CORE SAFETY COMPETENCIES REQUIRED BY TECHNICIANS FOR EFFECTIVE MAINTENANCE OF ANDROID SMART PHONES IN LAGOS STATE

BY

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Abstract
The study determined core safety competencies required by technicians for the maintenance of android smart phones in Lagos State. A survey research design was employed for the study. Three research questions guided the study while three null hypotheses formulated were tested at 0.05 level of significance. The population for the study was 70 respondents comprised 35 lecturers, 14 instructors and 21 supervisors in telecommunication industries. There was no sampling because of the manageable size of the respondents. A 49-items structured questionnaire was used as instrument for data collection. The instrument was validated by three experts. Cronbach alpha method was used to determine the reliability of the instruments with a coefficient of 0.80. Seventy copies of the instrument were administered on the respondents by the researchers and research assistants on one to one basis. Sixty seven copies of the questionnaire were retrieved and analyzed using mean to answer the research questions while Analysis of variance was used to test the hypotheses of no significant difference. The study found out that 16 core safety competencies in trouble shooting android phones, 12 core competencies in upgrading smart phones and 20 core safety competencies were required by technicians when repairing android smart phones. It was recommended that all the identified core safety competencies should be used to empower android smart phone technicians for effective performance in Lagos State. Relevant facilities should be made available either by government or individuals for the implementation of core safety competencies.
Keywords: Technicians, Android smart phone, Maintenance, Safety, Core competency

Introduction

Android smart phones are mobile phones with recent communication features. They are sophisticated telecommunication gadgets basically used to make and receive calls, send messages, snap pictures, play stored video and audios. Donner and Steenson (2008) explained that android smart phone makes use of different mobile communication methods, such as SMS, Wireless Application Protocol (WAP), Wireless Local Area Network (WLAN), WIFI, GPRS, Bluetooth, Infrared and Infra red Data Association (IrDA). Naeem (2011) also stated that phones are in different types manufactured by different companies

with their trademarks or brands. Android smart phones are fragile, complex in nature and therefore found very difficult to maintain whenever they are bad.

Maintenance of android smart phones becomes difficult for technicians when they are faulty. Maintenance is an action necessary for retaining or restoring a piece of equipment, machine, or system to the specified operable condition to achieve its maximum useful life. Bakare (2014) stated that both corrective maintenance and preventive maintenance are usually carried out on cell phones most especially when they are bad. Activities such as trouble shooting, upgrading, and repair activities are necessary when carry out corrective maintenance on android phones. Troubleshooting is the activity carried out to eliminate faults in equipment. Green and Gosse, (2000) stated that troubleshooting is the systematic elimination of various parts of a system, circuit or process to locate a malfunctioning part. Effective troubleshooting requires a skill that combines technical expertise, logical and creative thought process. Schultz (2007) explained that ability to troubleshoot is improved through experience. In troubleshooting, a technician is required to identify malfunctions or symptoms in electronic gadgets with experience to generate possible causes of the faults, and repairing the faults. Troubleshooting therefore is the act of identifying and eliminating problems or faults, especially in electronic gadgets such as smart phone. Effective troubleshooting enables technicians to identify and repair faults in android cell phones

Upgrading is the act of inculcating new or recent parts or components into a phone in order to improve its performance. Larry (2013) explained that skills in upgrading handsets are the abilities required to improve the quality, standard, or performance of a cell phone, especially by incorporating new advances. Repair is a corrective measure required to bring back a faulty equipment to its operable state. Repairing fault in cell phone as defined by Millano (2004) is a process of finding solution to a failed part of the system and this involves the technician using tools and equipment in repairing or replacing equipment with new ones, such as dead PCB, broken screen, burnt resistors, transistors, burnt integrated circuits (ICs), in order to bring live to the failed android phones. Bakare (2014) stated that skills in repairing cell phones are the abilities to restore all kinds of dead or cell phones with major

faults. A technician must acquire core safety competences for troubleshooting, upgrading and repairing smart phones.

Android smart phones have great impacts on human activities especially in Lagos State but still create some maintenance problems when they bad. Most of the technicians still found it difficult to repair or maintain android smart phones efficiently in Lagos State. In the same vein, James (2011) stated that android smart phones help in selling and buying of goods and services with ease but has created some management problems to the users in the areas of effective maintenance. Technicians are skilled and competent in servicing or maintaining low end cell phones for the users but lack core safety competencies required to rectify various faults in smart phones because of their complexities and special features. Due to lack of efficient technicians to repair or service faulty android smart phones, the users whose phones are bad abandoned them for the purchase of new ones. Seun (2010) stated that few technicians available often caused more damages to android phones contracted to them due to lack of core safety competencies.

Safety is the freedom from dangers of both human and material resources. Okparaeke (2004) described safety as the avoidance of accident which may lead to injury to persons, wastage of materials and damages of tools, equipment or machines in the work site through adherence or compliance to precautionary measures. Olaitan, Nwachukwu, Igbo, Onyemachi and Ekong (1999) stated that safety is an art of inculcating the necessity of taking precautions for the avoidance or reduction of accidents in order to protect people and worthy properties. Taking appropriate safety measures during maintenance of smart phones avoids wastage of materials and damage of phones being maintained. Determination of the core safety competencies therefore becomes necessary in order to train technicians for effective maintenance of android smart phones.

A competency is the combination of knowledge, skill and attitude critical for producing key outputs. This combination sometimes utilized to improve work place performance. Mc Celelland (2011) described competence as the state or quality of being adequately or well qualified, having the ability to perform a specific role. Someone possesses a competence as long as the skills, abilities, and knowledge that constitute competence area

are part of him, enabling the personnel to perform effective action within a certain workplace environment. Olaitan (2003) stated that to be competent means the individual has acquired the knowledge, skills and attitudes required to perform successfully at a specified proficiency level in a given work. John (2015) therefore stated that core competencies typically comprise fundamental knowledge, ability or expertise in a specific subject area or skill set, allow a business to reach a wide range of markets, and cannot be easily replicated by competitors. These competencies are core because they are the major knowledge, skills and unique characteristics a technician must possess in order to perform maintenance operations successfully on different types of android smart phones.

A technician requires core safety competencies to carry out a meaningful maintenance such as repair, upgrading and troubleshooting on android smart phones. Core safety competencies required to repair smart phones are the abilities or actions to restore all kinds of dead or cell phones with major faults without causing further damages. Core safety competencies for upgrading handsets according to Larry (2013) are the skills and knowledge to improve the quality, standard, or performance of a cell phone, especially by incorporating new advances without causing any further damages. Bakare (2014) described technicians as informally trained individuals who found maintaining all kinds of smart cell phones for members of the society. Supervisors, lecturers and instructors may have differences in their responses. Supervisors are experienced technical personnel in telecommunication industries in the study area overseeing the activities of technicians. They also acquire knowledge and skills in servicing, repairing or maintenance of all kinds of cell phones. Instructors and lecturers are academic staff in the polytechnics. Instructors concentrate in teaching practical contents of electrical/electronic courses. They repair, service or maintain all kinds of home appliances including cell phones. Instructors and lecturers work together in order to achieve the objectives of electrical/electronic courses. Lecturers are academic staff who has been trained to teach electrical/electronic courses in polytechnics. They also possess knowledge, skills and attitude in electrical/electronic courses. Most of these technicians often destroy android smart phones during maintenance and this may be associated with the lack of core

safety competencies. This worry necessitated the study to determine core safety competencies required by technicians for the maintenance of android smart phones.

Purpose of the Study

The study was carried out to determine core safety competencies required by technicians for the maintenance of android smart phones in Lagos State. Specifically the study sought to identify:

1. Core safety competencies required by technicians when troubleshooting android smart phones
2. Core safety competencies required by technicians when upgrading android smart phones
3. Core safety competencies required by technicians when repairing malfunctional android smart phones

Research Questions

The following research questions guided the study:

1. What are the core safety competencies required by technicians when testing and troubleshooting android smart phones
2. What are the core safety competencies required by technicians when upgrading android smart phones
3. What are the core safety competencies required by technicians when repairing malfunctional android smart phones

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

$H0_1$: There is no significant difference in the mean responses of lecturers of electrical/electronic technology, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when testing and troubleshooting android smart phones

$H0_2$: There is no significant difference in the mean responses of lecturers of electrical/electronic technology, instructors and supervisors in telecommunication

industries on the core safety competencies required by technicians when upgrading android smart phones

$H0_3$: There is no significant difference in the mean responses of lecturers of electrical/electronic technology, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when repairing malfunctional android smart phones

Methodology

Design of the Study

The study adopted descriptive research design. Descriptive research design according to Kothari and Garg (2014) is appropriate for those studies which are concerned with describing the characteristics of a particular individual, or of a group.

Area of the Study

The study was conducted in Lagos State of Nigeria. The study was carried out in Lagos State because there were reasonable numbers of telecommunication industries and polytechnics where researcher could locate supervisors, lecturers and instructors to react to the questionnaire. Also, Lagos State is a place where users of android phones from other states repair their phones when faulty and these made Lagos State a proper place for the conduct of the research.

Population for the Study

The population for the study was 70 which comprised all the 35 lecturers and 14 instructors of electrical/electronic technology from Department of Electrical/Electronics Technology, Yaba College of Technology, Lagos State Polytechnic Ikorodu and Lagos City Polytechnic Ikeja and 21 supervisors in mobile telecommunication industries in Lagos State (Staff Data book, 2015). The entire lecturers, instructors and supervisors were involved in the study because of their manageable size.

Instrument for Data Collection

A structured questionnaire titled Android Smart Phone Core Safety Competency Questionnaire (ASPCSQ) with five point Likert response scales of 5, 4, 3, 2 and 1 representing Strongly Required, Required, Undecided, Not Required, and Strongly Not Required was developed to collect data from the respondents. The questionnaire was divided into Part 1 and 2. Part 1 solicited for information on personal data of the respondents while part 2 with three sections A, B, and C solicited on: core safety competencies required by technicians when troubleshooting android smart phones, core safety competencies required by technicians when upgrading android smart phones and core safety competencies required by technicians when repairing malfunctional android smart phones respectively.

Validation of the Instrument

The Android Smart Phone Core Safety Competency Questionnaire (ASPCSCQ) was subjected to both face and intrinsic validation by three Experts. For face validation, the draft copies of the questionnaire were given to experts to include one from the Department of Science and Technology Education, University of Lagos, Akoka, one from the Department of Electrical/Electronic Technology, Federal College of Education (Technical) Akoka and one from the Department of Electrical/Electronic Technology, Yaba College of Technology Yaba Lagos State.

The intrinsic validity value was obtained through the use of the test statistics. The intrinsic validity coefficients obtained for each section of the instrument were as follows: Section A, 0.82; Section B, 0.84; Section C, 0.80 .These values indicated a high level at which the items on the questionnaire measure what they should measure.

Reliability of the Instrument

Cronbach alpha reliability method was used for determining the internal consistency of questionnaire items. Twenty copies of validated structured questionnaire were administered on 10 lecturers, 5 instructors of electrical/electronic technology in the polytechnics and 5 supervisors in electrical/electronic industries in Oyo State. Their

responses were analyzed using Statistical Package for the Social Science (SPSS) 16 versions and overall Cronbach alpha Coefficient value of 0.80 was obtained.

Method of Data Collection

Copies of the structured questionnaire were administered on the respondents at various locations within Lagos State by the researchers with the help of three research assistants. One week after the administration of the questionnaire, the researcher and research assistants went round to collect the copies of the questionnaire from the respondents and 34 copies of the questionnaire were retrieved back from lecturers, 13 copies were collected back from the instructors while 20 copies were retrieved back from supervisors. Out of 70 copies of questionnaire administered altogether 67 copies were duly collected back from the respondents which represent 95.71 percent return rate.

Method of Data Analysis

Data collected for answering research questions 1, 2 and 3 were analysed using Mean while analysis of variance (ANOVA) was used to test null hypotheses one to three at 0.05 level of significance. A cut-off point of 3.50 was used for decision making and any item whose Mean value is 3.50 or above was judged as required, while any item whose Mean value is less than 3.50 was judged as not required.

In taking decision on the hypotheses tested, the hypotheses of no significant difference was accepted where the P-value is greater than 0.05 levels and this indicated that there was no significant difference in the mean ratings of the responses of the groups of respondents on that item. If the P-value is less than 0.05 levels, this indicated that the hypothesis of no significant difference in the mean responses of the groups of respondents was rejected for that item. All computations were done using the Statistical Package for Social Sciences (SPSS) Version 16.0.

Results

The results for the study were obtained from the research questions answered and hypotheses tested through data collected and analyzed.

Research Question 1

What are the core safety competencies required by technicians when troubleshooting android smart phones?

Hypothesis one

There is no significant difference in the mean responses of lecturers of electrical/electronic technology, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when troubleshooting android smart phones

The data answering research question 1 are presented in Table 1

Table 1: Mean Responses and ANOVA of Respondents on the Core Safety Competencies required by Technicians when Troubleshooting Android Smart Phones

S/N	Competency Items	Mean	SD	P-Values	Remark,	Ho
1	Take down the actual complains of customer regarding the faulty smart phone	3.77	0.56	0.98	Required,	NS
2	Identify first class facilities for trouble shooting faulty smart phone	3.56	0.32	0.68	Required,	NS
3	Test the faulty android phone in the present of the owner	3.57	0.51	0.81	Required,	NS
4	Recognize the symptoms of all the possible faults	3.51	0.39	0.35	Required,	NS
5	List all the possible causes of the problems	3.51	0.45	0.56	Required,	NS
6	Check the list of possible causes against the list of the symptoms	3.56	0.54	0.62	Required,	NS
7	Rank the remaining causes in order of likelihood	3.74	0.50	1.01	Required,	NS
8	Reveal the result of the trouble shooting to the owner of the cell phone	3.77	0.38	0.67	Required,	NS
9	Use tested okay unit to replace bad unit of the same capacity if fault is obvious	3.54	0.49	0.09	Required,	NS
10	Test the unit or component one by one to ascertain the location of the faults	3.79	0.61	0.10	Required,	NS
11	Record down the outcome of the trouble shooting	3.67	0.67	0.44	Required,	NS

12	Tackle the likeliest causes in the order of the complexity, cost and /or time required to check them	3.71	0.53	0.89	Required,	NS
13	Put on safety wear while troubleshooting android phone	3.69	0.59	0.81	Required,	NS
14	Trouble shoot faulty android phone off power supply	3.60	0.51	0.75	Required,	NS
15	Use compatible auxiliary equipment for the troubleshooting of smart phones	3.56	0.62	0.30	Required,	NS
16	Set ohmmeter to zero position when using it	3.58	0.71	1.22	Required,	NS

The data presented in Table 1 reveal that all the 16 items have their mean values ranged from 3.51 to 3.79 which are above the cutoff point of 3.50. This showed that all the 16 items are the core safety competencies required by technicians when troubleshooting android smart phones. The table also indicated that all the items had their P-values greater than 0.05 at degree of freedom 3 and 67. This indicated that there was no significant difference in the mean responses of lecturers, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when troubleshooting android smart phones. Therefore, the null hypothesis of no significant difference was upheld for all the 16 competencies in trouble shooting android smart phones.

Research Question 2

What are the core safety competencies required by technicians when upgrading android smart phones?

Hypothesis Two

There is no significant difference in the mean responses of lecturers of electrical/electronic technology, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when upgrading android smart phones

The data answering research question 2 are presented in Table 2

Table 2: Mean Responses and ANOVA of Respondents on the Core Safety Competencies required by Technicians when upgrading Android Smart Phones

S/N	Competency Items	Mean	SD	P-values	Remark,	Ho
1	Select appropriate tools for upgrading smart phones	3.77	0.56	0.98	Required,	NS
2	Apply recommended tools while upgrading smart phone	3.58	0.57	0.98	Required,	NS
3	Apply various options in upgrading a cell phone	3.56	0.32	0.68	Required,	NS
4	Detect parts of the android phone that needs to be upgraded	3.57	0.51	0.81	Required,	NS
5	Download relevant virus-free application software for upgrading android phone	3.51	0.39	0.35	Required,	NS
6	Install application software for upgrading android phone using recommended or laid down steps	3.51	0.45	0.56	Required,	NS
7	Remove obsolete components or parts from smart phone with care	3.56	0.54	0.62	Required,	NS
8	Install new component onto the android phones carefully	3.74	0.50	1.01	Required,	NS
9	Couple back the cell phone using laid down procedures	3.77	0.38	0.67	Required,	NS
10	Confirm functionality of the upgraded android phone before use	3.54	0.49	0.09	Required,	NS
11	Upgrade android phones on insulated table	3.79	0.61	0.10	Required,	NS
12	Put on first class safety wears (anti static wrist strap) while upgrading android phone	3.67	0.67	0.44	Required,	NS

The data presented in Table 2 reveal that all the 12 items have their mean values ranged from 3.50 to 3.81 which are above the cutoff point of 3.50. This showed that all the 12 items are the core safety competencies required by technicians when upgrading android smart phones. The table also indicated that all the items had their P-values greater than 0.05 at degree of freedom 3 and 67. This indicated that there was no significant difference in the mean responses of lecturers, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when upgrading android smart phones. Therefore, the null hypothesis of no significant difference was upheld for all the 12 competencies in upgrading android smart phones.

Research Question 3

What are the core safety competencies required by technicians when repairing malfunctional android smart phones?

Hypotheses Three

There is no significant difference in the mean responses of lecturers of electrical/electronic technology, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when repairing malfunctional android smart phones

The data answering research question 3 are presented in Table 3

Table 3: Mean Responses and ANOVA of Respondents on the Core Safety Competencies required by Technicians when Repairing Malfunctional Android Smart Phones

S/N	Competency Items	Mean	SD	P-value	Remark,	Ho
1	Unscrew android smart phone with recommended tools	3.77	0.56	0.98	Required,	NS
2	Dismantle the cell phones gently	3.56	0.32	0.68	Required,	NS
3	Split out the casing of the cell phone gently	3.57	0.51	0.81	Required,	NS
4	Separate the key pad from the mechanism	3.51	0.39	0.35	Required,	NS
5	Move the slider down	3.51	0.45	0.56	Required,	NS
6	Lift the connector up to unplug the screen that is attached to the circuit ribbon	3.56	0.54	0.62	Required,	NS
7	Move the slider up in case of slide phone	3.74	0.50	1.01	Required,	NS
8	Remove the front cover of the cell phone	3.77	0.38	0.67	Required,	NS
9	Identify faulty area or components in a smart phone	3.54	0.49	0.09	Required,	NS
10	Test the components with appropriate testing instruments	3.79	0.61	0.10	Required,	NS
11	Remove the component(s) from the mother board using recommended tools	3.67	0.67	0.44	Required,	NS
12	Select components of correct specification	3.71	0.53	0.89	Required,	NS

13	Verify the condition of the components before fixing it back to the mother board	3.69	0.59	-0.81	Required,	NS
14	Repair or change the faulty components if totally bad	3.60	0.51	0.75	Required,	NS
15	Fixes back the components onto mother board correctly	3.56	0.62	-1.30	Required,	NS
16	Applies soldering iron for only 3 seconds if needed	3.58	0.71	1.22	Required,	NS
17	Applies sufficient flux to point(s) being soldered	3.74	0.50	1.01	Required,	NS
18	Couple the android phone by following approved procedures	3.77	0.38	0.67	Required,	NS
19	Configure the phone using recommended facilities	3.54	0.49	0.09	Required,	NS
20	Screw android smart phone with recommended tools	3.79	0.61	0.10	Required,	NS
21	Test the functionality of the android phone with compatible battery or power source	3.67	0.68	0.12	Required,	NS

The data presented in Table 3 reveal that all the 20 items have their mean values ranged from 3.53 to 3.89 which are above the cutoff point of 3.50. This showed that all the 21 items are the core safety competencies required by technicians when repairing android smart phones. The table also indicated that all the items had their P-values greater than 0.05 at degree of freedom 3 and 67. This indicated that there was no significant difference in the mean responses of lecturers, instructors and supervisors in telecommunication industries on the core safety competencies required by technicians when repairing android smart phones. Therefore, the null hypothesis of no significant difference was upheld for all the 21 competencies in repairing android smart phones.

Discussion of findings

The finding of the study reveals 16 core safety competencies in trouble shooting android phones, 12 core competencies in upgrading smart phones and 21 core safety competencies required by technicians when repairing android smart phones. These findings are in agreement with the findings of Ogbuanya and Bakare (2014) who developed appropriate contents in cell phone maintenance for youths empowerment and found out 20 appropriate competencies in trouble shooting and repairing faulty cell phones, 26 competencies in

configuring and flashing malfunctioned cell phones, 21 competencies in maintaining malfunctioned cell phones and 25 facilities for maintenance of cell phones.

This finding is also in agreement with the study of Akinduro (2006) who carried out a study on electrical installation and maintenance work skills needed by technical college's graduates to enhance their employability in Ondo state. The author found out that the graduates of technical colleges need domestic installation skills, industrial installation skills, cable jointing skills, battery charging skills and winding skills in electrical machine for employment in Ondo State.

This finding is in line with the finding of Yakubu (2004) who conducted a study on safety practice skills needed by woodwork students of technical colleges in Kaduna state where he found out that students of woodwork in technical colleges needed sixteen safety practice skills in using hand tools; twenty safety practice skills in operating portable power tools; thirty safety practice skills in operating machines; ten safety practice skills in handling wood materials and ten safety practice observances in the use of instructional operating guides. The findings of the above researchers in their various research activities helped to support the justification of the results of this study on the core safety competencies required by technicians for the maintenance of android smart phones in Lagos State.

Conclusion

Android smart phones are sophisticated telecommunication technologies found very difficult to maintain by technicians due to their complexity and features. These technologies have created some maintenance problems to the users in the areas of maintenance. Most of the users could not easily locate efficient technicians who could repair and service faulty cell phones without causing further more havoc to them during maintenance. This worry necessitated the study to determine core safety competencies required by technicians for the maintenance of android smart phones in Lagos State

Recommendations

The following are the recommendations for the implementation of the findings of the study:

1. The identified core safety competencies should be used to empower technicians for effective maintenance of android smart phones in Lagos State

2. Relevant facilities should be made available either by government or individuals for the implementation of core safety competencies

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