

ASSESSMENT OF RISK FACTORS AND PREVENTIVE MEASURES ON THE
CONSTRUCTION SITE IN LUGBE METROPOLIS, ABUJA.

BY

CHIBUTUTU ABRAHAM

2016/1/63735TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

APRIL, 2023

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**A RESEARCH PROJECT SUBMITTED TO THE
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TECHNOLOGY EDUCATION**

APRIL, 2023

DECLARATION

I Chibututu Abraham Matric No: 2016/1/63735TI an undergraduate student of the Department of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other university

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CERTIFICATION

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

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DEDICATION

I dedicate this research work to the Almighty God whom has granted me the strength, wisdom and knowledge to carry out this work successfully and also to my Parents Mr. Christopher and Dr.Mrs Margaret Chibututu for their tremendous support and prayers all through my academic year.

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My profound appreciation goes to my parents, Mr.Christopher and Dr.Mrs Margaret Chibututu, and my siblings Comfort, Emmanuel, and Christian for their love, care and support.

ABSTRACT

The research was designed to assess the risk factors and preventive measures on the construction site in Lugbe metropolis, Abuja. Three research questions were answered and three hypotheses tested at 0.5 level of significance were formulated for the study. A survey research design was adopted for the study. The major purpose of this study is to identify the risk factors on construction sites, the causes of risk factors on the construction sites, the risk preventive measures on the construction site. The literature was reviewed in line with the three research questions, and the null hypotheses were formulated to guide the study, in which several sub-headings were discussed as regard to the purpose of the study. The research design used for this study is survey research design in which questionnaire was formulated to solicit information from respondents. The target population comprised of Civil engineers and Builders. The total population for the study is 60 which consisted of 24 Civil engineers and 36 builders in Lugbe metropolis Abuja. Data obtained was analyzed using mean, standard deviation, and t-test statistics. the study concluded and recommended the following: that among the various factors that causes risk on the construction site, poor organization and spacing, lack of safety signage on the site unsafe storage of hazardous substances. Construction firms should provide complete personal protective equipment for all worker's and should ensure strict compliance on usage. there should be effective warning systems in the construction sites to alert workers of any risk emergency.

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CHAPTER ONE

INTRODUCTION

1.1 Background of study

The construction industry is recognized as a sector with great contribution to the economic and social development of a country, particularly due to the number of direct and indirect jobs generated and its influence on several other sectors which produce materials, equipment, and services in its production process. The industry provides all the basic infrastructure citizens and non-indigenes of a country need to ensure their business works smoothly, the sector builds roads, bridges, dams, airports, seaports just to mention a few. The industry is divided into three categories there are building construction, infrastructure construction and industrial construction. Construction' is generally defined to encompass the creation of physical infrastructure (roads, railways, harbours), other civil-engineering work (dams, irrigation projects, power plants), all building work (including housing), as well as the maintenance and repair of existing structures.

A construction site is primarily where the project is being built, be that a commercial building, housing estate or piece of infrastructure. However, there may also be other locations where materials are designed, or parts of the project are pre-made and fitted together, to then travel to the final site. A typical construction site will have a range of workers onsite at any one time. Unfortunately, Construction work is also considered to be one of the most hazardous industrial activities in the world. The rate of injury in the construction industry is higher than any other industry. Every year many people fall victim to injury, harm and even death caused by accidents on construction sites. Internationally, construction workers are two to three times more

likely to die on the job than workers in other industries while the risk of serious injury is almost three times higher(Bran, 2014).

O.S.H.A (2005), ascertained that there are at least 60,000 fatal accidents on construction sites annually around the world, the fatalinjury rate for the construction industry is higher than national average among industries worldwide.

Risk refers to uncertainty about and severity of the events and consequences (or outcomes) of an activity with respect to something that humans value (Aven&Renn, 2009). Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss, or harmful effects on the environment

Risk factors is a characteristic, condition, or behavior that increases the likelihood of getting a disease or injury. Construction workers can be exposed to many risk factors during their working life and they therefore face an increased risk of developing health problems.

Preventive measures means any reasonable measures taken by any person in response to an incident, to prevent, minimize, or mitigate loss or damage, or to effect environmental.

1.2 Statement of the problem

Construction industry is an industry faced with many disparities were many resources have been put together for the completion of any construction project.

There are risk factors at every stage of the construction industry which includes, Falling, Slipping & Tripping, Airborne & Material Exposure, Struck-By Incidents, Excessive Noise, Vibration-Related Injury, Scaffold-Related Injury, Electrical Incidents. Which has significant

relationship with the construction site. Hence, the question for this study is Assessment of risk factors and the preventive measures on the construction site in LUGBE, metropolis Abuja.

1.3 Purpose of the study

The purpose of this study is to determine the Assessment of risk factors and the preventive measures on the construction site in LUGBE, metropolis Abuja.

To achieve this specifically the study will identify:

1. The risk factors on the construction sites.
2. The causes of risk factors on the construction sites.
3. The risk preventive measures on the construction sites.

1.4 Significance of the Study

The research would be of great significance to the construction industry, to the Government, to the Quantity surveyor, the builder and the architect as it assesses the risk factors of the construction site and further solves them by proffering solutions to the risk factors which is their preventive measures.

It can also be of benefit to the clients because if they are aware of the risk factors ...it will save cost

It can also be beneficial to Federal Ministry of works.

1.5 Scope of study

The study is delimited to the assessment of risk factors and preventive measures on the construction site in Lugbe Metropolis, Abuja. The study hopes to cover the assessment of the

risk factors, the causes of these risk factors and the preventive measures of these risk factors in Lugbe metropolis Abuja.

1.6 Research Questions

1. What are risk factors on the construction site?
2. What are the causes of risk factors on the construction site?
3. What are the preventive measures of these risk factors on the construction site?

1.7 Hypothesis

The following null hypothesis were formulated and will be tested at 0.05 level of significance

HO₁. There is no significant differences between the mean responses of civil engineers and builders and risk factors on the construction site in Lugbe Abuja.

HO₂. There is no significant difference between the mean responses of civil engineers and builders on the causes of risk factors on the construction site in Lugbe Abuja.

HO₃. There is no significant difference between the mean responses of civil engineers and builders on the preventive measures of the risk factors on the construction site in Lugbe Abuja.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Construction Industry

2.1.2 Construction sites

2.1.3 Risk Factors on the Construction Site

2.1.4 Causes of Risk Factors on construction sites

2.1.5 Prevention of Risk Factors on construction sites

2.2 Conceptual Framework

2.3 Review of Empirical Studies

2.4 Summary of Literature Review

APPLICABILITY OF MASLOW'S THEORY ON CONSTRUCTION WORKERS

Nature of Construction Workers

The construction workers are basically people of brawn than brain. They are prepared to put in any amount of efforts in their work. If they are annoyed, the outcome will be quite unpleasant. If they are patted, definitely, the result is marvelous.

In dealing with workers, particularly, construction workers, the Site In Charge/Site Engineer must show humane approach. Their behavior is instant in reaction. A kind treatment will make them enslaved to the builder and work like a robot, without even bothered about the time aspect.

Contrary to the above, any annoyance caused will make them behave rather irritably and at times, to the level of even halting the work. The person handling construction workers must be ingenious. Their nature being what it is, they cannot bear even a slight harassment. If they feel they are harassed, they will literally pour a hell at the site and controlling them will become very difficult.

The psychology of workers is that they will always harbour at the deep of their mind that just because they are uneducated, they are forced to do a job like this and that an educated person is simply bossing over them, unmindful of their age.

This was eminently displayed in the first site. It is just a small thing but led to a bitter quarrel.

The workers were served Tea. The quantity of tea was pretty less. The tea cup was tiny and it was like an ounce glass. Even in Tea Stall, they will give tea in a bigger cup (they call it as “Single”).

The workers were grumbling at the quantity of the tea (which will be over in just two or three sips) being served to them. On the day of the incident, the tea served was not hot enough and all the site workers started shouting at the Site In Charge. More like a war of words.

The Site In Charge, basically a hotly guy, was simply arguing with them brushing aside their just feelings. The Builder came in at that time to inspect the progress at the site.

All the aggrieved workers straightaway rushed towards him and made a loud complaint about the dirty behavior of the Site In Charge. The builder was really shocked. Upon enquiry, he came to know that the Site In Charge was a very mean minded person and he was supplying only an

ounce of tea (in the name of 'single tea') and was swindling the balance money. He warned sternly the Site In Charge.

He did not stop with that. He went one step further in making a sincere apology to the workers for the mistake. He assured them of hot tea and in right quantity. The workers were quite touched by the genuineness of the builder and became very emotional.

The issue may seem to be very simple or frivolous, but the impact it produced is really huge.

The Hierarchy Need Model of Maslow starts with Physiological Needs. These are the very basic needs that any individual requires for their very survival. It is beyond the status of the individuals. Whether they are rich or poor, educated or uneducated and a host of others like that.

These basic needs are called "Survival Needs" and are common to any living being.

An extension of this application shows that even the Site Engineers or the Project Managers, for that matter, the very well educated persons too, when they do such a strenuous job, it is but natural that they need some sort of hot drink (whether Tea or Coffee or any other drink) in required quantity to keep themselves fit for the work.

This works as a sort of stimulation to keep the tempo on in the work. If it is not given, an 'in explainable sense' of irritation will surface in their feelings and if it is continued, it will result in restlessness in mind and will produce negative feelings in their perception, expression and will end up in utter mess.

If the site workers, with whom only the construction goes on floor after floor, are ruptured, whatever be the reason, the negative impact of that will get resulted in the construction, irrespective of the supervision.

This is a case of Physiological needs, ie, the First of the Needs.

Utmost care is to be bestowed in construction as, it is the considered opinion of the Civil Engineers, that any revision in work is only tantamount to weakening the structure. A wilful error in pipe laying will lead to refurbishing the whole work once again. This, besides leading to cost penalty to the builder, will weaken the structure as well.

The builder will finish the construction within the timescale and handover the apartments to the purchasers. The dwellers will only feel the brunt of the problem, after some time. This is the reason that eminent builders will never do or agree for any rework or alteration from the approved specification.

When a young Site Engineer is instructing the workers or under the worst circumstances, questioning them, definitely it is like fanning the flame. They cannot control themselves in their reaction. It is a practical problem in any site.

Workplace Safety is Yet a Question Mark

Construction work is not only laborious but also quite risky. In fact, more the number of floors, more the risk factors are. It is quite natural that the workers posted at the top floors are always gripped with a sort of fear either real or imaginary. They show passive resistance to work in top floors, but in vain.

The fear factor is dampening their contribution. It has a telling effect on their productivity. Many worksite accidents occur due to surge of fear in the minds of workers about their safety, though they would be protected with safety equipment. This is inevitable. With enormous activities

taking place simultaneously, it is very difficult to be wary at all times. Even a genuine slip may prove costly.

In the second site, it was observed that the workers were doing their work sincerely, but there was an element of ingrained fear in their minds about their safety. A group of workers were arguing with the Site Engineer that personal protection equipments were not properly provided to them.

They expressed vertigo problem while performing the work. The Site Engineer ridiculed at them for the poor stamina they have. He further said that construction workers must possess a robust body and strong mind to face any arduous operating conditions.

The annoyed workers were quick in their reply. They were totally uncomfortable with the piece of wood as seat and the thick rope with which they were tied. They openly said that they did not have any uncomfortable feeling at all even when they were working on eighth or ninth floor where they were provided with steel chains and a cushion seat as Personal Protection Equipment (PPE).

In this regard, it is worthwhile noting that “falling from a height is the most common type of fatal accident in the Construction Industry”.

The important point to be noted here is that the safety feelings play a predominant role in contributing or determining the productivity of the site workers.

It is true that fear dominated workers are sure to make mistakes. Simple mistakes can be easily set right whereas bigger mistakes will result in catastrophe. Fear erodes concentration and a kind of consternation engulfs them. This is enough for work site accidents.

If the accidents are serious, the builder will be in trouble. Not only that, the site will be covered with a gloom and the other workers would only prefer to go away from that site to any other place. It is very easy to get job in construction industry and the reality is that the builders find it difficult to retain committed workers. This is equally true with labour contractors as well.

One other thing to be seen is that the name of the builder will also be sullied. If he is embroiled in court case, whatever be the verdict later on, the reputation of the builder would be at stake. Such information will spread like forest fire.

The prospective purchasers will think differently about the builder. If he cannot show commitment in saving the lives of his own workmen, what will be his commitment level to his Home Buyers. The question may have differing degree of acceptance. But, such a question, once crops up in the minds of people, they would only shelve the idea of buying an apartment from that Builder. He cannot change that stigma for quite some time.

The safety aspect is much to be desired in many places. Of course, eminent builders are exception to this.

Workers are also human beings and they too have the right to demand things that they need legitimately for the safety of their operation.

This incident amply proves the Maslow's theory of Safety Needs.

2.1.1 Construction Industry

There is some confusion about what the construction industry is. For example, it is common to see separate references to the building industry, the construction industry or the building industry is defined in many different ways. Most of these definitions, which are based on the nature of the

construction process and features of the industry's products, are merely indications of what the construction industry includes or does not include. Nam and Tatum 1989 suggest that, historically, construction refers to all types of activities associated with the erection and repair of immobile structures and facilities. The United States Department of Commerce defines construction by considering, in particular, the immobility of its products. Thus, the production of durable and complex capital goods, such as ships which have many of the characteristics of constructed items is not construction. Considering the difficulty of sufficiently defining it, as well as its desperate nature, some writers suggest that a construction industry as such does not exist. Instead construction is considered to be a sector comprising a number of industries.

Hillebrand 1984, defines construction as covering the parties involved in the construction process and, to some extent, the suppliers of the industry's inputs. In a review of statistics on construction in the United Kingdom construction was interpreted to mean the resources directly used in construction, the products of construction activity, and financial and operational aspects of the building materials and construction industries.

Considering the participants in the construction process, the various definitions appear to portray the industry as a series of related but distinct activities, persons or organizations. The main difficulty associated with efforts to define the industry is one of delineation.

The construction industry is the main engine driving the country's economy because it is the means through which physical progress is accomplished. The degree of self-reliance increases with the supply of resources, labor, materials, equipment, capital, and market exchange from inside the national economy. Construction managers are under more pressure than ever to complete projects on schedule, within the allocated budget, and to the highest quality due to the

complexity of infrastructure projects and the environment in which they are built (Enshassi et al 2003).

2.1.2 Construction Site

A construction site refers to land where all physical construction activities related to a proposed structure take place. Many people typically use the term building site to refer to a construction site. However, the term building site refers to a site where only housing projects occur, whereas a construction site is an umbrella term for all kinds of construction.

The landscape properties such as soil and vegetation are modified to provide a suitable environment for professionals to continue their fieldwork. A piece of land turns to a construction site when land is handed over to a contractor to commence construction works.

A construction site does not imply radical changes in a built-in environment. Even small projects with minimal changes qualify as construction sites. Construction sites need to comply with the relevant building regulations as these regulations govern the extent of a construction site.

2.1.3 Risk Factors on the Construction Site

Every construction activity no matter what its size and complexity are, involves risks, which may vary in their final effect on deliverables (Dey 2002; [3], Poon et al, 2004). And “no construction project is risk free. Risk can be managed, minimized, shared, transferred or accepted. It can not be ignored” (Lutham, 1994).

The construction industry is more prone to risk and uncertainty than other industries (Jaafari, 2001). Also, risk is an integral part of construction which calls for consideration due to its overall

effect of time and cost on construction projects (Makui et al., 2009). Risk is involved virtually in all activities. However, either success or failure of such risk grossly depend on how these risks are being handled (Dey and Ogunlana, 2004), failure to appropriately respond to these risks will lead to cost and time overrun. The incessant increase in the rate of accident on construction site is a pointer of unsafe working place and system of work in which workers are prone to and therefore already at risk of accident. Many people have met their untimely death on construction sites in Nigeria while others have become permanently deformed as a result of injuries. To achieve excellence in the construction industry, there is need to assess the risk factors associated with health and safety in the construction industry; however, it is revealed in literature that a greater emphasis is laid on construction cost, duration and quality of a project, at the expense of safety (Lubega et al., 2001).

Construction work is by its very nature complex and takes place in a constantly changing environment where a large number of workers interact incoherently with highly powered machinery, massive materials, and frequently significant heights. Due to their frequent movement and work-related activities, there is always a high risk of injuries occurring at any given moment or place on the site. Despite the size of this sector, many construction firms are performing below expectations (Odediran, et al., 2012). Likewise, many construction companies do not value the H&S of their workers (Chia-fen et al., 2014). Many unskilled persons can be found on Nigerian construction sites working with bare slippers as footwear and without using other PPE (Odediran et al., 2012).

As a result, many people have been exposed to hazardous conditions on construction sites, increasing the likelihood of accidents due to a lack of adherence to or inadequate implementation of safety measures. This suggests that many contractors in the construction sector are more

focused on the price, timeline, and quality of the project delivery, but are less concerned about the safety of the workers, who are the facilitator of the project delivery to cost, time and quality. There is the urgent need to apply control measures on risk factors in the construction industry.

Construction workers face many risks (UK Essays, 2013) e.g. of being hit by falling objects and falling from heights (Rahman, 2015). The exposure of frontline construction workers to harsh environmental conditions like sun, rain, wind, etc makes them more prone to ailments like backache, headache, skin diseases, joint pains, lung disorders and other muscular skeletal disorders (Tiwary, and Gangopadhyay, 2011). Working in confined spaces and tight schedules compounds the risks of construction (Orji et al, 2016).

Other risk factors includes unprofessional operation of construction equipment, unsafe use of ladders, exposure to welding fumes, working at heights without adequate safety gears, working on scaffolds in an unsafe manner, use of unsafe/defective equipment, operating equipment without authority, lack of sufficient maintenance of equipment, bad house-keeping practices, violation of safety rules, majority of untrained people both in management and labor, no safety-friendly work culture both in workers and management level.

2.1.4 Causes of Risk Factors on construction sites

Risks in construction can be caused by various factors which include lack of knowledge, non-compliance with rules and regulations, non-use of Personal Protective Equipment (PPE), unsafe acts, and negligence (Ndekugri and Corbett, 2004). The amount of risks in construction undertakings in Nigerian is quite high (Olubunmi, 2012). Nigeria is a country with a population of more than 188 million people (National Population Commission, 2016) and it has various types of construction companies that deliver diverse types of projects and employ many people

(Kadiri et al, 2014). Many uneducated and unskilled workers are time and again employed to work in the Nigerian construction industry and they often exhibit a pitiable understanding of the Health and Safety (H&S) regulations as well as a lack of diligence and caution which makes them prone to various degrees of accidents and injuries. However, this view cannot be substantiated statistically as the construction industry does not always report accidents to the relevant authority (Agwu and Olele, 2014). Measurable information in this regard is thus scarce, e.g. less than 100 accidents were reported between the years 2001 to 2006 (Olubunmi, 2012; Kadiri et al, 2014). There is also a dearth of published literature on the subject matter. For the overall safety performance of the construction industry to be improved in especially Nigeria, the root causes of accidents should be scrutinized and addressed (Abdul Hamid et al, 2014).

Low education level of construction practitioners (Cheng et al. 2004), poor and inadequate communication human error, lack of training, sub-contracting etc. are other causes of risk factors which led to accidents and temporary works failure. The Health and Safety Executives in U.K. concluded that human behavior is a contributing factor in approximately 80 % of the accidents. Many studies revealed that the majority of accidents and resulting injuries are attributed to unsafe work practices of the workers rather than unsafe working conditions (Choudhry and Fang 2008). New workers often become victim of accidents because they do not have the knowledge about potential hazards and problems on sites (Choudhry and Fang 2008). “Don’t know” is one of the significant factors responsible for unsafe workers’ behavior on sites. It provides an explanation to 78.38 % of all construction “over-3-day injuries” (Edwards and Holt 2008). Usually, near misses or incidents make workers realize the significance of safety practices on sites. Some people, therefore, advocates the importance to share these near misses more effectively among the workers (Choudhry and Fang 2008)

Globally, over 317 million fatal accidents are attributed to construction activities (ILO, 2013). Non-compliance with safety acts by workers, not obeying working procedures, low-level of technical knowhow, poor site management, lack of cooperation and teamwork are among the causes of construction accidents (Alhajeri, 2011; Bashir, 2013). Other common causes of accident are falls from a high object or structure, being smashed by any falling/moving object from crane tower, collision with moving vehicles, striking a fixed or stationary object and slips, trips and falls (Hughes and Ferrett, 2011).

Indeed, there are many causes of accidents. Bashir, (2013) considers onsite versus offsite causes of accidents while Zailani (2012) reflects on the two-fold classes of: 1) incident Occurrence (e.g. slips, trips and falls) versus 2) immediate causes (such as using equipment improperly, not using PPE (Personal Protection Equipment) when required, etc.). Abdul Hamid et al. (2014) and Kadiri et al. (2014) are of the opinion that carelessness can lead to workers' injury on site.

Many cases of accidents and fatalities occur more in developing countries where the causes include “extensive subcontracting, absence of safety training, lack of safety awareness, inefficiency of safety regulations and legislations, and unsupportive top management” (Awwad et al, 2016, pp.2). Other contributors are the weak commitment of management, ineffective supervision, inadequate training and lack of competency on the part of workers on construction sites (Awwad et al, 2016).

2.1.5 Prevention of Risk Factors on Construction site

Risk prevention methods include all techniques and management practices that help to avert avoidable or foreseeable risks.

In order to prevent accidents in Nigeria, Bashir et al. (2012) suggest the application of lean construction tools on sites. Anieku (2007) suggests that workers should be encouraged by companies to adhere to safety rules through periodic H&S seminars and workshops, safety campaigns, warning signs, etc. Some principles which can be adopted to prevent accidents in construction in developing countries like Nigeria include the use of modern technology and standard materials, eliminating risks from the early stages of projects, and encouraging workers to practice H&S in all aspects of their activities.

Accident prevention begins with a thorough understanding of the factors that contribute to causation.

i. Start with safety training

All workers must have an identification card before they commence work on-site. Site-specific induction training should also be completed by each worker, to point out any high risk areas and provide instructions for emergency management.



Figure 2.1 Safety training

ii. Site security

Site access restrictions should be implemented for more than just protecting equipment from damage or theft. To safeguard pedestrians from potential construction risks, security is essential both during and outside of work hours. This includes site visitors who have been given permission to visit.

Contractors will also be protected from accountability and negligence in the event of a safety incident or security breach if they follow strict security and safety measures.



Figure 2.2 Site security

iii. Use clear signage throughout the site

The site SWMS should be prominently displayed at the construction site so that all safety protocols, such as a 24-hour emergency contact number and a map or directions to the site office, are immediately available. Site utilities (such as bathrooms), entry and exit points, and first aid or emergency fire equipment should all be clearly marked.



Figure 2.3 Clear signage

iv. Entry and exit points

To improve pedestrian safety at high traffic areas, separate entry and departure points for heavy machinery/vehicle access should be constructed.

v. Compliant chemical storage

To avoid fires, explosions, asphyxiation, chemical damage, and pollution, chemicals must be stored with extraordinary caution on construction sites. Use high-quality, compliant outdoor storage alternatives like explosive storage cabinets to separate chemicals and prevent leakage.



Figure

2.4Chemical storage

vi. First aidKits and Accident Reporting

It is excellent practice in the construction sector to have one first aid officer for every 25 workers. On-site first-aid kits and equipment must be kept in an immediately accessible location. Construction sites are hazardous places, and first aid and rescue equipment should always be available. Types of first aid needed depend on the size of the site and the numbers of employees. On large sites with more than 200 people are employed, there should be a properly equipped first aid room. On any construction site of that size, at least one person on every shift should have been trained in first aid.



Figure 2.5 First aid kit

vii. Working Environment

Chemical substances are the major health hazards since there are many chemicals used in the construction industry, which include insecticides, adhesives, cleaning agents, wood preservatives, fungicides, and paints, etc. Many of these chemicals are hazardous, with a potential to cause poisoning. Toxic substances can cause both acute and chronic effects resulting from exposure for a long period. Dust from many sources is also a major hazard in construction industry. Silica and asbestos dust can permanently damage the lung tissue. Cement mixes is also a well known cause of skin disease

viii. Personal factors

The personal factors consist of bad temper, ignorance from management, mental and health problems, motivation, lacking of understanding and misbehavior of construction workers towards their team members lead to the causes of accidents during construction. For better and safer construction projects, the excellent team work is an important criteria. Motivation is the important feature towards the productivity of construction. It was revealed that satisfaction in job significantly affect the attitude of construction workers. It is the utmost responsibility of

management that job satisfaction of workers must be enhanced in order to make the construction work safer. The pressure from the management to the construction workers can change the safety behavior of the construction workers towards the safety.

ix. Safety checks and safety signs

The factor safety check contains no periodic safety checking system and no records of safety checking as a sub factors. To improve the safety in construction projects during design, the design of safety is considered as a better approach. 40% of construction accidents are due to safety design. Hence design is considered as serious impact on construction projects and construction accidents can be reduced by implementing unsafe factors in safety design. There is a need to measure proper safety checks and records in order to ensure the quality of safety. Moreover safety signs contain the sub-factors as; no safety sign location plans, no erection of signs as required, no warning signs, no on-site monitoring system of workers, no location tracking of workers. Safety signs are the signs to transfer the message to the construction workers and to inform and warn them about the severity and danger in the construction place. Safety signs are the most important factor in order to control the accidents in construction. Safety signs not only provide direction but also give true protection in construction sites.



Figure 2.6 Safety sign

x. Personal Protective Equipment (PPE)

The PPE consists of poor quality of PPE used, failure to provide PPE and negligence in using safety belts in heights as a sub-factors. PPE provides the defined importance in terms of safety and overall health. In order to ensure the guarantee of construction workers in high-rise building projects the provision of PPE is essential. In construction of building projects, the temporary work is the primary cause of accident which lead to the serious injuries and fatalities. Therefore, there is a need to provide PPE to construction workers. Further, PPE consists of safety helmet, safety hand gloves, safety boots, hardhats, face shields and provision of these equipment is made necessary in order to avoid the accidents in the construction sites. Safety belts act as a safety device when working in heights in order to protect when fall from heights happen. Similarly, safety shoes act as a safety device during construction in order to protect from sharp metals and heavy objects. Safety hats also act as a safety device to protect the injuries during construction and serve as head protector. Likewise, safety glasses and safety clothes act as a safety device in

order to ensure the safety during construction of high rise building projects. It was found that usage of PPE is important to decrease the fatality and injury rates among the workers in building projects. However, many construction workers do not use PPE because of feeling unease. Before proceed to the construction, the project manager should ensure the following requirements for personal protective equipment i) It should be light in weight and provide maximum comfort to construction workers, ii) It should provide adequate protection falling from heights, iii) It should be durable and iv) It should be made according to the guidelines of safety parameters. However, this equipment is not usually worn properly. There is a need to conduct the visual inspection and to ensure the usage of PPE.



Figure 2.7 Personal protective equipment (PPE)

xi. Work condition & low knowledge and skill level of works

The factor work condition involves sub factors like; hot & rainy weather, dusty & noisy condition and fire hazard. Fire hazards in buildings are also considered as the most important safety factor causing damages. As far as the weather is concerned, the weather of some countries like Malaysia is mostly hot and humid throughout the year and experiences two types of Monsoon seasons; Northeast Monsoon and Southeast Monsoon. The Northeast Monsoon season brings very heavy rainfall while in Southeast Monsoon season brings minimal rainfall in most of the states in Malaysia. The rainy season not only contribute in accidents but also effect the project cost and efficiency. For better and idle construction works always depend upon the condition of the working environment. Furthermore, the factor low knowledge and skill level of works can also cause accidents and thus consider as accidental safety factors in construction of high-rise building construction. Due to negligence of the workers during construction can lead towards serious injuries and losses. The project manager must ensure the safety knowledge and skill level of the construction workers before proceed to work.

2.2 Conceptual Framework

Assessment: generally speaking, assessment can be considered the systematic collection, review, and use of information about educational programs and services undertaken for the purpose of quality improvement, planning, and decision-making.

Risk factors: Anything that increases risk or susceptibility

Preventive measures: means any reasonable measures taken by any person in response to an incident, to prevent, minimize, or mitigate loss or damage

Construction site: A **construction site** is an area or piece of land on which construction works are being carried out.

2.3 Review of Empirical Studies

Factors influencing unsafe behaviors and accidents on construction sites: a review: In line with Khosravi et al. that concluded from a review of construction site safety literature that there is little research on the key causes and contributing factors of unsafe behaviors and accidents on construction sites.

Causes of Accidents in the Nigerian Construction Industry

In line with Dansadau, et al conclusion that Lack of compliance to safety rules by workers is a strong factor in causing accidents. Construction workers should be made to observe all H&S rules and all project managers should observe their workers more closely to ensure compliance. Construction organizations could consider introducing penalties for offences pertaining to negligence about H&S. It is recommended that periodic training and frequent reminders should be introduced to the workers through notice boards, placards and other means of conveying information onsite. This will definitely help to minimize negligence on the part of workers and thus reduce the number of accidents in construction in Nigeria.

Hazard Identification and Risk Assessment in Construction Industry

In line with Devdatt P Purohit et al. Conclusion that the first step for emergency preparedness and maintaining a safe workplace is defining and analyzing hazards. Hazard identification and risk assessment can be used to establish priorities so that the most dangerous situations are addressed first and those least likely to occur and least likely to cause major problems can be considered later.

They also require that health and safety risk to be communicated to workers and that PPE be provided for worker. Regular inspections, penalties and compliance certificates issued by regulatory institutions influence risk management more.

Health Hazards, Risk and Safety Practices in Construction Sites – A Review Study

In line with V. H. P. Vitharana et al, that the Mostly reported acute health hazards are “workers fall from height” and “electric shocks”, while mostly reported chronic health hazard is “exposure to hazardous substances”. Lack of awareness about site safety or dislike to wear Personal Protective Equipment (PPE) was identified as one of the main causes for scarcity of safety practices in construction sites. Other causes of poor safety practices include “Lack of productivity after lunch”, ”lack of training facilities”, ”lack of effective labour training (possibly due to the transient nature of the construction work force),“lack of understanding of the job”, “unsafe behavior found at industry (working with moving machinery, wearing dangling clothes, unsafe lifting, carrying and placing), “financial difficulties” and “influence of alcohol and drugs”.

Furthermore they concluded that to enhance safety practices, one of the major needs in the construction industry is to enhance professionals’ interests in active safety management and implementation of awareness programs, which must be developed and implemented among construction workers. An additional training for the workers, which could be provided by contractors about equipment they use, before workers engage in their duty, would also help to prevent accidents. Awareness on possible risk factors and knowledge on how to reduce these risk factors among workers and contractors will enhance site safety.

2.4 Summary of Literature Review

The review of the literature presented for this study began with an overview of the construction industry in which a vivid explanation of the concept of the construction industry was stated; the importance of construction industry to the nation's economy was explained. The concept of the construction site was explained. A construction site refers to land where all physical construction activities related to a proposed structure take place. It was also distinguished from a building site. The term building site is to refer to a construction site. However, the term building site refers to a site where only housing projects occur.

The risks factors prone to the construction site were assessed and examined, varieties of definitions given by different writers, based on the different perceptions of the writers were outlined. The harm that could occur as a result of being exposed to these risk factors were also studied. The causes of the various risk factors on the construction site were carefully assessed and clearly stated. The ways in which these risk factors could be prevented were analyzed and stated in line with the perception of various writers. Furthermore, the construction site would be a safe environment for site workers when proactive measures to mitigate these risk factors would be put in place and strictly adhered to.

CHAPTER THREE

3.0. RESEARCH METHODOLOGY

This chapter describes research design, area of the study, population, sample, instrument for data collection, validation of the instrument, administration of the instrument, method of the data analysis and decision rule.

3.1 Design of the Study

Survey research design was used for this study. ([Check & Schutt, 2012, p. 160](#)) defined Survey research as the collection of information from a sample of individuals through their responses to questions. Therefore the survey design was considered suitable since it will seek information for this study.

3.2 Area of the Study

This study was carried out on building construction sites at Lugbe, Abuja.

3.3 Population of the study

The target population for this study is made up of 50 respondents consisting of 24 civil engineers, and 36 professional builders in construction firms and sites in Lugbe metropolis, Abuja.

3.4 Sample and Sampling Technique

The total population of 60 respondents consisting of 24 civil engineers, and 36 professional builders will be used. Hence, there will be no need for sampling or adopting any special sampling technique.

3.5 Instrument for Data Collection

A structured questionnaire titled “Assessment of risk factors and preventive measures on the building construction site” on four rating scale was used to collect data for the study.

It consists of two (2) parts. Part I consists of introduction and Part II consist of instructions to guide the respondents on how to complete the questionnaire and contains section (A, B, C) of according to the research question. Section A dealt with the risk factors on the construction sites in Lugbe metropolis, Abuja. While section B dealt with the causes risk factors on the construction sites in Lugbe metropolis, Abuja. Also, section C dealt with the risk preventive measures on the construction sites in Lugbe metropolis, Abuja.

All the items are to be completed by indicating the proper respondent’s best perception using four-point rating scale. Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD).

3.6 Validation of the instrument

The instrument was designed by the researcher and was submitted to three lecturers in the department of industrial and Technology Education in of Federal University of Technology, Minna. Furthermore, the validators’ suggestion will use to adjust and produce the final copy of the instrument before the administration of the instrument. This is to ensure that the instrument can elicit essential information desired for the study.

3.7 Administration of the instrument

The instrument that will be used for the data collection will be administered to the respondent by the researcher and a researcher assistant for the study area selected for this research.

Subsequently, the administered questionnaires were obtained with an estimated 90% return.

3.8 Method of Data Collection

All the 60 respondents (civil engineers and builders) were administered with the questionnaire. A research assistant also assisted to administer the instrument. The researcher administered the questionnaire to the respondents and the completed questionnaires were collected from the respondents. The researcher studied the respondent's response to the items to obtain a satisfactory data.

3.9 Method of data analysis

Data collected will be analysed using mean and t-test for the research questions. A four (4) point rating scale was used to analyse the data as shown below.

The four point scale was used to analyze the response to each item in the following order

Strongly agree (SA) - 4

Agree (A) -3

Disagree (D) -2

Strongly disagree (SD) -1

The formula below was used to calculate the mean.

$$\bar{X} = \frac{\sum FX}{N}$$

Where:

\bar{X} = mean

Σ = sum of normal value (summation)

X = weight of the response

F = frequency

N = number of respondents to the items

Therefore, the mean value of the 4-point scale is:

$$\bar{X} = \frac{4+3+2+1}{4} = \frac{10}{2} = 2.5$$

3.10 Decision Rule

The level of the mean score of 2.50 will be chosen as the agreed. This is interpreted relatively according to the 4-point rating adopted for this study. In view of the latter items with a calculated mean of 2.50 and above was target as agreed. Meanwhile, any item with a mean of 2.49 and below was disagreed. Also, the statistics t-test will be used to test the hypothesis at 0.05 level of significance to compare the mean response of the two group. A critical value of ± 1.960 was selected based on the on the degree of freedom at 0.05 significance. Therefore, every item with t-calculated value less than the critical value will be consider as insignificance while every item with t-calculated value equal or greater than the critical value will regard as significance.

CHAPTER FOUR

4.0 PRESENTATION AND ANALYSIS OF DATA

4.1 Research Question 1: what are the risk factors on the construction site?

Table 4.1: below revealed the Mean Responses and the Standard Deviation of Civil engineers and Builders on the risk factors on the Construction site in Lugbe metropolis, Abuja.

Source: Field Survey, 2023

(N₁= 24, N₂ = 36)

Grand mean $\bar{X}_1 = 3.24$

Grand mean $\bar{X}_2 = 3.30$

S/N	ITEM	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_t	SD _t	REMARK
1	Exposure to contaminated / disease carrying bodies e.g. sanitary sewer.	3.17	0.48	3.39	0.73	3.28	0.18	Agreed
2	Inhalation of polluted air e.g smoke, fumes.	3.25	0.53	3.22	0.76	3.24	0.16	Agreed
3	Congestion of workers in site.	3.67	0.56	3.53	0.65	3.6	0.06	Agreed
4	Use of defective or faulty Machinery or equipment e.g faulty compacting machine.	3.04	0.55	3.08	0.87	3.06	0.23	Agreed
5	Unprofessional handling of hazardous substances e.g spray paint	3.13	0.74	3.22	0.68	3.18	0.04	Agreed
6	Use of faulty scaffold while working at heights.	3.29	0.75	3.22	0.87	3.26	0.08	Agreed
7	Construction site supervisor negligence.	3.63	0.49	3.58	0.65	3.61	0.11	Agreed
8	Contact with exposed wires.	3.46	0.66	3.42	0.69	3.44	0.02	Agreed
9	Using unsafe ladders.	3.33	0.56	3.39	0.6	3.36	0.03	Agreed
10	Working in the sun and high temperature.	2.75	0.9	2.92	0.87	2.84	0.02	Agreed
11	Accidental struck by object on site.	3.08	0.58	3.42	0.65	3.25	0.05	Agreed

12	Aggression and violence on site.	3.13	0.68	3.31	0.75	3.22	0.05	Agreed
13	Exposure to electrical dangers	3.12	0.66	3.30	0.74	3.21	0.04	Agreed

KEY:

\bar{X}_1 = Mean response of Civil engineers

\bar{X}_2 = Mean response of Builders

SD_1 = Standard Deviation of the Mean Response of Civil engineers

SD_2 = Standard Deviation the Mean Response of Builders

\bar{X}_t = Mean of mean or average response of Civil engineers and Builders

N_1 = Number of Civil engineers

N_2 = Number of Builders

The result on **table 4.1** shown above revealed that items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, & 13 were agreed as the Risk factors on the Construction sites since the item values are within the range of (2.84 – 3.61) on the cut-off point of 2.50.

This signifies that the twelve (13) items are the Risk factors on the Construction site.

4.2 Research Question 2: What are the causes of risk factors on construction sites?

Table 4.2 below revealed the Mean Responses and the Standard Deviation of Civil engineers and Builders on the causes of risk factors on construction sites in Lugbe metropolis, Abuja.

Source: Field Survey, 2023

(N₁= 24, N₂ = 36)

S/N	ITEM	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_t	SD _t	REMARK
1	Inadequate / incomplete use of personal protective equipment (PPE).	3.29	0.69	3.47	0.7	3.38	0.01	Agreed
2	Absence of routine maintenance of machinery and equipment.	3.25	0.53	3.36	0.64	3.31	0.08	Agreed
3	Poor site organization and spacing.	3.29	0.55	3.08	0.65	3.19	0.07	Agreed
4	Lack of safety awareness amongst workers.	3.29	0.62	3.25	0.6	3.27	0.01	Agreed
5	Lack of routine safety inspection in the site.	3.04	0.55	3.25	0.73	3.15	0.13	Agreed
6	Use of sub-standard scaffolds.	3.13	0.45	3.36	0.68	3.25	0.16	Agreed
7	Overstressing the workers.	3.38	0.65	3.42	0.81	3.4	0.11	Agreed
8	Use of substandard ladders.	3.25	0.61	3.17	0.7	3.21	0.06	Agreed
9	Lack of safety signage on the site.	3.29	0.62	3.22	0.9	3.26	0.2	Agreed
10	Absence of site engineer to ensure safe operation of equipment.	3.00	0.72	3.03	0.88	3.02	0.11	Agreed
11	Unsafe storage of hazardous substances e.g. spray paints which can cause explosion.	3.33	0.70	3.47	0.56	3.4	0.1	Agreed
12	Inadequate warning systems on the site e.g. fire alarms.	3.32	0.61	3.46	0.54	3.3	0.1	Agreed

KEY:

\bar{X}_1 = Mean response of Civil engineers

\bar{X}_2 = Mean response of Builders

SD₁ = Standard Deviation of the Mean Response of Civil engineers

SD₂ = Standard Deviation the Mean Response of Builders

\bar{X}_t = Mean of mean or average response of Civil engineers and Builders

N₁ = Number of Civil engineers

N₂ = Number of Builders

The result on **table 4.2** shown above revealed that items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, & 12 were agreed as the causes of risk factors on the construction sites since the item values are within the range of (3.38 – 3.02) on the cut-off point of 2.50.

This signifies that the eleven (12) items are the causes of Risk Factors on construction sites.

4.3 Research Question 3: What are the preventive measures of the risk factors on construction site?

Table 4.3 below revealed the Mean Responses and the Standard Deviation of Civil engineers and Builders on the Preventive measures of the risk factors on construction site in Lugbe metropolis, Abuja.

Source: Field Survey, 2023

(N₁= 24, N₂ = 36)

S/N	ITEM	\bar{X}_1	SD ₁	\bar{X}_2	SD ₂	\bar{X}_t	SD _t	REMARK
1	Use of clear signage all through the construction site.	3.75	0.44	3.69	0.58	3.72	0.1	Agreed
2	Use of personal protective equipment (PPE) e.g. Boot, helmet, gloves.	3.58	0.5	3.72	0.45	3.65	0.04	Agreed
3	Proper site organization and spacing.	3.67	0.48	3.64	0.49	3.66	0.01	Agreed
4	Conduction of safety trainings for workers.	3.63	0.49	3.75	0.44	3.69	0.04	Agreed
5	Conducting routine safety inspections in site.	3.46	0.51	3.53	0.56	3.5	0.04	Agreed
6	Use of standardized scaffolds while working at heights.	3.58	0.58	3.61	0.49	3.6	0.06	Agreed
7	Proper maintenance of tools, equipment and machinery.	3.54	0.59	3.56	0.5	3.55	0.06	Agreed
8	Communicate with workers about health and safety risks in their tasks and control measures.	3.5	0.51	3.58	0.55	3.54	0.03	Agreed
9	Availability of safety gadgets like fire extinguishers in the construction site.	3.58	0.5	3.5	0.56	3.54	0.04	Agreed
10	Availability of adequate warning systems on site e.g. fire alarms.	3.54	0.51	3.56	0.65	3.55	0.1	Agreed

11	Safe storage of hazardous substances on site e.g. lead based paint.	3.54	0.51	3.47	0.56	3.51	0.04	Agreed
12	Proper labelling of hazardous substances.	3.5	0.51	3.56	0.65	3.53	0.1	Agreed
13	Provision of first-aid to workers for minor injuries on site.	3.5	0.51	3.56	0.65	3.53	0.1	Agreed
14	Ensuring adequate communication between the workers.	3.65	0.43	3.53	0.64	3.52	0.02	Agreed

KEY:

\bar{X}_1 = Mean response of Civil engineers

\bar{X}_2 = Mean response of Builders

SD_1 = Standard Deviation of the Mean Response of Civil engineers

SD_2 = Standard Deviation the Mean Response of Builders

\bar{X}_t = Mean of mean or average responses of Civil engineers and Builders

N_1 = Number of Civil engineers

N_2 = Number of Builders

The result on **table 4.3** shown above revealed that items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 & 14 were agreed as the preventive measures of the risk factors on construction site since the item values are within the range of (3.50 – 3.72) on the cut-off point of 2.50.

This signifies that the twelve (14) items are the preventive measures of the risk factors on construction site.

4.4 Research Hypotheses 1: There is no significant difference in mean responses of the Civil engineers and Builders as regards the risk factors on the construction site.

Table 4.4 below revealed the Mean, Standard Deviation, and T-cal Analysis of the Responses of Civil engineers and Builders on the risk factors on the construction site in Lugbe metropolis, Abuja.

Source: Field Survey, 2023

(N₁= 24, N₂ = 36)

S/N	ITEM	SD ₁	SD ₂	T-Cal	REMARK
1	Exposure to contaminated / disease carrying bodies e.g. sanitary sewer.	0.48	0.73	-1.95	NS
2	Inhalation of polluted air e.g. smoke, fumes.	0.53	0.76	0.24	NS
3	Congestion of workers in site.	0.56	0.65	1.11	NS
4	Use of defective or faulty Machinery or equipment e.g. faulty compacting machine.	0.55	0.87	-0.3	NS
5	Unprofessional handling of hazardous substances e.g. spray paint	0.74	0.68	-0.55	NS
6	Use of faulty scaffold while working at heights.	0.75	0.87	0.4	NS
7	Construction site supervisor negligence.	0.49	0.65	0.45	NS
8	Contact with exposed wires.	0.66	0.69	0.27	NS
9	Using unsafe ladders.	0.56	0.6	-0.48	NS
10	Working in the sun and high temperature.	0.9	0.87	-0.83	NS
11	Accidental struck by object on site.	0.58	0.65	-2.61	NS
12	Aggression and violence on site.	0.68	0.75	-1.17	NS
13	Exposure to electrical dangers	0.65	0.74	-1.17	NS

KEY:

T-Cal = t-test calculated

T-Critical = 1.960

NS = No significant differences

SD₁ = Standard Deviation of Response of Civil engineers

SD₂ = Standard Deviation of Response of Builders

N₁= Number of Civil engineers

N₂= Number of Builders

The result on **table 4.4** shown above revealed that all the items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, & 13 were less than the critical value (1.960) at 0.05 level of significant. This signifies that the null hypotheses which stated that there is no significant difference in mean responses of the civil

engineers, and builders as regards the risk factors on the construction site is accepted at 0.05 level of significant.

4.5 Research Hypotheses 2: There is no significant difference in mean responses of the Civil engineers, and Builders as regards the causes of risk factors on construction sites.

Table 4.5 below revealed the Mean, Standard Deviation, and T-cal Analysis of the Responses of Civil engineers, and Builders on the causes of risk factors on construction site in Lugbe metropolis, Abuja.

Source: Field Survey, 2023

(N₁= 24, N₂ = 36)

S/N	ITEM	SD ₁	SD ₂	T-Cal	REMARK
1	Inadequate / incomplete use of personal protective equipment (PPE).	0.69	0.7	-1.17	NS
2	Absence of routine maintenance of machinery and equipment.	0.53	0.64	-0.92	NS
3	Poor site organization and spacing.	0.55	0.65	1.69	NS
4	Lack of safety awareness amongst workers.	0.62	0.6	0.29	NS
5	Lack of routine safety inspection in the site.	0.55	0.73	-1.65	NS
6	Use of sub-standard scaffolds.	0.45	0.68	-2.2	NS
7	Overstressing the workers.	0.65	0.81	-0.27	NS
8	Use of substandard ladders.	0.61	0.7	0.58	NS
9	Lack of safety signage on the site.	0.62	0.9	0.47	NS
10	Absence of site engineer to ensure safe operation of equipment.	0.72	0.88	-0.18	NS
11	Unsafe storage of hazardous substances e.g. spray paints which can cause explosion.	0.7	0.56	-0.92	NS
12	Inadequate warning systems on the site e.g. fire alarms.	0.69	0.7	-1.17	NS

KEY:

T-Cal = t-test calculated

T-Critical = 1.960

NS = No significant differences

SD₁ = Standard Deviation of Response of Civil engineers

SD₂ = Standard Deviation of Response of Builders

N₁= Number of Civil engineers

N₂= Number of Builders

The result on **table 4.5** shown above revealed that all the items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, & 12 were less than the critical value (1.960) at 0.05 level of significant. This signifies that the null hypotheses which stated that there is no significant difference in mean responses of the civil engineers, and builders as regards the causes of risk factors on construction site is accepted at 0.05 level of significant.

4.6 Research Hypotheses 3: There is no significant difference in mean responses of the Civil engineers, and Builders as regards the preventive measures of the risk factors on construction site.

Table 4.6 below revealed the Mean, Standard Deviation, and T-cal Analysis of the Responses of Civil engineers, and Builders on the preventive measures of the risk factors on construction site in Lugbe metropolis, Abuja.

Source: Field Survey, 2023

(**N₁**= 24, **N₂** = 36)

S/N	ITEM	SD₁	SD₂	T-Cal	REMARK
1	Use of clear signage all through the construction site.	0.44	0.58	0.61	NS
2	Use of personal protective equipment (PPE) e.g. Boot, helmet, gloves.	0.5	0.45	-1.3	NS
3	Proper site organization and spacing.	0.48	0.49	0.29	NS
4	Conduction of safety trainings for workers.	0.49	0.44	-1.14	NS
5	Conducting routine safety inspections in site.	0.51	0.56	-0.62	NS
6	Use of standardized scaffolds while working at heights.	0.58	0.49	-0.24	NS
7	Proper maintenance of tools, equipment and machinery.	0.59	0.5	-0.16	NS
8	Communicate with workers about health and safety risks in their tasks and control	0.51	0.55	-0.71	NS

	measures.				
9	Availability of safety gadgets like fire extinguishers in the construction site.	0.5	0.56	0.72	NS
10	Availability of adequate warning systems on site e.g. fire alarms.	0.51	0.65	-0.17	NS
11	Safe storage of hazardous substances on site e.g. lead based paint.	0.51	0.56	0.62	NS
12	Proper labelling of hazardous substances.	0.51	0.65	-0.52	NS
13	Provision of first-aid to workers for minor injuries on site.	0.50	0.65	-0.51	NS
14	Ensuring adequate communication between the workers.	0.49	0.64	-0.50	NS

KEY:

T-Cal = t-test calculated

T-Critical = 1.960

NS = No significant differences

SD₁ = Standard Deviation of Response of Civil engineers

SD₂ = Standard Deviation of Response of Builders

N₁= Number of Civil engineers

N₂= Number of Builders

The result on **table 4.6** shown above revealed that all the items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, & 14 were less than the critical value (1.960) at 0.05 level of significant. This signifies that the null hypotheses which stated that there is no significant difference in mean responses of the civil engineers, and builders as regards the preventive measures of the risk factors on construction site is accepted at 0.05 level of significant.

4.7 Findings of the study

The following are the main findings of the study. They are prepared based on the research question and hypothesis tested.

Risk factors and preventive measures on the construction site in Lugbe metropolis, Abuja, Nigeria. Include the following;

What are the risk factors on construction sites?

- i. Exposure to contaminated / disease carrying bodies e.g. sanitary sewer.
- ii. Inhalation of polluted air e.g. smoke, fumes.
- iii. Congestion of workers in site.
- iv. Use of defective or faulty Machinery or equipment e.g. faulty compacting machine.
- v. Unprofessional handling of hazardous substances e.g. spray paint
- vi. Use of faulty scaffold while working at heights.
- vii. Construction site supervisor negligence.
- viii. Contact with exposed wires.
- ix. Using unsafe ladders.
- x. Working in the sun and high temperature.
- xi. Accidental struck by object on site.
- xii. Aggression and violence on site.
- xiii. Exposure to electrical dangers.

What are the causes of risk factors on construction sites

- i. Inadequate / incomplete use of personal protective equipment (PPE).
- ii. Absence of routine maintenance of machinery and equipment.
- iii. Poor site organization and spacing.
- iv. Lack of safety awareness amongst workers.
- v. Lack of routine safety inspection in the site.

- vi. Use of sub-standard scaffolds.
- vii. Overstressing the workers.
- viii. Use of substandard ladders.
- ix. Lack of safety signage on the site.
- x. Absence of site engineer to ensure safe operation of equipment.
- xi. Unsafe storage of hazardous substances e.g. spray paints which can cause explosion.
- xii. Inadequate warning systems on the site e.g. fire alarms.

What are the preventive measures of the risk factors on construction site?

- i. Use of clear signage all through the construction site.
- ii. Use of personal protective equipment (PPE) e.g. Boot, helmet, gloves.
- iii. Proper site organization and spacing.
- iv. Conduction of safety trainings for workers.
- v. Conducting routine safety inspections in site.
- vi. Use of standardized scaffolds while working at heights.
- vii. Proper maintenance of tools, equipment and machinery.
- viii. Communicate with workers about health and safety risks in their tasks and control measures.
- ix. Availability of safety gadgets like fire extinguishers in the construction site.
- x. Availability of adequate warning systems on site e.g. fire alarms.
- xi. Safe storage of hazardous substances on site e.g. leads based paint.
- xii. Proper labeling of hazardous substances.
- xiii. Provision of first-aid to workers for minor injuries on site.
- xiv. Ensuring adequate communication between the workers.

4.8 Discussion of findings.

The result from table 4.1 shows the findings on the risk factors and preventive measures on the construction site in Lugbe metropolis, Abuja, Nigeria. The findings of the study among others shows that sanitary sewer, inhalation of polluted air, use of faulty machinery, use of unsafe wires, use of bad ladders or scaffoldings and other basic items agreed by the respondents in research question one is significantly part of the risk factors and preventive measures on the construction site in Lugbe metropolis, Abuja, Nigeria. The findings are in line with Adefinet *al.* (2016) which stated that the risk factors in a construction site are mainly caused by poor management and negligence of site workers and engineers to hazardous substances and faulty machineries.

From table 4.2, the findings show that Inadequate / incomplete use of personal protective equipment (PPE), absence of routine maintenance of machinery and equipment, poor site organization and spacing, lack of safety awareness amongst workers, Lack of routine safety inspection in the site, use of sub-standard scaffolds, overstressing the workers, use of substandard ladders, lack of safety signage on the site and all the items agreed in research question two are the causes of risk factors on construction sites.

The result of the hypothesis regarding differences between the mean responses of builders and civil engineers and risk factors on the construction site in Lugbe Abuja shows that there is no significant difference between the mean responses of builders and civil engineers and risk factors on the construction site in Lugbe Abuja.

Furthermore, in table 4.3, the findings indicated that the preventive measures of risk factors on construction site include; Use of clear signage all through the construction site. Use of personal

protective equipment (PPE) e.g. Boot, helmet, gloves, proper site organization and spacing, conduction of safety trainings for workers, conducting routine safety inspections in site, use of standardized scaffolds while working at heights, proper maintenance of tools, equipment and machinery, communicate with workers about health and safety risks in their tasks and control measures, availability of safety gadgets like fire extinguishers in the construction site, availability of adequate warning systems on site e.g. fire alarms, safe storage of hazardous substances on site e.g. leads based paint, proper labeling of hazardous substances, provision of first-aid to workers for minor injuries on site and ensuring adequate communication between the workers as agreed by the respondents.

The result of the hypothesis regarding mean responses of builders and civil engineers on the causes of risk factors on the construction site in Lugbe Abujashows that there is no significant difference between the mean responses of civil engineers and builders on risk factors on the construction site in Lugbe Abuja.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Study

The main goal of this research study is to find out the risk factors and preventive measures on the construction site in Lugbe metropolis, Abuja, Nigeria.

Chapter 1 of the study discussed the background of the study, the statement of problem, purpose, significance, scope and the research questions were all stated and discussed for the conduct of this research.

The review of related literature looked into Construction Industry and building construction sites. Various views of different authors concerning the topic were harmonized in a comprehensive literature review and empirical studies.

A survey approach was used to developed instrument for the study; the respondents identified as the population of the study were site workers. A number of 50 questionnaires were administered. The instrument used was analyzed using frequency count, and mean scores as well as standard deviation. The research questions were discussed base on the findings from the responses and results of the instrument used.

Implication of the study and conclusions were also drawn from the findings discussed. Recommendations and suggestions for further study were formulated and stated according to the findings of the study.

5.2 Implication of the Study

The findings of the study had implications for government, construction firms. From the outcome of the study, it implies that every construction team should be well equipped with adequate knowledge in construction site safety so as to be able to minimize loss. Adequate knowledge about site safety practices amongst the labour force would contribute to ensuring a safer environment for the construction site workers. Contractors and sub-contractors should as a matter of policy train and retrain site workers to improve their safety awareness which will eventually result in accident free environment.

5.3 Conclusion

Based on the findings of the study, the study concludes that among the various factors that causes risk and on the construction site poor site organization and spacing, lack of safety signage on the site, unsafe storage of hazardous substances e.g. spray paints which can cause explosion, and inadequate warning systems on the site e.g. fire alarms are said to be the major factors that is considered. Proper risk assessment makes foreffective planning and guarantees the prevention of unnecessary accidents and injuries and these are the topmost priority of site workers.

5.4 Recommendations

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

- i. Construction firms should provide complete personal protective equipment for all workers and should ensure strict compliance on usage.
- ii. There should be effective warning systems in construction sites to alert workers of any risk emergency.
- iii. Contractors and subcontractors should provide adequate and functional working tools/equipment for their workers.

- iv. There should be adequate safety training of all workers before the commencement of works.
- v. Routine safety inspections should be done by site engineers to ensure there are no compromises on safety.

5.5 Suggestion for Further Study

The following are suggested for further studies:

- i. Unforeseen risk factors in construction sites
- ii. Effective risk management in construction sites
- iii. Site safety and reliability.

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REQUEST LETTER TO VALIDATORS

Department Industrial and Technology

Education

School of Science and Technology Education

Federal University of Technology,

P.M.B 65, Minna.

25th January 2023.

Dear Sir

REQUEST FOR FACE VALIDATION OF INSTRUMENT FOR ASSESSMENT OF RISK FACTORS AND PREVENTIVE MEASURES ON THE CONSTRUCTION SITE IN LUGBE METROPOLIS, ABUJA, NIGERIA.

I am an undergraduate student of the above mentioned institution currently undertaking a study on the topic: ASSESSMENT OF RISK FACTORS AND THE PREVENTIVE MEASURES ON THE CONSTRUCTION SITE IN LUGBE METROPOLIS, ABUJA.

Attached is a draft copy of the instrument. As an expert in this area, your assistance is hereby solicited to enable me accomplish this task. Kindly go through the item to verify their clarity, relevance and appropriateness in the use of language. In addition to this you can also make further suggestions that will improve the status and quality of the instrument. Your contribution to this work is highly appreciated.

Thanks

Yours faithfully,

CHIBUTUTU ABRAHAM

Purpose/Objectives

The purpose of this study is to determine the Assessment of risk factors and the preventive measures on the construction site in LUGBE, metropolis Abuja.

To achieve this specifically the study will identify:

1. The risk factors on the construction sites.
2. The causes of risk factors on the construction sites.
3. The risk preventive measures on the construction sites.

Decision rule

The questions should be responded to using this four point scale method.

Strongly agree	SA
Agree	A
Disagree	D
Strongly disagree	SD

Research Question 1.

What are the risk factors on the construction site

SN	ITEMS	SA	A	D	SD
1	Exposure to contaminated / disease carrying bodies e.g., sanitary sewer.				
2	Inhalation of polluted air e.g., smoke, fumes.				
3	Congestion of workers in site.				
4	Use of defective or faulty Machinery or equipment e.g. faulty compacting machine.				
5	Unprofessional handling of hazardous substances e.g., spray paint				
6	Use of faulty scaffold while working at heights.				
7	Construction site supervisor negligence.				
8	Contact with exposed wires.				
9	Using unsafe ladders.				
10	Working in the sun and high temperature.				
11	Accidental struck by object on site.				
12	Aggression and violence on site.				
13	Exposure to electrical dangers.				

Research Question 2.

What are the causes of risk factors on construction sites.

SN	ITEMS	SA	A	D	SD
1	Inadequate / incomplete use of personal protective equipment (PPE).				
2	Absence of routine maintenance of machinery and equipment.				
3	Poor site organization and spacing.				
4	Lack of safety awareness amongst workers.				
5	Lack of routine safety inspection in the site.				
6	Use of sub-standard scaffolds.				
7	Overstressing the workers.				
8	Use of substandard ladders.				
9	Lack of safety signage on the site.				
10	Absence of site engineer to ensure safe operation of equipment.				
11	Unsafe storage of hazardous substances e.g spray paints which can cause explosion.				
12	Inadequate warning systems on the site e.g fire alarms.				

Research Question 3.

What are the preventive measures of the risk factors on construction site.

SN	ITEMS	SA	A	D	SD
1	Use of clear signage all through the construction site.				
2	Use of personal protective equipment (PPE) e.g. Boot, helmet, gloves.				
3	Proper site organization and spacing.				
4	Conduction of safety trainings for workers.				
5	Conducting routine safety inspections in site.				
6	Use of standardized scaffolds while working at heights.				
7	Proper maintenance of tools, equipment and machinery.				
8	Communicate with workers about health and safety risks in their tasks and control measures.				
9	Availability of safety gadgets like fire extinguishers in the construction site.				
10	Availability of adequate warning systems on site e.g fire alarms.				
11	Safe storage of hazardous substances on site e.g lead based paint.				
12	Proper labeling of hazardous substances.				
13	Provision of first-aid to workers for minor injuries on site.				
14	Ensuring adequate communication between the workers.				

Department Industrial and Technology

Education

School of Science and Technology Education

Federal University of Technology,

P.M.B 65, Minna.

25th January 2023.

Dear Respondent,

REQUEST FOR RESPONSE TO QUESTIONNAIRE

I am a final year student of the above mentioned institution, undertaking a study titled: Assessment of Risk Factors and Preventive Measures on the Construction site in FCT Abuja.

Your objective responses are highly needed in ascertaining the facts under investigation. Please feel free to share your mind objectively as your responses have great impact on the findings. All collected responses will be used for this research and treated confidentially.

Thank you.