



WEST AFRICA BUILT ENVIRONMENT RESEARCH (WABER) CONFERENCE  
*Knowledge, Interaction, People & Leadership*

**PROCEEDINGS OF THE  
WABER 2021 CONFERENCE**  
9<sup>th</sup>-11<sup>th</sup> August 2021  
Accra, Ghana

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Proceedings of the West Africa Built Environment Research (WABER) Conference 2021

9<sup>th</sup> – 11<sup>th</sup> August 2021

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Declaration

All papers in this publication have been through a review process involving initial screening of abstracts, review of full papers by at least two referees, reporting of comments to authors, review of papers by authors and re-evaluation of re-submitted papers to ensure quality of content.

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NEA ONNIM NO SUA A, OHU

*"He who does not know can know from learning"*

This is the Adinkra symbol of knowledge, life-long education and continued quest for knowledge. The Akan people in West Africa believe that the search for knowledge is a life-long process. This is evident from the Akan saying "Nea onnim sua a, ohu; nea odwen se onim dodo no, se ogyae sua a, ketewa no koraa a onim no firi ne nsa" which translates into "He who does not know can become knowledgeable from learning; he who thinks he knows and ceases to continue to learn will stagnate".

## FOREWORD

I would like to welcome each participant to the WABER 2021 Conference. Since its inception in 2009, the WABER Conference series has done a great deal to nurture and support researchers, initially in West Africa, also, in other parts of Africa and elsewhere. I would like to thank all delegates for your participation which enables us to keep this Conference going.

The WABER Conference enjoys a positive international reputation and has continued to grow from strength to strength over the past 13 years. For this, I would like to thank our team, keynote speakers and participants over the years for every contribution you have made to the success of this Conference. This year's Conference has an excellent programme, line up of speakers and authors.

I would like to thank and commend the authors of all 72 papers in this Conference proceedings. If the research paper writing process was compared to a marathon, the authors of the 72 papers in this publication would be adjudged as the ones who have endured and finished the race.

We opened the call for papers for this Conference in December 2020 and over 100 abstracts were submitted by authors. However, it is one thing to propose to write a paper, and it is quite another thing to actually write the paper. Therefore, I would like to thank and congratulate all authors who succeeded in completing the process of getting published in this conference proceedings.

It is befitting that we have an excellent range of interesting topics in the 72 papers to be discussed at this conference.

We are honoured to welcome Professor Charles Egbu, Vice Chancellor of Leeds Trinity University, to give us a special opening address.

In the three days of this conference, we will have various plenary presentations by experienced international academics and I would like to thank and welcome each of them below.

Professor Albert Chan  
Richard Lorch  
Professor Taibat Lawanson  
Professor Dato' Sri Ar Dr Asiah Abdul Rahim  
Professor George Ofori

In addition to these speakers, we have other interesting sessions on the programme including a special session for doctoral students and supervisors several other experienced speakers addressing various topics that should be of interest to many of us.

I would like to thank all members of the organising team particularly Associate Professor Emmanuel Essah, Dr Yakubu Aminu Dodo and Dr Sam Moveh for their efforts which has helped to organise this Conference successfully. I would also like to thank all of our reviewers particularly Associate Professor Emmanuel Essah and Dr Haruna Moda for the considerable time and effort spent reviewing and checking all papers to ensure a high standard of quality.

The WABER Conference Team always plays an excellent role in the success of our events and I would like to thank and appreciate the contributions of Florence, Sam Boakye, Victor Ayitey and his team, Kwesi Kwofie and Issah Abdul Rahman to the success of this Conference.

I hope you enjoy our first hybrid conference and engage with our exciting speakers on the diverse topics that will be covered over the three days of this Conference.

Sam Laryea  
University of the Witwatersrand, Johannesburg, South Africa  
Chairman of WABER Conference  
August 2021

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## PEER REVIEW AND SCIENTIFIC PUBLISHING STATEMENT



9<sup>th</sup> August 2021

### TO WHOM IT MAY CONCERN

The scientific information published in peer-reviewed outlets carries special status, and confers unique responsibilities on editors and authors. We must protect the integrity of the scientific process by publishing only manuscripts that have been properly peer-reviewed by scientific reviewers and confirmed by editors to be of sufficient quality.

I confirm that all papers in the WABER 2021 Conference Proceedings have been through a peer review process involving initial screening of abstracts, review of full papers by at least two referees, reporting of comments to authors, revision of papers by authors, and re-evaluation of re-submitted papers to ensure quality of content.

It is the policy of the West Africa Built Environment Research (WABER) Conference that all papers must go through a systematic peer review process involving examination by at least two referees who are knowledgeable on the subject. A paper is only accepted for publication in the conference proceedings based on the recommendation of the reviewers and decision of the editors.

The names and affiliation of members of the Scientific Committee & Review Panel for WABER 2021 Conference are published in the Conference Proceedings and on our website [www.waberconference.com](http://www.waberconference.com)

Papers in the WABER Conference Proceedings are published open access on the conference website [www.waberconference.com](http://www.waberconference.com) to facilitate public access to the research papers and wider dissemination of the scientific knowledge.

Yours Sincerely,

A handwritten signature in black ink, appearing to read 'Sam Laryea', is written over a horizontal line.

Sam Laryea, PhD  
Chairman of WABER Conference

## PEER REVIEW PANEL

WABER Conference is very grateful to each the following persons for your contribution to the peer review process. Thank you so much.

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## ASSESSMENT OF THE CHALLENGES AND SOLUTIONS TO IMPLEMENTATION OF SAFETY MEASURES BY SMALL AND MEDIUM SIZED CONSTRUCTION FIRMS IN ABUJA, NIGERIA

Jibril Adamu Muhammad<sup>1</sup>, Abdullateef Adewale Shittu<sup>2</sup>, Yakubu Danasabe Mohammed<sup>3</sup>, John Ebhohimen Idiake<sup>4</sup> and Zannah Alhaji Ali<sup>5</sup>

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Studies have revealed that construction firms lack proper implementation of safety measures on construction projects in Abuja, Nigeria. Construction works all over the world therefore pose serious threat to workers and non-workers in most of the developing countries such as Nigeria. This paper assessed the level of implementation of safety measures by small and medium sized construction firms (construction SMEs) in Abuja with a view to improving the safety performance of construction firms. This was achieved through: identification of the effective safety measures required on construction sites; examination of the challenges affecting the implementation of safety measures on construction sites; and suggesting strategies for improving the level of implementation of safety measures by construction SMEs. Data were obtained from selected construction SMEs in Abuja using structured questionnaire distributed to 50 randomly selected SMEs with a response rate of 92%. Relative Importance Index (RII) and Mean Item Score (MIS) were employed for data analysis. It was revealed that the use of personal protective clothing (MIS = 4.54) is the most effective safety measure required on construction sites. It was also found that ineffective management commitment (MIS = 4.63) is the most severe challenge affecting the implementation of safety measures by construction SMEs. The study also found that provision of personal protective equipment (RII = 0.94) is the most effective strategy for improving the level of implementation of safety measures on construction sites. It was however concluded that the level implementing safety measures by construction SMEs in Abuja is low. Therefore, this research recommends that construction stakeholders should encourage, ensure, and promote the proper implementation of safety measures in construction SMEs. This will assist to curb the challenges inhibiting safety measures implementation so as to improve the safety performance of construction SMEs.

**Keywords:** construction firms, construction SMEs, safety measures

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## INTRODUCTION

The construction industry is an important sector of the economy in many countries and it is often seen as a driver of economic growth by contributing to Gross Domestic Product (GDP), capital formation, and employment especially in developing countries (Phoya, 2012). Diugwu et al., (2012) state that construction industry in developing countries have performed far below expectation in the area of health and safety (H&S), the situation in Nigeria is no exception. This is due to the fact that the existing legislation with regards to occupational H&S in Nigeria is not functional (Umeokafor et al., 2014). According to Nzuve and Lawrence (2012) low level of inspection and examination of workplaces might determine the level of compliance with occupational safety and health (OSH) regulations as evident in workplaces in Nairobi. The same can be said of Nigeria, where lack of enforcement characterizes regulatory institutions (Idubor and Osiamoje, 2013), most laws appear to fulfil all righteousness or are used for political or victimization reasons, and the institutions alleged and proved to be corrupt and arbitrarily exercise its powers (Zou and Sunindijo, 2015).

Koehn et al., (2013) also observed that framework for the implementation of safety measures applies mainly to the large scale multinational construction firms. Therefore, little or no emphasis is laid on the small and medium sized construction firms in Nigeria.

Diugwu et al., (2013) opined that Nigeria is among the countries having no adaptive H&S measures and regulations where small and medium sized construction firms allocate little or no resources to H&S management. Bima et al., (2015) revealed that legislation on H&S are endorsed by the Nigerian government, including International Labour Organization (ILO) conventions. However, their implementation by the relevant government bodies and workers is poor (Shittu et al., 2015a and b; Shittu et al., 2016; David et al., 2018). Awwad et al. (2016) added that safety practices lack necessary framework for the implementation of safety measures on construction projects with particular emphasis to the small and medium sized construction firms (construction SMEs) and thus leading to increase in accidents on construction sites and cost of compensation to injured workers. This brings about ineffective cost performance of projects.

Frameworks facilitate the assessment of the effectiveness of construction firms, identify the deficiencies and the weaknesses, and create procedures to manage the accident in future by controlling the safety behaviour of employees. Gurcanli et al. (2015) observed that studies on the cost of safety measures as a part of project costs during a construction project are very rare. This is a gap left by these studies from the global scene. The Nigerian construction industry researches carried out on health and safety include: application of H&S plan in Nigerian construction firms (Dodo, 2014); enforcement of OHS Regulation in Nigeria (Umeokafor et al., 2014); influence of organizational characteristics on H&S practices of construction firms in Abuja; and evaluation of accidents and safety in the Nigerian construction industry (Aniekwu, 2017).

In summary, the previous studies on H&S appear to have been conducted to investigate on safety costs involved in the construction stage. But there exist

limited studies on effective implementation of safety measures by construction SMEs in Nigeria as the existing ones are applied to larger construction firms and are particular to foreign and multi-national construction firms which are characterized with shortcomings of not capturing the peculiarities of SMEs in Nigeria. This paper will fill this research gap by assessing the level of implementation of safety measures by construction SMEs in Abuja with a view to improving the safety performance of construction firms. A larger study (Doctoral research) will then develop a framework for effective implementation of safety measures by small and medium sized construction firms in Nigeria. This paper is therefore a part of this larger study. In order to achieve the aim of this paper, the following objectives were formulated:

1. Identify the effective safety measures required on construction sites by construction SMEs. Using relative importance index (RII).
2. Examine the challenges affecting the level of implementation of safety measures on construction sites by SMEs.
3. Suggest strategies for improving the level of implementation of safety measures on construction sites by SMEs.

## REVIEW OF LITERATURE

### The construction industry

The construction industry is considered as a leading driver of economic development in a country. Belel and Mahmud (2012) state that the construction industry brings significant contribution and benefit in facilities production which initiates various economic activities and enhance the social and environmental needs of a nation. Thus construction safety becomes one of the significant concerns.

The construction industry is unique among all other sectors because it provides the necessary infrastructures that stimulate national development (Jackman, 2010). Nigeria being the most populous country in Africa and also the largest economy in Africa according to (World Bank, 2016) its construction industry plays an important role in the nation's economy. In 2012 the sector's contribution to national gross domestic product stood at 3.05% and in that same year the sector employed an estimated amount of 6.9 million workers (National Bureau of Statistics, 2015).

Occupational Health and Safety (OHS) is well recognised in the construction industry as one of the most important subjects. The implementation of OHS measures in the industry is critical for the protection of all project stakeholders (Lingard, et al., 2015). Despite the persistent endeavours that have been made to improve and promote construction safety (Sherratt, et al., 2015) those accidents still plague the industry (Zhou, et al., 2015).

### The concept of small and medium-sized construction firms

The Nigeria Bureau of Statistics (NBS) and (SMEDAN) (2012) categorised construction firms with 25 employees as small but this has been considered an unsuitable definition considering the high level of subcontracting in the

construction industry (Eyiah 2004). The definition of SMEs in the Nigerian context, like in the UK and many other countries, varies between researchers and government institutions of the country. SMEs are broadly defined as business with turnover of less than 100 million per annum and/or less than 300 employees. Onugu, (2005) NBS and SMEDAN (2012) added that about 81% of construction SMEs in Nigeria is small-scale enterprises while about 19% are medium (NBS and SMEDAN, 2012). Majority of the Nigerian construction SMEs are sole proprietorship business enterprises; that is about 92% of the Nigerian construction SMEs are sole proprietorship mode. The highest number of the owners/managers of the Nigerian construction SMEs is of ages between 36 and 50 years and this constitutes about 42% of the total population of the Nigerian construction SMEs. The Nigerian construction SMEs have a great contribution to the Nigerian economy in terms of the building and construction investment; that is the Nigerian construction SMEs contribute to about 11% of the Nigeria's Gross Domestic Product (GDP) in 2010 (NBS and SMEDAN, 2012).

The regulations of OSH in Nigeria has received little attention, with little emphasis to strict adherence to safety in the construction industry and very minimal impact made by the inspection officers towards ensuring strict compliance. The accidents record in Nigeria indicate an alarming rate of injuries and fatalities on sites (Diugwu et al., 2012). Hence, there is need to find a way of minimizing the rate of falls and injuries in Nigerian construction industry.

#### **Effective health and safety measures required on construction sites**

Construction industry is considered one of the most hazardous industries because of its unique nature (Fang and Wu, 2013). It comprises of a wide range of activities (both construction and repair) that rely intensively on labourers, heavy machinery and equipment. Construction workers engage in many activities that may expose them to serious hazards, such as falling from rooftops, encountering unguarded machinery, and being struck by heavy construction equipment (Popov et al., 2016). Therefore, safety procedures related to the construction industry or project sites have been established in different countries (Muiruri and Mulinge, 2014) to ensure that construction sites or the industry are not the cause of immediate danger to the public or workers at a project site. Construction safety regulations are also useful for ensuring that every finished product meets the required safety standards.

#### **Health and safety regulations**

Research studies trace the origin of H&S regulations generally to the UK and US (Sunil& Hari., 2019). Nigeria as a former colony of Britain depended solely on standards and regulations of her colonial master before and even after independence. As a result, almost all existing regulations of reference on H&S in Nigeria originated from foreign countries (Kolawole 2014).

Chudley and Greeno (2016) defined construction regulations as statutory instruments setting out the minimum legal requirements for construction works and relate primarily to the health, safety and welfare of the workforce which must be taken into account when planning construction operations and during the actual construction period. Regulation cannot on its own be effective without enforcement. Idubor and Osiamoje (2013) opine that regulations without proper enforcement are tantamount to no laws.

Globally, health and safety regulations governing the construction industry and other work related industries exist. In Nigeria also, a number of legislations on occupational health and safety exist. These include; Labour Act of 1974 modified to Labour Acts 1990, and updated to Labour Act, Cap L1, Laws of the Federation of Nigeria (LFN), 2004; the Factories Act of 1987 which became effective in 1990 and later updated to Factories Act, Cap. F1, LFN, 2004 Federal Government of Nigeria, "The Factory Act Of 1990"; the Workman's Compensation Act of 1987 which became effective in 1990, modified to Workman's Compensation Act, Cap W6, LFN, 2004 and repeal to Employee's Compensation Act, No. 13, 2010 of the laws of the Federal Republic of Nigeria, "Factories Act 126 Cap. F1 LFN. 2004," Federation of Nigeria (2010) the Insurance Act, 2003 and the Labour, Safety, Health and Welfare Bill of 2012 including the National Building Code Enforcement Bill which has suffered huge political setback over the years, and is yet to be passed into law by the National Assembly.

In spite of numerous statutory provisions and expectations in Nigeria, gap still exist in health and safety. This problem is linked to adopting almost all existing regulations of reference on health and safety in Nigeria from foreign countries, especially from the British legal system with little or no changes made. Kolo (2015) observed that some provisions from these laws do not necessarily meet the conditions experienced in Nigeria.

Dodo (2014) linked the problem to adopting almost all existing regulations of reference on health and safety in Nigeria from foreign countries, especially from the British legal system with little or no changes made.

Nevertheless, the emergence of new regulations, laws, standards and codes has made many construction organisations to improve their safety performance.

#### **Safety code of practice in construction industry**

The purpose of building codes and construction regulations cannot be over emphasized in project development and management, they ensure health and safety of workers, it provide habitable facilities, promotion of energy efficiency, it also facilitate sustainable development and contribute greatly to meeting the demands construction stakeholders. Muiruri ( 2014) asserted that code and regulations is not stand alone to improve construction safety at reduce cost, rather poor codes and regulations can only add to project cost without any solution to construction safety compliance. The cost arises from delays in construction progress include both direct and indirect cost on the employers and employees.

The numerous numbers of codes and regulations that support management of health and safety practice includes: The provision and use of Equipment Regulation (1992), ILO code of practice-International Labour Office (1992), The Manual Handling Operations Regulations (1992), The Personal Protective Equipment at Work Regulations(1992), The occupational safety and health act of (2007), The Health and Safety (Display Screen Equipment) Regulations (1991), Health and Safety (First-Aid) Regulations (1981), Management of Health and Safety at Work Regulations (1999), Control of Substances Hazardous to Health Regulations (2002), Construction Design and Management Regulations 2015 (CDM 2015), Nigerian National Building Code (2007) (Bamisile, 2004 and Muiruri , 2014).



### **The provision of Nigerian National Building Code**

The Nigerian National Building Code came on board after several debates and agitation by the representative of stakeholders in the built environment and government under the headship of the Minister of Housing and Urban Development. The code intended to serve as means of enhancing construction project, by disengagement of quacks and the use of 'non-tested' materials in the execution of building production. The objectives of the code is to provides solution to current challenges confronting the Nigerian building industry, this include: Inadequate town planning in Nigerian cities, occurrence of building collapse and accident related issues, dearth of construction standards for regulating building designs and production, and the poor maintenance culture in the industry.

The code stated in section 7 (49) stated the need to protect the general public and workers anytime a building production process, demolished and maintenance work are to be carried out. The following provisions were made in the code to ensure safety compliance of the operatives involved during production works on site: Section 7 (55) stated the requirement for the use of scaffolds and their components should provide support without failure at least four times the maximum intended loads.

Section 7 (60) stated the requirement for managing health hazards, every construction or maintenance operation which results in the diffusion of noise, dust, stone and other small particles, toxic gases or other harmful substances in quantities hazardous to health shall be safeguarded by means of local ventilation or other protective wears to ensure the safety of the workers and the public as required by this code.

Windapo and Jegede (2013) also noted that contractors (who are SMEs) prioritize savings cost to H &S in the Nigerian construction industry .

### **Safety policy**

A health and safety policy is a written document which recognizes that health and safety is an integral part of the building and construction industry performance. It is a statement by the industry of its intentions and approach in relation to its overall health and safety performance and provides a framework for action, and for the setting of its health and safety objectives and targets.

In every construction site or organization, Site managers should have a written safety policy for their organization setting out the safety and health standards which it is their objective to achieve. The policy should appoint a senior executive who is responsible for seeing that the standards are achieved, and who has authority to allocate responsibilities to management and supervisors at all levels and to see that they are carried out. Construction safety policy must therefore be developed by each site manager and operating company prior to starting any construction job. Once developed the development safety plan should be placed into a training program that's needed to be participated in by every site worker previous to partaking in any job found on the positioning irrespective of the roles simplicity. The absence of site meetings as established in this survey implies that workers are not given a forum learn about various risks on the sites and Supervisors equally do not have opportunities to communicate important health and safety

matters to the workers. Site meetings are one of the ways of sensitizing workers on their health and safety in the site and should therefore be held frequently.

The policy should indicate the intention and purposes of the industry to operate a workplace, which is drug-free, specify the kind of substances to be banned e.g. alcohol, explain the applied testing methods, state, and describe any assistance programs and penalties. Mandatory testing before hiring, testing for cause and continuous random testing should be addressed by the drug-testing program. Compulsory drug testing should be included in the employment application process.

#### **Concept of safety culture in construction industry**

For a long time, the construction industry has been labelled with a poor occupational safety and health culture. Efforts to improve occupational safety and health performance will not be effective until the occupational safety and health culture is improved (Misnan et al. 2012). It is a generally accepted wisdom that an organization that develops and maintains a strong safety culture is more effective at preventing individual and large scale accidents (Agwu and Oledede, 2014). Agwu and Oledede (2014) in Mbuya and Lema (2016) opined that in most developing countries, safety consideration in construction project delivery is not given a priority and the employment of safety measures during construction is considered a burden. Enhassi et al., (2015) reported that in many developing countries, the legislation governing Occupational Health and Safety is significantly limited when compared with UK. They further reported that there are rarely any special provisions for construction workers' safety and the general conditions of work are often not addressed. Agwu and Oledede (2014) reported that in many of the countries where safety legislation exists, the regulatory authority is weak and non-existent and employers 'pay lip service' to regulations.

#### **Challenges affecting the implementation of health and safety measures on construction sites**

According to Nzube and Lawrence (2012) low level of inspection and examination of workplaces might determine the level of compliance with occupational safety and health (OSH) regulations as evident in workplaces in Nairobi. The same can be said of Nigeria, where lack of enforcement characterizes regulatory institutions (Idubor and Osiamoje, 2013). Furthermore, Okojie, (2010) argues that insignificant penalties stipulated by the OSH laws do not guarantee compliance in any way, suggesting that penalties should serve as indirect instruments for enforcement of OSH regulations; that way, it can serve as deterrent to offenders. Diugwu et al., (2012) argue that lack of resources can hinder occupational safety and health (OSH) management efforts. Conclusively, strict enforcement, weak national occupational health and safety standards, lack of adequate information, bribery and corruption, management commitment, weak legal structure, beliefs, lack of funding, and lack of awareness and improper medium for information dissemination are some of the challenges reviewed.

Other challenges of H & S measures implementation for construction SMEs include the following:

- I. Poor Supervision and Monitoring
- II. Inadequate training and retraining

- III. Low capitalization
- IV. Poor policy implementation
- V. Poor budgetary provision and implementation
- VI. Lack of enabling environment (Social, Political, Legislative, macroeconomic and bureaucratic obstacles).

#### **Strategies for improving the level of implementation of safety measures on construction sites**

Ghousi et al., (2018) described a safety program as a fundamental and necessary basic program for building construction projects. Ghousi et al. (2018) further explained that a successful safety program must have three essential parts: Personal Protective Equipment (PPE), safety measures or Collective Protective Measures (CPM) and safety training. Construction sites are dangerous places, and as such first aid and rescue equipment should always be available. Work in the construction industry is tedious and involves much manual or physical activity. It is also hazardous and dirty and therefore good welfare facilities not only improve workers' welfare but also enhance efficiency. In order to reduce hazards and accidents in a construction site, health and safety risk assessment is an important measure (El-Mashaleh 2010). Safety strategies reviewed include safety program, first aid kit and accident reporting, welfare facilities, safety promotion, safety personnel salary, health and safety file, health and safety risk assessment, site layout and planning, and working environment (Jannadi & Bu-Khasim 2002).

Other strategies for improving the Level of Implementation of Safety Measures on construction Sites include;

#### **First aid kits and accident reporting**

According to Nzuve & Lawrence (2012) Construction sites are dangerous places, and as such first aid and rescue equipment should always be available. What is needed depends on the size of the site and the numbers employed, there should be a blanket and a stretcher. On large sites with more than 200 employees, 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 to a nationally recognized standard. On day-to-day works procedures, an accident register book should be kept at the site, in which all types of minor injury such as bruises, to major accidents should be recorded (HSE 1998).

Most of the construction sites that had first aid boxes were ill equipped with only spirit, bandage, paracetamol and cotton wool. First aid is a lifesaving exercise which is taken for granted on the sites visited and shows that workers are exposed to danger and risks when injured.

#### **Welfare facilities**

Work in the construction industry is tedious and involves much manual or physical activity. It is also hazardous and dirty and therefore good welfare facilities not only improve workers' welfare but also enhance efficiency. Welfare facilities such as the provision of drinking-water, washing, sanitary and changing accommodation, rest-rooms and shelter, facilities for preparing and eating meals, temporary housing, assistance in transport from place of residence to the work site and back, all help to reduce fatigue and improve workers' health.

Therefore health and safety measures employed on construction sites are inadequate and fail to meet the required standards. The culture and attitude of construction workers and the site supervisors about health and safety often condone risk taking and unsafe work practices. Lack of proper information and ignorance are also to blame for the poor safety measures in construction sites. For instance some workers felt that the safety equipment's such as hard helmets and reinforced boots are too cumbersome and uncomfortable.

#### Health and safety risk assessment

In order to reduce hazards and accidents in a construction site, health and safety risk assessment is an important measure. In the context of health and safety, common definitions used for risk are that: risk is the likelihood of a substance to cause harm; and risk is a combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure.

The Health and Safety Executive (HSE,1998) defined risk assessment as a process that identifies the hazards associated with particular activities/tasks, evaluates the effects of exposure to these hazards and implements the measure needed to control the risk of injury/ill health to as low a level as possible.

### RESEARCH METHODOLOGY

This study adopted a quantitative research approach this is due to high rate of accidents that occur in the construction SMEs. The study encompassed a review of literature survey from journals, conference papers and past projects to assess level of implementation of safety measures for small and medium sized construction firms. Data were collected from both primary and secondary sources. The use of questionnaire was employed to gather data for this study. Descriptive statistics comprising of Relative Importance Index (RII) and Mean Item Score (MIS) were employed to analyse the data collected in order to achieve the research objectives. The use of RII and MIS for the analysis of data in this study is based on the formula depicted in Equation 3.1 and 3.2 respectively.

$$RII = \frac{\sum W}{A \times N} \dots\dots\dots (3.1)$$

Where;

$\Sigma$  = Summation, W = the weights of every one of the factors given by respondents and it was in the range of (1 - 5), (A=5) the largest value of weight (i.e. highest factor) and finally N refers to the Total number respondents.

$$MIS = \frac{\sum W}{N} \dots\dots\dots (3.2)$$

Where;

$\Sigma$  = Summation, W = Weight, and N = Total number respondents

The decision rule employed for the RII and MIS analysis is summarized in Table 3.

**Table 1: Decision rule for analysis of data**

SCALE	Cut-Off Point		Interpretations		
	<i>R/I</i>	<i>MIS</i>	<i>Level of Awareness</i>	<i>Level of Severity</i>	<i>Level of Effectiveness</i>
5	0.81 - 1.00	4.51 - 5.00	Highly Aware	Very Severe	Very Effective
4	0.61 - 0.80	3.51 - 4.50	Aware	Severe	Effective
3	0.41 - 0.60	2.51 - 3.50	Fairly Aware	Fairly Severe	Fairly Effective
2	0.21 - 0.40	1.51 - 2.50	Unaware	Less Severe	Less Effective
1	0.00 - 0.20	1.00 - 1.50	Highly Unaware	Least Severe	Least Effective

Source: Adapted and modified from Shittu et al. (2015a)

**Reliability test**

Cronbach's Alpha test was used to measure the internal consistency or reliability of a set of items and used when the multiple Likert's scale is adopted in a questionnaire survey. Cronbach's Alpha Test was carried out to ascertain the reliability of the quantitative data collected for the study. Table2 Contain result of the reliability checks for the various sections of the questionnaire. The Cronbach's alpha value of the variables tested ranges between 0.299 - 0.802, with an average of 0.587.

**Table 2 Results of Cronbach's Alpha for Reliability Test**

S/No.	Variables Tested	Cronbach's Alpha	No. of Items
1.	Identify and assess the effective safety measures required on construction sites by SMEs	0.661	15
2.	Examine the challenges affecting the implementation of safety measures on construction sites by SMEs	0.299	10
3.	Suggest strategies for improving the level of implementation of safety measures on construction sites by SMEs	0.802	15
	Average	0.587	

Source: Researcher's field survey (2020)

**RESULTS AND DISCUSSIONS**

This section describes and presents the analysis and interpretation of research data. The research which adopts a primarily sourced data using a well-structured questionnaire had been analysed. The results of the descriptive analysis are presented in Table 1 – 3. The discussion for each Table thereafter follows below.

**Result and discussion for effective safety measures required on construction sites**  
 Table 3 presents the MIS result of the analysis on the level of effectiveness of safety measures required on construction sites.

Table 3 reveals that the use of personal protective clothing (PPC) with MIS of 4.54 and standard deviation of 0.504, safety policy with MIS of 4.15, and standard deviation of 1.010, use of first aid kits with MIS of 4.11 and standard deviation of 0.849, health and safety training with MIS of 3.98 and standard deviation of 0.906, and good working environment with MIS of 3.96 and standard deviation of 0.965 are the effective safety measures required on construction sites. This is in line with the findings of El-Mashaleh et al. (2010) where they found that undertaking regular

meeting on safety at the project level, ensuring adequate measures on safety, making available personal protection equipment (PPE), putting up safety signs and posters, undertaking regular safety inspections, establishing a system for acknowledging and awarding safe conduct are essential for safety performance on construction sites.

**Table 3: Effective safety measures required on the site of an organisation**

S/No.	Effective Safety Measures	MIS	SD	Rank
1.	Use of personal protective clothing (PPC)	4.54	0.504	1st
2.	Safety policy	4.15	1.010	2nd
3.	Use of first aid kits	4.11	0.849	3rd
4.	Health and safety training	3.98	0.906	4th
5.	Good working environment	3.96	0.965	5th
6.	Safety personnel	3.80	0.934	6th
7.	Health and safety risk assessment	3.76	0.872	7th
8.	Welfare facilities	3.70	0.866	8th
9.	Safety inductions	3.63	1.040	9th
10.	Use of posters and other signs to give safety education	3.57	1.068	10th
11.	Display of safety information clearly	3.50	0.888	11th
12.	Keep safety procedures updated	3.41	0.956	12th
13.	Safety meetings	3.37	1.082	13th
14.	Alcohol-and substance-abuse programme	3.24	1.251	14th
15.	Health and safety warning signs	3.22	0.917	15th
	Average	3.73		

Source: Researcher's data analysis (2020).

**Result and discussion for challenges affecting the implementation of safety measures by construction small and medium sized enterprises**

Table 4 Shows the RII result of the identified challenges affecting the implementation of safety measures by construction small and medium sized enterprises.

**Table 4. Challenges affecting the implementation of safety measures by construction small and medium sized enterprises**

S/No.	Challenges	RII	SD	Rank
1.	Management commitment	4.63	0.488	1st
2.	Low level of compliance with occupational health and safety regulations	4.24	0.848	2nd
3.	Weak national OHS standards	3.96	0.759	3rd
4.	Lack of adequate information on OHS	3.59	1.166	4th
5.	Weak legal structures	3.54	0.982	5th
6.	Awareness and proper medium of information dissemination	3.39	0.930	6th
7.	Provision of safety facilities	3.26	0.976	7th
8.	Lack of funding for inspecting and H&S plan in a construction sites	3.04	0.868	8th
9.	Bribery and Corruption	2.80	1.067	9th
10.	Absence of safety representatives	2.74	1.104	10th
	Average	3.52		

Source: Researcher's data analysis (2020)

Table 4 revealed that the most severe challenge affecting the implementation of safety measures by construction SMEs are management commitment with MIS of 4.63 and standard deviation of 0.488, low level of compliance with occupational health and safety regulations with mean score of 4.24 and standard deviation of 0.848, Weak national OHS standards with mean score of 3.96 and standard deviation of 0.759, Lack of adequate information on OHS with mean score of 3.59 and standard deviation of 1.166, and Weak legal structures with mean score of 3.54 and standard deviation of 0.982. This agrees with the findings of Nzube and Lawrence (2012) which revealed that low level of inspection and examination of workplaces might determine the level of compliance with occupational safety and health (OSH) regulations as evident in workplaces. And contradict with the findings of Idubor and Osiamoje (2013) which assert that bribery and corruption are the biggest hindrances to proper compliance with occupational safety and health (OSH) regulations in Nigeria.

**Result and discussion for strategies for improving the level of implementation of safety measures on construction sites**

Table 5 shows the MIS result on the strategies for improving the level of implementation of safety measures on construction sites.

**Table 5 Strategies for improving the level of implementation of safety measures on construction sites**

S/No.	Strategies	MIS	SD	Rank
1.	Provision of personal protective equipment	0.94	0.502	1st
2.	Provide first aid supplies	0.88	0.774	2nd
3.	Use of Building codes of practice	0.86	0.628	3rd
4.	Training and Competence	0.85	0.801	4th
5.	Communication of H&S policy and programs to staff	0.84	0.778	5th
6.	Deal with any hazards promptly	0.83	0.957	6th
7.	Training and Enforcement	0.81	0.759	7th
8.	Risk Awareness, management and tolerance	0.80	0.989	8th
9.	Safety inspection	0.79	0.904	9th
10.	Keep safety procedures updated	0.78	0.948	10th
11.	Meet fire safety standard	0.77	0.749	11th
12.	Strategic safety communication	0.75	0.899	12th
13.	Collective protective equipment such as scaffolding, safety nets fencing and accessibility	0.74	0.779	13th
14.	Display safety information clearly	0.72	1.085	14th
15.	Worksite organization	0.71	0.981	15th
	Average	0.81		

Source: Researcher's data analysis (2020).

Table 5 which highlights the strategies used for improving the level of implementation of safety measure identified provision of personal protective equipment (PPE) with the RII of 0.94 and standard deviation of 0.502, provide first aid supplies with the RII of 0.88 and standard deviation of 0.774, use of building codes of practice with the RII of 0.86 and standard deviation of 0.628, training and competence with the RII of 0.85 and standard deviation of 0.801, and communication of H&S policy and programs to staff with the RII of 0.84 and

standard deviation of 0.778 as the most effective strategy to improve the level of implementation of safety measure. This corroborate with the findings of Ikpe (2010) where he asserted that provision of personal protective equipment can be argued to be the most significant element in terms of improving the level of implementation of safety measure.

In view of that the following observations have been made;

- I. Analysis from table 3 which highlights the effective safety measures required on construction site revealed that the most effective safety measures implemented on their site(s) are; use of personal protective clothing (PPC), safety policy and use of first aid kits.
- II. Table 4 which identified the challenges affecting the implementation of safety measures by construction small and medium sized enterprises, and revealed that the most severe challenge affecting such implementation is management commitment Other severe challenges identified during the study include; is low level of compliance with occupational health and safety regulations., lack of adequate information on OHS, weak national OHS standards, weak legal structures, awareness and proper medium of information dissemination, provision of safety facilities, lack of funding for inspecting and H&S plan in a construction sites, bribery and corruption and absence of safety representatives.
- III. Table 5 which highlights the strategies used for improving the level of implementation of safety measure identified provision of personal protective equipment as the most effective strategy to improve the level of implementation of safety measure.

It was shown from the results of the MIS and RII analysis that the use of personal protective clothing is an effective measure required on construction sites and the most severe challenge affecting the implementation of safety measures by construction SMEs is management commitment. Provision of personal protective equipment (PPE) was identified as the most effective strategies used for improving the level of implementation of safety measure identified.

## CONCLUSIONS

### Conclusions and recommendations

Upon analysis, this research brought forth the following conclusions:

- Use of personal protective clothing (PPC), safety policy, use of first aid kits, health and safety training and good working environment are the most required safety measures required on construction sites of SMEs.
- Management commitment, low level of compliance with occupational health and safety regulations, weak national occupational health and safety (OHS) standards, lack of adequate information on occupational health and safety (OHS), and weak legal structures are the most severe challenges affecting the implementation of safety measures by construction SMEs.



- Provision of personal protective equipment, provision of first aid supplies, use of building codes of practice, training and competence, and communication of H&S policy and programs to staff are the most effective strategies that can improve the level of implementation of safety measures on construction sites by SMEs.
- It can finally be concluded that there is low level of implementation of safety measures on construction sites by construction SMEs in Abuja.

In view of the aforementioned conclusions and based on the findings from this research, this study recommends the following:

- Construction firms should encourage and enhance the implementation/use of personal protective clothing (PPC), safety policy, use of first aid kits, health and safety training and good working environment so as to further reduce rate of accidents and unnecessary expenses that may amount as result of accidents.
- This study recommends that firms should have a more stringent in-house rules by incorporating the 'carrot and stick' approach (that is, a combination of reward and punishment) to induce good behaviour. In addition, reduction in cost of safety training, adoption of seminars and workshops to engage SMEs to be part of OHS activities, and ensuring the right safety culture for professionals/site workers is crucial for the advancement of OHS and for the wellbeing of the workers.
- This research recommend that construction firms should ensure provision of adequate personal protective equipment, provide first aid supplies, encourage the use of building codes of practice, facilitate staff training and competence, ensure proper communication of H&S policy and programs to staff, and conduct safety inspections at predetermined intervals so as to improve the level of implementation of safety measure on construction sites by SMEs.
- Finally, organizations and construction stakeholders should encourage, ensure, and promote the proper implementation safety measures as it is intended to support small and medium sized construction firms as well as professionals in identifying safety issues, putting measures in place to curb challenges inhibiting safety measures implementation and improving on the safety practices of small and medium sized construction firms in order to enhance firm's competitive advantage and boost performance.

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