INDUSTRIAL HAZARDS MANAGEMENT PRACTICE IN THE ABUJA ELECTRICITY DISTRIBUTION COMPANY MINNA, NIGER STATE

BY

MUHAMMAD ABUBAKAR SADIQ
2018/3/74385TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION FEDERAL UNIVERSITY OF TECHNOOGY, MINNA IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF TECHNOLOGY DEGREE (B. TECH) IN INDUSTRIAL AND TECHNOLOGY EDUCATION

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DECLARATION

I MUHAMMAD ABUBAKAR SADIQ with matriculation number 2018/3/74385TI an undergraduate of the Department of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any Diploma or Degree of this or any other university.

MUHAMMAD ABUBAKAR SADIQ _____
2018/3/74385TI **Sign and Date**

CERTIFICATION

This project has been read and approved as meeting the requirement for the award of B.Tech in (Electrical/Electronics Technology) Education, Industrial and Technology Education, School of Science and Technology Education, Federal University of Technology Minna, Niger State.

Mr. Stephen, Y. N
Supervisor _____ Signature & Date

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Head of Department _____ Signature & Date

External Examiner _____ Signature & Date

DEDICATION

This research work is dedicated to Almighty Allah.

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My sincere appreciation goes to Almighty Allah, the originator and giver of life for His Divine protection and guidance, His selfless-love towards me, His grace, wisdom and knowledge during the period of writing this project and beyond.

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ABSTRACT

The study is to Industrial Hazard Management Practices in AEDC Minna. Three research question and three hypotheses were formulated and tested at 0.05 level of significance. The research working is a descriptive survey; a well-structured questionnaire was developed by the researcher and used for data collection. The study was carried out in Abuja Electricity Distribution Company (AEDC) office in Minna. Numbers of respondents are fifty (50) being made up of fifteen (15) management staff and thirty-five (35) technical staff was used for the study. The data collected was evaluated using mean, standard deviation and t-test statistic to test the three hypotheses. The findings discovered that lack of adequate preparation before carrying out work is a cause of industrial hazards. The findings also discovered that laxity of the safety measures in carrying out repairs and mismanagement of tools and equipment in the workplace are also another factor to the cause of industrial hazards. Based on the findings, it was recommended that technical workers should be authorized to conduct a hazard assessment before commencing any work and that supervisors should implement strict submission with safety rules and regulations.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Distribution system is an electrical system between the substation fed by the transmission system and the consumer end. It is the final stage in delivery of electricity from the transmission system to the industry. The primary purpose of an electricity distribution company is to deliver power to every household and business to meet consumer demand. According to the Nigerian electricity regulatory commission (NERC), there are eleven distribution companies (Discos) in Nigeria namely: (I) Benin electricity distribution company (II) Eko electricity distribution company (III) Enugu electricity distribution company (IV) Ibadan electricity distribution company (V) Ikeja electricity distribution company (VI) Jos electricity distribution company (VII) Kaduna electricity distribution company (VIII) Kano electricity distribution company (IX) Port Harcourt electricity distribution company (X) Yola electricity distribution company (XI) Abuja electricity distribution company (NERC 2013).

Abuja Electricity Distribution Company (AEDC) which is one of the privatized electricity distribution company in Nigeria is responsible for distributing electricity within the following states; Abuja, Niger, Kogi, and Nasarawa. The Company was successfully privatized and handover to new investors on 1st November 2013. According to Nigerian electricity regulatory commission (NERC), the company is ranked the fourth among the eleventh distribution companies in Nigeria for electricity purchase and distribution. AEDC also known as Abuja Disco is responsible for owning and maintaining distribution network within it franchise area. It is also required to manage meter installation, installation of transformers, installation of high and low tension poles, maintenance of substations, coordinate consumer credit and revenue collection. To carry out the above mention function in AEDC, procedures

such as: proper installation, testing and various checking's should be adequately done to ensure a successful operation. Ignorance to the above mention leads to a potential harm which is referred to as hazard.

A hazard is a potential source of harm that could lead to loss of life, health, property or environment. It is also an unsecured condition in work practice that could cause permanent injury, illness or even death to the workers as well as cause damage to tools, equipments and machines which could lead to poor networking, poor power generation, poor consumer satisfaction, inadequate metering, billing system challenges and low revenue generation. Hazards are situation which technologist encounter in the workplace that poses a level of threat to life, health, property or environment (Ogbuanya et al., 2020)

Hazard poses a level of threat to human and its environment and can be seen as practical certainty that injuries may result from wrong or unconscious use of substance or agent, equipment and machines under specified condition or quality and manner of use, these injuries range from minor bruises to burns, scalds, electrocution or even death of the workers. Workforce attitude in respect to safety are closely linked to the hazard practice management within an industry. Hence, any unreasonable or risky actions of workers can potentially lead to accidents at work (Kruzhilko et al., 2020). Having a safety culture is not an easy task but it has been proven that workers with positive patterns of attitude towards a good hazard and safety practice found in the industry will help prevent injuries. Therefore, an industrial hazard is any physical condition produce by the industries which can cause injury or death to personnel or loss of product or property (Dash 2020).

To ensure effective prevention of injuries in the industry, it is crucial to determine the probable causes of accident and justify the appropriate measures and protective equipments so as to promote protection of workers health by controlling and eliminating hazardous factors in the workplace. Thus, it is necessary to create conditions under which employers will benefit, reduce the like-hood of accidents, injuries and occupational disease in industries (Maystrenko et al., 2020). Hence, failure of identifying these hazards and eliminating or controlling them as early as possible will cause AEDC loss of income, lost of life, lost of qualify workers, low revenue generation, damages of tools and equipments or even cripple the industry. In other to overcome the above mentioned, there is need for proper management of hazard.

Management is integrating processes by which authorized personnel or group can create, maintain and operate an industry or organization in the selection of its objectives. Management in the view of Jones *et al.* (2018) is a process of planning, organizing, leading and control of human and other resource to achieve organizational goals efficiently and effectively. As a result it is important to identify highly innovative and effective hazard recognition strategies such as implementing techniques to avoid accident. A case was reported by punch newspaper on the 29th, July, 2019 in which a boy strayed into an electric unprotected transformer and was electrocuted to death due to negligence of AEDC management staff on the potential harm that was seen but not managed effectively. The occurrence of the accidents' majority in any industry, both in the present and in the past, can be traced to the absence or weak implementation of occupational safety and health management systems (Mekkathil et al., 2016). The International Labor Organization (ILO) report on workers' health and safety in 2015 argues that industries must do more to improve worker health and safety at work. This implies that AEDC as an industry must take protective management measures in the industry. If the management of hazard

will be put into place effectively, it will give the industry a good reputation and help attract more customers. Hence this study will be carried out to investigate the industrial hazard management practices in AEDC Minna with a view of identifying if the industry has been managing it hazard effectively and safety measures adopted in order to safeguard the safety, health and welfare of the employees, properties and the environment.

1.2 Statement of the Problem

Hazard is a source that is capable of causing accidents with varying severity from minor cuts and bruises to serious injuries, disability or even death. Records of accidents in AEDC are alarming which could be due to poor management and inadequate knowledge of worker on effective management of job related hazard in the industry. Apart from suffering that accident induces, lack of proper management also retards the progress of the industry. A case was reported on 3rd September, 2015 buy punch newspaper in which a girl was electrocuted due to negligence of AEDC staff. The accident occurred when the staff left a live wire lying on the ground after he has disconnected it from her resident. More so, in June 2016, one of the AEDC staff was electrocuted on a high tension pole at Barikin Saleh due to poor management and ignorance of basic hazard precautions needed before engaging in such activity.

Mostly industrial accident take place as a result of hazard left uncontrolled, this may be due to inadequate supervision and inspection of the working condition by AEDC staff. In many industrial sectors, the safety performance of workers is predominantly measured based of their ability to proactively identify and respond to hazards in the work environment (Song et al., 2020).

In other to get rid of these problems in the AEDC, the followings must be properly put in place: train the workers to be aware of possible potential hazards along with the ways to avoid those hazards in

the working environment, importance of adherence to safety precaution in the industry and there must also be control measures to the industrial hazards. If all these factors are effectively used, then there will be a great improvement in the industry, safety of workers and good image of the organization will be ensured. Therefore it is necessary for AEDC to adopt a safe and healthy management practice. Above all, industrial accident jeopardizes the image of an organization. Sequel to this, the study is design to investigate the industrial hazard management practices in AEDC minna.

1.3 Objectives of the Study

The main purpose of the study is to identify the industrial hazards management practice in the Abuja Electricity Distribution Company (AEDC) Minna, Niger State. Specifically, the study is to determine:

1. Types of hazard management being practice in AEDC Minna.
2. Level of industrial hazard awareness by AEDC staff in Minna.
3. Strategies for improving the management of hazard in AEDC Minna.

1.4 Significance of the Study

The findings from this study will be of benefit to AEDC staff, customers and the society.

The study will benefit AEDC staff in term of creating awareness of various hazardous factors that are present in the industry and also equip them with relevant knowledge needed in identifying hazards and their remedies. It will also improve the skills of engineers and technicians by providing them with a guide on reduction of accident in the industry if and only if the staff of AEDC minna can identify and correct the potential harm around them and the industry by publishing a book which will be distributed

to all the technical and management staff reviewing the implementation of management and needful action in case of non-compliance.

The findings from this study will also be of benefit to consumers in avoiding electrocution, loss of properties, equipments and human lives caused by hazard. The study will help inform them on the risk associated with hazard and procedures of controlling them only if AEDC minna will send her staff to each and every residence in order to educate them on prevention of various hazardous factors that may be present in their various houses.

Finally, the society will also derive enormous benefit from the study. It will provide them with a general knowledge on hazard identification and management needed in safeguarding and controlling hazard that are present in their environment in as much as AEDC minna setup committee that will be assigned to different communities to educate them on management of hazard, there will be better output to the society which will enhance better living.

1.5 Scope of the study

The study will determine how AEDC minna are managing the hazard that are present in the industry due to the frequent occurrence of accidents and the preventive measures taking in other to control those hazards. The study will be limited to industrial hazard management's practices in AEDC Minna, Niger state. The electrical engineers and management staff opinion on industrial hazard management practices will be assessed using a questionnaire.

1.6 Research Questions

The following research questions will be developed to guide the Study.

1. What are the types of hazard management being practice in AEDC Minna?
2. What are the levels of industrial hazard awareness by AEDC staff in Minna?
3. What are the strategies for improving the management of hazard in AEDC Minna?

1.7 Research Hypotheses

The following hypotheses will be formulated and tested at 0.05 level of significance.

Ho_1: There is no significant difference between the mean response of the management staff and the technical workers as regard the type of hazard management being practice in AEDC Minna.

Ho_2: There is no significant difference between the mean response of the management staff and the technical workers as regard the level of industrial hazard awareness by AEDC staff in Minna.

Ho_3: There is no significant difference between the mean response of the management staff and the technical workers as regard the strategies for improving the management of hazards in AEDC Minna.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURES

- Theoretical framework
- Conceptual framework
- Review of Empirical Studies
- Summary of Literature Reviewed

2.1 Theoretical Framework

2.1.1 Human versus Machine Safety Theory

Heinrich, Peter and Roos propounded the safety theory which they referred to as 'Human Versus Machine Safety Theory in 1980 which state that the elimination of unsafe acts of workers, the use of mechanical guarding and correction of environmental, mechanical or physical hazards are fundamentals and first requirement of a complete safety programme. Emphasizing further, they said that safety begin with the use of correct tools, machines work process and materials in safe environment.

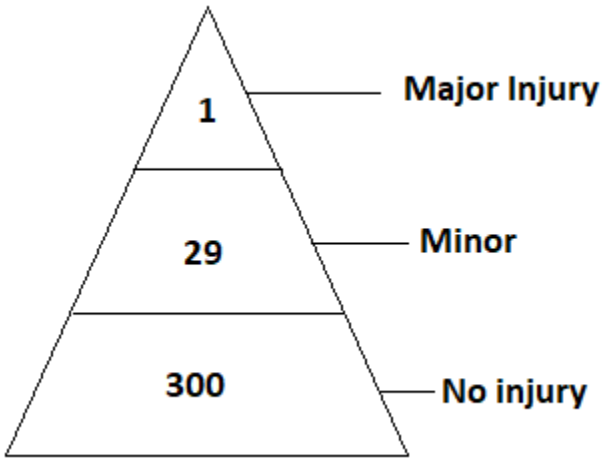
They added that the dangerous nature of machines can be attributed to either the designers or users technical incapability. This is because the incorrect use and abuse of machines, which create danger, are blamed on people. The tarrying degree of workers failure is fully portrayed by its direct result in loss of limb or money. They remarked that the misunderstanding of instructions, recklessness, violent temper and lack of knowledge or training results in unsafe acts which cause personnel injuries or property damage.

The above theory had provided a good framework on which the study will be based. This is because of the relevance of the theory to the study, especially in the area of using tools, materials and operating equipment in AEDC environment with the associated hazards or accidents and the solutions, which the theory indicated will be based on improvement of unsafe acts.

2.1.2 Heinrich's Theory of Accident

Heinrich estimates that in a unit group of 330 accidents of the same kind and involving the same person, considering average of averages, 30 results in no injuries, 29 in minor injuries and 1 in major lost time injury.

It indicates an ample opportunity to prevent any injury by efforts during 300 no-injuries or warning accident. This foundation of a major injury is shown in this picture.



H.W Heinrich, a pioneer in safety first published his work, Industrial Prevention, in 1931. Many of his principles a philosophy of accident causation and prevention are confirmed by time and application, but, some questioned and criticized. His philosophy is I his 10 axioms (self evident truths) as follow:

Ten Axioms of Industrial Safety:

1. The occurrence of an injury invariable from a completed sequence of factors – One of these being the accident its accident in turn is invariably permitted directly by the unsafe act of and/or a mechanical or physical hazard.
2. The unsafe acts of persons are response a majority of accidents.
3. The person who suffers a disabling injury caused by an unsafe act, in the average had over 300 narrow escapes from serious as a result of committing the very same act. Likewise, persons are to mechanical hazards hundreds of time they suffer injury.
4. The severity of an injury is largely fortuitously the occurrence of the accident that re-injury is largely preventable.
5. The four basic motives or reasons occurrence of unsafe acts provide a guide selection of appropriate corrective measures these are: Improper attitude, Lack of knowledge or skill, Physical unsuitability and improper mechanical or physical environment.
6. Four basic methods are available for preventing accidents. These are engineering revision, Persuasion and appeal, Personnel adjustment and Discipline.
7. Methods of most value in accident prevention are analogous with the methods required for the control of the quality, cost and quantity of production.
8. Management has the best opportunity and ability to initiate the work of prevention; therefore it should assume the responsibility.
9. The supervisor or foreman is the key man in individual accident prevention. His application of the art of supervision for the control of work performance is the factor of greatest influence in successful accident prevention. It can be expressed and taught as a simple four step formula –

Identify the problem, find and verify the reason for the existence of the problem, select the appropriate, remedy and apply the remedy.

10. The humanitarian incentive for preventing accidental injury is supplemented by two powerful economic factors:

- The safe establishment is efficiently productive and the unsafe establishment is inefficient.
- The direct employer's cost of industrial injuries for compensation claims and for medical treatment is about one-fifth of the total (direct plus indirect) cost which the employer must pay.

2.2 Conceptual Framework

2.2.1 Industrial Hazard

Hazard is something that is potentially harmful to a person's life, health or the environment (Ogbuanya et al., 2020). Whereas, industrial hazard can be seen as any condition produced by industries that may cause injury, death to personnel or loss of product of property. The process of industrialization comes with some peculiar problems that if not properly tackled can damage not only to the environment but to the workers as well. Industrial safety refers to shared attitudes, values, beliefs, and practices concerning safety and the necessity for effective controls in the industry (Glendon 2015). Such hazards include physical, chemical, biological and psychosocial factors that may have contrary effects on the health and well-being of workers. These hazards are brought about by two broad categories of causes namely" unsafe work condition" and "unsafe work behaviours". Occupational Safety and Health Administration (OSHA 2015). Unsafe work conditions focus attention on the various aspects of work environment, physical, chemical, biological and psychological as already specified. On the other hand, unsafe work behaviour focuses attention on habits, lifestyle, compliance with rules and regulation, body types and proneness to accidents. The degree of maturity of motives, attitudes, concepts provides

and allows predicting the direction of professional behaviour with a high degree of probability, including those aspects that are related to risk tolerance and meeting safety requirements (Wittenberger 2015). Interactions between these two broad factors are the major cause of industrial hazards resulting in injuries and health problems. Therefore, occupational health practitioner presumes that each employer of labor has a general concept of hazards. (OSHA 2015). Every employee on the other hand has the "special duty" of complying with standards of safety and health established by the employer. In an industrial setting, processing, project construction activities, petroleum products marketing, industrials and municipal waste disposal, etc. these sites may generate atmospheric pollutants that pose serious risks/threats to human health.

The fact however remains that as much as a country seeks to be industrialized, structures and legislations should be put in place and enforced to ensure that the health and safety of workers are not compromised.

While it may be true that organizations exist for the major purpose of making profit in the long run, they have also come to realize that the health, safety and welfare of their employees cannot be separated from their continued effective existence. Hence organizations are taking more interest in the welfare of their employees not only as a means of protecting their profit line but also because certain laws have been put in place to ensure that organizations provide their employees with a safe working environment.

The penalties of industrial hazards (accidents, ill-health and environmental pollution) on workers' productivity are so grave that industries should be legally, morally and socially compelled to incorporate job hazard analysis as one of their production inputs in taming the tide of the ugly incidents. Song (2016), in his contribution stated that exerting pressure in the right area and employing labour behaviour management that reduces accidents is only possible if employees themselves are

aware of the need to comply with safety regulations, use safe techniques for work performance, and are willing to act accordingly.

There are many modes of for an industrial hazard, which includes:

- Dormant – This situation has the potential to be hazardous, but no people, property, or environment is currently affected by this. For instance, a hillside may be unstable, with the potential for a landslide, but there is nothing below or on the hillside that could be affected.
- Potential – Also, known as 'Armed', this is a situation where the hazard is in the position to affect persons, property, or environment. This type of hazard is likely to require further risk assessment.
- Mitigated – A potential hazard has been recognized, but actions have been taken in order to ensure it does not become an incident. This may not be an absolute guarantee of no risk, but it is likely to have been undertaken to significantly reduce the danger.

2.2.2 Types of Industrial Hazards

1. Electrical Hazard: electrical blast effect that can result from arcing. If the current involved is great enough, these arcs can cause injury and start fires. Extremely High-energy arcs can damage equipment causing fragmented metal to fly in all directions. Low energy arcs can cause violent explosions or blasts in atmospheres containing explosive gases, vapors or combustible dust. The hot heated metal from the arc blast will combine with oxygen and become an oxide of the metal of the arc. These molten particles will stick to almost anything actually melting into many surfaces. Clothing may ignite as a result of contact with this molten material and a victim may receive serious burns. Also, your body has an instinctive reaction when you are suddenly startled to breath in heavy or gasp. Inhaling the hot vaporized particles will cause serious damage to your respiratory system by burning the lungs, throat and esophagus. There is no equipment available to completely protect electrical

workers from the effects of blast. However, safe practices, such as standing to the hinged side a cubicle door when operating a breaker and other precautions listed below can be taken to minimize the effect of a blast.

2. Chemical Hazards: are substances that can cause harm or damage to the body property or the environment. They are substances which, because of its characteristics and effects, may cause harm to human Health and safety. Chemical hazards can be broken down to include exposure to; vapors, gasses, mist, dusts, fumes and smoke. Examples of chemical hazards include exposure to: Chemical reactions, production of chemicals, chemical incapability, Chemical storage, Flammable Substances, combustible substance, Carcinogenic substances Pressurized containers etc.

3. Biological hazards: Are organisms or substances produced by organisms that may pose a threat to human health and safety. Biological hazards include exposure to:

Blood or other body fluid or tissue human waste anthrax Fungi / molds bacteria and viruses' poisonous plants animal waste Threat of insect or animal bites drugs / cytotoxic substance

4. Physical Hazards: Physical hazards cause injury to workers when an object, piece of equipment or material comes to contact with a worker. Physical hazards are often associated with an uncontrolled source of energy; kinetic, electrical, Pneumatic, hydraulic, etc. Example of physical hazards are: Flash arc, exposure to unguarded or unprotected electrical equipment, working with high voltage equipment , exposure to electro- magnetic fields incorrect wiring, loose surface conditions, Object(s) on the floor Blocked walkways, poor designed or lay-out of works area, Uneven surfaces, Small or inadequate walkways, Force of movement, Repetition of movement, awkward posts, Sustained / static postures, contract stress Vibration, poor work station design, Lighting conditions, Temperature extremes, Humidity extremes, exposure to sunlight/UV radiation, working at heights, Restricted / confined

spaces, working with powered equipment, working with unguarded equipment, Pinch Points, unguarded machines or work areas, Overhead Hazards, Sharp edges, fast moving equipment

5. Psychological Hazards: Psychological hazards cause workers mental distress or distraction. Although a rather new hazard classification, it is critical that psychology hazards are thoroughly identified and controlled examples of psychological hazards include:

Violence in the workplace, work pace working alone, over/ under worked work phobias, poor leadership, Lack of motivation, no procedures, Bullying and harassment, Client / Patient aggression, fatigue shift work.

According to occupational health and safety (OHS), hazards are sometimes classified into three modes:

Dormant – The situation has the potential to be hazardous, but no people, property, or environment is currently affected by this. For instance, a hillside may be unstable, with the potential for a landslide, but there is nothing below or on the hillside that could be affected.

Armed – People, Property, or environment are in potential harm's way.

Active – A harmful incident involving the hazard has actually occurred. Often this is referred to not as an "active hazard" but as an accident, emergency, incident, or disaster.

2.2.3 Industrial Hazards Management

Hazard Management is an area that is concerned with ensuring the safety, health and welfare of people engaged in work or employment in an industry. It goes further to protect co-workers, family members, employers, customers, suppliers, nearby communities and other members of the public who are impacted by the workplace environment. The occurrence of the accidents' majority in any industry, both in the present and in the past, can be traced to the absence or weak implementation of occupational

safety and health management systems (Sokolov et al 2018). Establishing the parameters of the process including the standards by which hazards will be assessed. Staff and contractors are to follow the hazard management model of an industry to ensure all hazards are identified, control and evaluated for effectiveness. The level of risk is to be determined through the risk assessments process recommended control measures implemented.

From the foregoing, it is obvious that the responsibility is on management to prevent accident and eliminate health and safety hazards in other to minimize the suffering of the employee and by so doing minimize their own loss. Effective management of major hazards requires a proactive approach to risk management, so information to confirm that critical systems are operating as intended is essential (Awolusi 2015). In an industrializing economy such as Nigeria where there are no accurate data and laws are not enforced, the figures may not be higher. Newspapers reports abound in Nigeria, of industrial accidents in factories namely owned by expatriates that are poorly equipped abysmal safety standard that will not be tolerated anywhere else. These accidents are lead to deaths and amputations of limbs are permanent disabilities of the worker. Due to poor management of the industrial hazards, low level of compliance to rule and lack of enforcement of those rules, the company barely loses everything. This means that financing of measures to prevent accidents and occupational diseases is more profitable for employers than compensation for damage to victims. (Marinina 2017). According to the European Union Agency (ERA), “Safety culture refers to the interaction between the requirements of the Safety Management System (SMS), how people make sense of them, based on their attitudes, values, and beliefs, and what they actually do, as seen in decisions and behaviors”. To achieve a safety culture, an industry must have the capability to report incidents and willingness to learn and change.

An organization or industry is required to establish and implement procedures for ongoing hazard identification, risk assessment and determination of controls. The hazard identification must include infrastructure, equipment, human behaviours, capabilities, and routine and non-routine activities of all personnel. It also requires that organizations or industry to provide an occupational health and safety policy that reveals the company's shared vision, commitment, direction and intension. It obliges and organizational plan that identifies hazard and show implementation and maintenance control; and outlines risk addressing strategies, it has to reflect a compliance statement with regard to legal obligations and other requirements. With respect to implementation and operation, organizations need reveal well defined responsibilities, adequate commitment of resources by qualified experts, up to date documents and date and ensure control measure and adequate emergency preparedness. It demands an on-going management review for continual improvement through a regular review of audits, corrective actions, legislation and other critical information (LMCS, 2016). The policy aids to form all-embracing protective measure for the safety the workers against industrial hazards and make provision for the evaluation of the success of its implementation.

It enables a positive attitude towards audits and every implementation level, and give guidance to the process of continual improvement the standard help minimize delays and disruption of production due to incidents. It helps organizations to adopt a proactive rather than a reactive approach to hazard management that is cost effective in the long term in preventing lawsuits and compensations pay-out. Establishments that tend to priorities profit before safety often perceive prevention as not economically feasible, inconvenient, troublesome and unrealistic. They prefer easily identified cost to non-tangible and difficult-to-observe benefits (Zwetsloot 2015). The Standard helps to improve industrial workforce relationships and guarantees quality of service that is attractive to customers and helps withstand international competition. It highlights hidden strengths and weakness and room for

improvements and discloses an ethical stance of the organization in giving priority to health ouf safety and health of themselves and other persons as follows: Workers Should always observe the employer's stipulations that need to be performed and complied with. They ought to carry out all given lawful orders and fellow given procedures. A worker should report any unsafe or unhealthy situation that comes to his/her attention as soon as possible and report every incident that may affect his/her healthy, or cause him/her harm, as soon as possible.

2.2.4 Industrial hazard management procedure

The first step in developing a hazard management is to have procedure in place which provides guidelines for employees to perform various tasks safely. The procedure should help eliminate injuries by providing rules and guidelines for people working on or near energized electrical circuit conductors. It should address qualifications, tools, protective equipment, approval levels and attendance required for various tasks, as well as other additional cautionary information. Also these procedures should address safe approach distance for qualified personnel. However effective hazard management can be achieved by:

- Identification of reasonably likely hazards.
- Assessment of level of risk association with exposure to, or unintentional release of, the hazard.
- Development of risk control methods and their implementation.
- Evaluation of the control measures and their adjustment, if necessary, to ensure effective control of risk.

- **2.2.5 Hazard Assessment**

A hazard assessment is an evaluation of a workplace that helps an industry determine what hazard their employees are exposed to and the personnel protective equipment they need to protect themselves from those hazards.

An effective assessment should include:

- The jobs (or tasks) that the employees do
- The hazard the employees are exposed to where the hazards are located
- The likelihood that those hazards could injure the employees
- The severity of a potential injury
- The types of preventive measures necessary to protect the employees from those hazard

2.2.6 Hazard Identification

The hazards are defined as potential for harm or all aspects of technology and activity that produces risks. Whilst risk assessment is about deciding who might be harmed and then judging how likely it is something goes wrong, and how serious the consequences could be and how to reduce it to as low a level as possible. In this paper risk assessment refers to the process that identifies the hazards associated with particular activities/tasks on electricity sites, evaluates the effect and estimate hazard or aspect of exposure to these hazards. The outcome of this process is to dictate what applicable and suitable monitoring and measurement, training operational control, objectives and targets as well as related safety programmes must be put in place by the organization. According to the Canadian centre for occupational health and safety (CCOHS 2015), the goal of hazard identification is to find and record possible hazard that maybe present in your workplace. Sometimes we take risks ourselves, but when we are responsible for others, we are more careful. Sometimes others see hazard that we overlook. Of course, it is possible to be talked out of our concerns by someone who is reckless or dangerous. Don't take chance. Careful planning of safety procedures reduces the risk of injury.

2.2.7 Evaluate Hazards

When evaluating hazards, it is best to identify all possible hazards first, and then evaluate the risk of injury from each hazard. Do not assume the risk is low until you evaluate the hazards (CCOHS 2015). It is dangerous to overlook hazards. Job sites are especially dangerous because they are always

changing. Many people are working at different tasks. Job sites are frequently exposed to bad weather. A reasonable place to work on a bright sunny day might be very hazardous in the rain. The risks in your work environment need to be evaluated all the time. Then, whatever hazards are present need to be controlled.

2.2.8 Control Hazards

Once industrial hazards have been recognized and evaluated, they must be controlled (OSHA 2015). You control industrial hazards in two main ways:

1) Created a safe work environment and
2) Use safe work practices.

One way to implement this model for safe work environment is to conduct a job hazard analysis (JHA). This involves development of chart: 1) Column 1, breaking down the job into is separate, task or steps, 2) Column 2, evaluating the hazard (s) of each task, and 3) Column 3, developing a control for each hazard. See the example below.

Hazard Analysis on tasks carried out and recommendations

Task Analysis	Hazard Analysis	Recommendation
Removing the cover	Electric shock from exposed live wires.	De-energize by opening circuit breaker or removing fuse.
Removing old Ground fault Circuit Interrupter (GFCI)	Possible other live wires in openings.	Test wires with appropriate voltmeter to ensure all wires are de-energizing.
Installing new GFCI	Possible connecting wire incorrectly.	Check wiring diagrams to ensure proper connection s
Replace cover and re-energizing	Possible deflective GFCI	Test the GFCI

Source:
https://ehs.ncsu.edu/occupational-safety/job-hazard-analysis-jha/

2.2.9 Creating a safe work practices

Industrial hazard in electrical industries are largely preventable through safe work practices.

Example of these practices including the following:

- De energizing electric equipment before inspection or repair,
- Keeping electric tools properly maintained,
- Exercising caution when working near energized lines, and
- Using appropriate protective equipment.

Electrical safety- related work practices requirements for general industry are detailed in subpart S of 29 CFR part 1910, in sections 1910.331-1910.335. For construction applications, electrical safely-

related work practices requirements are detailed in subpart K of 29 CFR part 1926.416 to 1926.417. OSHA3075 (2015). Safe work practices can be maintained by controlling contact with electrical voltages and the currents. Electrical currents need to be controlled so they do not pass through the body. In addition to preventing shocks, a safe work environment reduces the chance of fires, burns, and falls. You need to guard against contact with electrical voltages and control electrical currents in order to create a safe work environment. Make your environment safer by doing the following:

- Treat all conductors – even "de-energized" ones – as if they are energized until they are locked out and tagged
- Verify circuits are de-energized before starting work.
- Lock out and tag out circuits and machines
- Prevent overloaded wiring by using the right size and type of wire.
- Prevent exposure to live electrical parts by insulating them
- Prevent shock from electrical systems and tools by grounding them.
- Prevent shocking current by using GFCIs
- Prevent too much current in circuits by using over-current protection devices.

2.2.10 General Management of industrial Hazards

- Once hazards have been recognized, appropriates control measure must be put in place. The ways of controlling risks are ranked from the highest level of protection and reliability to lowest. This ranking is known as the hierarchy or risk control. You must work through this hierarchy to choose to control the most effectively eliminates or minimizes the risk in the circumstances, so far as is reasonably practicable. In order to retain employees working in harmful and hazardous working conditions and personnel involved in optimal working conditions, electric power companies are

developing various programs and projects that can improve the welfare of workers in a particular organization. (Repnikova 2019).

- Elimination: the most effective measure is to remove the hazard or hazardous work practice. By designing-in or designing-out certain features, hazards may be eliminated.
- Substitution: replacing a hazardous process or material with one that is less hazardous will reduce the hazard, and hence the risk. For example, it may be reasonably practicable to use extra-low voltage electrical equipment such as a battery-operated tool rather than a tool that is plugged into mains electricity.
- Isolation: preventing workers from coming into contact with the source of an electrical hazard will reduce the relevant risks.
- Engineering controls: Use engineering control measures to minimize the risk, for example installing residual current devices to reduce the risk of receiving a fatal electric shock.
- Administrative Controls: Administrative controls involve the use of safe work practices to control the risk, for example establishing exclusion zones, use of permits and warning signs.
- Personal Protective Equipment (PPE): PPE includes protective eyewear, insulated gloves, hard hats, aprons and breathing protection. Most forms of PPA are not relevant to minimizing electrical risks in workplaces, except in relation to energized electrical work. Administrative controls and PPE do nothing to change the hazard itself. They rely on people behaving as expected and require a high level of supervision. Exclusive reliance on administrative controls and PPE must only occur where other measures are not reasonably practicable or as an interim control while the preferred control measure id being implemented.

2.3 Review of Empirical Studies

Marius and Egheosase (2018) carried a study on the impact of hazard management practices on organizational performance, involving four dimensions of improved management/employees safety practices; enhanced productivity; increased profitability; and reduced accident rates in three companies (Cutix Plc.; Chicason Group; and IbetoCement) in Nnewi, Anambra State. Exploratory, cross-sectional survey research design was used in generating the primary data required for the study. One hundred and sixty-two (162) respondents were sampled from the three selected firms in Nnewi, Anambra State, Nigeria. Questionnaire was used as the instrument for data collection. ANOVA was used to analyze the collected data. From the findings, hazard management through job analysis represents a process of identifying potential hazards in job activities and assessing the potential effects on employees, organizational assets and the environment generally. It takes anchorage on the theory that effective hazard management through sound job hazard analysis at the task level in organizations has an influence not only on employee performance, but also, on organizational performance through enhancement of productivity and profitability, as well as reduction of accident rates. The paper posits that if organizations foster and maintain an effective hazard management practices through comprehensive job hazard analysis, there is likely to be an improvement in organizational performance. To accomplish this, organizational employees must be in a position to efficiently and effectively discharge their respective tasks. This, to a great extent, depends on the level of institutionalized safety practices in the workplace.

The study reviewed is related to this study as the two studies seek to find out the impact of hazard management practices. The studies are also related in terms of instrument for data collection and data

analysis. Though, the two studies differ in terms of area of the study, research design, population and sampling technique.

Afube *et al.* (2019). Assessed hazards and Safety Practices in Food and Beverage Industry in Nigeria. This work evaluated safety hazards and safety practices in the food and beverage industry (FBI) in South-South, Nigeria. A structured questionnaire designed in accordance with World Health Organization standard was administered to a total of 144 workers, out of which 134 (93.0%) were completed and returned. The questionnaire was fashioned to extract information on types of hazards, awareness of safety hazards, implementation of hazards and risks control measures and the effectiveness of safety hazards and risk management programmes in the food and beverage industry. A modified four-point Liker Scale was used to analyze and evaluate the questionnaire. A Proportional Importance Index (PII) was used to rank each factor variable in the questionnaire. The study identified the major hazards in the FBI as working at height (with PII = 3.3, respondents = 91%); high voltage areas (PII = 3.1 and respondents = 90%), loud noise (PII = 3.0, respondents = 80%), machines and equipment vibration (PII = 2.8, respondents = 69%) and faulty machines and equipment (PII = 2.7, respondents = 65%). The level of awareness on safety hazards amongst the workers was statistically significant ($p < 0.05$, 95%CI; PII = 3.1-3.6). The outcome of intervention showed that FBI-2 improved from 79.62% to 96.82%, FBI-3 improved from 89.81% to 96.18%, FBI-4 improved from 78.34% to 95.54% on worker's knowledge on the assessment of hazards and risk in the FBIs. There was effective implementation of safety hazards and risks management programmes and controls in the FBI. Administrative control measures are used to reduce hazards and workers make adequate use of personnel protective equipment. There is need to evaluate the risks associated with identified high ranking hazards and develop a risk management framework for the industry based on ISO 31000 and other relevant safety regulations and guidelines.

The study reviewed is related to this study as the two studies seek to find out the impact of hazard management practices. The studies are also related in terms of instrument for data collection and data analysis. Though, the two studies differ in terms of area of the study, population and sampling technique.

Onuorah *et al.* (2020) examine the relationship between management of work hazard and employee service delivery in Nigerian Breweries, Plc., Enugu which is the objective the researcher want to achieve. Many organizations have relegated the safety of their workers to the background. They have compromised with the safety of the workers in the working place. This study examined management of work hazard in organizations. The study adopted descriptive design. The population of the study is 474 workers and sample size of 217. Stratification sampling technique was used to select the respondents. . Data obtained from the copies of the questionnaire was analyzed using descriptive statistics, which involved the weighted mean. Pearson's Product-Moment Correlation Coefficient was adopted to establish the relationship between management work hazard programmes and employee performance. The study found out that occupational health surveillance gives the employees the ability to plan and be able to undertake work in an organized manner while identifying priorities. More so, health and safety committees ensure that employees usually put extra effort to complete an assignment on time. The study further recommended that Nigerian Breweries companies should ensure that they use occupational health surveillance so as to give the employees the ability to plan and be able to undertake work in an organized manner while identifying priorities. Nigerian Breweries companies should employ health and safety committees to ensure that employees usually put extra effort to complete an assignment on time.

The study reviewed is related to this study as the two studies seek to find out the management hazard management practices in organization. The studies are also related in terms of research design and

instrument for data collection. Though, the two studies differ in terms of area of the study, population and sampling technique.

Olufunsho *et al.* (2017). Studied occupational hazards and safety measures amongst the paint factory workers in Lagos, Nigeria the manufacture of paint involves a variety of processes that present with medical hazards. Safety initiatives are hence introduced to limit hazard exposures and promote workplace safety. This aim of this study is to assess the use of available control measures/initiatives in selected paint factories in Lagos West Senatorial District, Nigeria. Descriptive survey research design was used. A total of 400 randomly selected paint factory workers were involved in the study. A well structured World Health Organization standard questionnaire was designed and distributed to the workers to elicit information on awareness to occupational hazards, use of personal protective devices, and commonly experienced adverse symptoms. Urine samples were obtained from 50 workers randomly selected from these 400 participants, and the concentrations of the heavy metals (lead, cadmium, arsenic, and chromium) were determined using atomic absorption spectroscopy. The results show that 72.5% of the respondents are aware of the hazards associated with their jobs; 30% have had formal training on hazards and safety measures; 40% do not use personal protective devices, and 90% of the respondents reported symptoms relating to hazard exposure. There was a statistically significant ($p < 0.05$) increase in the mean heavy metal concentrations in the urine samples obtained from paint factory workers as compared with non factory workers. The need to develop effective frameworks that will initiate the integration and ensure implementation of safety regulations in paint factories is evident. Where these exist, there is a need to promote adherence to these practice guidelines.

The study reviewed is related to this study as the two studies seek to find out on hazard management practices. The studies are also related in terms of research design. Though, the two studies differ in terms of area of the study, population and sampling technique.

2.4 Summary of Literature Reviews

The literature reviewed for this study focused on theoretical framework, conceptual framework and review of empirical studies. Theories related to hazard were visited, such as Human versus Machine Safety Theory which was propounded by Heinrich, Peter and Roos which state that the elimination of unsafe acts of workers, the use of mechanical guarding and correction of environmental, mechanical or physical hazards are fundamentals and first requirement of a complete safety programme. Similarly, Heinrich's Theory of Accident propounded by Heinrich, indicates an ample opportunity to prevent any injury by efforts.

The conceptual framework was on industrial hazard, types of industrial hazard, industrial hazard management, Industrial hazard management procedure, hazard assessment, hazard identification, creating a safe work practices and General Management of industrial Hazards were all reviewed as it relates to this research work.

The review of empirical studies carried out by different researchers in the field of industrial hazards identification and risk analysis (IHIRA). The information gathered from the identification and management of hazards will form an important part of a safety programme for management and control of risks within the company. The study will improve occupational health and safety in an organization or industry because the produced risk registers of existing controls were identified and additional controls for the risks have been proposed.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter describes the procedures used in this study. These include the research design, area of study, population, sample and instrument for data collection, validation of instrument and administration of Instrument, Method of Data Analysis and the Decision Rule. This study includes the working principle of the equipment, the working condition and the standards to be followed, the safety precautions taken, individual activity carried out in and out of AEDC Minna.

3.1 Research Design

The research design used in this study is survey research. The study utilizes a survey design due to the nature of result and information required for this investigation. Questionnaires will be used to solicit the opinions of the respondents on Industrial Hazard Management Practices in AEDC Minna. Oghene (2010) defines a survey as a research technique in which information is gathered from a sample of people through questionnaire and interview. Thus, because of the need to generate primary data to achieve the objectives of this study, survey research was adopted. The survey design is therefore considered appropriate since the study seeks information from a respondent using a questionnaire.

3.2 Area of the Study

The study will be carried out in AEDC Minna. Namely: Bosso outreach unit, Maikunkele outreach unit, and Tunga (UK Bello) head office. It comprises of both management and technical staff that serve as respondents.

3.3 Population of the study

The target population for the study comprised fifty (50) employees of AEDC, which include fifteen (15) management Staff and thirty-five (35) Technical workers in AEDC Minna, Niger state. This information was gotten from AEDC office in Bosso outreach unit.

AEDC minna area Office	**numbers of management staff**	**numbers of technical workers**
Bosso outreach Unit	4	10
Maikunkele outreach Unit	4	10
Tunga (UK Bello) head office	7	15

3.4 Sample

The entire population will used for the study since the population is small, there will be no sampling.

3.5 Instrument for Data Collection

Questionnaires were the sole instrument developed by the researcher for data collection. The questionnaires were divided into sections 'A' and 'B'. Section A; contains the personal data of the respondent. Section B; which contains sixty (60) questionnaire items was further subdivided into three, based on the research questions. A Questionnaire can be simply defined as a set of a questions used to gather information in a survey.

3.6 Validation of Instrument

The questionnaire used for the study will be content validated by three experts in AEDC minna. All necessary corrections will be effected based on the observation made and final draft will be produced.

3.7 Administration of Instrument

The questionnaires designed will be administered by the researcher and the research assistants, by visiting the various AEDC offices in Minna with the questionnaire. A total of fifty (50) questionnaires

will be distributed to AEDC; Bosso outreach unit, Maikunkele outreach unit, and Tunga (UK Bello) head office.

3.8 Method of Data Analysis

The data's will be analyzed in line with the research questions and hypothesis. Mean and standard deviation will be used in answering the research questions while t-test will be used to test the null hypothesis at 0.05 level of probability

3.9 Decision Rule

To determine the acceptance level, a four-point rating scale was calculated to get a mean of 2.5, the mean of 2.5 was selected to serve as a deciding point between agreed and disagreed. Thus, responses with a mean of 2.5 and above were considered agreed, while response from 2.49 and below were considered disagreed.

The four-point scale adopted is as follows;

Highly Possessed (HP) = 4

Possessed (P) = 3

Less possessed $\frac{10}{4} = 2.50$

Not Possessed (NP) = 1

The mean value was therefore = $\frac{4+3+2+1}{4}$ =

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter deals with the presentation and analysis of data with respect to the research questions and hypotheses formulated for this study. The result of data analysis for the research questions were presented first followed by the hypotheses tested for the study.

4.1 Research Question One

What are the types of hazard management being practice in AEDC Minna?

Table 4.1: Mean Responses of Management Staff and Technical Staff on the types of hazard management being practice in AEDC Minna.

				$N_1=35$	$N_2=15$		
S/N	**ITEMS**	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{X}_t$	**Remarks**
1.	Adequate usage of safety posters	3.54	0.87	3.02	0.96	3.29	Practiced
2.	Health and safety color coding	3.46	0.61	3.35	0.67	3.41	Practiced
3.	Health and safety inspection	3.11	0.78	3.87	0.89	3.49	Practiced
4.	Hazard analysis	3.80	0.90	3.60	0.59	3.70	Practiced
5.	Proper record keeping of accidents in the workshop	3.32	0.46	2.88	0.79	3.10	Practiced
6.	Enforcing utilization of PPE	3.58	0.53	3.67	0.83	3.63	Practiced
7.	Tools and equipments are well insulated	3.57	0.82	3.54	0.79	3.55	Practiced

Key

N_1= Number of Technical Staff
N_2= Number of management staff
$\bar{X}_1$= Mean of Technical Staff
$\bar{X}_2$= Mean of Management Staff
SD_1= Standard Deviation for Technical Staff
SD_2= Standard Deviation for Management Staff
$\bar{X}_t$= Average mean of Technical staff and Management staff.

The data presented in Table 1 revealed that the respondents practiced all the items with mean scores ranging between 2.85 – 3.70.

4.2 Research question Two

What are the levels of industrial hazard awareness by AEDC staff in Minna?

Table 4.2: Mean Responses of Technical staff and Management Staff on the levels of industrial hazard awareness by AEDC staff in Minna.

		$N_1=35$		$N_2=15$			
S/N	**ITEMS**	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	$\overline{X}_t$	**Remarks**
8.	Inadequate Illumination in the workshop	2.86	0.95	3.59	0.47	3.22	Aware
9.	Inadequate ventilation in the workshop	3.70	0.76	3.74	0.53	3.72	Aware
10.	Functional fire extinguishers are placed where fire outburst is most possible	3.30	0.82	2.87	0.91	3.58	Aware
11.	Failure to report any damaged tools or equipment to the supervisor	3.82	0.69	3.45	0.63	3.63	Aware
12.	Overcrowding in the workshop	3.67	0.87	3.60	0.78	3.63	Aware
13.	Poor record keeping	3.60	0.72	3.55	0.43	3.57	Aware
14.	Improper maintaining of tools and equipments	3.76	0.59	3.65	0.81	3.70	Aware
15.	Lack of concentration in the workshop	3.55	0.62	3.66	0.70	3.60	Aware
16.	Distraction during work by other co-workers	3.57	0.58	3.68	0.84	3.62	Aware
17.	Lack of enforcing adequate usage of PPE	3.68	0.84	3.55	0.81	3.61	Aware
18	Lack of health and safety inspection	3.80	0.62	3.68	0.84	3.74	Aware

Key

N_1= Number of Technical Staff
N_2=Number of Management Staff
X_1=Mean of Technical Staff
X_2=Mean of Management Staff
SD_1= Standard Deviation for Technical Staff
SD_2= Standard Deviation for Management Staff
X_t=Average Mean of Technical Staff and Management Staff

The data presented in Table 4.2 reveal that all the respondents are aware of all the items with mean scores ranging between 3.45-3.74.

4.3 Research Question Three

What are the strategies for improving the management of hazard in AEDC Minna?

Table 4.3: Mean Responses of Technical Staff and Management Staff on what are the possible Ways of Improving the Hazard Management Practices of AEDC, in Minna?

		$N_1=35$		$N_2=15$			
S/N	**ITEMS**	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	$\overline{X}_t$	**Remarks**
19.	Proper planning of work and safety procedures	3.88	0.67	3.81	0.69	3.84	Agreed
20.	Ensuring that all joints are electrically and mechanically sound	3.94	0.59	3.86	0.65	3.90	Agreed
21.	Retraining of AEDC workers on safety management	3.96	0.56	3.48	0.81	3.72	Agreed
22.	sensitizing customers on hazard around them (transformer base)	3.88	0.67	3.68	0.84	3.78	Agreed
23.	Use of proper wiring and connectors	3.80	0.61	3.85	0.62	3.82	Agreed
24.	Avoiding repairs out repairs near inflammable substances	3.92	0.52	3.81	0.71	3.86	Agreed
25.	Replacing all wires with bad insulation	3.54	0.72	3.62	0.49	3.58	Agreed
26.	Adequate usage of safety posters	3.80	0.61	3.65	0.59	3.72	Agreed
27.	Provision of standard protective kits	3.90	0.52	3.86	0.65	3.88	Agreed
28.	Regular checking of switches and insulation	3.88	0.67	3.74	0.75	3.81	Agreed
29.	Ensuring that electrical equipment are properly grounded before working on them	3.29	0.62	2.90	0.63	3.02	Agreed
30.	Organizing a mandatory orientation course on safety for every new staff upon employment.	3.35	0.63	3.91	0.58	3.63	Agreed
31.	Workmen banned from making and receiving calls while working on a pole or where sensitive operations are involved.	3.80	0.61	3.92	0.61	3.86	Agreed
32.	Supervisors enforce strict compliance with safety rule and regulations.	3.90	0.52	3.86	0.60	3.88	Agreed
33.	Promptly reported and documented all accidents, major or minor.	3.68	0.84	3.86	0.60	3.77	Agreed
34.	Conducting relevant test on power equipment to confirm isolation/outage before any operation is carried out.	3.54	0.67	3.66	0.80	3.60	Agreed
35.	A health and safety day should be declared in the company annually to create safety consciousness among the workers.	3.74	0.75	3.86	0.60	3.80	Agreed

Key

N_1= Number of Technical Staff
N_2=Number of Management Staff
X_1=Mean of Technical Staff
X_2=Mean of Management Staff
SD_1= Standard Deviation for Technical Staff
SD_2= Standard Deviation for Management Staff
X_t=Average Mean of Technical Staff and Management Staff

The data presented in Table 4.3 revealed that all the respondents agreed with all the items with mean scores ranging from 2.94 – 3.96.

4.4 Hypothesis One

There is no significant difference between the mean response of the management staff and the technical workers as regard the type of hazard management being practice in AEDC Minna.

Table 4.4: t-test Analysis of the type of hazard management being practice in AEDC Minna.

S/N	ITEMS	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	t-cal	Remarks
1.	Adequate usage of safety posters	3.54	0.77	3.02	0.82	2.19	S
2.	Health and safety color coding	3.46	0.71	3.35	0.51	0.81	NS
3.	Health and safety inspection	3.11	0.67	3.87	0.83	0.97	NS
4.	Hazard analysis	3.80	0.41	3.60	0.46	1.04	NS
5.	Proper record keeping of accidents in the workshop	3.32	0.95	2.88	1.07	1.42	NS
6.	Enforcing utilization of PPE	3.58	0.67	3.67	0.49	0.49	NS
7.	Tools and equipments are well insulated	3.57	0.66	3.54	0.71	0.25	NS

Key:

N1 = Number of Technical Staff
N2 = Number of management staff
X^-1 = Mean of Technical staff
X^-2= Mean of management staff
SD1 = Standard Deviation of management staff
t-cal = t-calculated
t-critical = (table value) = ±1.96
S = Significant NS = Not Significant
Df (degree of freedom) = N1 + N2 – 2 = 35 + 15 – 2 = 48

The analysis in Table 4.4 showed that the t-cal values of 7 items; 2, 3, 4, 5, 6 and 7 were less than the t-critical value (±1.96), while item 1 was greater than the t-table value (±1.96). Therefore, the null hypothesis was rejected for the item while it was accepted for each of the 6 items. This implies that there is no significance difference for items accepted but there is significance difference for the items rejected in the mean rating of technical staff and management staff on the type of hazard management being practice in AEDC Minna.

4.5 Hypothesis Two

There is no significant difference between the mean response of the management staff and the technical workers as regard the level of industrial hazard awarenessby AEDC staff in Minna.

Table 4.5: t-test Analysis on the level of industrial hazard awareness by AEDC staff in Minna.?

S/N	ITEMS	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	t-cal	Remarks
8.	Adequate Illumination in the workshop	2.86	1.15	3.59	0.72	3.37	S
9.	Adequate ventilation in the workshop	3.70	0.66	3.74	0.52	0.47	NS
10.	Functional fire extinguishers are placed where fire outburst is most possible	3.30	0.79	2.87	0.84	1.39	NS
11.	Failure to report any damaged tools or equipment to the supervisor	3.82	0.30	3.45	0.58	1.35	NS
12.	Overcrowding in the workshop	3.67	0.56	3.60	0.34	2.36	S
13.	Poor record keeping	3.60	0.46	3.55	0.68	0.56	NS
14.	Proper maintaining of tools and equipments	3.76	0.52	3.65	0.47	0.77	NS
15.	Lack of concentration in the workshop	3.55	0.64	3.66	0.42	0.64	NS
16.	Distraction during work by other co-workers	3.57	0.62	3.68	0.44	0.76	NS
17.	Lack of enforcing adequate usage of PPE	3.68	0.59	3.55	0.54	1.22	NS
18	Lack of health and safety inspection	3.80	0.34	3.68	0.45	0.37	NS

Key:
N1 = Number of Technical Staff
N2 = Number of management staff
X^-_1 = Mean of Technical staff
X^-_2 = Mean of management staff
SD_1 = Standard Deviation of Technical staff
SD_2 = Standard Deviation of management staff
t-cal = t-calculated
t-critical (table value) = ±1.96
S = Significant NS= Not Significant
Df (degree of freedom) = N1 + N2 – 2 = 35 + 15 – 2 = 48.

The analysis in table 5 showed that the t-cal values of 9 items: 9, 10, 11, 13, 14, 15, 16, 17 and 18were less than the t-critical value (±1.96). While 2 questionnaires items 8 and 12 were greater than the t-table value (±1.96). Therefore, the null hypothesis was rejected for each of the 2 items while it was accepted for each of the 9 items. This implies that there is no significance difference for items accepted but there is significance difference for the items rejected in the mean rating of technical staff and management staff's as regard the level of industrial hazard awarenessby AEDC staff in Minna.

4.6 Hypothesis Three

There is no significant difference between the mean response of the management staff and the technical workers as regard the strategies for improving the management of hazards in AEDC Minna.

Table 4.6:t-test Analysis of the strategies for improving the management of hazards in AEDC Minna

S/N	ITEMS	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	t-cal	Remarks
19.	Proper planning of work and safety procedures	3.88	0.34	3.81	0.45	0.78	NS
20.	Ensuring that all joints are electrically and mechanically sound	3.94	0.24	3.86	0.35	0.65	NS
21.	Retraining of AEDC workers on safety management	3.96	0.20	3.48	0.82	2.24	S
22.	sensitizing customers on hazard around them (transformer base)	3.88	0.33	3.68	0.48	1.66	NS
23.	Use of proper wiring and connectors	3.80	0.40	3.85	0.37	0.82	NS
24.	Avoiding repairs out repairs near inflammable substances	3.92	0.35	3.81	0.42	0.38	NS
25.	Replacing all wires with bad insulation	3.54	0.71	3.62	0.61	0.25	NS
26.	Adequate usage of safety posters	3.80	0.40	3.65	0.37	0.24	NS
27.	Provision of standard protective kits	3.90	0.29	3.86	0.36	0.69	NS
28.	Regular checking of switches and insulation	3.88	0.33	3.74	0.45	1.24	NS
29.	Ensuring that electrical equipment are properly grounded before working on them	3.29	1.05	2.90	1.04	0.40	NS
30.	Organizing a mandatory orientation course on safety for every new staff upon employment.	3.35	1.36	3.91	0.27	3.46	S

31.	Workmen banned from making and receiving calls while working on a pole or where sensitive operations are involved.	3.80	0.40	3.92	0.24	1.72	NS
32.	Supervisors enforce strict compliance with safety rule and regulations.	3.90	0.31	3.86	0.36	0.24	NS
33.	Promptly reported and documented all accidents, major or minor.	3.68	0.47	3.86	0.36	1.92	NS
34.	Conducting relevant test on power equipment to confirm isolation/outage before any operation is carried out.	3.54	0.75	3.66	0.80	0.47	NS
35.	A health and safety day should be declared in the company annually to create safety consciousness among the workers.	3.74	0.44	3.86	0.36	1.20	NS

Key:

N1 = Number of Technical Staff
N2 = Number of management staff
X^{-}_1 = Mean of Technical staff
X^{-}_2 = Mean of management staff
SD_1 = Standard Deviation of Technical staff
SD_2 = Standard Deviation of management staff
t-cal = t-calculated
t-critical (table value) = ±1.96
S = Significant NS= Not Significant
Df (degree of freedom) = N1 + N2 – 2 = 55 + 15 – 2 = 48.

The analysis in table 4.6 showed that the t-cal values of 15 items: 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34 and 35were less than the t-critical value (±1.96). While 2 questionnaires items 21 and 30 was greater than the t-critical value (±1.96). Therefore, the null hypothesis was rejected for the 2 items while it was accepted for each of the 15 items. This implies that there is no significance difference for items accepted but there is significance difference for the items rejected in the mean rating of technical staff and management staff's concerning strategies for improving the management of hazards in AEDC Minna.

4.7 Findings of the Study

1. There is significance difference for the items rejected in the mean rating of technical staff and management staff on the type of hazard management being practice in AEDC Minna.
2. There is no significance difference for items accepted but there is significance difference for the items rejected in the mean rating of technical staff and management staff's as regard the level of industrial hazard awareness by AEDC staff in Minna.
3. There is significance difference for the items rejected in the mean rating of technical staff and management staff's concerning strategies for improving the management of hazards in AEDC Minna

4.8 Discussions of Finding

Finding from table 4.1 of this study, reveals that the Adequate usage of safety posters, health and safety color coding, health and safety inspection, hazard analysis, and proper record keeping of accidents in the workshop are well practiced in AEDC Minna, this is in agreement with the study of Marius and Egheosase (2018) on the impact of hazard management practices on organizational performance. The findings of Afube *et al.* (2019) also agreed with the study when assessed hazards and safety practices in food and beverage industry in Nigeria. There was effective implementation of safety hazards and risks management programmes and controls. Administrative control measures are used to reduce hazards and workers make adequate use of personnel protective equipment Essiet (2005) reported that high rate of accidents in Nigeria industries have been traced to violation of standard safety code of practice.

Findings from table 4.2 of this study indicated that the staff are aware that the inadequate Illumination in the workshop, inadequate ventilation in the workshop and faulty fire extinguishers are of industrial hazard in AEDC, the findings is in agreement with the findings of Afube *et al.* (2019), who identified

the major hazards in the FBI as working at height; high voltage areas, loud noise, machines and equipment vibration and faulty machines and equipment. The level of awareness on safety hazards amongst the workers was statistically significant.

Also, the study indicates proper usage of safety poster and signs in the workplace as a means of controlling hazards. Goshwe (2006) identified ways of curtailing hazards in the workplace include placing of safety signs and procedures at strategic positions, regular publicity of awareness on safety rules and precautions.

More so, the study also reveals that most accident during work are not regularly recorded and documented by the workers in the industry, According to OSHA (2002) accident in the workplace should be recorded and document so that it can be used to evaluate and control other similar occurrence that may course any hazarding the future.

Findings from table 4.3 of this study indicated that proper planning of work and safety procedure is one of the ways of managing hazards in the industry. National Institute for occupational Safety and Health NIOSH (2009) emphasize that careful planning of safety procedures reduces the risk of injury or death.

Laul et al. (2006) identified hazards / (chemical, electrical, physical, and industrial) as potential initiators that could lead to an accident. Hazard analysis is used to evaluate identified hazards.

The findings also confirm that hazards can be managed by avoiding working in wet environment and wearing the right personal protective equipment (PPE). According to Dorlan (2008) workers should not participate in any electrical work if their clothes are wet, so as to avoid electrocution.

Findings from the study further pointed that organizing a mandatory orientation course on safety for every new staff upon employment. This was supported by Okoro (2013) who stated thus: “to be able to provide useful contributions to the National Economy, the technical staffs require a strong updating

in technology and theoretical principle which can best be acquired through organizing a mandatory induction course on hazard for every new staff upon employment".

The Workplace Health and Safety Acts of 2002 imposes obligations on people at workplaces to ensure workplace health and safety. Workplace health and safety is ensured when persons are free from death, injury or harm created by workplaces, relevant workplace areas, work activities or plant/substances for use at workplace. Ensuring workplace health and safety involved identifying and managing exposure to the risks.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATION

5.1 Summary of the Study

Due to the useful, importance and relevant of electricity to man, effort is being made to ensure adequate supply of electricity to meet human needs. AEDC is responsible for the distribution of electricity for industrial and household use. However, AEDC is being faced with a lot of hazards in the course of their duty, which is capable of causing death and loss of valuable assets.

Working with electricity can be hazardous as it could cause loss of life and valuable properties. This is why an industrial hazard management practice of AEDC Minna is conducted with the purpose of assessing the industrial hazards management practices in the Abuja Electricity Distribution Company Minna. The specific objectives are to: types of hazard management being practice in AEDC Minna, level of industrial hazard awareness by AEDC staff in Minna and strategies for improving the management of hazard in AEDC Minna.

Electrical hazard can simply be defined as hazards associated with working with electricity with a view of tendering means of effectively managing it. The review of related literature is done under the following topics; industrial hazards, industrial hazard management and review of empirical studies on industrial hazards identification and risk assessment (IHIRA).

The study used a survey research approach to determine the industrial hazard management practices of AEDC, Minna thirty-five (35) items were generated in the questionnaires to elicit AEDC management staff and technical staff responses and the questionnaire was validated by 3 experts in AEDC Minna. A total of 50 validated questionnaires were issued to 35 technical staff and 15

management staff of AEDC. The instrument for data collection was analyzed using mean, standard deviation and t-test statistics.

5.2 Implication of the Study

It could be deduced from the study that the current hazard management practices of the Abuja Electricity Distribution Company Minna is not effectively implemented and practiced by the management staff and technical staff. This due to the lack of hazard assessments before carrying out any work by the management staff and technical staff of AEDC. Hence, they will be exposed to more hazards during the course of their work.

It can also be deduced from the study that the technical staffs do not use adequate personal protective equipment or use the appropriate tools and equipment during work.

It was further deduced that there are no proper orientation programmes on hazard awareness and management of hazards in the workplace, this limit their knowledge on the various hazard they could be exposed to during work, which could have been avoided.

5.3 Contribution to Knowledge

The study therefore contributed on adequate provision of appropriate safety kits, their timely replacement when worn out and updated job aids should be made available to all cadres of staff based on their job schedule.

5.4 Conclusions

In conclusion, regular assessment on hazard management practices that is effective for the workplace would help the management staff and technical workers in identifying the possible situations that can pose them in any hazard in their workplace and the various ways to evaluate the hazards and finally how to control the hazard from occurring, which can only be achieved through a hazard management

practices. Therefore, assessment of the hazard management practice is very important task that is to be embarked upon by any industry if frequent loss of lives and valuable properties is to be minimized to the lowest or completely avoided.

5.5 Recommendations

Based on the findings of the study, the following recommendations are made:

1. Conduct of a hazard assessment before the commencement of any work should be mandatory to both management and technical staff.
2. Technical staff should be well equipped with adequate and appropriate tools and kit required to carry out any work.
3. Management staff should provide adequate safety protective materials to the technical staffs and should be mandated to put them on, to prevent them against any unforeseen hazards.
4. Safety signs and cautions should be properly posted where necessary.
5. Regular training of staffs on hazard management practices.

5.6 Suggestions for Further Research

Based on the findings of the study, the following suggestions were made for further study:

1. Assessment of electrical hazard factors in Abuja Electricity Distribution Company Minna.
2. Developing a standard form of evaluation for assessing the hazard management practices.
3. Investigation of the best hazard management practices needed by Abuja Electricity Distribution Company Minna
4. Incorporating Information and communication Technology (ICT) into industrial hazards management practices.

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APPENDIX I

FORMULAE

MEAN $\bar{X} = \frac{\sum fx}{\sum f}$

$\bar{X}$= Mean

$\sum$= the sum of

X= the score

F= The Frequency of each point in the scale

Standard Deviation

SD = $\sqrt{\frac{\sum f(x-\overline{x})^2}{\sum f}}$

$\bar{X}$= Mean

$\sum$= The sum of

X= the Score

F= the frequency

t – Test Formula

t- Test= $\frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S.D_1^2}{N_1} + \frac{S.D_2^2}{N_2}}}$

Where:

$\bar{X}_1$ = Mean Score of Technicians

$\bar{X}_2$ = Mean Score of Management

S_1 = Variance of Technicians

$S_{2=}$ Variance of management staff

N_1= Number of Technicians

$N_{2=}$ Number of Management staff

APPENDIX III

RESEARCH QUESTIONNAIRE

MANAGEMENT STAFF AND TECHNICAL WORKERS (MSTW)

TOPIC: INDUSTRIAL HAZARD MANAGEMENT PRACTICES IN ABUJA ELECTRICITY DISTRIBUTION COMPANY (AEDC)

SECTION A

INTRODUCTION: I am an undergraduate student of the above named institution, carrying out a research project on industrial hazard management practices in AEDC minna metropolis of Niger state. Please complete this questionnaire faithfully as possible and sincerely tick [√] the column that best represents your perception about the above topic.

The questionnaire is for research purpose and your view will be treated confidentially.

Research categories are:

Highly practiced= HP	**Practiced= P**	**Somehow practiced= SP**	**Not practiced=NP**
Highly aware=HA	**Aware=A**	**Somehow aware=SA**	**Not aware=NA**
Strongly agreed=SA	**Agreed=A**	**Disagreed=D**	**strongly disagreed=SD**

SECTION A

AEDC Outreach Stations: Maikunkele ( ), UK Bello Road ( ), Bosso ( )

AEDC Management staff ( ), Technical workers ( ).

Please Tick (√) as appropriate

SECTION B

Research question 1

What are the types of hazard management being practice in AEDC Minna

S/N	ITEMS	HP	P	SP	NP
1.	Adequate usage of safety posters				
2.	Health and safety color coding				
3.	Health and safety inspection				
4.	Hazard analysis				
5.	Proper record keeping of accidents in the workshop				
6.	Enforcing utilization of PPE				
7.	Tools and equipments are well insulated				

Research question 2

What are the levels of industrial hazard awareness by AEDC staff in Minna.

S/N	ITEMS	HA	A	SA	NA
8.	Inadequate Illumination in the workshop				
9.	Inadequate ventilation in the workshop				
10.	Functional fire extinguishers are placed where fire outburst is most possible				
11.	Failure to report any damaged tools or equipment to the supervisor				
12.	Overcrowding in the workshop				
13.	Poor record keeping				
14.	Improper maintaining of tools and equipments				
15.	Lack of concentration in the workshop				
16.	Distraction during work by other co-workers				
17.	Lack of enforcing adequate usage of PPE				
18	Lack of health and safety inspection				

Research question 3

What are the strategies for improving the management of hazard in AEDC Minna

S/N	ITEMS	SA	A	D	SD
19.	Proper planning of work and safety procedures				
20.	Ensuring that all joints are electrically and mechanically sound				
21.	Retraining of AEDC workers on safety management				
22.	sensitizing customers on hazard around them (transformer base)				
23.	Use of proper wiring and connectors				
24.	Avoiding repairs out repairs near inflammable substances				
25.	Replacing all wires with bad insulation				
26.	Adequate usage of safety posters				
27.	Provision of standard protective kits				
28.	Regular checking of switches and insulation				
29.	Ensuring that electrical equipment are properly grounded before working on them				
30.	Organizing a mandatory orientation course on safety for every new staff upon employment.				
31.	Workmen banned from making and receiving calls while working on a pole or where sensitive operations are involved.				
32.	Supervisors enforce strict compliance with safety rule and regulations.				
33.	Promptly reported and documented all accidents, major or minor.				
34.	Conducting relevant test on power equipment to confirm isolation/outage before any operation is carried out.				
35.	A health and safety day should be declared in the company annually to create safety consciousness among the workers.				