Influence of electrical/electronic workshop climate on the workshop accidents among self-employed electrical/electronic service personnel in Ebonyi State

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ABSTRACT

This study aims to investigate the influence of electrical/electronic workshop climate on workshop accidents among self-employed electrical/electronic service personnel in Ebonyi State. The study adopted a descriptive survey research design. The population for the study was 622 registered (Unions) electrical/electronic service personnel. A sample of 120 was drawn from the population for the study through a proportionate stratified random sampling technique. The study found that Regardless of the Administrative style; Number of the workshop users; Arrangement of the workshop and Available equipment in the electrical/electronic workshop respectively, there is an occasional rate of accident. But some types of accidents record varying rates of occurrence depending on the type of administrative style, number of workshop users, arrangement of the workshop, and workshop equipment in the said workshop. Based on the conclusions drawn from the findings of the study, the study recommended that Government should provide soft loans, start-up grants for the self-employed service personnel for the acquisition of the needed equipment; Government also should institute a fund that can help work accident victims to take care of the medical expenses.

INTRODUCTION

The Electrical/Electronic workshop should have in it, all the basic facilities, equipment, well arranged and also the right number of workshop users to ensure the effective functioning of the workshop. Regardless of the fact that the Electrical/Electronic workshop is potentially hazardous, the level of the accidents should be reduced to the barest minimum by maintaining safe working environment. This means that the safety of the life and property in the Electrical/Electronic workshop is paramount and should be ensured in the workshop by the workshop owner through the employment of appropriate administrative style that promotes safety in the workshop and reduces Electrical/Electronic workshop accidents. Provision of appropriate workshop equipment and PPE is to be made for the workshop users as a means of curbing and controlling Electrical/Electronic workshop accidents. This would make the workshop owner reap the full economic benefit of the workshop. High level of performance in an Electrical/Electronic workshop is always desired. This can only be achieved when the accident rate is reduced.

However, there is currently a high level of accidents even though many cases go unreported in the Electrical/Electronic workshop. Most Electrical/Electronic workshops in Ebonyi State have a workshop climate that may improve or reduce the chances of frequent electrical/electronic workshop accident, without having the knowledge of what role those factors play. The unsafe acts and conditions which are evident in and around the workshop create a workshop climate that can be said to be hostile to the workshop users’ safety. In most of these Electrical/Electronic workshops owned by the self-employed Electrical/Electronic service personnel, the number of the apprentices using the workshop is usually over what can be reasonably said to be a safe number. As a result of the economic...
situation of most of these Electrical/Electronic service Personnel, it is a common knowledge that most of the workshops are not adequate for the number of workshop users. Also, the administrative style used, may in itself be instrumental to the frequency of accidents, without the knowledge of the master craftsmen. This poor Electrical/Electronic workshop climate may be a major driving force to the ever-increasing level of Electrical/Electronic workshop accident in the State and in Nigeria. This increasing level of accidents in the Electrical/Electronic workshop has affected the productivity level of most of the Electrical/Electronic servicing enterprises that operate in Ebonyi State. Consequently, causing attrition (when accidents become frequent, thus most apprentices do not complete their training duration) and having an adverse effect on the financial state of the Electrical/Electronic Service Personnel.

Consequently, there is a need to empirically determine the relationship that exists between the Electrical/Electronic workshop climate and the occurrence of these accidents in the workshop. This is as a result of the current state of lack in the empirical data on how workshop climate influences the accidents that take place in the Electrical/Electronic workshops in Nigeria and in Ebonyi State specifically. It becomes a source of concern, contemplating the type of influence workshop climate has on the increasing cases of accidents in the Electrical/Electronic workshops of self-employed Electrical/Electronic service personnel in Ebonyi State. The problem of this study therefore is the lack information on the influence workshop climate has on the accidents in the workshop of a self-employed Electrical/Electronic Service Personnel in Ebonyi State, Nigeria.

The following research question guided the study:

i. What influence does administrative style have on accidents at the Electrical/Electronic workshop?
ii. What influence does the number of workshop users have on accidents at the Electrical/Electronic workshop?
iii. What influence does workshop arrangement have on accidents at the Electrical/Electronic workshop?
iv. What influence does workshop equipment and facilities have on accidents at the Electrical/Electronic workshop?

Literature Review

Theoretical Background and Hypothesis Development

Electrical/Electronic workshop climate is pivotal to safety in the workshop and wellbeing of the workshop users. The workshop climate indicates the mode in which the workshop conditions in any Electrical/Electronic workshop would be perceived and in turn determines the conduct of the Electrical/Electronic workshop users. According to Hecker and Goldenhar (2014), workshop climate corresponds to the more variable mood and conditions present in the workshop. The workshop climate connotes the general outlook as perceived by the workshop users, (be it negative or positive, conducive or adverse). Workshop climate is the perceived value placed on the safety, conduciveness, and appropriateness or otherwise of the workshop at a particular point in time, which is the view or notion held by the workshop users about their workshop (Government of Queensland, 2017). Therefore, Electrical/Electronic workshop climate is considered to be the workshop condition in such workshop as perceived by the workshop users, which can influence the occurrence and frequency of accidents in the Electrical/Electronic workshop. When the Electrical/Electronic workshop climate is not proper, the safety of the workshop is jeopardized and consequently, exposing Electrical/Electronic workshop users to accidents which generally may result to harm and/or damage to workshop facilities.

Safety in any workshop is predicated on conditions in the workshop and the relative lack or reduced level of accidents. Accidents are seen as undesired and unplanned events. According to the International Labour Organization (ILO) (2015), accidents are those occurrences arising from, or in the course of work which results in fatal or non-fatal injuries and damage to the facility. Accidents are those events that cause serious injuries and fatalities in the workshop (Nadhim, Hon, Xia, Stewart, & Fang, 2016). Accidents are undesirable in the workshop because, in an event of an accident, there are injuries to workshop users, damages to the facility and definitely losses in man-hour. In other words, accidents are those undesirable and unplanned events that take place in the Electrical/Electronic workshop, which have negative impacts on the workshop users and facilities in the workshop, causing injuries or death to the worker(s) and also may cause damage to the equipment or facility. Some of these accidents include; electric shock/electrocution, falling from heights, being hit by flying or falling object, impact from electrical arcing, cut from tools, burn from arcing or from exploding electrical components, hammer falling from heights, breaking of the ladder in use, flying tools, among others. Some of these above listed accidents in the Electrical/Electronic workshop are fire related, others are electrical related while other are impact related and so on. In the Electrical/Electronic workshop, accidents have different effects on the workshop users and the work material. Effects of accidents are mostly apparent, but some effects of workshop accidents are not. These conditions which are not obvious may result in some conditions that gradually degenerate into a more complex health challenge that affect the human systems.

Some accidents that occur in the Electrical/Electronic workshop may injure the body in a different way which is not rather superficial. These health conditions are called Musculoskeletal disorders (MSDs). According to Cheng, Wong, Yu, and Ju (2016), musculoskeletal disorders are conditions that arise from occupational exposures, which include a wide range of inflammatory and degenerative conditions affecting the musculoskeletal systems and can occur from a single traumatic event or cumulative overuse injuries. The condition slowly degenerates in the body of the workshop users, most time when the warning signs are ignored without remedial action taken to correct the problem as they arise. Musculoskeletal disorders (MSDs) according to Summers, Jinnett, and Bevan (2015), represent those conditions that affect the muscles, tendons, ligaments, joints, peripheral nerves and supporting blood
vessels in the body, which encompasses a variety of conditions, ranging from those that have an acute onset and a short duration, to lifelong disorders. Regardless of the mode of occurrence, MSDs has been touted as the most common health challenge faced by workshop users. Consequently, musculoskeletal disorders (MSDs) are regarded by this study as physiological disorders that gradually develop in an Electrical/Electronic workshop user(s), which affects the muscles, bones, joints, ligaments, and tendons of the person, as a result of work in the Electrical/Electronic workshop. In order to prevent the MSDs, injuries, fatalities, and damages to the life and properties in the Electrical/Electronic workshop as a result of accidents, many considerations should be made, including the workshop climate which could be instrumental to reducing or increasing the frequency of accident in the workshop.

There are factors that constitute the workshop climate and determine in what state the workshop climate is perceived (positive or negative) to be. Workshop climate according to Ali, Lei, and Wei (2017), Profijit (2015), Russell (2015), Jyoti (2013), Permarupan, Safii, Kasim and Balakrishnan (2013), and Cooke and Meyer (2007), has to do with the administrative style adopted by the management; level of equipping the workshop; population of users of the workshop; workshop layout/design and arrangement of the workshop; work-flow type and so on. These factors serve as the basis with which the workshop users measure/rate the workshop climate in their workshop. It is common knowledge that these factors, have varying level of influence and may contribute to the accidents recorded in the Electrical/Electronic workshop and the overall safety of the workshop users.

In the Electrical/Electronic workshop, the administrative style (such as; autocratic, democratic, paternalistic, laissez-faire, action-centered, bureaucratic, and corrective administrative styles) which workshop owner adopts goes a long way to determine the mood in the workshop and the behaviour of the workshop users. According to Iqbal, Anwar and Haider (2015), administrative style is the strategy adopted by the workshop owner to help in carry out the responsibility of providing guidance and ensuring unity of purpose among the employee, so as to lead them to better performance and make them expert for maintaining the quality. The administration of the workshop through effective administrative style creates in the Electrical/Electronic workshop users the drive to prevent accidents in the workshop. According to Ike and Eze (2013), administrative style is the way the management creates such conditions which are conducive to maximize efforts so that people are able to perform their tasks efficiently and effectively by applying a suitable process of management. The administrative style in this study is the same with the leadership style that the master craftsman employs in the control and management of affairs in the Electrical/Electronic workshop and in the relationship with the apprentices and other workshop users. In creating a conducive workshop climate, not only the administrative style needs to be looked into, but also the workshop equipment needs to be properly arranged in a manner that can prevent accidents.

The workshop should be arranged to reflect the mode of operations, characteristics of the users and the flow of work in the workshop, also to maintain safe operations. According to Nik Mohamed, Ab Rashid, Mohd Rose, and Ting (2015), workshop arrangement is a layout of everything needed for delivery of services; also, it is an entity that provides the performance of any task that includes a work center, testing areas, and storage areas. An Electrical/Electronic workshop arrangement/layout is a blueprint or a plan of everything needed for the production of goods or delivery of services, which determine the physical organization of the Electrical/Electronic workshop. Wanniarachchi, Gopura, and Punchihewa (2016) stated that the workshop layout is an arrangement of everything needed for the production of goods or delivery of services. Therefore, in this study, Electrical/Electronic workshop arrangement is the layout or organization of Electrical/Electronic workshop which has to do with equipment placement, work-bench arrangement and the gangway for human and material traffic. Since the space allocated for the laboratory is fairly small, as is the case with most Electrical/Electronic workshop, (International Electrotechnical Commission (IEC), 2012) the arrangement of the room has to be given special thought, thus the room layout should be planned carefully, including a dedicated test area where tests can be performed in logical sequences; assembly and repair area with the necessary equipment; storage cabinets for test equipment and office desks also need to have specific placement areas. For safe operations in the Electrical/Electronic workshop to be maintained, the arrangement of the workshop should also provide for and enforce strict adherence to the stipulated number of users.

In making the arrangement of an Electrical/Electronic workshop, special consideration should be made for the number of workshop users it can support. According to The Government of the Hong Kong Special Administrative Region (2009), the number of workshop users should be such that ensure the workshop is not overcrowded as it contributes to accidents. When the wrong number of workshop users is allowed in the workshop, there is a strong likelihood of accidents happening. To prevent the occurrence of accidents in the workshop, Yekinni (2016), suggested that a series of preventive measures should be implemented. These measures according to Yekinni include among other things the proper management of the workshop as well as ensuring that the appropriate number of workshop users is allowed to use the workshop at any given time. Therefore, adhering to the appropriate number of workshop users would ensure that hazards as a result of overcrowding are curbed to the lowest minimum. For the operations in the Electrical/Electronic workshop to be safely carried out, even by an appropriate number of workshop users, there is some protective equipment that is needed by the workshop users.

Protective equipment designed to ensure the safety of workers in the workshop is needed, this protective equipment is called Personal Protective Equipment (PPE). According to Tanko and Amibogu (2012), Personal Protective Equipment, commonly referred to as “PPE” is any equipment used to minimize exposure to a variety of hazards; is also a method to protect a person from hot and cold temperatures. All PPEs used, have their different uses and functionality. According to Ofonime and Oluseyi (2016), Personal Protective Equipment (PPE) is a tool that plays a very important role in the health and safety of workers and when utilized at workplace/workshops minimize the exposure to a variety of hazards. In other words, personal protective equipment (PPE) are those equipment employed by workers to reduce the occurrence and effects of Electrical/Electronic workshop accidents in the workshop,
which are mostly used by workshop users to protect life and guard against the occurrence and effect of potentially fatal accidents. These personal protective equipment PPE include such equipment as, coverall, goggles, ear-muff, hard hat/helmet, hand gloves, safety boots, safety belts, safety nets and so on. According to Budathohiki, Singh, Sagatani, Niraula, and Pokharel (2014), the use of personal protective equipment (PPE) at all times is a good safety practice for workshop users to protect themselves from exposure to hazards and injuries at work. But because of the inadequate provision and use of PPE, there is an increase in the severity of the effect of accidents in the workshops. Accidents appear not to be abated, notwithstanding the availability of this personal protective equipment in the market, especially among self-employed Electrical/Electronic service personnel(s) (Yekinni (2016), and Joseph, Amadike, Nsikan, and Sagbara (2016)). These, however, may be as a result of the unique characteristic of a self-employed Electrical/Electronic Service Personnel.

The Electrical/Electronic Service Personnel is a skilled person in the trade of Electrical/Electronic, who are trained to carry out maintenance, and installation of electrical and electronic appliances, equipment and installations. In the view of Ohanu (2012), the Electrical/Electronic Service Personnel are people who are specially trained and skilled to meet the electrical/electronic requirements of man in the ever-changing technological society. In other words, the Electrical/Electronic Service Personnel are master craftsmen who specializes in and has the necessary skills in construction, maintenance of electrical installations. In addition, they deal with maintenance of electronic appliances and equipment, such as Radio, Television, Mobile Phones, and Computer Hardware among others (Orji and Ogbuanya, 2020; Orji, 2021). It is a common knowledge that some of this Electrical/Electronic Service Personnel are self-employed, who own, run and operate their Electrical/Electronic workshop personally.

In Nigeria, most Electrical/Electronic Service Personnel are self-employed. This means that they provide their means of livelihood through their services to customers. Anaele, Adelaku, Olumoko, and Kanu (2014), saw self-employment as a situation which refers to where an individual creates, begins and takes control of the business decision rather than working for an employer. A self-employed Electrical/Electronic Service Personnel is an individual who provides professional Electrical/Electronic services to clients independently, in a private setting where the responsibility for making decisions, wages and observance of rest is personal without recourse to anybody. Oluka, (2016) stated that self-employed personnel are those individuals that utilizes the acquired skills to assume the responsibility and risk of business operations by setting-up a personally ran private enterprise instead of waiting for a paid employment that may or may not come. Therefore, self-employed Electrical/Electronic Service Personnel is a skilled individual who owns and manages the Electrical/Electronic service enterprise his/her source of livelihood.

The self-employed Electrical/Electronic Service Personnel are in the context of this study, the master craftsmen. These master craftsmen are distinctively differentiated by the level of experience they have attained in their trade. Some master craftsmen are better experienced than others; this is due to the number of years they have invested in the trade (Orji, 2015; Orji & Ogbuanya 2018). The years of experience of a particular master craftsman may have an influence on the likely administrative style he will adopt and also the mode of workshop arrangement the workshop manager goes for, in his workshop. Wachter and Yorio (2014) and Rice, (2010) stated that years of experience for the master craftsman is the number of years spent in the trade and is a major deciding factor for the level of job performance, as it enhances the knowledge, skills, and productivity of workers. Therefore, in the context of this study, the experienced master craftsmen are individuals who have practiced the trade for five years and above, while the less experienced master craftsmen are individuals who have practiced the trade for less than five years. According to Uppal, Mishra, and Vohra, (2014) personality factors rather than work or job experience guarantee positive work performance. On the other hand, Kotur and Anbazhagan, (2014) stated that the performance of the employees gradually increases with their experience. Also, Peake and Marshall, (2009) stated that related activities experience were positive and significantly increased the probability of obtaining positive estimates for performance. As such a master craftsman who has armed himself with adequate years of experience, may or may not become effective in the handling of workshop affairs. Kotur and Anbazhagan (2014), stated that master craftsman is a leader; who is an expert; dependable and more efficient with tact and knowledge in the trade; and finally, can effectively pass down his skills to his trainees. The trainees, in this case, are the apprentices.

Apprentice is an individual who is under the tutelage of an experienced person (master craftsman) with the intent of acquiring skills from the experienced person in a particular trade (Ogbuanya, Chukwu and Orji, 2020). Molz, (2015) stated that apprentice is more or less an employee who learns while they work for the master craftsman. The arrangement, where an individual works as an apprentice is called apprenticeship. Fajobi, Olatujoye, Amusa and Adeyoyin (2017), Udu (2015) and Adekola, (2013) implied in their definitions that the scheme is one that provides learners or trainees with skills training through an on-the-job training by a master craftsman, according to terms of the agreement between the two parties (Master Craftsman and Apprentice). Therefore, the Apprentice is an individual undergoing skill training under the Electrical/Electronic master craftsman. The Electrical/Electronic Servicing Enterprise run by the craftsman being a privately owned and operated business that as well trains apprentices require to operate in an environment with reduced challenges in order for the enterprise to succeed. But Ali, Lei, and Wei, (2017) stated that in the Electrical/Electronic workshops run by the self-employed Electrical/Electronic Service Personnel, a good workshop climate and safety culture are not strictly adhered to, thus they are very poor to compare with a larger enterprise where regulations are strictly enforced.

The Electrical/Electronic Service Personnel and their Enterprise are regularly faced with huge challenges, which some of them are as a result of accidents in their workshop. These challenges according to Permarupan, Saufi, Kasim, and Balakrishnan, (2013) have
resulted in low productivity orchestrated by the negative or poor Electrical/Electronic workshop climate. Several other problems such as attrition of the apprentices and low patronage owing to the unimpressive workshop arrangement that the client experience; can be traced to the inability to maintain a good Electrical/Electronic workshop climate, be it what can be termed conducive or unconducive may have positive or negative influence on the cases of accidents in the workshop. The knowledge of the influence all these factors has on the Electrical/Electronic workshop accidents remain unclear, as the cases of the problems attributed to the workshop have continued to rise among self-employed Electrical/Electronic service personnel in Ebonyi State.

The problem of Electrical/Electronic workshop accidents is on the high side and in most cases may have gone unreported. Attrition and depreciation in task performance are very evident and on the rise. In Nigeria, the Electrical/Electronic workshop has a high accident rate that is generally unreported as pointed out by Yekinni (2016), who stated that the actual accident figures for Electrical/Electronic workshop users and students in Vocational/Technical Institutions would be much greater in number nowadays if all accidents were reported. There is a high level of accidents in Electrical/Electronic workshops (Joseph, Amadike, Nsikan, & Sagbara, 2016) in Akwa Ibom State, Nigeria, because Electrical/Electronic Workshop users are generally exposed to accidents in their workplace, due to the conditions and tools used in the workplace or workshop. There are several cases of attrition among the Electrical/Electronic apprentice and also the abandonment of the trade as a result of several problems attributed to frequent accidents in the workshops, (Yekinni, 2016). This is also the case in Ebonyi state. In the same vein, Yekinni (2016), went on to make reference to some Electrical/Electronic workshop accident that has recently occurred with varying level of effect they have on the workshop users. In Ebony state just like what was reported by Joseph Amadike, Nsikan, and Sagbara, (2016) the case is not different as several cases of Electrical/Electronic workshop accidents has been reported. Okutu, (2016) and Eze, (2018) reported that several accidents have been witnessed over the years, thus stripping many skilled people off their means of livelihood, owning to workplace accidents like fire and so on. However, these accidents in the Electrical/Electronic workshops may not easily be linked to the workshop climate, unless empirical data proves so.

Injuries, MSDs and other physical health condition which are consequences of Electrical/Electronic workshop accidents have made the level of attrition among the Electrical/Electronic Service Personnel to rise. This has continued to contribute to the dwindling level of skilled personnel in the trade of Electrical/Electronic servicing in the society, which can be traced to the increasing and higher rate of accidents in the workshop. The performance of these enterprises is jeopardized in any event of an accident because the business loses financially and in the area of man-hour. As a result of these issues, that are consequent of the frequent accidents, in the Electrical/Electronic workshops in Ebony state operated by the self-employed master craftsmen drives most of them into seeking ways of diversifying their sources of income by going into other menial jobs like; car/motorcycle taxi, hocking, and so on. This is because some injuries and effects of accidents in the workshop may make it difficult to engage in some certain tasks, thus may cause the closure or the abandonment of the trade by the Master Craftsman. Consequently, making accidents in the Electrical/Electronic workshop the major cause of the dwindling number of Electrical/Electronic Service Personnel and increasing cases of attrition in the trade as suggested by Yekinni, (2016). Accidents affect task performance, increases absenteeism and attrition, in Electrical/Electronic workshops. It creates a situation that robs the trade the capable hands to adequately handle the responsibilities of the Electrical/Electronic service personnel in the society. Thus, there is a need to understand the influence which the Electrical/Electronic workshop climate has on the accidents that occur in the workshop of the self-employed Electrical/Electronic Service Personnel.

Hypotheses

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

HO: There is no significant difference between the mean response of Master Craftsmen and the apprentices on the rate of impact-related accidents in the Electrical/Electronics workshop.

HO: Years of experience of the workshop user will not have a significant influence on their mean responses on the rate of musculoskeletal disorder related accidents at the Electrical/Electronics workshop.

HO: The mean responses of the Master Craftsmen and the apprentices would not differ significantly, on the rate of fire-related accident in the electrical/Electronics workshop.

HO: The mean responses of the Master Craftsmen and the Apprentices would not differ significantly, on the rate of electrical related accidents in the electrical/Electronics workshop.

Research and Methodology

Design of the Study

This study employed a descriptive survey design. The researcher considered the descriptive survey design because the design was the most appropriate since the influence that Electrical/Electronic workshop climate on accident in the workshop of the self-employed service personnel was solicited from the Self-employed Electrical/Electronic Service Personnel themselves.

Area of the Study

The study was carried out in Abakaliki metropolis among the Electrical/Electronic Service Personnel (Technicians) who deals on electronics (Radio, Television, mobile phones computer hardware etc.) repairs and as well technicians who deal on house wiring and maintenance. The researcher saw the need to sought solutions to many abandonments and high attrition experienced in the
Electrical/Electronic servicing trade, in Ebonyi state where the researcher resides. Data for the research was collected from Abakaliki the capital city of Ebonyi state, because this is where the self-employed Electrical/Electronic Service Personnel are better organized and are registered in a group in the town. The metropolis is made up of parts of Abakaliki, Ebonyi, Izzi, and Ezza North Local Government Areas.

Population for the Study

The population for the study consisted of 622 Electrical/Electronic service personnel, who were registered in the different unions in the trade Electrical/Electronic services. The population of the study was made up of Electrical/Electronic service Master craftsmen and their Apprentices/Trainees, among which 98 were mobile phone repair and maintenance Technicians, 81 computer hardware repair and maintenance Technicians, 211 electronics repair and maintenance technician, 232 house wiring and maintenance Technician (the number inclusive of the Apprentices, Trainees, and the Master craftsmen).

Sample and Sampling Technique

A sample of 120 Master craftsmen and apprentices were drawn from the population. The sample consisted of 61 master craftsmen and 59 apprentices drawn using the proportionate stratified random sampling technique. Cutting across self-employed electrical/electronic service personnel from the different areas of the trade (mobile phone repair technicians, computer hardware repair technicians, electronics repair technician, house wiring and Maintenance technician).

Instrument for Data Collection

A structured questionnaire was used for collecting data from the respondents. The questionnaire consisted of two parts A and B, the part A was designed to collect demographic data like the designation of respondents (master craftsmen and apprentice) while part B consisted of two sections A and B. Section A was designed to collect information on some of the factors of workshop climate (administrative style, number of workshop users, workshop arrangement and workshop equipment) as present in their workshop. Then section B was designed to collect different workshop accident rate, on different type of electrical/electronic workshop accidents. The section contains 53 items, divided into four different workshop accident (impact related, musculoskeletal disorder related, MSD related and electrical related electrical/electronic workshop accidents with 18, 12, 9 and 13 items respectively). The section B of the second part of the instrument was designed to have four response options thus, frequently (4), occasionally (3), rarely (2) and never (1).

Validation of the Instrument

Two experts from the Department of Industrial Technical Education and one from the Department of Science Education University of Nigeria, Nsukka. One from Electrical/Electronic Technology, the second from Building/Woodwork Technology and the other from Measurement and evaluation. These experts carried out face validation on the instrument, to ensure that all the items were relevant. Their comments, suggestions, and advice (re-casting of statements in some items, restructuring of instrument, increasing of items on the instrument) were used to correct the affected items, (see Appendix I pg. 141)

Reliability of the Instrument

The reliability of the instrument was established by trial testing using Electrical/Electronic Service Personnel in Nsukka urban in Enugu state. Nsukka was selected because of some level of similarity that exist between the self-employed Electrical/Electronic Service Personnel in Nsukka and those in Ebonyi (Area of Study). Cronbach alpha was used to determine reliability index of the instrument. The overall reliability index of 0.83 was obtained thus the instrument was considered reliable, this was in agreement with the position of Abonyi (2011) who stated that in determining the reliability index of any instrument, any reliability index value that is from 0.5-1 is to be considered reliable.

Method of Data Collection

The researcher administered and collected the instrument personally with the help of two research assistants. The research assistants were briefed on the different parts and sections of the instrument and the meaning of the terms and how to collect data. They were asked to assist the technicians to make sense of the terms and read out the items in the cases where the technicians could not read and understand them. The research assistants were also asked to administer the instrument to the respondents and collect them immediately after completion by the respondents. The respondents were required to supply information that represents their view within the response alternatives which was provided in the questionnaire. The instrument was collected immediately after its being administered and responded to.

Method of Data Analysis

The data collected was analyzed using mean and standard deviation. The hypothesis was tested with a t-test and ANOVA for independent samples at 0.05 level of significance. The Statistical Package for Social Sciences (SPSS) was used for the data analysis. The response to the items was interpreted using the real limit of numbers as follows: frequently 3.50 – 4.00, occasionally 2.50 – 3.49, rarely 1.50 – 2.49 and never 0.50 – 1.49. Based on the stated limits, all items were interpreted according to the mean response given to the item by the respondents.
Analysis and Findings

Research question 1: What influence do administrative style have on rate of accidents at the Electrical/Electronic workshop?

| S/N | Electrical/electronic workshop that is managed using | \( \bar{x} \) | SD | Remark |
|-----|-----------------------------------------------------|--------|-----|--------|
| 1   | autocratic administrative style                     | 3.0086 | .27110 | Occasionally |
| 2   | democratic administrative style                      | 2.7792 | .25118 | Occasionally |
| 3   | paternalistic administrative style                   | 3.0471 | .28199 | Occasionally |
| 4   | laissez-faire administrative style                  | 3.2559 | .46341 | Occasionally |
| 5   | action-centered administrative style                 | 2.9676 | .29553 | Occasionally |
| 6   | bureaucratic administrative style                    | 3.1148 | .24416 | Occasionally |
| 7   | corrective administrative style                      | 2.9207 | .30341 | Occasionally |

S/N = Serial Number, \( \bar{x} = \) Mean, SD = Standard Deviation

The data in the Table 1 shows that overall, the seven administrative styles have a similar influence on the rate of workshop accident. The result shows that notwithstanding the administrative style employed in the management of human and material resources at the electrical/electronic workshop, accidents occasionally occur at the workshop. This is because the mean score of accidents rate in workshop with different administrative styles ranged from 2.78 – 3.11. However, looking at the item-by-item analysis, the bureaucratic administrative style recorded frequent accident rate of accident, in items 1, 9, 13, and 34; while in item 2, autocratic, action-centered and democratic administrative styles recorded frequent accident rate. Similarly, in item 16 laissez-faire and democratic administrative style recorded frequent accident rate; but in item 10, only democratic administrative style recorded occasional accidents while all other six administrative styles recorded a frequent accident rate. Finally, in item 53 only laissez-faire administrative style recorded a rarely, while all the other six administrative styles have never experienced that accident in their workshop.

Research question 2: What influence does a number of workshop users have on accidents at the Electrical/Electronic workshop?

| S/N | Electrical/electronic workshop that has | \( \bar{x} \) | SD | Remark |
|-----|-----------------------------------------|--------|-----|--------|
| 1   | large number (10 and above)              | 3.0050 | .27901 | Occasionally |
| 2   | medium sized (5-9)                       | 3.0402 | .28137 | Occasionally |
| 3   | small number (2-4)                       | 2.7392 | .28351 | Occasionally |

S/N = serial number, \( \bar{x} = \) Mean, SD = Standard Deviation

The data in the Table 2 shows that overall, workshop accident occurs occasionally, regardless of the number of workshop users making use of the said electrical/electronic workshop. The result shows that among the three categories of workshop population (number of workshop user) the influence of each of the three categories (large number, medium-sized and small number) is generally an occasional accident in the workshop. This is because the mean score of accidents rate in workshops with different number of workshop users, ranged from 2.74 – 3.04. However, looking at the item-by-item analysis, the electrical/electronic workshop with small number of workshop users (2-4) recorded a score that showed that they have never had the type of accidents in items 13, 35, 36 and 39, while others were recording scores that show that accident rarely occur. Please see Appendix E page 102 and 103.

Research question 3: What influence does workshop arrangement have on accidents at the Electrical/Electronic workshop?

| S/N | Workshop arrangement | \( \bar{x} \) | SD | Remark |
|-----|----------------------|--------|-----|--------|
| 1   | well demarcated work areas | 2.7887 | 2.7887 | Occasionally |
| 2   | separated work-bench and cluster work areas for all workshop users | 3.0417 | 3.0417 | Occasionally |
| 3   | single workbench for all workshop users | 2.9748 | 2.9748 | Occasionally |

S/N = serial number, \( \bar{x} = \) Mean, SD = Standard Deviation

The data in the Table 3 shows that regardless of the electrical/electronic workshop arrangement, there is an occasional accident that occurs in the workshop. The result in the Table 3 in the workshop that has well-demarcated work areas, the one that has separated work-bench and cluster work area, and the one that has single work-bench, there is an occasional accident. This is because the mean score of accidents rate in workshops with different workshop arrangement, ranged from 2.79 – 3.04. However, in the item-by-item analysis, the data shows that electrical/electronic workshops there is well demarcated work areas have never experienced the accidents in item 34 and 46, while they rarely experience an accident in item 47, but other recorded scores that the accident occasionally happen. In item 44 however, workshop where there is a separated work-bench but cluster work areas, there was according to the data frequent accident, while another type of workshop had such accident occasionally.
Research question 4: What influence does workshop equipment have on accidents at the Electrical/Electronic workshop?

Table 4: Mean Score of Accident Rates in Different Electrical/Electronic Workshops having Different Level of Equipment Availability.

| S/N | Electrical/electronic Workshop where                          | $\bar{x}$ | SD   | Remark       |
|-----|-------------------------------------------------------------|----------|------|--------------|
| 1   | safety equipment are available                              | 3.0601   | .2721| Occasionally |
| 2   | most equipment needed for tasks are available               | 2.9660   | .29636| Occasionally  |
| 3   | most equipment needed for tasks are not available           | 2.6681   | .23211| Occasionally  |

S/N=serial number, $\bar{x}$ = Mean, SD = Standard Deviation

The data in the Table 4 shows that there is an occasional accident in the electrical/electronic workshop, regardless of the available workshop equipment. The result in the Table 4 shows that there is an occasional accident in a workshop that has safety equipment; most of the equipment and the workshop that lacks most of the needed workshop equipment respectively. This is because the mean score of accidents rate in workshops with different workshop equipment, ranged from 2.67 – 3.06. However, in the item-by-item analysis, the electrical/electronic workshop where most tools needed for the task are not available only had a case of a frequent accident in item 2, but aside that there was no major difference on the influence the three types of workshops had on the rate of accident in the workshop. But in item 10, workshop where most equipment needed for tasks are available recorded occasional accident while others recorded frequent accident rate. Please see Appendix G page 106 and 107.

Hypothesis One (HO1)

There is no significant difference between the mean response of Master Craftsmen and the apprentices on the rate of impact-related accidents in the Electrical/Electronics workshop.

Table 5: The t-test Analysis of Responses from the Master Craftsmen and the Apprentice on the Rate of Impact-Related Accidents in the Electrical/Electronics Workshop.

| S/N | Items                                                                 | MC N=61 | AP N=59 | df | Sig     | Decision |
|-----|-----------------------------------------------------------------------|---------|---------|----|---------|----------|
|     |                                                                        | $\bar{x}$ | SD      | $\bar{x}$ | SD      |          |
| 1   | Cut from cable cutter/knife                                           | 3.41 .30 | .32 .00 | .50 .118| .879    | Not significant |
| 2   | Burn from electric arc                                               | 3.48 .62 | .31 .31 | .66 .118| .216    | Not significant |
| 3   | Hit by flying/falling screw driver                                    | 2.10 .40 | .21 .39 | .118 .887|        | Not significant |
| 4   | Hit by particles from an exploding electrical component during repairs| 2.15 .36 | .24 .60 | .118 .001|        | Significant  |
| 5   | Fall from height during electrical installations                       | 2.62 .76 | .25 .68 | .118 .540|        | Not significant |
| 6   | Fall from broken ladder during electrical installations               | 2.57 .56 | .26 .56 | .118 .850|        | Not significant |
| 7   | Cut from bad plier                                                    | 2.77 .69 | .28 .62 | .118 .939|        | Not significant |
| 8   | Injuries to eye from debris during electrical installations           | 2.93 .89 | .29 .88 | .118 .764|        | Not significant |
| 9   | Hit by tool thrown by another workshop users                          | 3.15 .36 | .30 .53 | .118 .453|        | Not significant |
| 10  | Cut from faulty cable cutters                                         | 3.44 .83 | .35 .70 | .118 .477|        | Not significant |
| 11  | Burn from soldering tool                                             | 3.77 .46 | .35 .84 | .118 .069|        | Not significant |
| 12  | Hit by hammer used by another workshop user, during electrical installations| 3.60 .76 | .34 .80 | .118 .420|        | Not significant |
| 13  | Accident as a result of noisy workshop                               | 1.83 .90 | .21 .11 | .118 .160|        | Not significant |
| 14  | Accident as a result use of distractions from phones                  | 3.34 .95 | .39 .87 | .118 .784|        | Not significant |
| 15  | Injuries as a result of using teeth to peel cable                     | 3.36 .48 | .39 .49 | .118 .744|        | Not significant |
| 16  | Accident as a result failure to use safety equipment                  | 3.03 .84 | .30 .74 | .118 .994|        | Not significant |
| 17  | Accident as a result of improper workshop behaviour                      | 3.44 .50 | .36 .49 | .118 .043|        | Significant  |
| 18  | Accidents as a result of fighting of co-workers in the workshop       | 2.95 .62 | .31 .62 | .118 .055|        | Not significant |

Cluster mean 3.00 .26 | 3.04 .27 | .118 .510 | Not significant |

Key: S/N= serial number, $\bar{x}$ = mean, SD= standard deviation, df= degree of freedom, sig= significant value, MC=master craftsmen, AP=apprentices, N=sum of the group.

The data in the Table 5 show that the Master Craftsmen and Apprentice responses did not differ, on the rate of impact-related accidents, this according to the data on the Table 5 in the cluster mean. However, the response given by the Master Craftsmen and the Apprentices differed significantly in items 4 and 17. Since p in the Table 5 is 0.510 and is greater than the significance level 0.05 (that is 0.510>0.05) we can accept the null hypothesis. thus there is no significant difference between the mean response of Master Craftsmen and the Apprentices on the rate of impact-related accidents in the Electrical/Electronics workshop.
Hypothesis Two (HO2)

Years of experience of the workshop user will not have a significant influence on their mean responses on the rate of musculoskeletal disorder related accidents at the Electrical/Electronics workshop.

Table 6: The ANOVA Analysis of Responses of the Three Groups of Electrical/Electronic Service Personnel Base on their Years of Experience on the Rate of Musculoskeletal Disorder Related Accidents at the Electrical/Electronics Workshop.

| Sources of variation | Df | Sum of square | Mean square | f-ratio | p   | remark     |
|----------------------|----|---------------|-------------|---------|-----|------------|
| Between group        | 2  | .133          | 0.67        | .658    | .520| Not significant |
| Within group         | 117| 11.827        | 0.101       |         |     |            |
| Total                | 119| 11.961        |             |         |     |            |

Key: df= degree of freedom, p= level of significance

A one-way ANOVA conducted to compare the means of the responses given by work users of different years of experience, produced the result as shown in the Table 6. The Table 6 shows that there were no significant difference in the mean responses given by workshop users who had been in the trade of 4 years and below, those who have been for 5-9 years, and those who have been in the trade for 10 years and above, on the rate of musculoskeletal disorder related accidents at the Electrical/Electronics workshop at p>0.05 for the three groups [f(2, 117) =0.658, p=0.520].

Hypothesis three (HO3)

The mean responses of the Master Craftsmen and the apprentices would not differ significantly, on the rate of fire-related accident in the Electrical/Electronics workshop.

Table 7: The t-test Analysis of Responses from the Master Craftsmen and the Apprentice on the Rate of Fire-Related Accidents in the Electrical/Electronics Workshop.

| S/N | Items                                           | MC N=61 | AP N=59 | df | Sig | Decision    |
|-----|------------------------------------------------|---------|---------|----|-----|-------------|
| 1   | Fire accident as a result of wrong electrical connections in the workshop | 3.08    | .64     | 3.03| .59 | Not significant |
| 2   | Explosion of electrical components/circuit as a result of wrong electrical connections in the workshop | 3.59    | .50     | 3.46| .68 | Not significant |
| 3   | Fire as a result of not disconnecting workshop equipment overnight | 1.84    | 1.00    | 2.02| .92 | Not significant |
| 4   | Fire in the workshop as a result of defective cable used in connections | 1.95    | 1.02    | 2.08| 1.02| Not significant |
| 5   | Fire as a result of overloading of circuit in the workshop | 2.62    | .74     | 2.59| .62 | Not significant |
| 6   | Electrical fire as a result of using inadequate fittings in the workshop | 2.62    | .55     | 2.66| .51 | Not significant |
| 7   | Fire from inflammable substance stored in the electrical/electronic workshop | 2.11    | 1.17    | 2.22| 1.22| Not significant |
| 8   | Fire as a result of smoking in the workshop | 1.05    | .21     | 1.15| .52 | Not significant |
| 9   | Fire as a result of open fire around the workshop | 2.18    | .39     | 2.15| .36 | Not significant |
|     | Cluster mean | 2.35    | .49     | 2.37| .46 | Not significant |

Key: S/N= serial number, \( \bar{x} \) = mean, SD= standard deviation, df= degree of freedom, sig= significant value, MC=master craftsmen, AP=apprentices, N=sum of the group

The data in the Table 7 show that the master craftsmen and apprentice responses did not differ, on the rate of fire-related accidents in the workshop, this according to the data on the Table 7 in the cluster mean. Also, the result from all the items in the Table 7 shows that the master craftsmen and the apprentices did not differ in their response as all the items showed no significant difference. Since p in the Table is 0.741 and is greater than the significance level 0.05 (that is 0.741 > 0.05) we can accept the null hypothesis. Thus, there is no significant difference in mean responses of the Master Craftsmen and the apprentices on the rate of fire-related accident in the Electrical/Electronics workshop.

Hypothesis four (HO4)

The mean responses of the Master Craftsmen and the Apprentices would not differ significantly, on the rate of electrical related accidents in the Electrical/Electronics workshop.
The findings of this study established in Table 1 revealed that notwithstanding the administrative style used in managing the operations in the electrical/electronic workshop, there is generally an occasional rate of accident. This is in contrast to the position of Uppal, Mishra, and Vohra (2014) who found that personality factors rather than work or job experience, guarantees positive work performance. This is to say that electrical/electronic service personnel’s workshop in Ebonyi generally has an occasional rate of accidents in the workshop, this according to the data on the Table 1 in the cluster mean. Also, the result from all the items in the Table 8 shows that the master craftsmen and the apprentices did not differ in their response as all the items showed no significant difference. Since p in the Table is 0.237 and is greater than the significance level 0.05 (that is $p > 0.05$) we can accept the null hypothesis. Thus there is no significant difference in mean responses of the Master Craftsmen and the Apprentices on the rate of electrical related accidents in the Electrical/Electronics workshop.

**Discussion**

The findings of this study established in Table 1 revealed that notwithstanding the administrative style used in managing the operations in the electrical/electronic workshop, there is generally an occasional rate of accident. This is in contrast to the position of Uppal, Mishra, and Vohra (2014) who found that personality factors rather than work or job experience, guarantees positive work performance. This is to say that electrical/electronic service personnel’s workshop in Ebonyi generally has an occasional rate of accidents in the workshop, this according to the data on the Table 1 in the cluster mean. Also, the result from all the items in the Table 8 shows that the master craftsmen and the apprentices did not differ in their response as all the items showed no significant difference. Since p in the Table is 0.237 and is greater than the significance level 0.05 (that is $p > 0.05$) we can accept the null hypothesis. Thus there is no significant difference in mean responses of the Master Craftsmen and the Apprentices on the rate of electrical related accidents in the Electrical/Electronics workshop.

**Table 8: The t-test Analysis Comparing Response from the Master Craftsmen and the Apprentice on the Rate of Electrical Related Accidents in the Electrical/Electronics Workshop.**

| Item | MC N=61 | AP N=59 | df | Sig | Decision |
|------|---------|---------|----|-----|----------|
| 1 Electric shock as a result of poor earthing system in the workshop | 2.95 | .762 | 2.93 | .666 | 118 | .887 | Not significant |
| 2 Electric shock from faulty equipment oscilloscope insulation | 2.80 | .771 | 3.07 | .848 | 118 | .077 | Not significant |
| 3 Electric shock as a result of defective hand glove | 3.10 | .300 | 3.15 | .363 | 118 | .375 | Not significant |
| 4 Electric shock as a result of wet workshop floor | 3.31 | .467 | 3.29 | .670 | 118 | .826 | Not significant |
| 5 Electric shock as a result of poor insulation of cables in the workshop | 3.31 | .467 | 3.24 | .429 | 118 | .366 | Not significant |
| 6 Electric shock as a result of dangerous connections in the electrical workshop | 1.85 | 1.11 | 2.08 | 1.21 | 118 | .275 | Not significant |
| 7 Electric shock as a result of defective electrical fittings | 2.84 | .663 | 2.93 | .666 | 118 | .430 | Not significant |
| 8 Electric shock as a result of defective pliers' insulation | 3.31 | .467 | 3.34 | .477 | 118 | .750 | Not significant |
| 9 Electric shock as a result of defective screw driver | 3.67 | .473 | 3.66 | .477 | 118 | .898 | Not significant |
| 10 Electric shock as a result of faulty tester | 3.11 | .858 | 3.25 | .843 | 118 | .371 | Not significant |
| 11 Electric shock as a result of faulty multi-meter | 3.49 | .849 | 3.64 | .737 | 118 | .296 | Not significant |
| 12 Electric shock as a result of poor insulation in an installation | 3.13 | .866 | 3.20 | .826 | 118 | .641 | Not significant |
| 13 Electrocution of co-worker | 1.03 | .180 | 1.05 | .222 | 118 | .625 | Not significant |
| Cluster mean | 2.92 | .321 | 2.99 | .337 | 118 | .237 | Not significant |

**Key: S/N= serial number, x= mean, SD= standard deviation, df= degree of freedom, sig= significant value, MC=master craftsmen, AP=apprentices, N=sum of the group**

The data in the Table 8 show that the master craftsmen and apprentice responses did not differ, on the rate of electrical related accidents in the workshop, this according to the data on the Table 8 in the cluster mean. Also, the result from all the items in the Table 8 shows that the master craftsmen and the apprentices did not differ in their response as all the items showed no significant difference. Since p in the Table is 0.237 and is greater than the significance level 0.05 (that is $p > 0.05$) we can accept the null hypothesis. Thus there is no significant difference in mean responses of the Master Craftsmen and the Apprentices on the rate of electrical related accidents in the Electrical/Electronics workshop.

The findings of the study in Table 2 shows that the number of electrical/electronic workshop user may have some level of influence on a number of accident in the electrical/electronic workshop, generally, there is an occasional accidents rate across the three category workshop population size. According to the findings of (López-Arquillos & Rubio-Rome, 2016) the number of workforce in the workshop has different influence on a different type of accident in the workshop, as the difference between workshops were more than 5 and that with less than 5 is not more than 1 (ranging from 1 to 9), the result from the above study is in line with the current study that generally did not show any difference in among the three categories of workshop population. One may easily conclude that the lesser the number of electrical/electronic workshop user the lesser the rate of workshop accidents, but the lack of major differences in the rate of accident among the three categories of workshop population may have been as a result of other unseen factors. This is buttressed by the findings of Mendeloff, Nelson, Ko, and Haviland, (2006) The smallest firms tend to have the highest fatality rates, thus 1-4 category, followed by the 5-9 category and the 10-19 category are almost on the same range.

The findings of the study in Table 3 shows that the arrangement of the Electrical/electronic workshop though may have different influence on the different types of accidents but generally, there is an occasional rate of accident in the electrical/electronic workshop notwithstanding the type of arrangement of the workshop. According to the findings of (Zakaria, Mansor, & Abdullah, 2012)
workplace design is among the most contributing variables that increase the rate of workplace accidents. This is to say that the arrangement of the electrical/electronic workshop as showed by the result of the present study that found that some method of electrical/electronic workshop arrangement has an influence on the rate of some types of accidents.

The finding of the study in Table 4 shows that the workshop equipment may have some influence on the rate of some accidents in the electrical/electronic workshop, but on the hold notwithstanding the level to which the electrical/electronic workshop is equipped the rate of accidents is occasional. According to (Government of South Australia, 2017) working at height, using power tools, and extension leads that may be damaged or wet, exposed to poor isolation of energy sources are all hazards that can cause an accident in the workshop. In that, the present study shows that the level of equipping the workshop has an influence on the type of workshop accident but generally there is an occasional rate of accident in the electrical/electronic workshop. The findings of Choudhry and Fang, (2008) Show that workers who work in height mostly record occasional accident at work but frequency and severity of the effect is reduced by the use of appropriate workshop equipment and personal safety equipment. This is in line with the findings of the present study that show the occasional occurrence of different types of accident in the electrical/electronic workshop.

**Conclusion**

The findings of this study will have a huge implication on the self-employed Electrical/electronic service personnel. This is because, from the findings of this study, the self-employed Electrical/electronic service personnel would understand that there is no major difference in the various administrative styles on the rate of workshop accident. But specifically have some influence on the various types of accidents. Thus design a safety management strategy that would work in their workshop and follow it. The information would help the self-employed Electrical/electronic service personnel, in reducing the rate of attrition among the Electrical/electronic service personnel in Nigeria. The cases of abandonment of the electrical/electronic trade on account of workshop/workplace accident will be reduced in the trade, because they would through the findings of the study be aware of the influence of workshop client factor. Consequently, when the cases of workshop accidents reduce, the productivity of these trade would definitely increase, thus making the trade viable and attractive. More so, this situation would open large employment opportunities in the trade, thereby reducing the ever unemployment record in Nigeria.

Based on the findings of this study it is concluded that generally, the different administrative style, number of workshop users, workshop arrangement and workshop equipment have little or no influence on the accident rate in the Electrical/electronic workshop. Though the workshop climate factors (administrative style, number of workshop users, workshop arrangement and workshop equipment) have influence on the rate of various types of accident in the electrical/electronic workshop (Impact related, MSD related, Fire related and Electrical accidents).

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

i. Electrical/electronic workshop owners should as much as possible, adopt the administrative style that reduces the rate of most frequent accident in their workshop.
ii. The Master Craftsmen who own Electrical/electronic workshops should be mindful of the number of apprentices recruited at any given time help control the rate workshop safety rule defaulting, and increase the efficiency in monitoring and supervision.
iii. The Master Craftsmen who own Electrical/electronic workshops should plan a workshop layout that takes into consideration the safety needs of the workshop users, the work-process flow and the financial strength of the enterprise.
iv. The Master Craftsmen who own Electrical/electronic workshops should ensure constant maintenance of their workshop equipment and the provision of PPEs to minimize those cases of accidents in their workshop.
v. The Government should provide soft-loans, start-up grants and/or help the electrical/electronic service personnel to lease equipment effective operate in safer workshops.
vi. The Government also should institute a fund that can help work accident victim to take care of the medical expenses, and help them bounce-back into the full capacity of operations, irrespective which sector the individual is of (public or private sector operator).

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