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Preface

This proceeding is a compendium of presentations at the first National Conference on Environmental Design, tagged "EDCon 2021", organized and hosted by the Faculty of Environmental Design, Ahmadu Bello University, Zaria, from June 29th to July 2nd 2021. It is not in doubt that our faculty stands on a towering pedestal as the leading force in Nigeria in the field of Environmental Design studies, having been the first faculty of its type in Nigeria. It is worthy of note that our faculty, due to its being a repository of knowledge and experience spanning many years, has trained many professionals, academics and practitioners in environmental studies who are leaders in their careers and vocations.

Our conference invitation was seen as a homecoming call by many, based on our vantage position as earlier expressed, and there was a massive attendance and conference participation. This has led to a generation of over 77 scholarly articles presented at various syndicate sessions at the faculty. These papers were presented in all areas of environmental studies spread into the eight existing departments of the faculty as follows:

- Architecture
- Building
- Fine Art
- Geomatics
- Glass and Silicate Technology
- Industrial Design
- Quantity Surveying, and
- Urban and Regional Planning.

All the papers were subjected to peer-reviews by a team of assessors from amongst our seasoned academics before they were subjected to this electronic publishing. I assure all readers of this Book of Proceedings a pleasurable and rewarding reading on topical issues in environmental studies.

Professor Umar A. A. Sullayman
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REVIEWING THE NEED FOR IMPLEMENTATION OF SAFETY MEASURES FOR SMALL AND MEDIUM SIZED CONSTRUCTION FIRMS IN ABUJA, NIGERIA

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ABSTRACT

Construction sites have been identified as one of the most hazardous places to work due to high level of health and safety risks. Safety measures in Nigeria lack necessary implementation due to absence of proper monitoring system, low level of safety awareness and inadequate support from safety managers with particular emphasis to the small and medium sized construction firms and thus leading to increase in accidents on construction sites and cost of compensation to injured *workers*. This study therefore reviewed level of implementation of safety measures for small and medium sized construction firms in Abuja, Nigeria with a view to improving the safety performance of the small and medium sized construction firms. Using information obtained from relevant literature reviews which are acquired from textbooks, journals, conferences and online publication. Primary and secondary data were obtained from various constructions SMEs through a well-structured questionnaire distributed to 353 randomly selected respondents with a response rate of 56%. Mean Item Score (MIS) and moment correlation analysis were employed for the analysis of data. The findings revealed that use of Personal Protective Clothing (PPC) is the most effective safety measure required on construction sites. It was also found that low level of compliance with occupational H&S regulations is the most severe challenge affecting the implementation of safety measures by construction SMEs. In the light of the findings, this study concludes that provision of personal protective equipment is the most effective strategy that can improve the level of implementation of safety measures on construction sites. Therefore, this research recommends that construction SMEs should improve the compliance with H&S regulations of firms by ensuring that all the safety measures are restructured to be in line with H&S regulations. Organizations and construction stakeholders should also put measures in place to curb challenges inhibiting safety measures implementation and improve on the safety practices of construction SMEs in order to enhance firm's competitive advantage and boost performance.

Keywords: Construction firms, Nigeria, Safety measures, SMEs

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). Furthermore, Diugwu and Baba (2012) stated 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, Jones and Umeadi 2014). Therefore, despite the importance and attractiveness of the industry it is considered risky with frequent and high accident rates, ill health problems to workers, practitioners, end users and the public (Kadiri *et al.*, 2014).

Accident and injury rates in developing countries such as Nigeria are generally considered to be higher than in the developed countries (Ibijoju, 2016). This has been attributed to lack of appropriate consideration of H&S management practices in construction project delivery process (Belel and Mahmud, 2012). Ibukun and Olaotan (2012) noted that safety should be a major concern for employers, but in Nigeria, it is believed that only the large sized construction industry has employees' safety as a major concern.

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. 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.

Odediran, *et al.*, (2012) and Odediran *et al.*, (2013) identified five (5) organisational characteristics in the study of the business structure of indigenous firms in Nigerian construction industry. These organisational characteristics identified are firms size (which was determined using annual turnover, staff strength and equipment capacity), area of specialisation (which was grouped into building, civil, and industrial/heavy engineering), type of client (which was grouped into public, federal ministries/Parastatals, state ministries/Parastatals, local governments, private, individual/institutions, international agencies and non-governmental organisations) business type (which was grouped in to build only, design and build or package deal, design, build & finance and design, build and operate), project funding arrangement (which was grouped into bank loans, retained earnings, share capital and mobilisation) and years of experience of firm.

One of the main differences between large organizations and SMEs is the financial resource capability and availability towards the implementation of OHS management practices (Kheni, *et al.*, 2010; Surienty, 2012). Large organizations often have strong financial capability that could ensure good implementation of safety management systems, while most SMEs have constrained financial capability that disables the commitment on planning and implementing safety management practices and programmes.

Adeogun and Okafor (2013) asserted that the implementation and adoption of Occupational Safety and Health (OSH) in Nigeria is still at preliminary stages. Similarly, Diugwu (2012) and Okolie (2012) stated that OSH in Nigeria has received little attention from the government. The ill-fated OSH regulatory system in the country does not encourage mandatory reporting of

accidents. However, Diugwu *et al.*, (2012) blamed the gap in the implementation of OSH regulatory system in Nigeria on the dysfunctional H&S laws in the country. As a result, the construction industry in the country is clearly unregulated in relation to OSH because it is not covered by the existing Factories Act LFN 2004 (Idoro 2008; Diugwu *et al.*, 2012), yet some construction firms especially multinationals adopt international legislation (Idoro, 2011).

Windapo and Jegede (2013) noted that multinational construction firms have very good system in place for managing H&S thus have better H&S records. Some of these firms develop policies and safety programs so as to protect their reputation in these developing countries and to reap the benefits of improved H&S such as higher productivity (Koehn *et al.*, 2013). However, the implementation of the standards and/or legislation is at the discretion of the adopters (Idoro 2008). Koehn *et al.*, (2013) also observed that framework for the implementation of safety measures is generic and 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. This brings about ineffective cost performance of projects

Thus, this study review literature on the implementation of safety measures for the small and medium sized construction firms in Nigeria. The specific objectives is to examine the effective safety measures required on construction sites and to Examine the strategies for improving the level of implementation of safety measures for small and medium sized construction firms in Abuja

REVIW OF RELATED LITERATURE

Occupational Health and Safety in the Nigerian Construction Industry

Occupational Health and Safety (OHS) is well known in the construction industry as one of the most important subjects by its very dynamic nature. The implementation of OHS measures in the industry is critical for the protection of all project stakeholders (Lingard, *et al.*, 2015). Occupational health and safety has been defined by the International Labour Organization (ILO) 2012 as: *"The prevention and maintenance of the highest degree of physical, mental and social well-being, the prevention of ill-health among workers caused by their working conditions, The protection of workers from factors adverse to their health in their employment, and the placing and maintaining workers in occupational environments adapted to their individual and psychological conditions."*

Over the years, the construction industry has recorded one of the poorest occupational safety and health records as compared to the other industries (Lingard, 2013; Sherratt, *et al.*, 2015; Choe and Leite, 2017). The high number of accidents (i.e. death, permanent disability and non-permanent disability) reported has been explained by the natural characteristics of construction work environment (Choe and Leite, 2017). 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). According to Arewa and Farrell (2012), Small and Medium-Sized Enterprises (SMEs) in construction accounts for 90% of the fatalities at work. Evidence has also shown that construction SMEs are the major contributor to the high incidence of serious injuries and fatalities (Zhou, *et al.*, 2015). Furthermore, there is evidence that accident rate is higher in small construction businesses than in larger ones (Kheni *et al.*, 2010).

The Concept of Small and Medium-Sized Construction Firms

There has been no commonly accepted definition of SMEs (Curran and Blackburn 2001; Harper 1984, Storey 1994, Walters 2001). Definitions vary from one country or industrial

sector to another. Researchers and governments employ various definitions to suit their purposes

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. Similarly Onugu, (2005) gave the following definitions:

- i. Small Enterprises: An enterprises whose total cost including working capital but excluding land is between ten million naira (N10,000,000) and one hundred million naira (N100,000,000) and/or a workforce between eleven (11) and seventy (70) full-time staff and/or with a turnover of not more than ten million naira (N10,000,000) in a year.
- ii. Medium Enterprises: A company with total cost including working capital but excluding cost of land of more than one hundred million naira (N100, 000,000.00) but less than three hundred million naira (N300, 000,000.00) and/or a staff strength of between seventy one (71) and two hundred (200) full-time workers and/or with an annual turnover of not more than twenty million naira (N20, 000,000.00) only.
- iii. 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.

Effective Health and Safety Measures Required on Construction Sites

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

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.

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.

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.

Strategies for Improving Level of Implementing Safety Measures

Poor safety practices thrive in Nigerian construction for instance failure to provide or the use of PPE, use of defective tools and failure to secure and warn against inherent hazards (Agwu *et al* 2014). Hence past studies have underscored the level of safety commitment of senior and middle management of many Nigerian construction industry (Olotuase 2014; Dodo 2014). As the authorities are less willing to take steps to tackle shoddy practices, accidents and other risks persist

Personal Protective Equipment (PPE)

Personal Protective Equipment are all equipment which is envisioned to be held or worn by a worker at work and which protects him against one or more risks to his health or safety, example include: safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. The provision of PPE can be argued to be the most significant element in terms of costs of accident prevention and prevention of accidents on construction sites (Ikpe, 2010). Therefore adequate provision of these equipment's can help contribute to prevention of accidents on construction sites.

Safety Training and Knowledge

Training Regulation 28 under Health and Safety Work Act (HSWA) 1974 provides for a much wider provision of training for persons carrying out construction work (Ferret and Hughes, 2016). All personnel must have sufficient training, technical knowledge or experience to ensure the reduction of risk of injury to others (HSE, 2003). Training provides more directive instruction as to how an act should be performed. It is therefore suggested that training will enable them to recognize, analysis and establish accident prevention and control measures. Thus training is crucial to the prevention of accidents on construction sites (Ikpe, 2009).

First aid Kits and Accident Reporting

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.

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. Table 1 presents a summary of some safety measures on construction SMEs in Nigeria and other developing countries

Table 1: Safety Measures for Construction SMEs in Nigeria and some Developing countries

S/no	Safety Measures	Authors
1	Use of Personal Protective Equipment (PPEs)	Idoro(2011),Umeokafor et al (2014),Agwu(2014),Olutuase (2014),Okoye(2016),Ezeokoli(2016),Adeogun Okafor(2013)
2	Safety Policy &Regulations	Idoro(2011),Okolie & Okoye(2016),Kalejaiye(2013),Akpan (2013),Windapo(2013), Umeokafor et al (2014),
3	Use of first aid kits	Misan et al (2012),),Ezeokoli(2016), Ezeokoli(2016),Ikpe(2010)
4	Safety Training &Knowledge	Idoro(2011),Umeokafor et al (2014),Agwu(2014),Olutuase (2014),Okoye(2016),Ezeokoli(2016),Adeogun Okafor(2013
5	Safety Risk Assessment	Rausad (2013),Mosaic(2016),Jones(2011),Windapo(2013),Ikpe(2010)
6	Safety Meetings &Inspection	Akinwale &Olusanya(2016), Mohammed(2015),Kochm(1999),Kheni(2008)

7	Safety Personnel	Eggerth et al (2018), Jones(2011), Agwu(2014), Muiruri & Mulinge(2014), Ochoa(2011),
8	Provision of Insurance cover for employees	
9	Safety Monitoring & Analysis	Kjellen (2011), Eggerth (2018), Haemeiainen et al(2016), Ochoa (2011)
10	Management Commitment	
11	Toolbox Safety talks	Belel & Mahmud (2012), Charenzehi & Ahankoob (2012), El-Mashalch et al (2010), Onyeozili (2005) Windapo(2013), Kalejaiye(2013), Diugwu (2012) Idoro(2011), Umeokafor et al (2014), Diugwu et al (2012)
12	Effective communication process	
13	Medical & Welfare facilities	Ikpe(2010), Eggerth et al (2018), Jones(2011), Agwu(2014),
14	Compliance with Occupational Health & Safety	

Sources: Researchers construct

METHODOLOGY

Data Collection and Analysis

Data used in this study basically consists of secondary sources as it is primarily a desk research. Thus, various journals, articles, conference proceedings, textbooks and thesis were perused. It must be emphasized that method adopted for data collection in this study is literature review. Upon extracting data from the review, inferences were drawn on construction SMEs and the need for implementing safety measures on them. This study used mean item score (MIS) to analyse responses from questionnaire

Inclusion Criteria

All literature collected involved safety in construction SMEs, this is to ensure that studies are searched as extensive as possible in order to reduce risk of publication bias and to identify relevant evidence as much as possible.

Search Strategy

Both Published and Unpublished literature were searched. Databases such as Science Direct, Taylor, Emerald Insight, Google and Google Scholar were consulted. The search expression include a combination of the following keywords: "Occupational Health and Safety", "Small and Medium sized firms", "Construction Industry" and "Abuja, Nigeria".

RESULTS/FINDINGS

Upon analysis and interpretation of the research data, this section seeks to discuss further the findings obtained from the study in relation to similar researches conducted in the past. In view of that the following observations have been made;

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), use of first aid kits, and safety policy. Results from the studies also revealed that the effects of implementation of safety measures on the cost of accident identified disruption of site activities as the most significant effect. Other significant effects identified are; personal injury claims, cost of workmen's compensation, time lost due to absence from work, loss of confidence and reputation, reduction in productivity, strained management-labour relationship, operational

inefficiency and ultimately decreasing performance become noticeable, cost of training and promotion and medical payments, insurance premium

The studies also revealed the effects of implementation of safety measures on the cost of accident identified disruption of site activities as the most significant effect. Other significant effects identified are; personal injury claims, cost of workmen's compensation, time lost due to absence from work, loss of confidence and reputation, reduction in productivity, strained management-labour relationship, operational inefficiency and ultimately decreasing performance become noticeable, cost of training and promotion and medical payments.

CONCLUSION

This study concludes that use of personal protective clothing (PPC), use of first aid kits, safety policy, safety personnel, health and safety risk assessment, health and safety training, good working environment, welfare facilities, and safety inductions are the implemented safety measures on construction sites by small and medium sized construction firms

On the effect of implementation of safety measures on the cost of accidents, this study concludes that; disruption of site activities, personal injury claims, cost of workmen's compensation, time lost due to absence from work, loss of confidence and reputation, reduction in productivity, and strained management-labour relationship are the effect of implementation of safety measures on cost of accidents.

This study also concludes that provision of personal protective equipment, communication of Safety policy and programs to staff, use of building codes of practice, collective protective equipment such as scaffolding, safety nets fencing and accessibility are the effective strategies used for improving the level of implementation of safety measures on construction sites by small and medium sized construction firms.

RECOMMENDATIONS

The study recommends the following:

- i. Construction firms should encourage and enhance the implementation/use of personal protective clothing (PPC), first aid kits, safety policy, safety personnel, safety risk assessment, health and safety training, good working environment, welfare facilities, and safety inductions as they have been identified from the results of the analyses using Mean Item Score as the effective safety measures required on construction sites to further reduce accidents and unnecessary expenses that may amount as result of accident.
- ii. This research recommend that construction firms should ensure provision of adequate personal protective equipment, communication of Safety policy and programs to staff, encourage the use of building codes of practice, provide collective protective equipment such as scaffolding, safety nets fencing and accessibility, provide first aid supplies, deal with any hazards promptly, training and enforcement risk awareness, management and tolerance, and conduct safety inspections at predetermined intervals so as to improve the level of implementation of safety measure on construction sites by SMEs.
- iii. Finally, organizations and construction stakeholders should encourage, ensure, and promote the proper implementation of safety measure 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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