SAFETY AUDIT AS AN INTRINSIC FACTOR IN CONSTRUCTION COMPANIES IN FEDERAL CAPITAL TERRITORY, ABUJA.

BY

AKAZUE, Chibuzor Mypeace

2014/1/52351TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

FEDERAL UNIVERSITY OF TECHNOLOGY,

MINNA, NIGER STATE.

JULY, 2021

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RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION. FEDERAL UNIVERSITY OF TECHNOLOGY,MINNA, NIGER STATE.

IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE AWARD OF BACHELOR OF TECHNOLOGY (B. TECH) IN INDUSTRIAL AND TECHNOLOGY EDUCATION

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DECLARATION

I, **AKAZUE CHIBUZOR MYPEACE** matriculation number **2014/1/52351TI** an undergraduate student of the Department of Industrial Technology education certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other university.

AKAZUE CHIBUZOR MYPEACE ……...

2014/1/52351TI Signature/Date

CERTIFICATION

This project has been read and approved as meeting the requirement for the awards of B.Tech. degree in Industrial and Technology Education of the Department of Industrial and Technology Education. School of Science and Technology Education, Federal University of Technology, Minna.

DR. A.B. KAGARA _____

Supervisor **Signature and Date**

Dr. I.Y Umar _____

Head of Department **Signature and Date**

_____ _____

External Examiner **Signature and Date**

DEDICATION

This project is dedicated to my perfectly beautiful parents Dr. and Dr. Mrs. Edward Olutoke for their infinite love, prayers and support. This project is also dedicated to all the women in construction companies home and abroad.

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ABSTRACT

This study was designed to assess safety audit as an intrinsic factor in construction companies in F.C.T, Abuja. Four research questions and four null hypotheses were formulated to guide the study. A descriptive survey research was adopted. It involves the use of questionnaires to obtain the opinion of respondents. The study covers twenty (20) construction companies in Abuja, chosen through sampling. A total of forty (40) respondents consisting of twenty (20) building site managers and twenty (20) building contractors were used as the population of the study. A forty-five (45) item questionnaire was developed by the researcher and validated by three (3) experts from Industrial and Technology Education Department, Federal University of Technology, Minna and was used for the data collected for the study. Data collected was analyzed using mean and standard deviation while T-test was used to test the null hypotheses at 0.05 level of significance. The findings revealed that the construction companies have great knowledge of the processes of safety auditing. The findings also revealed that the challenges the companies face include irregularly conducted safety audits, lack of trained man-power to conduct safety audits, much focus on low-risk hazards, lack of workers' participation in set-up safety programs. Based on the findings, it was recommended that construction workers should be enlightened to strictly follow safety rules, adequate funds should be provided especially by insurance companies to reduce expenses on safety corrections.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Construction, also called building construction, the techniques and industry involved in the assembly and erection of structures, primarily those to provide shelter. Construction today is a significant part of industrial culture, a manifestation of its diversity and complexity and a measure of its mastery of natural forces, which can produce a widely varied built environment to serve the diverse needs of society (Pao-Chi and Swenson, 2020). Building construction is the process of adding structures to areas of land, also known as real property sites. Typically, a project is instigated by or with the owner of the property (who may be an individual or an organisation); occasionally land may be compulsorily purchased from the owner for public use. In its most widely used context, construction covers the processes involved in delivering buildings, infrastructure and industrial facilities and associated activities through to the end of their life. It typically starts with planning, financing and design, and continues until the asset is built and ready for use; construction also covers repairs and maintenance work, any works to expand, extend and improve the asset, and its eventual and improve the asset, and its eventual demolition, dismantling or decommissioning. As an industry, construction accounts for more than 10% of global GDP (6-9% in developed countries) and employs around 7% of the global workforce – over 273 million people. The output of the global construction industry was worth an estimated 10.8 trillion dollars in 2017 (Wikipedia., 2020).

Construction is the process that sets up a portable plant, bring materials to the site, and on completion of the work, moves the plant away, leaving its output (all immobile structures e.g.

airports, buildings, dams, roads and tunnels, power plants, pipelines, residential houses) standing (Hyari K., 2005).

Safety is the state of 'being safe', the condition of being protected from harm or other non-desirable outcomes. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk. Safety is the condition of a 'steady state' of an organization or place doing what it is supposed to do. 'What it is supposed to do is defined in terms of public codes and standards, associated architectural and engineering designs, corporate vision and mission statements and operational plans and personnel policies. For any organization, place or function, large or small, safety is a normative concept. It complies with situation-specific definitions of what is expected and acceptable. Safety can be limited in relation to some guarantee or a standard or insurance to the quality and unharmful function of an object or organization. It is used in order to ensure that the object or organization will do only what it meant to do. It is important to realize that safety is relative. Eliminating all risk, if even possible would be extremely difficult and every expensive. A safe situation is one where risks of injury or property damage are low and manageable when something is called safe, this usually means that it is safe with certain reasonable limits and parameters (Wikipedia., 2021).

Safety is a concept that includes all measures and practices taken to preserve the life, health and bodily integrity of individuals. In the workplace, safety is measured through a series of metrics that track the rate of near misses, injuries, illnesses and fatalities. Ensuring the safety of workers is both necessary and beneficial for any organization. Regulatory bodies such as Occupational Safety and Health Administration including National Fire Protection Association mandate a variety of safety measures employers must take and have the authority to impose fines if their investigations reveal a violation of these standards. Safety is also beneficial for all organizations

since, in addition to avoiding costly fines. It ensures increased productivity, better morale and fewer lost work days (Safeopedia, 2020).

Construction site safety is an aspect of construction-related activities concerned with protecting construction site workers and others from death, injury, disease or other health-related risks. Construction is an often hazardous, predominantly land based activity where site workers may be exposed to various risks. Site risks can include working at height, moving machinery (vehicles, cranes) and materials, power tools and electrical equipment, hazardous substances plus the effects of excessive noise, dust and vibration. The leading causes of construction site fatalities are falls, electrocutions, crush injuries and caught-between injuries. Although construction sites face significantly the same hazards, the rate of accidents varies in different regions and countries due to a variety of safety cultures and workers' behavioural safety (Wikipedia., 2021).

In terms of the built environment, the term 'safety' generally refers to the condition of being protected, or safe, from hazards and other undesirable events. As construction is one of the most dangerous industries to work in, the positive control and management of hazards and risks to achieve a sufficiently-high level of safety is very important, and very important and is often a legal requirement. From a safety perspective, a hazard is a condition with the potential to cause physical impairment or health consequences in people or other types of life (Desingingbuildings, 2021).

Essentially, construction safety means implementing rules, regulations, and safeguards at construction sites to keep workers safe from possible injury and harm. OSHA (Occupational Safety and Health Administration), an organization that governs workplace safety, sets rules,

enforces them and provides resources that employers - and employees alike- have to be compliant to (Parsons, 2021)

Safety audit is a structured process whereby information is collected relating to the efficiency, effectiveness and reliability of a company's total health and safety management system. They are routinely conducted in order to determine whether the company is in compliance with safety legislation. These can be performed by representatives of a regulatory body or by the company itself and they are used to identify weaknesses in their safety programs and processes. These audits are then used as a guide for designing safety plans or to identify corrective actions that should be undertaken. A safety audit is a more thorough process than technical inspections. In addition to ensuring compliance, safety audits also review the company's safety documentation and determine whether their record-keeping systems are adequate or need to be more robust. They will also look beyond the current activity in the workplace and evaluate the company's safety training (Safeopedia, 2021).

A safety audit is a general term used to describe an activity where a facility gathers information about one or more aspects of the workplace in order to evaluate the risk levels for health or safety issues. During the audit one or more people will gather data related to the efficiency, reliability and effectiveness of their health and safety systems. When done properly, a safety audit will help determine if a company's day activities are in conformity with their safety efforts. This means a safety audit is typically only done after a safety plan is already in place. A safety audit can, however, be used as part of the process in the creation of a full workplace safety plan for a facility (Creative safety supply, 2020).

Buildings can present a great number of risks, both in construction and operation. The Health and Safety Executive (HSE) estimates that around 4% of construction workers suffer from a work-related illness every year, and 3% sustain a work related injury. This results in around 2.2 million working days being lost each year. Safety audits are carried out to assess health and safety processes on construction sites, considering; legislative requirements, industry best practice, and the contractor's own health and safety management systems.

They can demonstrate that a proactive approach is being taken to safety, can help to improve ways of working and ensure procedures are being followed, as well as demonstrating compliance with regulations such as the construction (Design and Management) Regulations 2015, which require reasonable steps are taken to ensure the health and safety arrangements made for managing the project are maintained and reviewed throughout the project. Regular audits can form a crucial part of the project management process, and may be untaken by in-house personnel, or by an independent auditing body. Safety audits differ from safety inspections in that they are organised at the discretion of the client or contractor, rather than being undertaken without notice by the Health and Safety Executive (HSE).

1.2 Statement of the Problem

Nigerian construction firms especially the multinationals which seem to have inheritedsafetypoliciesand systems from their parent companies still record repeated cases of accidents and injuries some of whichinclude falls from height, trapped by something collapsing oroverturning, struck by a moving vehicle, contactwith electricity or electrical discharge, struckby flying/falling object during machine lifting of materials, contactwith operating machineryor material being machined, exposure to hot or harmful substance or fire outbreak thatengulfed their entire office premises (Consultnet Ltd, 2011 as cited in Olutuase, 2014). Most

often, the problem is not the level ofawareness of importance of safety neither is a safety policy absent but it is more related to pooror lack ofimplementation of safety programmes and systems, as it is with many other key players in the Nigerianconstruction industry (LaMontagne*et al*, 2003; Indian Council of Medical Research, 2003 as cited in Olutuase, 2014).Procedures and programmes of safety audit system ofconstruction firms are naturally expectedto lead to highly safe construction sites if they are well followed and implemented. Research studies however,claim that accident and injury rate in many developing countries such as Nigeria is considerably higher than inEurope, U.S. and Australia. (Koehn, Ahmed &Jayanti, 2000 as cited in Olutuase, 2014), reported that statistics has shown that there are 8 or 9 times as many fatalities andaccidents onconstruction sites in developing countries than in industrialized developedregions. This is similar to the claimsof (Awodele&Ayoola, 2005 and Smallwood &Haupt, 2005 as cited in Olutuase, 2014) that not less than hundreds of constructionworkers are being killed each year and many more rendered permanently disabled on Nigerian constructionsites. It is either the installedsafety audit system is poorly managed or the safety system is notadequately addressing all the relevant safety issues involved in each construction project and site therebymaking workers on site highly prone to accident. This study therefore found it necessary to assess performancelevel of installed safety audit system existing in a typicalNigerianconstruction industry. This study investigates the prevalent safety audit practicesand perceptions in the construction companies in Abuja.

1.3 Purpose of the Study

This study is carried out to find out if the Construction companies in F.C.T, Abuja carry out safety audit of their workplace and if the carry it out accurately. Specifically, this study is to:

1. Determine the safety audit awareness of construction companies in F.C.T, Abuja.
2. Determine the processes involved in safety auditing in the construction companies in F.C.T, Abuja.
3. Determine the challenges the construction companies face in safety auditing in F.C.T, Abuja.
4. Determine possible ways in which these challenges can be solved.

1.4 Significance of the Study

This research work will be of benefit to construction industries and construction workers.

The construction industry will benefit from this study as it promotes constant review of systems to ensure that they do not become weakened by habit, facilitate planned improvements to programs, policies and procedures, help to identify weaknesses in human resources departments and reduce drastically the cost caused by accidents due to improved safety programs.

This study will help construction workers by helping to demonstrate management's dedication to employee health and safety and reduces occurrence of accidents, injuries, lost work-hours, workers' agitation etc.

1.5 Scope of the Study

The study is delimited to the safety auditing process undertaking in construction companies in F.C.T, Abuja. This work focuses specifically on the awareness of the construction companies on the process of safety audit, the challenges the companies face and the solutions possible.

1.6 Research Questions

The study is intended to answer the following research questions:

1. What is the level of awareness of safety audit in construction companies in F.C.T, Abuja?
2. What are the processes involved in safety audits by the construction companies in F.C.T, Abuja?
3. What are the safety audit challenges faced by construction companies in F.C.T, Abuja?
4. What are the possible solutions to the safety audit challenges faced in construction companies in F.C.T, Abuja?

1.7 Hypotheses

The following null hypotheses were formulated to guide the study

H_{01}: There is no significant difference in the mean responses of the building professionals' awareness of safety audit in construction companies located in Abuja.

H_{02}: There is no significant difference in the mean responses of the building professionals regarding the level of awareness of safety audit in construction companies located in Abuja.

H_{03}: There is no significant difference in the mean responses of the building professionals regarding the safety audit challenges faced in construction companies when carrying out safety auditing in construction companies located in Abuja.

H_{04}: There is no significant difference in the mean responses of the building professionals as regards to the possible solutions to the safety audit challenges faced in construction companies located in Abuja.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 Theoretical Framework

This study was based on the theoretical framework of accident causing theory in construction safety management.

2.1.1 Accident Causing Theory

Accident causing theory propounded by Chen and Wang (2021) states that “The occurrence of accidents is the result of internal or external joint action.” In the initial stage of accidents, there is

no specific form of accidents. However, if there are safety problems, these potential dangers will gradually appear in the development period over time and eventually lead to the occurrence of accidents by sudden changes. The purpose of establishing safety evaluation method is to take effective measures to eliminate potential problems and prevent them from mutating into accidents before accidents occur. Then, it is necessary to master the process of accident evolution, in order to do a better job in prevention and ensure the safety of work. Therefore, mastering the theory of accident causation is the premise of preventive work.

The whole analysis of accident causation theory mainly includes four factors: human, machine, material and environment. Through various experiments and current events, it is finally found that as long as any two factors exist at the same time, the accident will occur. When three or more factors exist at the same time, the probability of accidents is higher.

2.1.2 Safety Fuzzy Comprehensive Evaluation Model

The safety fuzzy evaluation model is based on the fuzzy mathematics theory. Through the quantitative processing of some uncertain and difficult quantitative factors, the membership degree of each evaluation index to the evaluation grade is obtained. The maximum membership principle is selected to evaluate the safety status of construction. The model construction mainly includes the following steps:

1. Set up evaluation grade set:

$V = \{v_1, v_2, \ldots\ldots v_n\}, (n=1,2\ldots.)$

2. Set up the evaluation factor set:

$U = \{U_{i1}, U_{i2}, \ldots. U_{ip}\}, (i = 1,2,\ldots.P)$

3. Fuzzy comprehensive evaluation:

$$R = \begin{matrix} B_1 \\ B_2 \\ M \\ B_P \end{matrix} = \begin{matrix} b_{11} & b_{12} & \cdots & b_{1m} \\ b_{21} & b_{22} & \cdots & b_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ b_{P1} & b_{P2} & \vdots & b_{Pm} \end{matrix}$$

4. Fuzzy comprehensive evaluation:

B’ = TR

Among them, B’ is the comprehensive evaluation result of all factors.

For the construction safety evaluation, the advantage of the traditional fuzzy comprehensive evaluation model is that it can quantify some uncertain and uncertain factors, use the membership degree to express the fuzziness of the construction safety level, and reflect the safety situation of the construction site objectively and not blindly; the disadvantages are that the selection of the construction safety evaluation index is not comprehensive, and the determination of the weight is one-sided, comprehensive evaluation is easy to lose data.

2.2 Conceptual Framework

2.2.1 Introduction

A safety audit is a structured process whereby information is collected relating to the efficiency, effectiveness, and reliability of a company’s total health and safety management system. A safety audit is a move thorough process than technical inspections or spot-check inspections. In addition to ensuring compliance, safety audits also review the company’s safety documentation

and determine whether their record-keeping systems are adequate or need to be more robust. They will also look beyond the current activity in the workplace and evaluate the company's safety training. A safety audit can involve a walk-through of the facility, interviewing management or employees, and reviewing company documentation (Safeopedia, 2020). A safety audit is a general term used to describe an activity where a facility gathers information about one or more aspects of the workplace in order to evaluate the risk levels for health or safety issues. During this audit one or more people will gather data related to the efficiency, reliability and effectiveness of their health and safety systems (Creative safety supply, 2020).

Safety inspections and safety audits approach the challenge of worker well-being from different angles. Safety inspections look for hazards, risks, and other tactics that might prevent a company from operating safely (Graphic products, 2020). Meanwhile, safety audits examine whether programs and strategies are meeting a company's goals. Safety inspection looks for safety hazards and unsafe practices throughout a facility. The inspection should:

1. Determine whether safeguards are in place.
2. Examine whether the equipment presents any hazards.
3. Gather air, water and other samples to test for hazardous substances.
4. Observe work practices to identify.

Safety audit evaluates safety programs and practices within an organization. Employers conducting an audit should:

1. Measure and collect information about a safety program's reliability and effectiveness.
2. Look at whether a safety program meets the company's stated goals.
3. Examine safety training and response efforts.

The following are reasons companies (should) partake in safety audits:

- To determine if your safety and health programs and procedures are working.
- To verify that your employees and management are engaged in your safety programs.
- To verify that your processes are in compliance with company policies and regulations.
- To verify compliance with applicable OSHA rules.
- To determine if you are documenting your safety and health program activities properly.
- To discover and identify potential hazards.
- To evaluate the effectiveness of existing management controls.
- To check the safety of your workplace.
- To check the safety of your equipment.
- To evaluate the adequacy of your supervisors' safety training and performance (Roux, 2014)

Advantages of performing regular safety audits for construction companies;

1. They highlight potential problems: if there are problems lurking behind the scenes, this can lead to accidents and other consequences. The sooner you identify and address them, the better prepared your company.
2. They increase employee awareness: audits can serve to increase an employee's awareness and understanding of environmental and safety regulations.
3. They enhance your company's credentials: if you are bidding for clients or looking into new business, you will find that the majority of companies expect you to have proper health and safety procedures in place. Having positive public relations on the back of this will ultimately benefit your business goals.
4. They can save you money: a health and safety audit provides a calculated analysis of procedures and provides fact-based changes to be implemented. This will save you from

wasting money on what may be little more than second guesses about procedures and benefit areas, such as employee sick leave.

5. They may be viewed favourably by regulatory agencies: a thoroughly completed audit with proper follow-up can signal that your company is making a good-faith effort to comply with applicable regulatory requirements (Bloghse, 2020)

2.2.2 Safety and Health Programs in Construction

Management provides the leadership, vision and resources needed to implement an effective safety and health program. Management leadership means that business owners, managers and supervisors should make worker safety and health a core organizational value, that they are fully committed to eliminating hazards, protecting workers and continuously improving safety and health on job sites and then provide sufficient resources to implement and maintain the safety and health program. A clear written policy helps you communicate that safety and health is a primary organizational value, as important as profitability, productivity, product or service quality and customer satisfaction. This is accomplished by;

1. Establish a written policy signed by top management describing the organization's commitment to safety and health, and pledging to establish and maintain a safety and health program for all workers;

- Communicate the policy to all workers and, at appropriate times and places, to relevant parties, including:
    I. Contractors, subcontractors, staffing agencies, and temporary workers at the worksites (s).
    II. Suppliers and vendors.
    III. Other businesses in a multi-tenant building.

IV. Visitors.

V. Customers.

- Reinforce management commitment by considering safety and health in all business decisions, including estimating and bidding on projects, subcontractors and vendor selection, scheduling and implementing safety designs into construction processes, drawings, and modifications.
- Be visible in operations and set an example by following the same safety and health procedures you expect workers to follow. Conduct weekly or daily talks on safety and health, and discuss or review safety and health indicators and/or open safety items on a "to do" list.

By establishing specific goals and objectives, management sets expectations for managers, supervisors and workers and for the program overall. The goals and objectives should focus on specific actions that will improve worker safety and health;

- Establish realistic, measurable goals for improving safety and health.
- Develop plans to achieve the goals by assigning tasks and responsibilities to particular people, setting timeframes and determining resource needs.

Management provides the resources needed to implement the safety and health program, pursue program goals, and address program shortcomings when they are identified;

- Estimate the resources needed to establish and implement the program. One example is ensuring safety equipment is included in the project budget.
- Allow time in workers' schedules for them to fully participate in the program. Safety can be built into the labour rates when estimating a project.

- Integrate safety and health into planning and budgeting processes and align budgets with program needs.
- Provide and direct resources to operate and maintain the program, meet safety and health commitments and pursue program goals.

Management leads the program effort by establishing roles and responsibilities and providing an open, positive environment that encourages communication about safety and health;

- Identify a frontline person or persons who will lead the safety program effort, make plans, coordinate activities, and track progress. Define and regularly communicate responsibilities and authorities for implementing and maintaining the program, and hold people accountable for performance.
- Provide positive recognition for meeting or exceeding safety and health goals aimed at preventing injury and illness (e.g. reporting close calls/near misses, attending training, conducting inspections).
- Establish ways for managements and all workers to communicate freely and often about safety and health issues, without fear of retaliation.

To be effective, any safety and health program needs the meaningful participation of workers and their representatives. Workers have much to gain from a successful program, and the most to lose if the program fails. They also often know the most about potential hazards associated with their jobs. Successful programs tap into this knowledge base. Worker participation means participation in establishing, operating, evaluating and improving the safety and health program. All workers at a worksite should participate, including those employed by subcontractors. In an effective safety and health program, all workers:

- Are encouraged to participate in the program and feel comfortable providing input and reporting safety or health concerns.
- Have access to information they need to participate effectively in the program.
- Have opportunities to participate in all phases of the program design and implementation.
- Do not experience retaliation when they raise safety and health concerns; report injuries, illnesses, and hazards; participate in the program; or exercise safety and health rights.

By encouraging workers to participate in the program, management signals that it values their input into safety and health decisions;

- Give workers the necessary time and resources to participate in the program.
- Acknowledge and provide positive reinforcement to those who participate in the program.
- Maintain an open door policy that invites workers to talk to managers about safety and health and to make suggestions.

Workers are often best positioned to identify safety and health concerns and programs shortcomings, such as emerging job site hazards, unsafe conditions, close calls or near misses and actual incidents. By encouraging reporting and following up promptly on all reports, employers can address issues before someone gets hurt or becomes ill.

- Establish a simple process for workers to report injuries, illnesses, close calls/near misses, hazards, and other safety and health concerns, and respond to reports promptly. Include an option for anonymous reporting to reduce fear of reprisal.
- Report back to workers routinely and frequently about action taken in response to their concerns and suggestions.

- Emphasize that management will use reported information only to improve job site safety and health, and that no worker will experience retaliation for bringing such information to management's attention.
- Empower all workers to initiate or request a temporary suspension or shutdown of any work activity or operation they believe to be unsafe.
- Involve workers in finding solutions to reported issues.

Sharing relevant safety and health information with workers foster trust and helps organizations make more informed safety and health decisions;

- Give workers the information they need to understand safety and health hazards and control measures on the job site. Some OSHA standards require employers to make specific types of information available to workers, such as:
    1. Safety Data Sheets (SDSs).
    2. Injury and illness data (prevent disclosure of sensitive and personal information as required).
    3. Results of worker exposure monitoring conducted at job sites (prevent disclosure of sensitive and personal information as required).
- Other useful information for workers to review can include:
    1. Chemical and equipment manufacturer safety recommendations.
    2. Job site equipment and vehicle inspection reports.
    3. Incident investigation reports (prevent disclosure of sensitive and personal information as required).
    4. Job hazard analyses (JHAs) and/or job safety analyses (JSAs).

Including worker input at every step of program design and implementation improves your ability to identify the presence and causes of job site hazards, creates a sense of program ownership among workers, enhances their understanding of how the program works, and helps sustain the program over time.

- Provide opportunities for workers to participate in all aspects of the program, including, but not limited to helping:
    1. Develop the program and set goals to reduce or eliminate injuries and illnesses.
    2. Report hazards and develop solutions that improve safety and health.
    3. Analyse hazards in each step of routine and non-routine jobs, tasks, and processes.
    4. Define and document safe work practices.
    5. Conduct site inspections, including equipment and vehicles.
    6. Develop and revise safety procedures.
    7. Participate in incident and close call/near miss investigations.
    8. Train current co-workers and new hires.
    9. Develop, implement, and evaluate training programs.
    10. Evaluate program performance and identify ways to improve it.
    11. Take part in exposure monitoring and medical surveillance associated with hazards.
- Conduct daily planning meetings, huddles, toolbox talks, or tailgate meetings to engage workers in the safety and health program.

To participate meaningfully in the program, workers must feel that their input is welcome, their voices will be heard, and they can access reporting mechanisms. Participation will be suppressed if language, education, or skill levels on the job site are not considered, or if workers fear retaliation or discrimination for speaking up (for example, if investigations focus on blaming individuals rather than the underlying conditions that led to the incident, or if reporting an incident or concern could jeopardize the award of incentive-based prizes, rewards, or bonuses).

- Ensure that workers from all levels of the organization can participate regardless of their skill level, education, or language.
- Provide frequent and regular feedback to show employees that their safety and health concerns are being heard and addressed.
- Authorize sufficient time and resources to facilitate worker participation; for example, hold safety and health meetings during regular working hours.
- Ensure that the program protects workers from being retaliated against for reporting injuries, illnesses, and hazards; participating in the program; or exercising their safety and health rights. Ensure that other policies and programs do not discourage worker participation.

In construction, unanticipated hazards can arise due to changes in project timelines, sequence of events, and the fast pace of some construction projects. Hazard identification and assessment is a crucial part of an effective safety and health program. One of the “root causes” of construction injuries, illnesses, and incidents is the failure to identify or recognize hazards that are present, or that could have been anticipated. A critical element of any effective safety and health program is a proactive, ongoing process to identify and assess such hazards. To identify and Assess hazards, employers and workers:

Collect and review information about the hazards present or likely to be present at the job site.

- Conduct frequent and regular inspections of the job site to identify new or recurring hazards.
- Investigate injuries, illnesses, incidents, and close calls/near misses to identify the underlying hazards, their causes, and safety and health program shortcomings.
- Group similar incidents and identify trends in injuries, illnesses, and hazards reported.
- Consider hazards associated with emergency or non-routine situations.
- For each hazard identified, determine the severity and likelihood of incidents that could result, and use this information to prioritize corrective actions.

Some hazards, such as housekeeping and tripping hazards, can and should be fixed as they are found. Fixing a hazard on the spot emphasizes the importance of safety and health and takes advantage of a safety leadership opportunity. Information on job site hazards may already be available (from both internal and external sources) to employers and workers;

- Collect, organize, and review information with workers to determine what types of hazards may be present and which workers may be exposed or potentially exposed.
- Information available may include:
    1. Equipment and machinery operating manuals.
    2. SDSs provided by chemical manufacturers.
    3. Self-inspection reports and inspection reports from insurance carriers, government agencies, and consultants.
    4. Records of previous injuries and illnesses, such as OSHA 300 and 301 logs and reports of incident investigations.
    5. Workers' compensation records and reports.

6. Patterns of frequently occurring injuries and illnesses.
7. Exposure monitoring results, industrial hygiene assessments, and medical records (appropriately redacted to ensure patient/worker privacy).
8. Existing safety and health programs (hazard communication, confined spaces in construction, respiratory protection, process safety management, PPE, etc.).
9. Input from workers, including surveys or minutes from safety and health committee meetings.
10. Results of job hazard analyses (also known as job safety analyses).

Information about hazards may be available from outside sources, such as:

1. OSHA, National Institute for Occupational Safety and Health (NIOSH), and Centres for Disease Control and Prevention (CDC) websites, publications and alerts.
2. Trade associations.
3. Labour unions, state and local occupational safety and health committees/coalitions ("COSH groups"), and worker advocacy groups.
4. Safety and health consultants.

Hazards can be introduced over time as conditions on the job site change, for example, as the building goes up, equipment or tools become worn, different trades arrive at and depart from the site, and housekeeping practices decline. Setting aside time to frequently and regularly inspect the job site for hazards can help identify shortcomings so that they can be addressed before an incident occurs.

- Designate a competent person to conduct frequent and regular inspections of the job sites, materials, and equipment. Have workers on the inspection team, and talk to them about hazards that they see or report.
- Plan ahead to anticipate the potential introduction of additional hazards by the next group of trades or sequence of construction activities and to address these additional hazards. For example, ensure that structures can handle any additional anticipated loads.
- Be sure to document inspections so you can later verify that hazardous conditions have been corrected. Take photos or video of problem areas to facilitate on-the-job discussion and brainstorming about how to immediately control them.
- Include all areas and activities in these inspections, such as trenching and excavations, staging areas, layout yards, working at heights, materials storage, heavy equipment maintenance, and the activities of on-site contractors, subcontractors, and temporary workers.
- Regularly inspect both mobile construction equipment (e.g., forklifts, bulldozers, aerial lifts and cranes) and transportation vehicles (e.g., cars, trucks).
- Create material delivery areas and internal traffic control plans for the construction site and laydown areas.
- • Use checklists that highlight things to look for. Typical hazards fall into several major categories, such as those listed below; each workplace will have its own list:
    1. Slip, trip, and fall hazards.
    2. Electrical hazards.
    3. General housekeeping.
    4. Equipment operation.

5. Equipment maintenance.
6. Fire protection.
7. Work organization and process flow (including staffing and scheduling).
8. Work practices.
9. Ergonomic problems.
10. Lack of emergency procedures.

- Before changing operations, workstations, or workflow; making major organizational changes; or introducing new equipment, materials, or processes, seek the input of workers and evaluate the planned changes for potential hazards and related risks.

Identifying workers' exposure to health hazards is typically more complex and less obvious than identifying physical safety hazards. For example, gases and vapors may be invisible, often have no odour, and may not have an immediately noticeable harmful health effect. Health hazards include chemical hazards (solvents, adhesives, paints, toxic dusts such as lead and silica, etc.), physical hazards (noise, radiation, heat, etc.), biological hazards (infectious diseases), and ergonomic risk factors (heavy lifting, repetitive motions, vibration from operating tools and earthmoving equipment).

- Identify chemical hazards—review SDSs and product labels to identify chemicals at your job site that have low exposure limits, are highly volatile, or are used in large quantities or in unventilated spaces. Identify activities that may result in skin exposure to chemicals.
- Identify physical hazards—identify any exposures to excessive noise (areas where you must raise your voice to be heard by others), elevated heat (indoor and outdoor), or sources of radiation (radioactive materials, X-rays, or radiofrequency radiation).

- Identify biological hazards—determine whether workers may be exposed to sources of infectious diseases, moulds, toxic or poisonous plants, or animal materials (fur or scat) capable of causing allergic reactions or occupational asthma.
- Identify ergonomic risk factors—examine work activities that require heavy lifting, work above shoulder height, repetitive motions, or tasks with significant vibration.
- Conduct quantitative exposure assessments, when possible, using air sampling or direct reading instruments.
- Review OSHA 300 logs to help identify health hazards associated with job site exposures.

Incidents including injuries, illnesses, close calls/near misses, and reports of other concerns provide a clear indication of where hazards exist. By thoroughly investigating incidents and reports, you will identify hazards that are likely to cause future harm. The purpose of an investigation must always be to identify the root causes (and there is often more than one) of the incident or concern, in order to prevent future occurrences.

- Develop a clear plan and procedure for conducting incident investigations, so that an investigation can begin immediately when an incident occurs. The plan should cover items such as:
    1. Who will be involved?
    2. Lines of communication.
    3. Materials, equipment, and supplies needed.
    4. Reporting forms and templates.
- Train investigative teams on incident investigation techniques, emphasizing objectivity and open-mindedness throughout the investigation process.

- Conduct investigations with a trained team that includes representatives of both management and workers.
- Investigate close calls/near misses.
- Identify and analyse root causes to address underlying program shortcomings that allowed the incidents to happen.
- Communicate the results of the investigation to managers, supervisors, and workers to prevent recurrence.

Emergencies present hazards that need to be recognized and understood. Non-routine or infrequent tasks, including mobilization and demobilization of the site, critical lifts with cranes, concrete pours, or setting critical structural members, also present potential hazards. Plans and procedures need to be developed for responding appropriately and safely to hazards associated with foreseeable emergency scenarios and non-routine situations.

- Identify foreseeable emergency scenarios and non-routine tasks, taking into account the types of material and equipment in use and the location at the worksite. Scenarios such as the following may be foreseeable:
    1. Structural collapse (i.e., bridges, buildings, trenches, and concrete forms).
    2. Non-routine tasks, such as infrequently performed activities (i.e., critical lifts and concrete pours).
    3. Fires and explosions.
    4. Medical emergencies.
    5. Weather emergencies and natural disasters.
    6. Hazardous material spills.
    7. Start-ups after planned or unplanned equipment shutdowns.

The next step is to assess and understand the hazards identified and the types of incidents that could result from worker exposure to those hazards. This information can be used to develop interim controls and to prioritize hazards for permanent control;

- Evaluate each hazard by considering the severity of potential outcomes, the likelihood that an event or exposure will occur, and the number of workers who might be exposed.
- Use interim control measures to protect workers until more permanent solutions can be implemented.
- Prioritize the hazards so that those presenting the greatest risk are addressed first. Note, however, that employers have an ongoing obligation to control all serious recognized hazards and to protect workers.

Effective controls protect workers from hazards; help avoid injuries, illnesses, and incidents; minimize or eliminate safety and health risks; and help employers provide workers with safe and healthful working conditions. The processes described in this section will help employers prevent and control hazards. To effectively control and prevent hazards, employers should:

- Involve workers, who often have the best understanding of the conditions that create hazards and insights into how they can be controlled.
- Identify and evaluate options for controlling hazards, using a “hierarchy of controls.”
- Use a hazard control plan to guide the selection and implementation of controls, and implement controls according to the plan.
- Develop plans with measures to protect workers during emergencies and non-routine activities.

- Evaluate the effectiveness of existing controls to determine whether they continue to provide protection, or whether different controls may be more effective. Review new technologies for their potential to be more protective, more reliable, or less costly.

A wealth of information exists to help employers investigate options for controlling identified hazards. Before selecting any control options, it is essential to solicit workers' input on their feasibility and effectiveness.

- Review sources such as OSHA standards and guidance, industry consensus standards, NIOSH publications, manufacturers' literature, and engineering reports to identify potential control measures. Keep current on relevant information from trade or professional associations.
- Investigate control measures used at other worksites and determine whether they would be effective at your job sites.
- Get input from workers who may be able to suggest and evaluate solutions based on their knowledge of the job site, equipment, and work processes.
- For complex hazards, consult with safety and health experts, including OSHA's On-site Consultation Program.
- Plan the sequencing of various trades to reduce overlap where possible and to avoid exposing other trades to hazards.

Employers should select the controls that are the most feasible, effective, and permanent.

- Eliminate or control all serious hazards (hazards that are causing or are likely to cause death or serious physical harm) immediately.
- Use interim controls while you develop and implement longer-term solutions.

- Select controls according to a hierarchy that emphasizes engineering solutions (including elimination or substitution) first, followed by safe work practices, administrative controls, and finally PPE.
- Avoid selecting controls that may directly or indirectly introduce new hazards. Examples include exhausting contaminated air into occupied work spaces or using hearing protection that makes it difficult to hear backup alarms.
- Review and discuss control options with workers to ensure that controls are feasible and effective.
- Use a combination of control options when no single method fully protects workers.

A hazard control plan describes how the selected controls will be implemented. An effective plan will address serious hazards first. Interim controls may be necessary, but the overall goal is to ensure effective long-term control of hazards. Control plans at a construction site may need to be updated and modified often as the project develops and the site conditions and hazards change.

- List the hazards needing controls in order of priority.
- Assign responsibility for installing/implementing the controls to a specific person or persons with the power or ability to implement the controls.
- Establish a target completion date.
- Plan how you will track progress toward completion.
- Plan how you will verify the effectiveness of controls after they are installed or implemented.

A hazard control plan includes provisions to protect workers during non-routine tasks and foreseeable emergencies, such as falls, cave-ins, fires and explosions, chemical releases, hazardous material spills, infrequent activities, natural and weather disasters, workplace violence,

terrorist or criminal attacks, disease outbreaks (e.g., pandemic influenza), and medical emergencies. Non-routine tasks, or tasks workers don't normally do, should be approached with particular caution. Prior to initiating such work, review JSAs with the workers involved and notify others about the nature of the work, work schedule, and any necessary precautions.

- Develop procedures to control hazards that may arise during non-routine tasks (e.g., mobilization and demobilization of the site, critical lifts with cranes, concrete pours, or setting critical structural members).
- Develop or modify plans to control hazards that may arise in emergency situations.
- Procure any equipment needed to control emergency-related hazards.
- Assign responsibilities for implementing the emergency plan.
- Conduct emergency drills to ensure that procedures and equipment provide adequate protection during emergency situations.

Once hazard prevention and control measures have been identified, they should be implemented according to the hazard control plan.

- Implement hazard control measures according to the priorities established in the hazard control plan.
- When resources are limited, implement measures on a "worst-first" basis, according to the hazard ranking priorities (risk) established during hazard identification and assessment. (Note, however, that regardless of limited resources, employers have an obligation to protect workers from recognized, serious hazards.)
- Promptly implement any measures that are easy and inexpensive such as general housekeeping, removal of obvious tripping hazards such as electrical cords, and basic lighting regardless of the level of hazard they involve.

To ensure that control measures are and remain effective, employers should track progress in implementing controls, inspect and evaluate controls once they are installed, and follow routine preventive maintenance practices.

- Track progress and verify implementation by asking the following questions:
    1. Have all control measures been implemented according to the hazard control plan?
    2. Have engineering controls been properly installed and tested?
    3. Have workers been appropriately trained so that they understand the controls, including how to operate engineering controls, safe work practices, and PPE use requirements?
    4. Are controls being used correctly and consistently?
- Conduct regular inspections (and industrial hygiene monitoring, if indicated) to confirm that engineering controls are operating as designed.
- Evaluate control measures to determine if they are effective or need to be modified. Involve workers in the evaluation of the controls. If controls are not effective, identify, select, and implement further control measures that will provide adequate protection.
- Confirm that work practices, administrative controls, and PPE use policies are being followed.
- Conduct routine preventive maintenance of equipment and controls to help prevent incidents due to equipment failure (OSHA, 2016)

2.2.3 Safety Audit Practices in Construction Companies

Due to the dangerous nature of the construction industry, the safety of workers must be actively pursued. This is done daily through the use of personal protective equipment, signage, and continuous training. However, even the most safety-focussed job sites can become complacent.

The problem is complacency when it comes to safety measures can turn deadly. That's why safety audits are so important since it is a review of a job site's safety program, the site itself and all the actions that are taken to prevent injury. Safety audits are meant to identify hazards and gaps in safety procedures that can lead to incidents and non-compliance. Safety audit in construction companies can be carried out by;

1. When planning a safety audit, it is important to follow a set process. You can start by forming a team or teams. Some companies choose to hire outside consultants to perform the audit, which can be very effective.
2. Prior to conducting the safety audit, inform all managers and supervisors so that all of the necessary documents, records and procedures will be readily available when the audit begins.
3. Scheduling safety audits periodically. It's natural to think that safety audit should be carried out annually or sometimes twice a year. No bigger mistake can be made. All job sites continually evolve and hazards can pop up when you least expect it. Safety audit should be scheduled periodically. That way, you are never scrambling to make a long list of changes and you have a better chance of preventing an accident.
4. Use the Occupational Safety and Health Administration standards for safety auditing. When safety is your primary focus, you can't lose focus on compliance with Occupational Safety and Health Administration standards. Let their rules and points of emphasis guide what you look for in an audit.
5. Review your current safety program. Your audit should start with a look at what you are currently doing from a safety standpoint. Does it adequately protect your workers? Are workers following it? Is there a clear focus on training? Have new hazards come up that

are not are not currently being covered? Look at any incident reports for the area they are auditing. Safety audit teams can go to the physical location and watch work being done there. They can ask questions of the employees in that work and get as much information as possible.

6. Take all the information and analyse it for potential safety concerns. Some safety issues will be quite obvious, but others may be hidden in the data. Once the audit is completed, either the same audit team or another team should begin making plans for what can be changed in the company to improve safety based on the information that was gathered during the audit (Trentcotney, 2020).

2.2.4 Challenges Companies Face when Carrying out Safety Audit Practices and Their Possible Solutions

1. The cost of carrying out safety audit: a comprehensive safety and health audit can involve a significant investment of resources. This can be controlled by asking yourself;

- Do I need a consultant? Unless you have technically complex issues, you probably don't need a paid consultant for technically complex portions of the inspection.
- Do I have the manpower in-house? Your managers are cross-trained; you may be able to use managers from one department to audit another. If you have a safety committee, you can draw some of your audit personnel from the committee.
- Will my insurance carrier help? Your liability insurer may provide risk management resources including personnel for the audit.
- What legal services are already available to me? If your company has an attorney on the payroll or on retainer, any necessary legal services should have a marginal cost.

2. What are my audit priorities? To maximise the return on your investment, always begin with the areas of highest risk or broadest exposure. Highest priority should be given to detecting hazards or violations most likely to cause serious injuries or cause injury to the largest number of people. Lowest priority can be given to hazards that are unlikely to occur, even if they could cause serious injury, or to hazards that are unlikely to endanger human life.
3. What about correction and abatement? Following your audit, you will have damning evidence of any potential hazards in your facility. It is vital that you correct serious hazards in a timely way. If you're inspected later, and an inspector discovers that you knew about a hazard and did not correct it, you could receive a wilful citation.
4. What about distribution of records? Some documents can be made available for the asking – to auditors, employers and their representatives, and inspectors – but others require more care. Low-security documents include inspection checklists, safety committee inspection reports and meeting minutes. High-security documents include accident or serious injury investigator's reports, documentation of serious violations, and unabated hazards. These documents may contain sensitive or confidential information and might need to be redacted before they are released (Lawton, 2014)

2.3 Review of Empirical Studies

The accident rate of construction industry has been very high, so the construction safety management is particularly important. Accident causation theory is a common theory which can improve the safety management of construction. The application of accident causing theory in construction safety management is studied. It is compared the common accident causing theories, selects the relatively more advantageous "4M" theory, applies it to the construction safety

management, selects two unfinished projects in the construction site for analysis, establishes the safety evaluation system and selects the safety fuzzy comprehensive evaluation method. After applying the accident cause theory, the human factor index score for item 1 is 91, material factor index score is 86, the management factor index score is 89, and the environmental factor index score is 91. The human factor index score for item 2 is 90, the material factor index score is 85, the management factor index score is 86 and the environmental factor index score is 88 (Wang and Chen, 2021).

Given the hazardous nature of the construction industry world over, the need for an effective safety management system which aims at forestalling the risks and hazards inherent on site has been reiterated by recent studies and applicable laws. Studies however show that level of effectiveness differs from country to country; industry to industry and from company to company. This study undertakes both qualitative and quantitative investigation into the safety management system of a Nigeria-based construction company with a view of determining how compliant the system is to international standards. Though a formed safety system exists in the company, the system is poorly organized and consequently, it is characterised by ineffectiveness and poor documentation. It is recommended that management gives an urgent attention to the company's safety management system with intense interest to standardise its operations and functionality (Olutuase, 2014).

Safe jobs are smart constructions since one serious injury can stop the growth of the construction work in its tracks. Safety at the construction site is a very relevant topic that needs to be addressed and given due importance. Everyday construction personnel are exposed to a lot of site perils that could result in injury or even fatality. A complete eradication of these construction site dangers are close to impossibility but, it can be reduced to a considerable extent. A safety audit

management system is one step to achieve a better, safe and accident free working environment. An audit is a systematic and wherever possible, independent examination to determine whether activities and related results conform to planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the organization's policy and objectives (Pulickal and Dhurai, 2015).

2.4 Summary of Reviewed Related Literature

Safety audit in building construction is of great importance aimed to reduce risks and hazards on a site and keep it to a minimum. It is crucial that construction companies set up a committee that will partake periodic safety audit according to the Occupational Safety and Health Administration's approved useful documents to record down findings. When this process is done properly, a safety audit will help determine if a company's day to day activities are conformity with their safety efforts. Safety audit can also be used as part of the process in the creation of a full safety plan for a company.

CHAPTER THREE

3.0 METHODOLOGY

This chapter describes the procedures used in carrying out this study under the following; research design, area of the study, population, sample, instrument for data collection, validation of instruments, methods of data analysis and decision rule.

3.1 Research Design

The research design adopted for this study is a descriptive survey research design. It can answer what, where, when and how questions. The researcher does not control or manipulate any of the variables, but only observes and measures them. This study employed the use of questionnaires which will help in determining the views of the respondent on the importance of safety audit in construction companies in F.C.T, Abuja.

3.2 Area of the Study

The study covers construction companies in F.C.T, Abuja metropolis. Abuja is located at the centre of Nigeria and has a land area of 8,000 square kilometres. It is bounded on the north by Kaduna state, on the west by Niger state, on the south-east by Nasarawa state and on the south-west by Kogi state. It falls within latitude 745'and 739'.

3.3 Population of the Study

The target population of this study comprises of the management of 58 construction companies in F.C.T, Abuja that is; 2 respondents from each construction company would be used as the

population of the study and totalling 116 respondents, which comprises of 58 building site managers and 58 building contractors in the building site.

3.4 Sample and Sampling Techniques

Thesampling technique used was convenience sampling technique where participants are selected based on availability and willingness to take part in the research study. Convenience sampling is a type of non-probability sampling that involves the sample being drawn from that part of the population that is close to hand. This type of sampling is also known as grab sampling or availability sampling. In addition, this type of sampling method does not require that a simple random sample is generated, since the only criterion is whether the participants agree to participate.

3.5 Instrument for Data Collection

The instrument used for data collection was a structured questionnaire, developed by the researcher. The instrument was designed to obtain responses from the respondents on safety audit as an intrinsic factor in construction companies. The questionnaire consists of 44 items which was used to obtain such factors like, what is the level of awareness of construction companies in Abuja on safety audit, what are the processes involved in carrying out the safety audits, what are the challenges the companies face and what are the possible solutions to the challenges faced.

The questionnaire consists of two (2) parts 1 and 2. Part 1 deals with the Bio-data of the respondents and introductions and guide for the respondents on how to complete the questionnaires, while part 2 contains research question A to D. Research question A contain 13

items which deals with the processes involved in safety audit in construction companies. Research question B contains 11 items which deals with the perception of level of awareness on safety processes involved in safety audit. Research question C contains 11 items which deals with the challenges the companies face in conducting safety audit, which research question D contains 10 items dealing with the solutions to the challenges of the safety audit the companies face.

The four-point rate scale was used which includes

Strongly agreed = 4 points

Agreed = 3 points

Disagreed = 2 points

Strongly disagreed = 1 point

3.6 Validation of the Instrument

The instrument for the data collection of the study was designed by the researcher and was validated by the supervisor and one lecturer in the Department of Industrial and Technology Education, to establish the appropriateness of questionnaires items before administering to the respondent.

3.7 Administration of Instrument

The instrument was administered to the respondent by the researcher and collected back immediately after response to the items.

3.8 Method of Analysis

The data collected was analysed using mean, standard deviation and t-test. A four-point rating scale was used to analyse the data as shown below.

Strongly agreed (SA) 4

Agreed (A) 3

Disagreed (D) 2

Strongly disagreed (SD) 1

The formula below was used to calculate the mean

$X_t = \sum fx / N$

$\sum$ = summation of

x = normal value of opinion (mean)

f = frequency of response of each option

X_t= Grand mean of each item

Therefore, the mean value = 4+3+2+1÷4 = 10÷4 = 2.50

Standard deviation

$\sqrt{\sum(Xi - \mu)^2 / N}$

$\sum$ = summation of

N = size of population

μ = population mean

Xi = each value from the population

3.9 Decision Rule

The mean value = 4+3+2+1÷4 = 10÷4 = 2.50. The mean rating of 2.50 was used as decision point for every item. Consequently, any item which mean response of 2.50 and above is accepted while items below 2.50 is rejected.

CHAPTER FOUR

PRESENTATION AND DATA ANALYSIS

This chapter is about the presentation and analysis of the data with respect to the research questions and hypothesis formulated for this study, the result of data analysis for the research question is presented first, followed by those of the hypothesis tested for the study.

4.1 Research Question 1

What are the processes involved in the safety audits by the construction companies in F.C.T, Abuja?

Table 1

Mean responses of respondents on the processes involved in safety audits in construction companies

$N_1 = 20$ AND $N_2 = 20$

S/N	ITEMS	X_t	SD	REMARK
1	Gathering of information about one or more aspects of the workplace in order to	3.78	0.42	Agreed

	evaluate the risk levels for health or safety issues			
2	Creating a safety audit committee in house	3.87	0.34	Agreed
3	Hiring of professionals from outside	2.33	0.97	Disagreed
4	Schedules the safety audits regularly e.g. once every year	3.95	0.22	Agreed
5	Uses guidelines provided by Occupational Safety and Health Administration standards for safety audits	3.85	0.36	Agreed
6	Analyses data gotten for potential safety hazards and errors	3.80	0.69	Agreed
7	Corrects all errors and hazards exposed by the audits that are high-risk first	3.18	1.17	Agreed
8	Corrects all errors and hazards that are low-risk first	2.63	1.25	Agreed
9	Puts in place safety programs designed to reduce risks and hazards after	3.87	0.34	Agreed
10	The audit having a documented checklist of potential hazards to discover	3.87	0.34	Agreed
11	Choosing where the designated tasks will be done for the audit	3.90	0.30	Agreed
12	Choosing of audit scope i.e. documented tasks, checklists for the audit	3.72	0.45	Agreed
13	Compilation of all safety audit process reports	3.63	0.58	Agreed

KEY:

N = 40

N1 (numbers of building site managers), N2 (numbers of building contractors)

Xt = average mean responses of N1 and N2

SD = standard deviation of the respondents

The analysis of the mean response of the respondents in table 1 show that the items under the sub-heading are rated as agreed and disagreed with average mean score ranging between 2.33 – 3.95. This shows that the respondents agreed and disagreed with the items as the processes

involved in safety audits in construction companies. The standard deviation score ranged between 0.22 and 1.25.

4.2 Research Question 2

What is the level of awareness of safety audit in construction companies in F.C.T, Abuja?

Table 2

Mean responses of respondents on level of awareness of safety audit in construction companies in F.C.T, Abuja

$N_1 = 20$ AND $N_2 = 20$

S/N	ITEMS	X_t	SD	REMARKS
1	They are aware of what safety audit is	3.65	0.53	Agreed
2	They are aware that safety audits differ from regular safety inspections i.e. the company undertakes it on their own	3.80	0.46	Agreed
3	They are aware of the importance of conducting safety audits	3.75	0.49	Agreed

4	They conduct safety audits regularly e.g. once every year	3.85	0.36	Agreed
5	They are aware that professional guidelines exist for safety audits	3.05	1.09	Agreed
6	They follow professional guidelines provided for safety audits	3.38	0.98	Agreed
7	They have a checklist for the different sections in their site and their potential hazards	3.70	0.46	Agreed
8	They create safety programs through safety audit	3.58	0.50	Agreed
9	They immediately correct errors and hazards exposed by safety audits	3.63	0.59	Agreed
10	Their workers on site are aware of this practice of safety audit	2.53	0.96	Agreed
11	The site workers are enlightened and participate actively during auditing	2.38	0.98	Disagreed

KEY:

N = 40

N1 (number of building site managers), N2 (number of building contractors)

Xt = average mean responses of N1 and N2

SD = standard deviation of the respondents

The analysis of the mean response of the respondents in table 2 show that the items under the sub-heading are rated as agreed with average mean score ranging between 2.38 – 3.85. This shows that the respondents agreed and disagreed with the items as the level of awareness of safety audit in construction companies. The standard deviation score ranged between 0.36 and 1.09. This showed that the responses of the managers and the contractors were divergent.

4.3 Research Question 3

What are the safety audit challenges faced by construction companies in F.C.T, Abuja?

Table 3

Mean response of respondents on the safety audit challenges faced by construction companies in F.C.T, Abuja

$N_1 = 20$ AND $N_2 = 20$

S/N	ITEMS	X_t	SD	REMARKS
1	The company does not regularly conduct safety audit but relies on outside safety inspection	3.55	0.75	Agreed
2	High cost of hiring professionals	3.60	0.71	Agreed
3	Unavailability of well-trained manpower in-house	3.83	0.68	Agreed
4	Too much focus on low-risk exposed hazards	3.25	1.15	Agreed
5	Too much focus on high-risk exposed hazards	2.33	1.14	Disagreed
6	Not correcting an exposed hazard immediately or on time	3.87	0.40	Agreed
7	Lack of workers' participation in safety programs put in place	3.45	0.55	Agreed
8	Lack of funds secured from insurance companies	3.42	0.55	Agreed
9	Absence of a documented check-list to narrow down audit focus	3.93	0.27	Agreed
10	Carelessness in compiling and securing audit reports	3.55	0.75	Agreed
11	Falsifying compiled audit reports	3.55	0.64	Agreed

KEY:

N = 40

N1 (number of building site managers), N2 (number of building contractors)

Xt = average mean responses of N1 and N2

The data presented in table 3 show that the items under the sub-heading are rated as agreed and disagreed with average mean score ranging between 2.33 – 3.93. This shows that the respondents agreed and disagreed with the items as the safety audit challenges faced by construction companies. The standard deviation score ranged between 0.27 and 1.15. This showed that the responses were divergent.

4.4 Research Question 4

What are the possible solutions to the safety audit challenges faced in construction companies in F.C.T, Abuja?

Table 4

Mean response of respondents on the possible solutions to the safety audit challenges faced in construction companies in F.C.T, Abuja

$N_1 = 20$ AND $N_2 = 20$

S/N	ITEMS	X_t	SD	REMARKS
1	Company management should make regular safety audit protocols mandatory	3.98	0.16	Agreed
2	Training personnel on carrying out safety audit protocols	3.68	0.66	Agreed
3	Reduce expenditure on hiring outside professionals	3.92	0.27	Agreed
4	More focus on high-risk exposed hazards first and immediately	3.20	1.20	Agreed
5	More focus on low-risk exposed hazards first and immediately	2.50	1.26	Agreed
6	Immediate correction of all exposed hazards and errors	3.88	0.40	Agreed
7	Enlightening workers on active participation in safety programs put in place	3.55	0.55	Agreed
8	A documented checklist for better focus in the safety audit process	3.65	0.62	Agreed
9	Criminalising falsifying compiled safety audit reports	3.70	0.61	Agreed
10	Regular professional safety inspections to keep companies on their toes	3.35	0.92	Agreed

KEY:

N = 40

N1 (number of building site managers), N2 (number of building contractors)

Xt = average mean responses of N1 and N2

SD = standard deviation of the respondents

The data presented in table 4 show that the items under the sub-heading are rated as agreed and disagreed with average mean score ranging between 2.50 – 4.00. This shows that the respondents agreed with the items as the possible solutions to the safety audit challenges faced in construction companies. The standard deviation score ranged between 0.16 and 1.26. This showed that the responses were divergent.

4.5 Hypothesis 1

There will be no significant difference in the mean responses of the building professionals as regards to the processes involved in safety audit in construction companies located in Abuja.

Table 5

T-test analysis of the respondents regarding the processes involved in safety audit in construction companies in Abuja.

$N_1 = 20$ AND $N_2 = 20$

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Building site manager	20	3.18	0.60	38	0.456	0.02	NS
Building contractor	20	3.20	0.84				

KEY:

N = 40

X_1 = mean of building site managers

X_2 = mean of building contractors

N_1 = no. of building site managers

N_2 = no. of building contractors

SD_1 = standard deviation of building site managers

SD_2 = standard deviation of building contractors

NS = Not Significant

Table 5 showed that there was no significant difference in the responses of building site managers and building contractors on the items; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.6 Hypothesis 2

There will be no significant difference in the mean responses of the building professionals regarding the level of awareness of safety audit in construction companies located in Abuja.

Table 6

T-test analysis of the respondents regarding the level of awareness of safety audit in construction companies in Abuja.

N_1 = 20 AND N_2 = 20

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Building site manager	20	3.15	0.60	38	0.288	0.06	NS
Building contractor	20	3.10	0.67				

KEY:

N = 40

X_1 = mean of building site managers

X_2 = mean of building contractors

N_1 = no. of building site managers

N_2 = no. of building contractors

SD_1 = standard deviation of building site managers

SD_2 = standard deviation of building contractors

NS = Not Significant

Table 6 showed that there was no significant difference in the responses of building site managers and building contractors on the items; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.7 Hypothesis 3

There will be no significant difference in the mean responses of the building professionals regarding the safety audit challenges faced in construction companies located in Abuja.

Table 7

T-test analysis of the respondents regarding the safety audit challenges faced in construction companies in Abuja.

N_1 = 20 AND N_2 = 20

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Building site manager	20	3.20	0.59	38	0.411	0.01	NS
Building contractor	20	3.05	0.79				

KEY:

N = 40

X_1 = mean of building site managers

X_2 = mean of building contractors

N_1 = no. of building site managers

N_2 = no. of building contractors

SD_1 = standard deviation of building site managers

SD_2 = standard deviation of building contractors

NS = Not Significant

Table 7 showed that there was no significant difference in the responses of building site managers and building contractors on the items; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.8 Hypothesis 4

There will be no significant difference in the mean responses of the building professionals as regards to the possible solutions to the safety audit challenges faced in construction companies located in Abuja.

Table 8

T-test analysis of the respondents regarding the possible solutions to the safety audit challenges faced in construction companies in Abuja.

N_1 = 20 AND N_2 = 20

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Building site manager	20	3.25	0.64	38	0.515	0.02	NS
Building contractor	20	3.23	0.75				

KEY:

N = 40

X_1 = mean of building site managers

X_2 = mean of building contractors

N_1 = no. of building site managers

N_2 = no. of building contractors

SD_1 = standard deviation of building site managers

SD_2 = standard deviation of building contractors

NS = Not Significant

Table 8 showed that there was no significant difference in the responses of building site managers and building contractors on the items; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.9 Findings of the Study

With the data collected, analysed and interpreted in this study, the following are the findings of the study as follows;

1) The construction companies in F.C.T, Abuja have full knowledge of the processes of conducting safety audit.

2) There is no significant difference in the mean responses of the building site managers and the building contractors on the processes involved in safety audit.

3) The construction companies in F.C.T, Abuja are aware of what safety audit is about.

4) There is no significant difference in the mean responses of the building site managers and the building contractors on the level of awareness of safety audit.

5) Focus on high-risk hazards first is disagreed on as a safety audit challenge.

6) There is no significant difference in the responses of the building site managers and the building contractors on the safety audit challenges.

7) The construction companies agree on the possible solutions to the safety audit challenges that they face.

8) There is no significant difference between in the mean responses of the building site managers and the building contractors on the possible solutions to the safety audit challenges.

4.10 Discussion of Findings

The discussion of findings is based on the research questions and hypothesis of the study, the data presented in table 1 which contains thirteen (13) items revealed that the processes involved in the safety audits by the construction companies does not include hiring professionals from outside but includes gathering of information about one or more aspects of the workplace in

order to evaluate the risk levels for health or safety issues, creating a safety audit committee in-house, schedules the safety audits regularly e.g. once every year, etc. This is in line with Trentcotney (2020) on how safety audit needs to be carried out. The hypotheses tested to this research question was accepted, which revealed that there is no significant difference between the mean responses of the building site managers and the building contractors.

The data analysis presented in table 2 which contains eleven (11) items revealed that the construction companies in F.C.T, Abuja are not only aware of what safety audit is but are also aware that safety audits differ from safety inspections as they take up the tasks themselves, they are aware of the importance to the company and the workers of regularly conducting safety audits, they not only are aware of professional guidelines for conducting safety audits but the companies follow these guideline too and they can create safety programs for the workers to follow after conducting safety audits. The companies when conducting their safety audits have a documented checklist to narrow down their search for hazards to a specific area on site, this in turn increases efficiency. Although, the workers on site are aware of the practice of safety auditing, the workers are not active in participating. The hypotheses tested to this research question was accepted, which revealed that there is no significant difference between the mean responses of the building site managers and the building contractors.

The data analysis presented in table 3 which contains eleven (11) items revealed that the safety audit challenges are the overreliance on the companies on outside safety inspections alone to find out and correct hazards, unavailability of trained man-power in the companies to set up a safety audit committee, not correcting an exposed hazard immediately or on time leading to pro-longed and long-term issues, lack of workers' participation in safety programs put in place often leading to accidents, carelessness in compiling and securing audit reports which leads to lost data,

leading to higher risks for the workers especially. The hypotheses tested to this research question was accepted, which revealed that there is no significant difference between the mean responses of the building site managers and the building contractors.

The data analysis presented in table 4 which contains ten (10) items revealed that the building professionals agree that Company management should make regular safety audit protocols mandatory as this in turn creates a safer environment and workspace for everyone, training personnel on carrying out safety audit protocols to reduce expenditure especially on spending on outside professionals, immediate correction of all exposed hazards and errors, enlightening workers' on active participation to safety programs put in place and criminalising falsifying compiled safety audit reports. The hypotheses tested to this research question was accepted, which revealed that there is no significant difference between the mean responses of the building site managers and the building contractors.

CHAPTER FIVE

SUMMARY CONCLUSION AND REOMMENDATION

The summary of the study, implication of the study, conclusion, recommendation and suggestion for further research are presented in this chapter, based on the findings of this study.

5.1 Summary of the Study

The purpose of the study is to research safety audit as an intrinsic factor in construction companies in F.C.T, Abuja. Related literature under the following sub-headings was reviewed; an overview on what safety audit is about, its difference from safety inspections, safety and

health programs in construction, safety audit practices in construction companies, challenges companies face when carrying out safety audit practices, the possible solutions to those challenges and review of safety audit from previous studies.

Appropriate statistical tools such as the mean, standard deviation and T-test were used to analyse the data collected for the purpose of the study. A total number of 40 respondents that consists of 20 building site managers and 20 building contractors in some selected construction companies in F.C.T, Abuja. A 45-item questionnaire was used as instrument for data collection and analysis according to each of the research questions using frequency counts, mean, standard deviation and T-test. Four questions were formulated for specific purposes to guide the study, while null hypothesis were also formulated and tested at 0.05 level of significance. A four-point scale was developed with a mean score of 2.50.

5.2 Implication of the Study

The implication of the study regarding; the level of awareness on safety audit by the construction companies, is that the companies are fully aware of safety audit and its right protocols.

The findings revealed that the construction companies fully are aware of the right processes in conducting safety audits, and the companies are also regular partakers of the safety audit protocol.

The companies also are aware of provided safety audit guidelines by the Occupational Safety and Health Administration and the companies follow the provided guidelines when carrying out safety audits on site.

The findings revealed that the construction companies do not fully agree on hiring professionals from outside to partake in the safety audits for the companies, instead the companies partake in safety audits on their own.

The findings also revealed that the companies agree on focusing more on high-risk hazards first more than low-risk hazards, and they correct the hazards and errors immediately.

The findings revealed too that lack of workers' participation in the safety programs set up on site especially is a huge problem that leads to various setbacks for the companies.

The findings also revealed that for the safety audit process to be more efficient, effective and faster, there has to be a documented checklist for hazards and errors to check for and the areas to find them.

5.3 Contribution to Knowledge

1. It exposes the researcher to methods of organizing a good research.
2. It exposes the researcher to various methods of data analysis.
3. The researcher was able to know about safety audit and its processes in construction companies.
4. The researcher was able to know about the challenges construction companies face when partaking in safety audits.
5. The researcher was able to know the possible solutions there are to the safety audit challenges faced by the construction companies.

5.4 Conclusion

The results of this survey show that the construction companies in F.C.T, Abuja should focus on being regular with their safety audit protocols, to not rely heavily on outside safety inspections,

the companies should focus on training employees in-house and/or select management staff in order to create safety audit committees that will be involved in the process. The companies are advised to shift their focus to correcting high-risk hazards and errors that are exposed other than on low-risk errors and hazards, as the high-risk hazards lead to bigger issues for the company and their workers. The workers of the company should be enlightened on better participation and obedience to set-up safety and health programs in the building sites. Falsifying compiled audit reports should be a serious punishable crime in order to discourage the practice in the construction companies

5.5 Recommendation

Based on the findings of the study and their implications, the following recommendations were made in order to improve the practice of safety audit.

1. Construction workers should be enlightened on the processes of safety audits and should be encouraged to participate in them because safety affects them directly.
2. Construction workers should be enlightened strictly to follow and strictly obey set up safety programs and protocols.
3. Construction company sites should be visited by safety inspection bodies to keep them on their toes.
4. Set up safety programs should be checked, reviewed and if necessary changed after safety audit protocols for the programs that are not yielding good results.

5.6 Suggestions for Further Research

Based on the above findings of this research study; the following suggestions were made for further research:

1. Assessing set up platforms that check the integrity of safety audit reports

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FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

SCHOOL OF TECHNOLOGY EDUCATION

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

BUILDING TECHNOLOGY OPTION

QUESTIONANNAIRE FOR SAFETY AUDIT AS AN INTRINSIC FACTOR IN CONSTRUCTION COMPANIES IN FCT ABUJA

PART ONE

Introduction: this is a research work on safety audit as an intrinsic factor in construction companies in FCT Abuja.

Please kindly complete this questionnaire by ticking [√] the column that represents best your perception about the research question, it will be highly appreciated if you could supply the necessary information needed from you. All the information provided will be treated with confidentiality.

Building site manager ☐

Building contractor ☐

Name of company:

A four-point rating scale is used to indicate your opinion as stated below

Strongly agree (SA) = 4 points

Agree (A) = 3 points

Disagree (D) = 2 points

Strongly disagree (SD) = 1 point

SECTION A

What are the processes involved in the safety audits by the construction companies in F.C.T, Abuja?

S/NO	ITEMS	SA	A	D	SD
1	Gathering of information about one or more aspects of the workplace in order to evaluate the risk levels for health or safety issues				
2	Creating a safety audit committee in-house				
3	Hiring professionals from outside				
4	Schedules the safety audits regularly e.g. once every year				
5	Uses guidelines provided by Occupational Safety and Health Administration standards for safety audits				
6	Analyses data gotten for potential safety hazards and errors				
7	Corrects all errors and hazards exposed by the audits that are high-risk first				
8	Corrects all errors and hazards that are low-risk first				
9	Puts in place safety programs designed to reduce risks and hazards after				
10	The audit having a checklist of potential hazards to discover				
11	Choosing where the designated tasks will be done for the audit				
12	Choosing of audit scope i.e. documented tasks, checklists for the audit.				
13	Compilation of all safety audit process reports				

SECTION B

What is the level of awareness of safety audit in construction companies in F.C.T, Abuja?

S/NO	ITEMS	SA	A	D	SD
1	They are aware of what safety audit is				
2	They are aware that safety audits differ from regular safety inspections i.e. the company				

	undertakes it on their own				
3	They are aware of the importance of conducting safety audits				
4	They conduct safety audits regularly e.g. once every year				
5	They are aware that professional guidelines exist for safety audits				
6	They follow professional guidelines provided for safety audits				
7	They have a checklist for the different sections in their site and their potential hazards				
8	They create safety programs through safety audits				
9	They immediately correct errors and hazards exposed by safety audits.				
10	Their workers on site are aware of this practice of safety audit				
11	The site workers are enlightened and participate actively during auditing				

SECTION C

What are the safety audit challenges faced by construction companies is F.C.T, Abuja?

S/NO	ITEMS	SA	A	D	SD
1	The company does not regularly conducts safety audits but relies on outside safety inspections				
2	High cost of hiring professionals				
3	Unavailability of well-trained manpower in-house				
4	Too much focus on low-risk exposed hazards				
5	Too much focus on high-risk exposed hazards				
6	Not correcting an exposed hazard immediately or on time				
7	Lack of workers' participation in safety programs put in place				
8	Lack of funds secured from insurance companies				
9	Absence of a documented checklist to narrow down audit focus				
10	Carelessness in compiling and securing				

	audit reports				
11	Falsifying compiled audit reports				

SECTION D

What are the possible solutions to the safety audit challenges faced in construction companies in F.C.T, Abuja?

S/NO	ITEMS	SA	A	D	SD
1	Company management should make regular safety audit protocols mandatory				
2	Training personnel on carrying out safety audit protocols				
3	Reduce expenditure on hiring outside professionals				
4	More focus on high-risk exposed hazards first and immediately				
5	More focus on low-risk exposed hazards first and immediately				
6	Immediate correction of all exposed hazards and errors				
7	Enlightening workers' on active participation to safety programs put in place				
8	A documented checklist for better focus in the safety audit process				
9	Criminalising falsifying compiled safety audit reports				
10	Regular professional safety inspections to keep companies on their toes				

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of The Study

According to Ochogba et al (2019), current technological developments have led to the introduction of various vocational training centers around the world, such as technical colleges, which prepare workers for services in various sectors, equipping people with valuable skills related to work and self-value. But technical skills are not just personalized for technical colleges. They can also be obtained at polytechnics and universities. They are also acquired informally in internships with road practitioners. Studies with a focus on automotive diagnostics and repair skills, which represent professional and technical experience in training, are suitable for automotive students at universities with an interest in the automotive trade as a job opportunity and independence.

Samuel & Ansah (2013) emphasize that the goal of VET is to bring people closer to VET as well as the professional skills needed for the socio-economic and industrial growth of society. Vocational training focuses on preparing people for self-employment. Samuel & Ansah also emphasized the importance of professional education, development and implementation of

curriculum and policy frameworks. Technical skills have a huge impact on the growth of society. The fact is the ability of science to create a risk-taking culture. Science improves skills such as observing, evaluating, classifying, predicting, recognizing, asking, hypothesizing, e, t, c data perceived by students in basic science, physics, chemistry, and ecology (Bamidele & Ogunleye, 2017). Ogunleye (2021) agrees that vocational training programs are an inevitable approach to indoctrinating the country's culture and risk taking, creating jobs and increasing people's incomes, revolutionizing society and promoting national financial development which is the object of the strength of development programs is science.

Cranmer (2014) revealed that skills are skills that are developed through careful, efficient and sustained determination, complex actions or work functions in relation to ideas (cognitive skills) of things (technical skills) and/or people (interpersonal skills) efficiently and adaptively. against running. Idoko (2014), which reveals skill acquisition as an exercise system organized by an individual or group of individuals to acquire knowledge for independence; It is used to train people in various professions, which are bound by a legal contract, pressed between the trainer and the apprentice for a certain period of time and according to certain rules and regulations. Two (2) skills have been considered in this paper; The first is Employability Skills, which are the mandatory exposures required to get, keep and achieve a job. These are the skills, methods, and activities that enable employees to network with their colleagues and supervisors and draw important conclusions. The second is technical skills. Johansen (2012) demonstrates practical skills or vocational training such as knowledge of methods, behaviors and actions to perform certain activities and technical knowledge of tools and operations with work-related devices.

A vehicle is a self-driving vehicle used to transport people and goods from point A to point B. It is used on both tarred and untarred roads. According to Bellis (2018), vehicles have taken many names due to vehicle differences. He claims that the credit for the (car) feature goes to an Italian artist and engineer named Martini. Although he never produced a vehicle, he prepared plans for a four-engine wagon. He completed the name of the car by combining the Greek word "auto" (meaning "me") and the Latin word "mobils" (meaning to move). Most people see vehicles as engines running on gasoline or diesel and capable of moving passengers and cargo from point A to point B. You don't realize this; An internal combustion engine is a heat engine that converts

energy from the heat of combustion of the fuel-air mixture into torque or power. This torque is then sent to the wheels to drive the car (Colwell, 2019).

Machines sometimes experience problems for various reasons due to high temperatures, vibration and poor maintenance. The Health and Safety Authority (2021) has revised that lack of maintenance and inadequate maintenance can lead to various uncomfortable conditions, accidents (accidents) and welfare complications. Some problems that develop can be easily identified and their causes or not. Proshop Automotive 2018 states that car diagnosis is a test that reveals various problems with the engine and transmission, oil and gas tanks and other car systems. The current trend of cars is equipped with an internal combustion engine, a group of systems / components that have a unique function to reduce the emission of toxic gases (exhaust gases). Very important because new vehicles placed on the market must comply with current regulations on dilution restrictions (e.g. SULEV, Euro 6, etc.).

The primary OBD requirement was introduced by the California Air Resources Council (CARB) in April 1985. The diagnostic kit is considered the age of first on-board diagnostic measure, OBD-1. Vehicles must meet the 1988 model OBD-1 specifications. The main advantage of diagnostic tests is that they detect problems in the car very quickly and accurately, thereby reducing repair time. That way, labor costs are reduced and the car doesn't spend as much time with mechanics and goes out of service. This is especially useful for commercial vehicles that want a permanent fleet and can't cope with their car that's been in the mechanic for a long time. The latest cars have the advantage of having a trouble code found on the vehicle's OBD (X-Engineer, 2021).

Repair means restoration by replacing parts or assembling torn or defective parts. There is also an option for technicians/students to contact the automaker to bring the car to a certain standard. Mark's view concludes, ‘‘Promoting physical activity in line with Ford FACT is critical as it connects students with automakers (Jeff Eagles Nigeria Limited, 2021). According to Jeff Eagles Nigeria Limited, 2021 the mechanical specifications of the car are; Diagnostic and mechanical skills, human skills, professionalism, problem solving, technology handling skills, work ethic.

The car is the most widely used vehicle in the country. Benjamin Alade (2018) states that "Nigeria Bureau of Statistics (NBS) estimates the total number of vehicles in the country to be around 11.7

million, with commercial vehicles accounting for about 58.08% of that number." These cars require trained technicians to function properly, saving the owner more money on over-frequent repairs. This in turn guarantees a livelihood for such technicians. But automotive students in Nigerian universities are not fully interested in this field due to many factors which may be due to curriculum factors, environmental factors, practical factors, learning strategies or administrative strategies. This has resulted in many graduates becoming unemployed and agrees with Mustafa Aliu in 2015 who stated that “Youth entrepreneurship is seen as an alternative method of creating jobs. However, there is a need in this area for global recognition and continued promotion of young entrepreneurs.

Automatic diagnosis and repair skills are professional. Knowledge of technical knowledge is developed in students through the use of appropriate learning experiences acquired either in technical colleges, vocational or technical schools, universities, automotive laboratories or in technical workshops. These skills are needed today due to advances in automotive engineering and mechanics. This makes the necessary skills necessary for anyone who wants to get into the field and achieve success and profit. Therefore, this study focuses on how to change the behavior of automotive students in Nigerian universities to acquire automotive diagnostic and repair skills for work and independence. This study hopes to create a better future by perceiving auto mechanic skills/crafts as a means of employment and self-employment, or at least directing the development of related research.

1.2 Statement of The Problem

Cars play an important role in achieving various goals and activities of any society. Therefore, it is undeniable that the car is always in good condition. However, society can deny this essential need if the cause of machine problems in the event of defects and breakdowns is not easy to find. Prompt delivery of services is a critical factor in the performance of any organization, person or civilization to grow financial markets in this rapidly changing world.

Self-diagnostic tests help identify faults preventing car use, thereby contributing to the day-to-day process of achieving public goals by showing technicians what to do to repair cars, thereby significantly increasing the engine run time which is shortened to unusable if using the old way. It opens up a huge market and provides technicians/students with up-to-date knowledge, automotive

repair skills and quick wits the opportunity to be independent and always have protection due to the trust of paying customers using fast and effective methods. It also requires the ability to quickly identify car faults in order to reset the vehicle to the standard specified by the manufacturer, which is a huge advantage in the automotive mechanic trade.

Any country that wants to make technological progress must take vocational training seriously. The growing automotive industry has made practical experience difficult for students. Therefore, after graduation, they need to be trained and retrained. This has resulted in a serious decline in vocational and technical education in Nigeria, according to Atabo (2015). Diagnostic tools such as OBD I and OBD II are designed to reduce the time required for automated troubleshooting. It is designed to read errors and codes on the display that show the results on the display. Technicians need extensive knowledge of their potencies and uses to achieve the best results. Therefore, it is important for universities and technical colleges to arouse students' interest in acquiring vehicle repair skills with respect to the use of diagnostic devices. Therefore, this research will show how students can become interested in getting more results in this field.

1.3 Scope of the Study

This research has been applied to the assessment of automotive technology strategies and teaching methodologies, teaching content and practices, seminar tools and equipment, and evaluation methods of automotive technology students prior to graduation from Nigerian universities in relation to the evaluation of available resources required to complete the degree.

1.4 Significance of The Study

The results of this study will enjoy the benefits of a good model of automatic instructor during class as it affects the concentration and academic performance of students. The research results will also provide an alternative dimension for the teaching and learning revolution in automotive engineering.

Curriculum developers will also benefit from this research. The results of this study will be useful in curriculum development. For example, materials on the teaching and learning process of

automotive technology based on the model are used in the appropriate curriculum development, adaptation, and review phases.

The results of this study will be very useful for students who are skeptical of studying automotive engineering because this research will be given a detailed exposure that will increase their knowledge of gasoline, diesel and other engines that are currently being developed. The use of the model is effective and, as such, students benefit from satisfactory information about the exposure history.

Later, educational institutions will evaluate this research. Research results can be used by educational institutions by holding meetings, discussions and exhibitions, informing and retraining automotive technology teachers on how to use models to improve their teaching.

1.5 Purpose of The Study

The purpose of the study is to determine strategies of improving acquisition of automobile and repair skills among automobile students in universities in Nigeria. The study is to;

1. Determine the relevance of learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today.

2. Determine the effectiveness of lecture method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities.

3. Ascertain the availability and adequacy of tools and equipment in automobile workshops in Nigerian Universities.

1.6 Research Question

As a result of the focus of this work stated above the following research questions were formulated to guide the study:

1. What is the relevant of learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today?

2. What is the effectiveness of the Instructional Method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities?

3. What is the availability and adequacy of tools and equipment in automobile workshops in Nigerian Universities?

1.7 Research Hypothesis

The following null hypotheses guided the study and were formulated based on the research questions above and tested at 0.05 confidence level:

H01. There is no significant difference between the mean response of Automobile Technology Students and the Automobile Technology Teachers towards the relevance of learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today.

H02. There is no significant difference between the mean response of Automobile Students and Automobile Teachers towards the effectiveness of Instructional Method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Automobile Diagnostics and Repair Skills as a TVET

Vocational training or TVET raining can be described as an educational or training process. It is added to universal teaching, technology and related disciplines, as well as applied skills related to the profession in various sectors of economic and social life, and includes formal (programs organized as part of the school system) and informal (organized classes outside the relevant). school (system).

Vocational education is understood as education, training, and skills development in relation to employment, production, services, and sustainability. Vocational training, lifelong learning, can take place in secondary, post-secondary and higher education and includes work-related education and training as well as professional development that can lead to qualifications. Vocational training also includes a range of skills development opportunities tailored to national and local contexts. Learning to learn, literacy and numeracy development, cross-sectoral skills and citizenship are integral parts of vocational education.

Automotive technology limits how vehicle systems work relative to one another to allow movement. As some authors view automotive technology as technological advancements in modern cars, such as on-board diagnostics, sensors, sophisticated driver assistance systems, and autonomous driving that enhance passenger safety (Fleming et al, 2018), others see automotive technology as a program that can improve the safety of passengers. conducted at the university level and designed to prepare students for jobs in the 21st century in the automotive industry (Ismail, 2015).

The main objective of automotive technology, as stated by (FRN) (2013), is to provide qualified high-level professionals who provide automotive education to colleges, entrepreneurs in the automotive trade and/or jobs in related vehicle institutions. In addition, Bindu et al, 2017 showed that the modular arrangement of automotive technology in universities allows easy

learning of curriculum and components. The authors further emphasize that quality time should be devoted to practice separately from theory, so that seventy percent of the total time is devoted to practice and thirty percent to theory. In practice, which usually lasts five years in college, a highly qualified workforce (FRN), known as automotive engineering graduates, will be created upon graduation.

2.2 Automobile Diagnostic

This car is equipped with an electric instrument panel that functions as the driver's information center, which was formerly known as the dashboard. It contains various dimensions and indicators that provide valuable information to the driver. The pressure gauge shows system status on a scale, such as distance, engine speed, vehicle speed and fuel level. While the indicator light provides information about something that is lit or warns the driver of a problem with the system. However, this toolbar has limitations in providing additional information in certain areas, such as: B. error problems, trip information, planned maintenance reminders and data logging systems. The information displayed on the control panel is retrieved from the vehicle's electronic control unit (ECU). ECUs that can provide this information typically have embedded diagnostic software (OBD) (known as diagnostic management systems). This control system runs diagnostic tests, records test results, and requires action to fail the test.

On-Board Diagnostics (OBD) is an automotive term that refers to a vehicle's ability to diagnose and read itself. The OBD system gives the vehicle owner or automotive repair technician access to the status of various vehicle subsystems. The diagnostic information available through OBD has been greatly improved since its introduction in the early 1980s. Earlier versions of OBD only flashed the error indicator when a major error was detected, but there was no way to provide more information about the nature of the error. Modern OBD systems have become more sophisticated and now use, in addition to a standard set of DTCs, a standard digital communication port for real-time data, which allows quick identification and troubleshooting of the vehicle, offering almost complete control and also monitoring parts of the vehicle chassis, bodywork and accessories and vehicle diagnostic control network.

OBD II was developed by the California Air Resources Council (CARB) and the United States Environmental Protection Agency (EPA) and is standardized in the US by the Society of Automotive Engineers (SAE) and worldwide (as EOBD) by the International Organization for Environmental Protection, for standardization (ISOs). The SAE standard (J1979) specifies methods for requesting various diagnostic data and standard parameter lists accessible to the control unit. The various available parameters are handled by the "parameter identification number" or PID specified in (J1979). The OBD-II PID is a code used to request vehicle data used as a diagnostic tool. All vehicles sold in the US must use ISO 15765-4, the signal variant of the Control Zone (CAN) bus.

2.3 Automobile Repair:

Car repairs are usually carried out by car mechanics who are experienced in self-diagnosing. Troubleshooting a broken car is a skill that has developed over the years. Various types of diagnostic methods are used today. This includes computer tests, driving tests, customer interviews, and basic troubleshooting techniques. Car defects are usually divided into three main categories. These are;

The motor,

The drive train,

General electronics.

Auto diagnostics requires an understanding of each category. The mechanic will use different diagnostics techniques depending on the category of the defect. Computer diagnostics is typically required for most modern cars. These computer devices are connected to the automobile with special software that reads the on-board diagnostic system. As technical systems become more and more complex and the demands for safety, reliability and environmental friendliness are rising, fault diagnosis is becoming increasingly important. One example is automotive systems, where fault diagnosis is a necessity for low emissions, high safety, high vehicle uptime, and efficient repair and maintenance. Over recent years, the amount of electrical and electronic equipment has increased considerably, and this trend is likely to continue into the next decade.

It should be noted that serious problems are likely to occur on modern vehicles if the person undertaking a repair does not understand the basic construction and operation of both the mechanical and electrical or electronic systems. This is particularly important in the field of diagnosis, because ignorance in either one of these areas of knowledge can lead to component damage and costly repairs. Whereas in the past, most repair activities on a motor vehicle could be divided into either mechanical or electrical tasks, nowadays the systems are fully integrated. The days of being only mechanically inclined are gone for most roadside mechanics. The general engineering mechanic and roadside mechanics or diagnosticians must be able to understand and appreciate the use of technology as a business tool. More so, according to Jeff Eagles Nigeria Limited, 2021, Auto Mechanic Requirements are;

Diagnostic & Mechanical Skills,

People Skills,

Professionalism,

Problem-Solving,

Ability to Use Technology,

Work Ethic.

Land transportation plays an important role in the development of the country's economy as this sector provides the mobility of work force, transporting goods and commodities which serve as the main sector of the community. It is vital to a day to day activities and needs qualified work force in all levels, namely;

Automotive engine electronic/electrical servicing

Automotive painting and body repair

Automotive body repair level

Automotive engine servicing

Automotive powertrain and under-chassis servicing

Automotive servicing operation

Automotive technology management

Maintenance and servicing of private and public cars, trucks, delivery vans, taxis

2.4 Automobile Repair Skills Acquisition:

Basic education such as literacy and numeracy is central and vital to TVET. The health and safety of workers often depend upon their ability to read instructions (e.g. on equipment macula label) and to make accurate calculations (e.g. of mixing and application levels). The wider skills of scientific and social literacy are also important, for example, equipment maintenance and repair and understanding technological change (scientific literacy) and for group work, dialogue and negotiation with colleagues and supervisions, gender and ethic tolerance and other skills needed for harmonious relations in the workplace (social literacy).

Effective Methods for Skill Acquisition There are three effective avenues or methods by which practical skills can effectively be acquired by students (youth) at all levels of TVET. These are:

Student Industrial Work Experience Scheme (SIWES).

Demonstration and project method.

Task-Instructional approach

Student Industrial Work Experience Scheme

The establishment of the Industrial Training Fund (ITF) by Decree No.47 of 8th October, 1971 ushered in the Students Industrial Work Experience Scheme (SIWES0) in 1973 (Olaitan et al, 1999) SIWES is an on-the-job practical experience for students undergoing all courses that demand exposure in industrial activities during their institution programme. One of the objectives of the scheme is to expose students to work methods and machinery that may not be available in the institution training workshops or laboratories. Through such a programme a meaningful work experience is combined with formal education, thus enabling students to acquire knowledge, skills and appropriate attitude for work. This eventually helps to bridge the yearning gap between theory and practice.

However, SIWES programme prepares students to fit in readily to employment in industries and commerce since they have been exposed to real life situations. In addition, it helps to strengthen partisanship between industries and institutions of higher learning, and gives the student the opportunity to change environment, and interact with worker of various cadre in the industries of their placement.**Demonstration and Project Approach**

This approach applies to both tertiary and post – primary (senior secondary schools and technical colleges) institutions. This is practicable under these conditions;

there should be a standard workshop,

functional tools and equipment must be available,

the trainer or instructor most be occupationally skilled and dedicated.

This approach can take place in an established institution or outside an institution. The following steps are taken in the approach;

The teacher or instructor discuses on the tasks involved objectives, materials to be used, and their function;

Try out with materials steps of skill learning by instructor before the learners to carry out the task individually or as small groups before the instructor.

the same materials to learners to carry out the task individually or as small groups before the instructor.

and inspect what the lecturers are doing and how they are carrying out the task;

Assess the job done by the learners to ascertain if they have acquired the necessary skills;

A report of the procedural steps taken to achieve the task(s) to provide by the learner.

demonstration and project methods provide the learner with the opportunity to observe, listen to the teacher, and ask question where necessary. The learner is allowed to practice the tasks involved in the project. The instructor supervises the learner and makes corrections when needed and assesses and feedback the learner on the spot. **The Tasks Instructional Approach**

This approach is designed to equip learners with skill in TVET institutions using problems-solving approach. According to Olaitan et, al. (1999) this approach has three levels;

(i) Work activity level;

(ii) The community training level; and

(ii) The job placement level.

At the work activity level, the teacher or instructor defines the job, identifies different steps involved in carrying-out the task(s) and demonstrates, while the trainee or student will be given the same tools and materials to practice same. The teacher supervises the trainee and eventually assesses him or her. At the community job training level, trainees are attached to an industrial or business center within the community. In the end of the job training period, learners found to be competent are assisted to secure job placement.

2.5 Impact of Automobile Student's Expertise in Automobile Diagnostic and Repair Skills in Relation to The Nation's Development;

Automobile technology graduates (ATGs) are the bedrock of automobile related industries and educational institutions. Scholars consider ATGs as individuals who have had school and industrial-based training in the repair and maintenance of vehicle systems, including the use of computerized gadgets in diagnosing vehicle faults (Beako, 2017). In Nigeria, ATGs are outputs of Industrial Technical Education which is one of the five-year courses offered in the Faculty of Vocation and Technical Education (FRN, 2004, 2013).

ATGs have been exposed to rigorous trainings in technical and engineering drawings; workshop practices, teaching practices and a compulsory Students' Industrial Work Experience Scheme (SIWES), among others (Ugwuanyi & Ezema, 2010; Ibegbulam et al, 2017). Upon graduation, ATGs are expected to possess skills required by automobile related industries for employment (Industrial Trust Fund (ITF) & United Nations Educational, Scientific and Cultural Organization (UNESCO), 2016).

Advantages of well-trained ATGs:

Stimulate sustainable national development,

Enhance employment,

Improve the quality of life,

Reduce poverty,

Limit the incidence of social vices due to joblessness; and

Promote a culture of peace, freedom and democracy.

2.6 Automobile Technology as a Solution to Unemployment:

According to the data, Nigeria has a total of 11,547,236 motor vehicles in the country, recording a 0.78% growth from the 11,458,370-vehicle population reported in the first quarter of 2017. This means, a total of 88,886 vehicles were bought between March 2017 and September 2017.

With a population of 193.3 million Nigerians, the data suggests that the total number of Nigerians available to one vehicle is 16.75. In terms of vehicles per 1000 Nigerians, it comes to about 59.7.

As at 2016, China and Brazil had 154 and 249 respectively. One can infer, based on this data, that Nigeria's vehicle market is still largely untapped as more Nigerians need to own their own vehicles.

Private Vehicles

Private vehicle data in the country currently stands at about 4,656,725 or 40.33% of total vehicle population. On the basis of private vehicles only, vehicles per 1000 Nigerians comes to about 24. It is also about 41 Nigerians to one private vehicle one of the lowest among its emerging market peers.

Commercial Vehicles

The data also reveals that Nigeria has a total of 6,749,461 commercial vehicles which is about 58.4% of total vehicle population in the country. In terms of vehicles per 1000 population, a total of about 34.9 vehicles are available per 1000 Nigerians.

This is an extremely low number and perhaps explains the difficulty in transporting Nigerians from one destination to another. Currently, Nigerians rely heavily on commercial motorcycles or tricycles (which is not included in this data) to commute either quickly or for short distances.

Vehicle Growth

Quarter 1 data from the NBS reveals a total vehicle population of about 11,458,370 suggesting an increase of about 0.78% or 88,866 from the previous quarter. On further inquiry, we were made to understand that the figure was revised as it included motorcycle data. Thus, it is not reliable for determining the number of new vehicles in the country.

However, information from the MD of Toyota Nigeria, Mr. Kunle Ade Ojo, in July revealed that the total sales figure of vehicles across the country including all brands stood at 2,000 units when compared to 5,500 vehicles sold within the same period in 2016.

He also said that, the poor sales of vehicles are attributed to the scarcity of foreign exchange, devaluation of naira and the high interest rate coupled with the economic shortfall, hiked prices of vehicles, and crippled buying power of many buyers."

Another contributing factor to the fall in sales of Made-in-Nigeria cars is the high rate of importation of foreign cars by Nigerians.

The Director General (DG) of the National Automotive Council, NAC, Mr. Aminu Jalal also disclosed that Nigerians spend about ₦600 billion annually on importation of vehicles. He explained that about 50,000 new and 150,000 used vehicles are imported into the country yearly.

The Federal Government currently has a vehicle automotive policy which was launched by the Goodluck Jonathan administration in 2014.

State of Made in Nigeria cars

The Government in 2015, through the National Automotive Design and Development Council (NADDC), awarded licenses for the establishment of 12 new vehicle assembly plants in the country.

The companies are automobile manufacturing giants such as Toyota, Honda, General Appliances West Africa, Perfection Motors Company, and Richbon Nigeria.

Others are R.T. Briscoe Nigeria, Nigeria-China Manufacturing Company, Nigeria Sino Trucks, Coscharis Motors, DAG Motorcycle Industry Nigeria, Globe Motors Nigeria, Century Auto-Assembly Nigeria, and Concept Auto Centre.

Last October, Coscharis Motors, Nigerian distributor of the Ford automobile brand, unveiled a vehicle assembly plant in Lagos said to be worth about N5 billion. It claimed that the assembly plant is the first of its kind in sub-Saharan Africa with only South Africa having another assembly plant in the whole continent.

Nissan however, claims to be the first automaker to build cars in Nigeria through a collaboration with Stallion Group. Also, last year, Perfection Motors Company Limited (a member of Lee Group) and FAW, China, announced that they set up a Semi-Knock Down (SKD) auto assembly in Ikeja, the commercial capital of Lagos.

The policy has obviously attracted gradual return of vehicle assembly plants in Nigeria but not yet at a level where it can make an impact on the retail market.

Huge opportunity

For Nigeria to achieve a vehicle per capita (1000 persons) of at least 150, we will need to have a total of about 29 million vehicles, which is about 18 million new vehicles, revealing just how huge the current gap is. The gap for private vehicles is even more humongous.

Is this achievable? Probably not but if you consider that the US sold about 6.9 million passenger cars in 2016 alone, then you get the size of the opportunities that currently exist. In fact, global projected car sales in 2017 is put at about 78 million and production, about 62 million.

However, All the few opportunities out listed herein are more suitable for a skilled (either formally or informally) and certified automobile technology graduate.

Ride sharing market

For ride sharing apps like Uber and Taxify, the data also reveals a huge gap still left to be covered in Nigeria, Africa's largest market. Latest data from Uber shows that Nigeria has 7000 Uber drivers and 267,000 riders.

This comes to about 26 drivers per 1000 Nigerians, much lower than the 34.9 vehicles per 1000 Nigerians average for Commercial vehicles, indicated above.

Car merchants

Nigeria is also home to a flurry of websites that are dedicated to selling used cars. The growing number of these online market places also indicates just how huge the opportunities are in the vehicle industry.

By simply listing your vehicles on their market places, sellers get exposed to a market made up of millions of Nigerians looking to buy their first cars. It is also a market place for determining going prices for all types of vehicles.

As more of these merchants become available, pipelines of selling fairly used in Nigeria cars will only expand, further boosting the supply side of the market.

Auto-mechanics

Technicians with up-to-date knowledge and skills on how to fix an automobile are in high demand due to the massive need for auto repairs daily. These repairs can either in the area of diagnosis, alignment, servicing, maintenance of fault fixing.

Provision of Political Will by Government for Quality Vocationalization;The political will of the day can ensure that educational polices are correctly enacted to improve TVET delivery to foster the aim, goals and philosophy of quality vocationalization (Oviawe et al, 2017).According to the authors, this policy will support the close monitoring of concerned agencies to craft and implement policies that will enable TVET students acquire 21st century skills and systematic

research and innovations to facilitate their successful transition into employment or become self-employed upon graduation.

If such is carried out as stated, an enabling teaching and learning environment will be created for TVET students. This will in turn produce the needed workforce to drive the 21st century workplaces with tangible results.

Introduction of a Compulsory One-year Students Industrial Work Experience Scheme (SIWES)for TVET Students;

Just as medical students spend one year in hospital as a policy, to adequately prepare for the ever-dynamic health system in the world according to (Dare et al, 2009), TVET students should also go through a compulsory one-year SIWES before graduation, as a policy against the current six-month period to enable them acquire more meaningful and relevant experiences to cope with today's workplace demands (Ayonmike & Okeke, 2016; Ekong & Ekong, 2016).

With such a policy in full enactment, there will be more time for students to be exposed to more meaningful skills needed to tackle technological advancement and work roles in automobile related industries and consequently, bridge the skills gap situation among ATGs.**School-to-workplace Collaboration;**

A smooth school-to-work transition is the desire of all graduates of TVET. However, TVET institutions cannot successfully play the role of providing high quality manpower with advanced skills if it operates in isolation of the operating industries that require skilled workers (Oviawe, 2018). Oviawe further mentioned that TVET institutions must establish collaborative linkages with these industries that require their graduates.

Such linkages on a well fashioned partnership and strongly supported by the government, according to Oviawe, will guarantee quality ATGs and as well facilitate their smooth transition from school-to-work. In view of these and for the success of TVET and learners, the practice of school-to-workplace collaboration is strongly advised.**Public-Private Partnership (PPP) in TVET;**According to Oviawe, public-private partnership talks about a long-term procurement contract between the public and private sectors in which proficiency of each party is focused in the designing, financing, building and operating an infrastructure, project or providing services

through the appropriate sharing of resources, risks and reward. The alliance between TVET and public-private sectors is a formidable partnership that can transform teaching and learning environment and processes as well in preparing graduates that can cope with the ever-changing workplace demands in the 21stcentury (Okoye & Chijioke, 2013). With such a partnership in place, the disturbing issues emanating from skills gap will drastically reduce over time.

2.8 Challenges Facing Effective Technical and Vocational education and Training (TVET) in the Nigerian universities: The problems facing TVET in achieving effective skill acquisition for the youths are as follows;

i. **Inadequate Supply of Technical Equipment:**

Vocational Technical Education is a skill-oriented programme, which requires the use of tools and equipment. But when it is not available or adequate it tends to frustrate the programme effectiveness. In some cases, the available ones are obsolete. There is therefore need for current and sophisticated equipment to be provided.ii. **Lack of Standard Technical Workshop:**

A standard workshop is an essential infrastructure for such programs to be effective. Most of the vocational institutions such as the Technical Colleges and Polytechnic and Universities cannot boast of a standard workshop. There are institutions that have some tools and equipment, but because of non-availability of a workshop these expensive materials are dumped outside, which may be regarded as economic waste.iii. **Inadequate Provision of Consumables:**

Consumables are materials needed to carry out work in a workshop. These materials are important in the sense that they facilitate the development of manipulative skills and competencies required in project or maintenance works.

iv. **Poor Remuneration of Teachers/Motivation:**

TVET teachers prepare students both in acquisition of knowledge and skills. This involves lots of hard work and risk-taking, which are not rewarded adequately. As a result, these teachers appear not to put in spirited efforts to ensure effectiveness and improve productivity.

iv Funding of Vocational-Technical Education Programme:

The development of effective programme of vocational and technical education in the schools requires a great deal of attention to the facilities needed for good instruction. But when funding is inadequate, it affects every other thing that goes on in a technical institution – no practical training will take place. Meanwhile, according to Olaitan (1996) The Federal Government is single-handedly funding programmes of Vocational-Technical Education. This situation calls for institutions to mobilize all resources to generate fund internally so as to compliment that of the Government NGO's and other relevant organizations that can be of help.

vi. Lack of Appropriate Skills and Occupational Experience of the Teachers:

Most Vocational-Technical Education teachers do not have adequate or appropriate skills and experience to teach skills. The national policy on education considered occupational experience as an important factor to be considered when recruiting teachers. This is always overlooked by the recruitment authorities. This class of teacher should be granted in-service training through which they can acquire skills needed in their areas of specialization.

2.9 Theoretical Framework

According to Taie (2014), Pondering over the process of language acquisition has been one of the old endeavors of human beings to solve the enigmas of second language acquisition (SLA). This endeavor which has been reified into different forms (such as, theories, framework, or models) has obsessed scholars from ancient times to modern days, from the Plato's problem to Truscott & Sharwood (2004) MOGUL. Nevertheless, though many of these ideas seem to be competing, they can be considered to be complementary. That is, like the parable about four blind men and an elephant, SLA can be considered to be like a giant elephant which can be observed by different scholars from different perspectives (VanPatten & Williams, 2007). Therefore, each SLA theory might shed light on one aspect of SLA. Taking this point into consideration, Skill Acquisition Theory- as one of the prominent and influential SLA theories which has considered language learning to be on a par with general human learning.

Skill Acquisition Theory is not just a theory of the development of language, rather it is a general theory of learning ranging from cognitive to psychomotor skills (Wiertelak & Pawlak, 2012). This theory, which is based on Adaptive Control of Thought model (ACT), claims that adults commence learning something through mainly explicit processes, and, through subsequent

sufficient practice and exposure, proceed to implicit processes (Vanpatten & Benati, 2010). Considering the fact that each one of the SLA theories illuminates one aspect of SLA (VanPatten & Williams, 2007).

Adaptive control of thought model (ACT)

According to Vanpatten & Benati (2010), Adaptive Control of Thought (ACT) model, developed by John Anderson, is the most well-known models of skill-based theories. Anderson (1982) proposed a framework for skill acquisition including two major stages in the development of a cognitive skill, i.e., declarative and procedural stage. In this framework "facts are encoded in a propositional network and procedures are encoded as productions" (Anderson, 1982). According to Vanpatten & Benati (2010), "Within this theory, development involves the use of declarative knowledge followed by procedural knowledge, with the latter‟s automatization." Therefore, SLA is conceived to be a progression through three stages, declarative, procedural, and autonomous. These three stages resemble the three stages of cognitive, associative, and autonomous stage which Fitts (1964, as cited in Taatgen, 2002) posits for skill acquisition. Taatgen (2002) has linked Anderson and Fitts stages by saying "In the cognitive stage knowledge is declarative and needs to be interpreted. Interpreting knowledge is slow, and may lead to errors if the relevant knowledge cannot be retrieved at the right time. Procedural knowledge on the other hand is compiled and therefore fast and free of errors, and can be associated with the autonomous stage. The associate stage is an in-between stage, during which part of the knowledge is declarative and another part compiled."

Ackerman's model:

Ackerman (1988) theory posits that there are different abilities underlying performance at stages of skill acquisition.

In phase 1; general ability measures (e.g., abstract reasoning) underlie performance.

in Phase 2; With the formation of the production systems for the consistent features of performance, the influence of these factors decreases, and perceptual speed abilities appear as important predictors of performance.

in Phase 3; performance is determined mainly by non-cognitive psychomotor abilities.

Dreyfus model

Sulta et Al (2020) unveiled that, Dreyfus model of skill acquisition is a model of how learners acquire skills through formal instruction and practicing, used in the fields of education and operations research. Brothers Stuart and Hubert Dreyfus proposed the model in 1980 in an 18-page report on their research at the University of California, Berkeley, Operations Research Center for the United States Air Force Office of Scientific Research. The model proposes that a student passes through five distinct stages and was originally determined as: novice, competence, proficiency, expertise, and mastery. The Dreyfus model is based on four qualities;

Recollection (non-situational or situational)

Recognition (decomposed or holistic)

Decision (analytical or intuitive)

Awareness (monitoring or absorbed)

2.10 Related Empirical Studies

Olatunji 2009, researched to find Strategies for improving the of Automobile Technology Students Interest in Technical Colleges in Ogun State. According to him, One of the major means of transportation in Nigeria is by road via automotive engines, as this is vital to economy sector in order to ease movement and conveyance of luggage. The dwindling interest of students applying or studying auto mechanics trade which has to do with repair and maintenance of motor vehicle these days in technical college is alarming. He said, Automobile Technology curriculum could only be effectively implemented if the students have interest and competencies. He said, Unemployment of graduates of auto mechanics technology from technical colleges defeats the objective of self-reliant emphasize in National Policy on Education (FRN, 2004). The study is aimed at identifying strategies for improving interest of Automobile technology students‟ in technical colleges in Ogun state. The findings of this study, if implemented will be of immense benefit to the auto-mechanics technology students in the technical colleges. Three (3) research questions guided the study while Five (5) null hypothesis was tested to 0.05 level of significance. As a result of his findings, he concluded by saying, "Oranu (2001), identify lack of interest, right attitude and behavior

of automobile technology graduates as one of the challenges facing the trade. This correlate with Ezeji (2001), who believe that unless a person is interested in a particular activity, it is difficult to coerce such a person into that activity and expect any measure of success. He further said interest is basic to all occupational activities". The paper holds that, Lack of interest by students on the trade has resulted into a situation whereby most of the technical college students enroll for other trades while the little that enrolls perform below average on their final exam. It is only through conducive environment that automobile technology students can successfully acquire knowledge. Many of these technical college students who read auto mechanics are found in the streets without job because their training is inadequate for societal needs, due to new innovation on the trade.

Rashid 2012, assessed Employability Skills among Technical and Vocational Education Students in Nigeria. The research was conducted to investigate the level of importance as well as the competence among the students of technical and vocational education in terms of employability skills in Nigeria. There are 233 final year students that constituted the sample for the study in Kano State. The respondents were picked from mechanical, electronic, electrical installation and automobile departments in technical colleges in the state. The data was collected using questionnaire which was adapted from Employability skills for Australian small and medium sized enterprises. The analysis was done using descriptive statistics such as mean and standard deviation. The findings of the study showed that all the respondents perceived the employability skills components as high and rated their competency as low. A significant difference was found among the students in terms of their ages while no significant difference was found between the respondents in the area of competency. The study concludes that there is still an opportunity for technical and vocational institution in Nigeria to focus and redouble efforts towards equipping the students' employability skills. Quality education and training enhances productivity, therefore, students of technical and vocational education in Nigeria need a better education that will help in accomplish the national goals.

Nwogu (2017), Skill Acquisition through Technical and Vocational Education and Training (TVET) Programme: Means for youth empowerment. According to him, one of the goals of TVET is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant. But, the rate of unemployment is an indicator that more is needed to turn this ugly situation around. This paper

therefore looks at TVET programmes and skill acquisition process, examines the best three ways of imparting appropriate skills to the youth, and proffer solution to the shortcoming of TVET for a better tomorrow. He concluded by saying, "To have a sustainable youth empowerment in the country, the role of TVET must be given topmost priority in our educational system. The important roles of the institutions concerned in TVET programmes both in the present and future of our youths and adults cannot be over-emphasized. Our youths are our fundamental resource. We must empower our youths by revitalizing TVET programs, since the future greatness of a nation in determined by the quality of her youths".

Oluwaseyi et Al 2020, investigate the Specifications and Analysis of Digitized Diagnostics of Automobiles: A Case Study of on-Board Diagnostic (OBD II). The paper holds that, "On-board diagnostics, (OBD) is an automotive term that refers to a vehicle's self-diagnostic and reporting ability. OBD systems enable owner of vehicles or automobile repair technician to gain access to the condition of the various vehicle sub-systems. Modern motor vehicles are highly sophisticated machines that incorporate development in electrical, electronic and mechanical engineering. The traditional "trial-and-error" mode of diagnosis could no longer be efficient to meet up with the need for maintenance and repairs on such vehicles. Therefore, this probes a challenge to meet up with the technological trend, and hence it becomes imperative to adopt new mode of diagnosis with high efficiency on the new generation motor vehicles. To facilitate and enhance the early detection of faults and malfunctions related to emissions control components, different diagnostic tools like Launch X-431 and Autel Maxidiag (Elite Series) were used and from the research carried out and the various results obtained from the various diagnostics of some selected automobiles from German Make, American Make, and Japanese Make vehicles, the diagnostics results provided an appreciated feedback through the triggering of Malfunction Indicator Light (MIL) and thereby with the use of diagnostic scan tools, the failures and faults within the engine compartment were detected. It was evident that On-Board Diagnostic has the capacity to facilitate and enhance the early detection of vehicle malfunction and faults related to emissions control components and as a result reducing high emissions caused by emission related malfunctions".

2.11 Summary of Literature Review

The content of Automobile diagnostic and repair skills as a Technical and Vocational education and training (TVET) programme, the impact of a well-trained, up-to-date Automobile

Technology graduate to the nation economy, as well as the need for improvement in the system and method of exposing learners to both theories and practice in order to enhance their interest towards the field in the Nigerian university was gathered from various sources. The findings point at the need for an indebt study on the university curriculum, government policies, a well-structured and equipped theory and practical learning environment which is able to build in the ATGs the competency they need to survive after school-in turn enhancing their interest towards the field.

The theoretical framework shows Adaptive control of thought Model (ACT), Ackerman Model, and Drefus Model as the background of the study. While, the Empirical study shows the trending research works on how to enhance the interest of learner's towards automobile repair skills and developing employability skills for the ATGs.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter describes Research Design, Area of the Study, population of the Study, Sample and Sampling Technique, Research Instrument, Validity of the Instrument, Reliability of the Instrument, Method of Data Collection, and Method of Data Analysis

3.1 Research Design

The research design adopted for the study is descriptive survey. This design is suitable because it enables the researcher to generate data through the standardized collection procedures based on highly structured research instrument(s) (questionnaire) and well-defined study concepts and related variables.

3.2 Area of the Study

This study was carried out at FUTMINNA in Minna, Niger State and UNIBEN in Benin city, Edo State. Niger is a state in the Middle Belt region of Nigeria and the largest state in the country. The state's capital is at Minna. Other major cities are Bida, Kontagora and Suleja. It was formed in 1976 when the then North-Western State was bifurcated into Niger State and Sokoto State. Minna has a population of 291,905 as at 2006 population census count making it the biggest city in Niger State. Minna is about 135km away from the Federal Capital Territory and 300km away from Kaduna city.

Edo State is one of the 36 states of Nigeria, located in the southern region of the country. As of 2006 National population census, the state was ranked as the 24th populated state (3, 233, 366) in Nigeria. The state's capital is Benin City. Benin City is the capital, and largest city of Edo State in southern Nigeria. It is the fourth-largest city in Nigeria after Lagos, Kano and Ibadan, with a total population of 1,782,000 as of 2021. It is situated approximately 40 kilometres (25 mi) north of the Benin River and 320 kilometres (200 mi) by road east of Lagos. Benin City is the centre of Nigeria's rubber industry, and oil production is also a significant industry.

3.3 Population of the Study

The study population consists of a randomly selected respondent. The whole comprises of Fifty (50) Automobile Technology Students of Federal University of Technology Minna (FUTMINNA), Twenty (20) Automobile Technology Students of University of Benin (UNIBEN), and Fifty (50) Automobile Teachers from both Universities. Irrespective of institution, the Automobile students and Automobile Teachers were grouped as one in this study.

3.4 Sample and Sampling Technique

Since the population is of considerable size, a random sampling technique was used to sampled out the targeted respondent.

3.5 Instrument of Data Collection

A structured questionnaire was used. The questionnaire was divided into two parts (A and B). Part A was used for collection of information on personal data of respondents while Part B which consist of the sections (A - C), Section A addressed question one, Section B addressed research question two, while Section C addressed research question three.

The questionnaire contained four responses as follows:

Strongly Agree = SA

Agree = A

Disagree = DA

Strongly Disagree = SDA

The respondents were expected to check or tick against response category that satisfy their opinion.

3.6 Validation of the Instrument

The designed questionnaire was validated by two (2) experts from the Department of Industrial and Technology Education (ITE), Federal University of Technology Minna Niger State. Their inputs will be used to improve the instrument before serving it to the respondents.

3.7 Reliability of the Instrument

The reliability of the research instrument is determined by administering twenty-four (24) questionnaires which is 20 percent sampled population to (lecturers and students) who are not part of the earlier sampled population to serve as pilot testing. Their response was compared using a t-test. There was no significance.

3.8 Method of Data Collection

The researcher collected the needed data through the use of questionnaire and its administration to Automobile students and Automobile Teachers of FUTMINNA and UNIBEN. The administration of the questionnaire was carried out by the researcher. A total of one hundred and twenty (120) copies of the questionnaire will be distributed to obtain responses from the Students and Teachers, and retrieved on the spot by the researcher.

3.9 Method of Data Analysis

The data collected from the use of instrument were analyzed using mean, standard deviation. The mean and standard deviation were used to answer research question 1-3. While a t-test was used to determine significant differences of respondents.

3.10 Decision Rule

To determine the acceptance and rejection level of any item, a mean of 2.50 was selected between agreed and disagreed. In other words, any item with a mean response of 2.50 and above was considered agreed. While, items with less than 2.50 mean responses were considered disagreed.

CHAPTER IV

4.0 PRESENTATION AND ANALYSIS OF DATA

This chapter presents the analysis of data collected from the research work. The data is organized based on the research questions and null hypothesis (HO) formulated for the study.4.01 **Research question 1**

How relevant is the learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today?

Table 1: Mean and Standard Deviation of Automobile Students and automobile teacher's response to the relevance of learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today.

$N_1 = 70$, $N_2 = 50$

S. N	ITEMS	X_1	X_2	X_t	REMARK
1.	Without training and re-training, automobile students are incompetent in the labour market.	3.60	3.38	3.49	Agreed
2.	Contents of automobile technology programs in Nigerian universities are mostly outdated.	3.85	2.75	3.30	Agreed
3.	Automobile teachers in the Nigerian universities don't teach relevant contents due to their incompetence.	3.33	3.38	3.35	Agreed
4.	Evaluation of graduating automobile students is not based on a thoroughly supervised work piece in the workshop but paper exam which encourages cheating.	3.55	3.75	3.65	Agreed
5.	The confidence of an automobile student is based on expertise in the relevant skills needed in the labour market.	3.70	2.75	3.23	Agreed
6.	Research to determine quality knowledge of the how-to-use of various modern technology and their procurement for workshop activities is not funded in Nigerian universities.	3.53	3.06	3.29	Agreed
7.	The cost of an effective automobile technology expository class with theory and practical synergy is expensive.	3.63	3.50	3.56	Agreed
8.	Maintenance culture, safe machine handling techniques, and creativity is not inculcated in the automobile students.	3.63	2.94	3.28	Agreed
9.	Self-reliance skills like diagnostic and relevant repair skills are not prioritized and perfected in the automobile students before graduation. Rather, re-training is advised after graduation.	3.50	3.63	3.38	Agreed
10.	The government and University administrators give little attention to delivering up to date learning content to automobile students.	3.56	3.63	3.50	Agreed

Key; N_1 = Number of Automobile Students, N_2 = Number of Automobile Teachers, X_1 = Mean score of Automobile Students, X_2 = Mean score of Automobile Teachers, X_t = Average Mean score of both groups

*the key above also applies to Table 2 and 3.

Table 1 Reveals that the groups agree with the items 1-10 with mean responses ranging from 3.23 to 3.65. Therefore, the result shows that the items agreed by respondents indicate that the learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today are not relevant today in the labour market.

4.02 Research question 2

How effective is the Instructional Method of teaching methods employed during teaching and learning process of automobile technology in Nigerian Universities?

Table 2: Mean Responses of Automobile Students and Automobile Teachers on the effectiveness of Instructional Method of teaching employed by automobile teachers during teaching and learning process in Nigerian Universities.

$N_1 = 70$, $N_2 = 50$

S. N	ITEMS	X_1	X_2	X_t	REMARK
1.	Not all teaching methods is effective for all students due to student's different learning styles.	3.78	3.69	3.73	Agreed
2.	A teaching method can only be effective if students are able to learn from the method.	3.88	3.50	3.69	Agreed
3.	Lecture method of teaching is boring to automobile students without practical classes for better understanding.	3.95	3.38	3.66	Agreed
4.	Demonstration or Practical method of teaching is frustrated without constant power supply in the automobile workshop.	3.25	3.75	3.50	Agreed
5.	Practical classes are only effective when the activity is able to achieve its objectives and the students are able to repeat the processes on their own.	3.08	3.73	2.44	Agreed
6.	Allergies of both teachers and students can frustrate the success of practical classes when the activity is done at an inappropriate workshop location and environment.	3.76	3.13	3.90	Agreed
7.	An unprofessional automobile teacher frustrates the success of automobile classes and thus the interest of automobile students with their incompetence.	3.44	2.81	3.65	Agreed
8.	Group Practical Project method proves to be effective due to the privilege the students gets to express themselves and therefore learn by teaching one another.	3.54	3.75	3.28	Agreed
9.	Theory and Practical exposures must have a synergy in the teaching methods of automobile technology for effective teaching and learning process.	3.76	3.69	3.83	Agreed
10.	In a Discussion method, instructional materials relating to subject matter should be presented before the students to help them Identify items and processes being discussed in a situation where no workshop is accessible.	3.69	3.90	3.46	Agreed

Table 2 Reveals that the groups agree with items 1-10 with Mean responses ranging from 3.08 to 3.76. Therefore, the result shows that the items agree by respondents indicate that the instructional method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities are not effective.

4.03 Research question 3

What is the availability and adequacy of tools and equipment in automobile workshops in Nigerian Universities?

Table 3 Mean responses of Automobile Students and Automobile Teachers on the availability and adequacy of tools and equipment in automobile workshops in Nigerian Universities.

$N_1 = 70$, $N_2 = 50$

S. N	ITEM	X_1	X_2	X_3	REMARK
1.	Tools and equipment available in the automobile workshops are obsolete.	3.75	3.95	3.85	Agreed
2.	Some tools and equipment that are found in the automobile workshops are worn-out.	3.81	3.75	3.88	Agreed
3.	Inadequate tools and equipment in workshops for automobile practical classes.	3.78	3.50	3.64	Agreed
4.	Adulterated tools and machine parts are present in the workshops.	3.75	3.81	3.40	Agreed
5.	Some tools that are available in the locality are extremely expensive.	3.60	3.73	3.38	Agreed
6.	Poor funding from the government to purchase the right tools and equipment.	3.44	3.52	3.55	Agreed
7.	Lack of technical know-how in the use of special tool results in the damage of tools.	3.37	3.38	3.45	Agreed
8.	Poor inventory control which gives room for carelessness of technicians and the automobile students.	3.53	3.75	3.53	Agreed
9.	Non-availability of modern repair and diagnostic tools and equipment in the workshops.	3.55	3.69	3.62	Agreed
10.	Lack of constant electricity supply in the automobile workshops to power tools, equipment and machinery.	3.35	3.88	3.61	Agreed

Table 3 Reveals that the respondent agrees with items 1-10 with Mean responses ranging from 3.52 to 3.85. Therefore, the result revealed that tools and equipment in automobile workshops in Nigerian Universities are not availably adequate.

4.04 Hypothesis 1

H01. There is no significant difference between the mean response of Automobile Students and the Automobile Teachers towards the relevance of learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today.

$N_1 = 70, N_2 = 50$

S. N	ITEM	SD_1	SD_2	t-test	REMARK
1.	Without training and re-training, automobile students are incompetent in the labour market.	0.98	0.92	-3.13	NS
2.	Contents of automobile technology programs in Nigerian universities are mostly outdated.	0.97	1.19	1.64	NS
3.	Automobile teachers in the Nigerian universities don't teach relevant contents due to their incompetence.	0.76	0.85	1.47	NS
4.	Evaluation of graduating automobile students is not based on a thoroughly supervised work piece in the workshop but paper exam which encourages cheating.	0.86	0.84	0.27	NS
5.	The confidence of an automobile student is based on expertise in the relevant skills needed in the labour market.	0.91	0.93	1.32	NS
6.	Research to determine quality knowledge of the how-to-use of various modern technology and their procurement for workshop activities is not funded in Nigerian universities.	0.99	0.89	-0.50	NS
7.	The cost of an effective automobile technology expository class with theory and practical synergy is expensive.	0.83	0.59	-1.60	NS
8.	Maintenance culture, safe machine handling techniques, and creativity is not inculcated in the automobile students.	1.02	0.87	-0.45	NS
9.	Self-reliance skills like diagnostic and relevant repair skills are not prioritized and perfected in the automobile students before graduation. Rather, re-training is advised after graduation.	0.60	0.81	0.70	NS
10.	The government and University administrators give little attention to delivering up to date learning content to technical students.	0.95	0.13	1.89	NS

Key**;** N_1 = Number of Automobile Students, N2 = Number of Automobile Teachers, SD_1 = Standard Deviation of Automobile Students, SD_2 = Standard Deviation of Automobile Teachers, t-test = Calculated t-test, NS = Not Significant

*the key above also applies to Hypothesis 2

4.05 Hypothesis 2

H02. There is no significant difference between the mean response of Automobile Students and Automobile Teachers towards the effectiveness of lecturr methods of teaching employed by automobile teachers during teaching and learning process in Nigerian Universities.

$N_1 = 70, N_2 = 50$

S. N	ITEM	SD_1	SD_2	t-test	REMARK
1.	Not all teaching methods is effective for all students due to student's different learning styles.	0.74	0.58	-1.80	NS
2.	A teaching method can only be effective if students are able to learn from the method.	0.91	1.02	2.46	NS
3.	Lecture method of teaching is boring to automobile students without practical classes for better understanding.	0.52	0.48	-0.62	NS
4.	Demonstration or Practical method of teaching is frustrated without constant power supply in the automobile workshop.	0.76	0.54	-0.65	NS
5.	Practical classes are only effective when the activity is able to achieve its objectives and the students are able to repeat the processes on their own.	1.00	1.11	1.83	NS
6.	Allergies of both teachers and students can frustrate the success of practical classes when the activity is done at an inappropriate workshop location and environment.	0.83	0.67	-2.43	NS
7.	An unprofessional automobile teacher frustrates the success of automobile classes and thus the interest of automobile students with their incompetence.	0.57	0.61	0.77	NS
8.	Group Practical Project method proves to be effective due to the privilege the students gets to express themselves and learn by teaching one another.	0.45	0.57	0.65	NS
9.	Theory and Practical exposures must have a synergy in the teaching methods of automobile technology for effective teaching and learning process.	0.27	0.41	-0.71	NS
10.	In a Discussion method, instructional materials relating to subject matter should be presented before the students to help them Identify items and processes being discussed in a situation where no workshop is accessible.	1.05	1.04	-2.04	NS

4.06 Major Findings:

Based on the data collected, the following findings were reviewed under each research question;

The finding related to research questions indicated that;

The learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today are not relevant today in the labour market.

The instructional method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities are not effective.

Tools and equipment in automobile workshops in Nigerian Universities are not availably adequate.

4.07 Discussion of Findings:

The discussion of the findings was organized and presented in line with the research question. The purpose of the study is to determine strategies of enhancing the interest of automobile students towards automobile diagnostic and repair skills in universities in Nigeria.

Based on this work, The learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today are not relevant in the labour market;

If the educational contents are reviewed to expose individuals who choose to study automobile technology to up-to-date information and practice in the field today, most problems encountered by the students, like their inability to operate modern tools and equipment will be solved or reduced to the nearest minimum. This agrees with the views of Okala (2005), that the provision of facilities is necessary for meeting the goal and objective of education, and will enhance learning process.

It was also discovered that the inculcation of maintenance culture into the automobile students and technicians makes them more responsible and this act of responsibility helps in the organization of the workshop. This also assists in inventory keeping which minimizes the rate at which tools are misplaced. This will also solve issues of tools inadequacy due to carelessness of the users. According to Habibu & Sabo (2013), When a student finds that he cannot do good work because of the condition of equipment or tool, he often develops hatred toward his work, students too who dislike shop do not put forth effort to share in the burden for its up keeping. When such conditions have prevailed, discouraged students have been known to deliberately abuse the tools and equipment. This agrees with this study and the need for a maintenance culture in automobile technology workshop.

The study also showed how unprofessional automobile teachers have contributed negatively to the current performance of the programme with their incompetence in teaching automobile contents and guiding the students during practical classes. It is observed by Isack (2015), that teachers who have mathematical knowledge, good attendance and participate in programs development have the students with good performances in mathematics. Therefore, teachers knowledgeable in both theory and practical of automobile technology boost student's interest and thus improvement.

Qualified teachers or professional teachers who have been trained and retrained and certified to be appropriate automobile technology instructors should be strictly soughted for, with respect to the goals and objectives of the programmme. This will ensure that the programme produces graduate who are not just motivated in the field but relevant to society need in the labour market today.

This work also showed that the instructional method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities are not effective;

It higlighted that not all teaching methods is effective for all students due to student's different learning styles. It also indicated that lecture method alone is boring to automobile students. According to Musa Aliyu (2020), The lecture method is teacher-centered rather than learner-centered and the students may quickly forget the information provided by the teacher during lecturing. Also, the lecture method does not adapt to individual differences nor does it promote independent learning. The students get bored when the teacher cannot combine teaching methods to make each lesson unique. Hence, agrees with the findings of this study.

Lecture methods alone, as widely practiced in the Nigerian universities was criticized by Ochaba, Ogide & Ogide (2019), which showed that students taught using lecture and demonstration method of teaching performed significantly better than those taught with conventional lecture method alone. Therefore, for the automobile technology to be an effective programme in the Nigerian universities, it must combine effective teaching methods like practical method, discussion methods, assignment method and group project works to the lecture method and not just leave the student at the mercy of industry supervisors during SIWES who might not be particular about the improvement in the performance of the students as compared to the school.

Lastly, It was concluded in this work that tools and equipment in automobile workshops in Nigerian Universities are not availably adequate;

According to Barky (2005), Availability of instructional resources has influence on the effectiveness of teaching and learning process. If the right tools and equipment are provided. practical work will be made easy thereby enhancing skill acquisition. This agrees with this study as it is observed from the study that poor funding from government to purchase the right tools and equipment, and the willingness to do so by the University has contributed largely to the problem of non-availability and adequacy of tools and equipment int the automobile workshop.

It also reveals that this problem can be solved if enough funds can be provided by either the government of the University to enhance student's interest in the study. Special bank loans services should be provided to assist private individual and a strategic pattern in the manner of collecting interest should be provided to suit the nature of job.

Chamberlain & Ede (2013), agreed with this study and spoke further that, "none availability of tools and equipment in Automobile workshop have a negative effect on students' performance, that makes them not to acquire good skills that will assist then in their jobs after graduation from school".

Thus, with regards to the findings of this study, Government and schools should make fund available for the purchase of tools and equipment relevant to the programme. They must realize that TVET programme must be taken seriously by any Nation that must be developed today.

CHAPTER V

5.0 SUMMARY CONCLUSSION AND RECOMMENDATIONS

5.1 Summary of the Study

Lack of interest by Automobile technology students to acquire Automobile Diagnostic and Repair Skills has resulted into a situation whereby most of the Nigerian University students enroll for other trades while the little that enrolls perform below average in the practice after graduation and aren't self-reliant due to incompetence. It is only through factors like relevant learning experiences, expertise in needed skills, qualified teachers and right teaching methods, that Nigerian universities automobile technology students best increase their relevance in the labour market and are therefore, important factors to the success of the automobile technology programme. However, absence of these factors has resulted in many of University graduate students who read auto mechanics to be found in the streets without job. This problem is largely due to inadequacy of their training for societal needs, by reason of new innovation on the trade. There is a gap between students' actual performance and performance required to succeed in occupation of their choice.

It is an issue that has discouraged many students from pursuing the automobile technology programme in universities in Nigeria, as it promises them the same fate. This study is carried out due to the believe that an effective automobile programme can only birth a graduate with relevant skills to be self-reliant in the labour market and it is therefore designed to:1. Determine the relevance of learning contents available to automobile students in Nigerian Universities in comparison to needed skills in the field today.

2. Determine the effectiveness of the instructional method of teaching employed during teaching and learning process of automobile technology in Nigerian Universities.

3. Ascertain the availability and adequacy of tools and equipment in automobile workshops in Nigerian Universities.

5.2 Summary of Procedures Used The researcher employed a descriptive survey research design with the use of structured questionnaire of 30 items to collect data for identifying the strategies for enhancing the interest of automobile students towards acquisition of automobile diagnostics and repair skills in Nigeria Universities. The population for study comprised 120 respondents made up of 70 Automobile students and 50 Automobile teachers. There was no sampling due to manageable size of the population.

The instrument was administered to 120 respondents and all the 120 questionnaires were retrieved (i.e 100% return). It was face-validated and tested for reliability. The data collected were analyzed using mean and standard deviation to answer the research question; while t-test statistics was used for testing the null hypothesis at 0.05 level of significance.

5.3 Implications of the Study The findings of this study have implications for government and administrators of, Nigerian Universities, technical colleges, Inspectorate Division of Ministry of Education. TVET Teachers and National Board for Technical Education (NBTE). This study has revealed inadequate tools and equipment, professional TVET Teachers, Proper workshop facilities, teaching methods, and fund. The findings implied that NBTE should take practical skills into consideration when planning the curriculum for auto mechanics student.

The findings of this study have some implications for technical instructors in the Universities and Technical Colleges, since instruction is meant to improve teaching and learning. This finding implied that government and the school should provide facilities, tools and equipment in Nigerian Technical Universities and colleges.**5.4 Recommendation**Base on the findings of this study, the following strategies are Recommended;

Resources should be allocated to automobile technology programme. Inadequate funds affect the provision of essentials such as well-equipped laboratories and workshops.

Automobile technology programme requires skilled and proficient teachers. Teachers preparation should be given a priority attention. There is the need for regular in-service training for teachers of technology to upgrade their skills. Periodical industrial training for teacher keep them abreast with the technological changes in the industry.

There is the need for our technical institutions to establish good relationship and linkages with similar institutions abroad as this will promote cross fertilization of ideas and enhance technology transfer. By doing this the Nigerian Universities will have access to new developments exchange programmes and other numerous benefits available at those institutions whose automobile technology programmes are well developed.

When there is collaboration between Universities and industries with respect to automobile technology, the relationship will enable the parties appreciate and understand their needs and proffer the right solutions for the benefits of the society.

The automobile technology curriculum taught in the Nigerian Universities should be reviewed to meet the demands of the labor market.

Federal and State Governments should be able to procure sophisticated tools/equipment for the TVET programmers in the Nigerian Universities to be able to equip the automobile students with contemporary skills and knowledge in relevant technology.

Hours for practical in Automobile technology should be adequate enough to achieve the objective of the activities.

5.5 Suggestion for Further Studies

For similar future research, the following topics are suggested;

1. Strategies for enhancing the interest of automobile students towards automobile diagnostic and repair skills in secondary schools in Nigeria.

2. Assessment of automobile workshop tools and equipment in polytechnics in Nigeria.

3. Strategies for improving the interest of automobile technology students in technical colleges in Nigeria.

4. Assessment of teaching methods employed by automobile teachers and it's impact on student's performance and programme success in the polytechnics in Nigeria.

5.6 Conclusion

This study sought to identify strategies for enhancing the interest of automobile technology students towards automobile diagnostics and repair skills in Nigerian Universities. This study has revealed inadequate tools and equipment, professional TVET Teachers, Proper workshop facilities, teaching methods, and fund. The findings implied that NBTE should take practical

skills into consideration when planning the curriculum for auto mechanics student as factors that can improve student's interest in the study of automobile technology in technical colleges.

These findings represent the opinions of Teachers and Students of Automobile technology who are considered to be directly affected. It is hoped therefore, that if all these strategies recommended are taken into consideration, the students will enroll, with zeal and interest on the trade. And that the performance of the students and programme success will be greatly increased.