ways of troubleshooting faults in LCD television related to picture, sound, control buttons, power section and other ways were revealed. It was concluded that Electronic technicians should carry out maintenance of LCD televisions by troubleshooting the suspected sections of the LCD television before carrying out any remedy to the faults.

Key Words: Electronic Technology, Liquid Crystal Display Television, Maintenance, Technician, Troubleshooting**.**

Introduction

Every electronic appliance develops fault at one time or another. To maintain electronic gadgets requires identifying their faults in other to put them in good working condition. Maintenance of electronic gadgets requires identifying the faults and the cause of the faults before providing the solution to the faults. This process of identifying faults is known as troubleshooting. Troubleshooting is one of the processes of carrying out maintenance of electronic gadgets. Maintenance is the process of keeping equipment, tools, materials, or system in good working condition. Ogbuanya (2009), defined maintenance is the action taken to restore or keep an item in good functional order. It involves decision making and planning by the personnel. Maintenance of electronic appliances can be in various forms such as dusting, lubricating, replacing burnt/damaged components, repairing, testing, using items for the purpose they are designed and following procedure for the operation of each appliance (Ogbuanya, 2009). Different types of maintenance have been mapped out for the maintenance of appliances such as preventive maintenance, predictive and corrective maintenance.

Preventive maintenance is systematic detection and prevention of potential faults before they occur (Bayle, 2007). According to Operations and Maintenance Best Practices (2012),

preventive maintenance are actions performed on a time- or machine-run-based schedule that detect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life through controlling degradation to an acceptable level. On the other hand, predictive maintenance is the type of maintenance that is carried out on an items/equipment when there is breakdown warning signal. It involves arresting the situation promptly before there is any major breakdown that will demand corrective maintenance. Corrective maintenance can also be referred to as breakdown maintenance. It is the kind of maintenance given to equipment or facility when it cannot function as it is supposed to (Bayle, 2007).

Maintenance is required to be carried out on most electronic gadgets as a result of their complex nature, fragile components used in their construction, miniaturized nature of some components of present day electronic gadgets, low current/voltage used by electronic gadgets, and so on. Innovations in the components used in construction of electronic gadgets require technicians who are familiar with the components for effective maintenance of the electronic gadgets. A technician is a person who is trained formally in a particular trade. Technicians are trained formally in technical colleges while artisans are trained informally through apprenticeship systems available in the society. According to Okoro (1999), the apprenticeship programme produces semiskilled craftsmen in auto-mechanics, electrical installation, radio and TV repair, carpentry and joinery, cabinet making, building construction and many more areas. Apprentice in electronic maintenance learn skills involved in maintenance of different kinds of electronic gadgets. However, due to innovation in the field of electronics, some of these apprentices limit themselves to learning about the maintenance of few electronic gadgets so as to become efficient in maintenance of such gadgets. Training of technicians at technical college involves imparting both theoretical and practical knowledge to the students under the guidance of the teacher within the school environment. Students at technical colleges are exposed to different skilled areas, through which one can be trained to become a self reliant technician. This type of education received at technical college level is known as technical education.

Federal Republic of Nigeria (2004) defined technical and vocational education as a comprehensive term referring to those aspects of the educational process involving in addition to general education the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. Technical Education is that aspect of education that leads to acquisition of practical and applied skills as well as basic scientific knowledge (Okoro, 1999). At technical college level, technical education is provided to impart technical/occupational skills in the areas of electricity, electronics, metalwork, woodwork, automobile, and so on. This implies that electronic technology is an aspect of technical education.

Electronic technology is the process of applying scientific knowledge in the design, selection of materials, construction, operation and maintenance of electronics (Theraja, 2007). It provides the skills, knowledge and attitudes necessary for effective employment in specific occupation. Electronic technicians produced at technical college level are those that offered courses in electronic technology. They are supposed to be skilled in different areas of electronic technology such as maintenance of electronic gadgets, designing of electronic circuits, as well as construction of some electronic gadgets/appliances. Electronic technicians are trained to meet the requirements of man in the ever changing technological society. One of such prominent changes in the field of electronics is the production of more sophisticated electronic gadgets of which liquid Crystal Display (LCD) television is one of

them. These new and sophisticated gadgets are constructed with different components which are more fragile, complex, costly, and can perform faster than the components used in the construction of earlier developed gadgets(such as the Cathode Ray Tube (CRT) television). Liquid Crystal Display (LCD) electronic gadgets are new in the society and they are available in different electronic gadgets such as wrist watches, laptop computers, desktop computers, calculators, phones, televisions, and so on.

According to Theraja and Theraja (2007), a liquid crystal display is a material (usually, an organic compound) which flows like a liquid at room temperature but whose molecular structure has some properties normally associated with solids (examples of such components are: cholesteryl nonanoate and p-azoxyanisole). Liquid crystal "cell" consists of a thin layer (about 10μm) of a liquid crystal sandwiched between two glass sheets with transparent electrodes deposited on their inside faces. The Liquid Crystal Display (LCD) materials are used in construction of LCD televisions. The LCD television has the advantage of reduced weight, low power consumption, among others (Theraja and Theraja, 2007). The advantage of reduced weight of LCD televisions can be attributed to the components that make up LCD televisions which are usually of little weight. These components develop faults at one time or the other.

Faults developed by LCD televisions are of various types, among them are ghosting of pictures, poor picture quality, audio faults, and so on. Wistrom (2011) identified some of the numerous problems of LCD television to include: on power/image, no signal, picture issues. If these faults are not properly checked, it may result to total damage of the television. Faults developed by LCD televisions can be traced and repaired. This process of tracing the faults of LCD televisions is known as troubleshooting.

Troubleshooting is a way of finding faults so as to provide necessary solutions. It is the act or process of identifying and eliminating problems or faults, especially in electronic or computer equipment (Encarta, 2009). Pullman (2009) stated that before sending television in for repair, one should try troubleshooting the television in his or her home. According to Pullman (2009), by troubleshooting your LCD television, you may save the time and money of having it serviced. Having identified the fault(s) of LCD television through troubleshooting, the next step will be providing solution (remedy) to the identified problem. Troubleshooting of LCD television can be done in different sections of the television circuit. Such sections include: picture section, sound section, power section, control button section and other sections. It is important to note that all parts/sections of the LCD television circuit cannot be troubleshooting at the same time. For instance, failure of power supply, which may be as a result of blown fuse, will require disconnection of video, audio circuits as well as other circuits not connected with the power section. This will help to ensure that no damage is done to other circuits in the cause of refusing the circuit (Goldwasser, 2011).

Unfortunately, most electronic technicians do not have adequate knowledge and skills required to troubleshoot, service, diagnose faults, and repair LCD televisions. This may be as a result of the fact that LCD televisions are new in the society and many electronic technicians did not study its maintenance in school. It may also be attributed to the fact that LCD television maintenance is not included in the curriculum of electronic technology at technical college level. The general maintenance provided in the curriculum of electronic technology is not enough to impart the necessary knowledge and skills required for maintenance of LCD televisions. The components used in construction of LCD televisions are different from the components used in construction of other televisions as such, the operation of the components are

different. It is also important to note that the internal components of LCD televisions are more complex, fragile and some are miniaturized in nature. Another issue of serious importance is the fact that LCD televisions are very expensive. This calls for the need for competent technicians to repair these televisions when they develop faults. Inadequate competent technicians to repair these televisions has led to continuous importation of new LCD television and increase in the number of faulty LCD televisions in the environment thereby causing environmental hazards such as being host to mosquitoes. Other challenges of LCD televisions include: insufficient screen resolution, problem of viewing angle and so on (Theraja and Theraja, 2007). This implies that electronic technicians require knowledge and skills which will enable them to troubleshoot and effectively maintain LCD televisions.

Purpose of the Study

The purpose of the study was to find out ways of Troubleshooting Faults in Liquid Crystal Display (LCD) Televisions. Specifically, the study sought:

1. Possible ways of troubleshooting faults in LCD televisions related to picture,
2. Possible ways of troubleshooting faults in LCD televisions related to sound,
3. Possible ways of troubleshooting faults in LCD televisions related to the power section,
4. Possible ways of troubleshooting faults in LCD televisions related to the control buttons,
5. Other possible ways of troubleshooting faults related to LCD televisions.

Research Questions

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study:

1. What are the possible ways of troubleshooting faults in LCD televisions related to picture?
2. What are the possible ways of troubleshooting faults in LCD televisions related to sound?
3. What are the possible ways of troubleshooting faults in LCD televisions related to the power section?
4. What are the possible ways of troubleshooting faults in LCD televisions related to the control buttons?
5. What are the other possible ways of troubleshooting faults related to LCD televisions?

Hypotheses

The following hypotheses that guided the study were tested at 0 .05 levels of significance:

Ho_1: There is no significant difference between the mean responses of electronic teachers and technicians on the possible ways of troubleshooting faults in LCD televisions related to picture.

Ho_2: There is no significant difference between the mean responses of electronic teachers and technicians on the possible ways of troubleshooting faults in LCD televisions related to sound.

Ho_3: There is no significant difference between the mean responses of electronic teachers and technicians on the possible ways of troubleshooting faults in LCD televisions related to the power section.

Ho_4: There is no significant difference between the mean responses of electronic teachers and technicians on the possible ways of troubleshooting faults in LCD televisions related to the control buttons.

Ho_5: There is no significant difference between the mean responses of electronic teachers and technicians on the possible ways of troubleshooting faults related to LCD televisions.

Method

The design adopted for this study was a descriptive survey research design. Descriptive survey design according to Ezeji (2004), is concerned with specifying the properties of educational and other phenomena. The design is appropriate because it sought the

representative views of electronic teachers and technicians on the Troubleshooting of Faults in Liquid Crystal Display (LCD) Televisions.

The population for the study was 3209 persons. This consists of 11 electronic teachers in 10 Government Technical Colleges in Anambra State as well as 3198 electronic technicians in Anambra State. This figure was obtained from Anambra State Post Primary School Management Board (2011) and Anambra State Ministry of Commerce and Industry (2012). All the 11 electronic technology teachers in 10 Government technical Colleges in Anambra State were used for study as well as 155 electronic technicians selected by simple random sampling. According to Gall, Gall, and Borg (2007), simple random sampling is the selection from a population through the process that provides every sample of a given size an equal probability of being selected. The teachers and the master craftsmen have similar culture.

The questionnaire was the instrument used for eliciting responses from the respondents. The questionnaire was divided into five sections namely sections A, B, C, D, and E, which consisted of 32 structured items. Section A sought information on the possible ways of troubleshooting faults in LCD televisions related to picture. Section B sought information on the possible ways of troubleshooting faults in LCD televisions related to sound, section C sought information on the possible ways of troubleshooting faults in LCD televisions related to power section, section D sought information on the possible ways of troubleshooting faults in LCD televisions related to control buttons, while section E sought information on the other possible ways of troubleshooting faults related to LCD televisions. The questionnaire utilized a 4-point scale of Very Possible (VP), Possible (P), Moderately Possible (MP), and Not Possible (NP).

Three experts, two from department of Vocational Teacher Education, University of Nigeria, Nsukka and one technician were requested to carry out face validation of the instrument. Their comments, suggestions and advice were used to modify some of the items. The reliability of the instrument was established by trial testing using electronic teachers and technicians in Enugu State. Cronbach Alpha was used to determine the internal consistency of the items in the instrument. A reliability coefficient of 0.89 was obtained.

The researcher administered and collects the instrument with the help of six research assistants. The research assistants were requested to administer the instrument to the respondents and collect them immediately after completion by the respondents. The respondents were required to provide information that represents their opinion out of the available response alternative in the questionnaire. The instrument was being collected immediately after its administration, the same day. It took two weeks to administer and collect the instrument and 95% of the administered instrument was returned. The data collected for this study was analyzed using mean. T-test for independent samples was used to test the hypothesis at 0.05 level of significance. The response to the items was interpreted using table of real limit of numbers as follows: Very Possible (VP) = 3.50 – 4.00; Possible (P) = 2.50 – 3.49; Moderately Possible (MP) =1.50 – 2.49; Not Possible (NP) = 0.50 – 1.49. Base on the above limits, any item that has a mean score of 3.50 – 4.00 was regarded as Very Possible, 2.50 – 3.49 was regarded as Possible, 1.50 –2.49 was regarded as Moderat

as Not Possible.

Results:

Table 1: Mean ratings, standard deviation and t-test Analysis of the Responses of Electronic Teachers and Technicians on the possible ways of troubleshooting faults in LCD televisions related to picture.

Possible ways of trouble shooting faults in LCD televisions related to picture.	$\bar{X}$	S.D	Electronic Technicians. n = 149		Electronic Teachers. n = 9		Df	t-cal	Sig.(2-tailed)	Decision
			$\bar{X}_1$	S.D 1	$\bar{X}_2$	S.D 2				
If there is no picture, check the connection of the aerial and the tuner.	3.45	0.64	3.48	0.63	2.89	0.60	156	2.744	0.007	S
For automatic turning off of the TV, check the IC or resistors or diodes on the power stage.	3.46	0.66	3.48	0.65	3.00	0.71	156	2.174	0.031	S
If there is no picture and menu information from equipment connected to the scart connector, check the optimal equipment to see it is on.	3.47	0.63	3.50	0.61	2.89	0.60	156	2.932	0.004	S
For ghosting of pictures, check the electrolytic capacitor on the horizontal stage.	3.45	0.64	3.47	0.64	3.11	0.60	156	1.631	0.117	NS
For appearance of snow and noise on the screen, check if the tuner is faulty.	3.44	0.62	3.48	0.60	2.89	0.78	156	2.806	0.006	S
If there is dotted lines or stripes on the TV screen, check if electrical noise such as cars, motorcycles, or hair-dryers are available. If it continues check if the electrolytic capacitor on the vertical stage is faulty.	3.46	0.64	3.48	0.63	3.00	0.71	156	2.212	0.028	S
For no colour on colour programmes, check if the transistor in the tube base is faulty.	3.46	0.62	3.50	0.60	2.89	0.78	156	2.900	0.004	S
If there is increased brightness of the TV picture, check picture adjustment.	3.47	0.63	3.50	0.61	3.00	0.71	156	2.348	0.020	S

Key: NS = Not Significant, S = Significant, df = Degree of freedom, t-cal = Calculated value of t-test using SPSS, S.D = Standard Deviation, $\bar{X}_1$ = Mean for Electronic technicians, $\bar{X}_2$ = Mean for Electronic Teachers, n_1 = number of Electronic technicians, n_2 = number of Electronic teachers, Level of Significance = 0.05.

Data presented In Table 1 show that all the items had their mean ranging from 3.44 to 3.47 which falls within the response categories of Possible. This indicates that all the items are the possible ways of trouble shooting faults in LCD televisions. The standard deviation for the items ranges from 0.62 to 0.66. This implies that the Electronic Teachers and Electronic Technicians are homogenous in their responses

on the possible ways of trouble shooting faults in LCD televisions. The result in Table 1 also shows that there is a significant difference in the mean responses of Electronic Teachers and Electronic Technicians on items 1, 2, 3, 5, 6, 7, and 8. Since their significance level ranges from 0.004 to 0.031, which are less than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was rejected for those items.

The result also revealed that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on item 4. Since its significance level is 0.117 which is more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance.

Table 2: Mean ratings, standard deviation and t-test Analysis of the Responses of Electronic Teachers and Technicians on the possible ways of troubleshooting faults in LCD televisions related to sound.

Possible ways of trouble shooting faults in LCD televisions related to sound.	$\bar{X}$	S.D	Electronic Technicians. n = 149		Electronic Teachers. n = 9		df	t-cal	Sig.(2-tailed)	Decision
			$\bar{X}_1$	S.D$_1$	$\bar{X}_2$	S.D$_2$				
If the TV picture is noisy, check if the IF stage or the tuner is faulty.	3.42	0.62	3.46	0.60	2.89	0.78	156	2.715	0.007	S
For stripe noise during playback, check for video head interference or playback cord.	3.46	0.61	3.48	0.60	3.00	0.71	156	2.325	0.021	S
If there is noisy picture when viewing a TV channel, check noise reduction option on the picture adjustment, if it continues, chect if the IF stage is faulty.	3.39	0.65	3.40	0.65	3.22	0.67	156	0.812	0.418	NS
If there is no TV sound but there is picture, check if the sound IC in the audio stage is faulty.	3.41	0.63	3.44	0.62	3.00	0.71	156	2.038	0.043	S
For failure of the TV to receive a stereo or dul sound broadcast, check if there is a faulty audio component like speakers.	3.36	0.65	3.38	0.64	3.00	0.71	156	1.724	0.087	NS
If the TV cabinet creaks, check the temperature.	3.43	0.60	3.44	0.60	3.22	0.67	156	1.070	0.286	NS
For buzzing of the TV, check if there is a surge sound when turning on the TV.	3.42	0.62	3.42	0.63	3.44	0.53	156	-0.101	0.920	NS

Key: NS = Not Significant, S = Significant, df = Degree of freedom, t-cal = Calculated value of t-test using SPSS, S.D = Standard Deviation, $\bar{X}_1$ = Mean for Electronic technicians, $\bar{X}_2$ = Mean for Electronic Teachers, n_1 = number of Electronic technicians, n_2 = number of Electronic teachers, Level of Significance = 0.05.

Data presented In Table 2 show that all the items had their mean ranging from 3.36 to 3.46 which falls within the response categories of Possible. This indicates that all the items are the

possible ways of trouble shooting faults in LCD televisions. The standard deviation for the items ranges from 0.60 to 0.65. This implies that the Electronic Teachers and Electronic Technicians are homogenous in their responses on the possible ways of trouble shooting faults in LCD televisions. The result in Table 2 also shows that there is a significant difference in the mean responses of Electronic Teachers and Electronic Technicians on items 9, 10, and 12. Since their significance level are 0.007, 0.021, and 0.043, which are less than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was rejected for items 9, 10, and 12.

The result also revealed that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on items 11, 13, 14, and 15. Since their significance level ranges from 0.087 to 0.920 which are more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items.

Table 3: Mean ratings, standard deviation and t-test Analysis of the Responses of Electronic Teachers and Technicians on the possible ways of troubleshooting faults in LCD televisions related to power section.

Possible ways of trouble shooting faults in LCD televisions related to power section.	$\bar{X}$	S.D	Electronic Technicians. n = 149		Electronic Teachers. n = 9		df	t-cal.	Sig.	Decision
			$\bar{X}_1$	**S.D 1**	$\bar{X}_2$	**S.D$_2$**				
If there is blinking/low power on the TV, check power capacitor (400V/220µF) in the power stage.	3.44	0.61	3.44	0.62	3.44	0.53	156	-0.007	0.994	NS
For short circuit, trace output lines to see if it registers the same reading.	3.41	0.65	3.42	0.65	3.22	0.67	156	0.899	0.370	NS
If the TV fails to power "on", check for blown fuse if it continues, chek if the power pack is faulty.	3.40	0.68	3.42	0.65	3.00	1.00	156	1.834	0.069	NS
If the TV fails to receive power, check the power IC and capacitor to ensure that they are not dameaged.	3.42	0.68	3.43	0.68	3.22	0.67	156	0.889	0.376	NS
If there is total TV dead set, wiggle the TV's cord both at the outlet and TV with the section while pressing the power-on button if it continues, check if there is faulty component in the power stage.	3.41	0.69	3.44	0.65	2.89	1.05	156	2.382	0.156	NS

Key: NS = Not Significant, S = Significant, df = Degree of freedom, t-cal = Calculated value of t-test using SPSS, S.D = Standard Deviation, $\bar{X}_1$ = Mean for Electronic technicians, $\bar{X}_2$ = Mean for Electronic Teachers, n_1 = number of Electronic technicians, n_2 = number of Electronic teachers, Level of Significance = 0.05.

Data presented In Table 3 show that all the items had their mean ranging from 3.40 to 3.44 which falls within the response categories of Possible. This indicates that all the items are the possible ways of trouble shooting faults in LCD televisions. The standard deviation for the items ranges from 0.61 to 0.69. This implies that the Electronic Teachers and Electronic Technicians are homogenous in their responses on the possible ways of trouble shooting faults in LCD televisions. The result in Table 3 shows that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on items 16, 17, 18, 19, and 20. Since their significance level ranges from 0.069 to 0.994 which are more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items.

Table 4: Mean ratings, standard deviation and t-test Analysis of the Responses of Electronic Teachers and Technicians on the possible ways of troubleshooting faults in LCD televisions related to control buttons.

Possible ways of trouble shooting faults in LCD televisions related to control buttons.	$\bar{X}$	S. D	Electronic Technicians. n = 149		Electronic Teachers. n = 9		Df	t-cal.	Sig.	Decision
			$\bar{X}_1$	S. D_1	$\bar{X}_2$	S.D $_2$				
If the TV power fails to turn on, check to see that the (•) mark on the energy saving switch is pressed.	3.37	0.68	3.43	0.64	3.44	0.73	156	-0.067	0.946	NS
If the TV control buttons refuse to function, check for short circuit in the control buttons circuit.	3.42	0.64	3.44	0.60	3.11	0.93	156	1.563	0.319	NS
For improper working of the TV control buttons, check the position of te variable resistor responsible for the control of tht button.	3.40	0.65	3.40	0.63	3.22	0.83	156	0.825	0.411	NS
For motion blurrs, check the TV colour setting.	3.43	0.63	3.36	0.63	3.33	0.87	156	0.132	0.895	NS
If the TV power button refuses to function, check if the power button is flakey.			3.38	0.64	3.44	0.73	156	-0.278	0.781	NS

Key: NS = Not Significant, S = Significant, df = Degree of freedom, t-cal = Calculated value of t-test using SPSS, S.D = Standard Deviation, $\bar{X}_1$ = Mean for Electronic technicians, $\bar{X}_2$ = Mean for Electronic Teachers, n_1 = number of Electronic technicians, n_2 = number of Electronic teachers, Level of Significance = 0.05.

Data presented In Table 4 show that all the items had their mean ranging from 3.37 to 3.43 which falls within the response categories of Possible. This indicates that all the items are the possible ways of trouble shooting faults in LCD televisions. The standard deviation for the items ranges from 0.63 to 0.68. This implies that the Electronic Teachers and Electronic Technicians are homogenous in their responses on the possible ways of trouble shooting faults in LCD televisions. The result in Table 4 shows that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on items 21, 22, 23, 24,

and 25. Since their significance level ranges from 0.319 to 0.946 which are more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items

Table 5: Mean ratings, standard deviation and t-test Analysis of the Responses of Electronic Teachers and Technicians on the possible ways of troubleshooting faults in LCD televisions related to other faults.

Possible ways of trouble shooting faults in LCD televisions related to power section.	$\bar{X}$	S. D	Electronic Technicians. n = 149		Electronic Teachers n = 9		Df	t-cal.	Sig.	Decision
			$\bar{X}_1$	S. D_1	$\bar{X}_2$	S.D $_2$				
If there is absence picture on the TV screen, check antenna connection and the tuner.	3.43	0.64	3.40	0.64	2.78	1.09	156	2.730	0.126	NS
If the TV standby indicator lights up in red, check the function IC	3.42	0.62	3.44	0.62	3.00	0.87	156	2.034	0.044	S
For absence of sound and picture on the TV, check if IC in the IF stage is faulty.	3.39	0.64	3.41	0.64	3.22	0.83	156	0.841	0.402	NS
If the TV menu refuses to function, check if the TV remote is not working.	3.36	0.64	3.45	0.61	3.11	0.93	156	1.568	0.310	NS
If there is fuzzy scanning lines, check the focusing of the TV.	3.39	0.65	3.39	0.63	3.33	0.87	156	0.252	0.802	NS
For poor horizontal images on the TV, check the setting of the size of horizontal deflection coils.	3.42	0.65	3.42	0.65	3.44	0.73	156	-0.127	0.899	NS
For poor vertical images on the TV, check the setting of the size of vertical deflection coils.	3.37	0.70	3.38	0.69	3.33	0.87	156	0.176	0.860	NS

Key: NS = Not Significant, S = Significant, df = Degree of freedom, t-cal = Calculated value of t-test using SPSS, S.D = Standard Deviation, $\bar{X}_1$ = Mean for Electronic technicians, $\bar{X}_2$ = Mean for Electronic Teachers, n_1 = number of Electronic technicians, n_2 = number of Electronic teachers, Level of Significance = 0.05.

Data presented In Table 5 show that all the items had their mean ranging from 3.37 to 3.43 which falls within the response categories of Possible. This indicates that all the items are the possible ways of trouble shooting faults in LCD televisions. The standard deviation for the items ranges from 0.62 to 0.70. This implies that the Electronic Teachers and Electronic Technicians are homogenous in their responses on the possible ways of trouble shooting faults in LCD televisions. The result in Table 5 shows that there is a significant difference in the mean responses of Electronic Teachers and Electronic Technicians on item 27. Since its significance level is 0.044, which is less than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was rejected for item 27.

The result also revealed that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on items 26, 28, 29, 30, 31, and 32. Since their significance level ranges from 0.126 to 0.899 which are more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items.

Discussion

The findings of the study revealed that the possible ways of troubleshooting faults in LCD televisions are: ways of troubleshooting faults related to picture include: checking the connection of the aerial and the tuner when there is absence of picture; checking the IC or resistors or diodes on the power stage when automatic turning off of the TV occurs; checking the optimal equipment to see it is on when there is no picture and menu information from equipment connected to the scart connector; checking the electrolytic capacitor on the horizontal stage for ghosting of pictures; checking if the tuner is faulty for appearance of snow and noise on the screen; if there is dotted lines or stripes on the TV screen, check if electrical noise such as cars, motorcycles, or hair-dryers are available, if it continues check if the electrolytic capacitor on the vertical stage is faulty; for no colour on colour programmes, check if the transistor in the tube base is faulty. This was in line with Goldwasser (2011). Goldwasser (2011) identified some of the possible ways of troubleshooting faults in LCD television as checking for blown fuse and using a low power soldering iron to disconnect any soldered wire. The result of the analysis of the hypothesis revealed that there was no significant difference in the responses of electronic technology teachers and electronic technicians on one of the possible ways of troubleshooting LCD television faults related to picture. However, significant difference existed in the respondents responses on seven items as can be seen from table 1. The hypothesis of no significant difference was upheld for one item, but was rejected for seven items (see table 1). The result confirms the findings of Goldwasser (2011) who identified possible ways of troubleshooting LCD television faults as checking for blown fuse and using a low power soldering iron to disconnect any soldered wire.

From the study, it was also revealed that ways of troubleshooting faults in LCD televisions related to sound include: if the TV picture is noisy, check if the IF stage or the tuner is faulty; for stripe noise during playback, check for video head interference or playback cord; if there is noisy picture when viewing a TV channel, check noise reduction option on the picture adjustment; if it continues, check if the IF stage is faulty; if there is no TV sound but there is picture, check if the sound IC in the audio stage is faulty; for failure of the TV to receive a stereo or dull sound broadcast, check if there is a faulty audio component like speakers; if the TV cabinet creaks, check the temperature; and for buzzing of the TV, check if there is a surge sound when turning on the TV. This was in line with Goldwasser (2011). Goldwasser (2011) identified some of the possible ways of troubleshooting faults in LCD television as checking for blown fuse and using a low power soldering iron to disconnect any soldered wire. The finding of the study shows that there is a significant difference in the mean responses of Electronic Teachers and Electronic Technicians on three items which are less than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was rejected for the three items (see table 2). The result also revealed that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on four items (table 2), since their significance levels were more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items.

The study also revealed that possible ways of troubleshooting faults in LCD televisions

related to the power section include: if there is blinking/low power on the TV, check power capacitor (400V/220μF) in the power stage; for short circuit, trace output lines to see if it registers the same reading; if the TV fails to power "on", check for blown fuse if it continues, check if the power pack is faulty; if the TV fails to receive power, check the power IC and capacitor to ensure that they are not damaged; if there is total TV dead set, wiggle the TV's cord both at the outlet and TV with the section while pressing the power-on button if it continues, check if there is faulty component in the power stage. From the result of the study, it was revealed that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on the five items, since their significance levels were more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items. This was in line with Goldwasser (2011). Goldwasser (2011) identified some of the possible ways of troubleshooting faults in LCD television as checking for blown fuse and using a low power soldering iron to disconnect any soldered wire.

The study also identified ways of troubleshooting faults in LCD televisions related to the control buttons to include: if the TV power fails to turn on, check to see that the (•) mark on the energy saving switch is pressed; if the TV control buttons refuse to function, check for short circuit in the control buttons circuit; for improper working of the TV control buttons, check the position of the variable resistor responsible for the control of the button; for motion blurrs, check the TV colour setting; and if the TV power button refuses to function, check if the power button is flakey. The findings of the study also shows that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on the five items, since their significance levels were more than 0.05 level of significance. Therefore, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those items. This was in line with Goldwasser (2011). Goldwasser (2011) identified some of the possible ways of troubleshooting faults in LCD television as checking for blown fuse and using a low power soldering iron to disconnect any soldered wire.

Other ways of troubleshooting faults in LCD televisions identified by the study include: if there is absence picture on the TV screen, check antenna connection and the tuner; if the TV standby indicator lights up in red, check the function IC; for absence of sound and picture on the TV, check if IC in the IF stage is faulty; and if the TV menu refuses to function, check if the TV remote is not working, if there is fuzzy scanning lines, check the focusing of the TV; for poor horizontal images on the TV, check the setting of the size of horizontal deflection coils; and for poor vertical images on the TV, check the setting of the size of vertical deflection coils. The shows shows that there was a significant difference in the mean responses of Electronic Teachers and Electronic Technicians on one item (see table 5). Since its significance level is less than 0.05 level of significance, the null hypothesis of no significance difference was rejected for the item. The result also revealed that there was no significance difference in the mean responses of Electronic Teachers and Electronic Technicians on six items(see table 5). Since their significance levels are more than 0.05 level of significance, the null hypothesis of no significance difference was not rejected at 0.05 level of significance for those six items. The result confirms the findings of Goldwasser (2011) who identified possible ways of troubleshooting LCD television faults as checking for blown fuse and using a low power soldering iron to disconnect any soldered wire.

Conclusion

Based on the findings of the study, the following conclusions were made: LCD televisions are new in the society and their maintenance should be taught as a separate topic in electronic technology. Electronic

technicians should carry out maintenance of LCD televisions by troubleshooting the suspected sections of the LCD television before carrying out any remedy to the faults. This will avoid damaging other components or sections that are working properly.

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