

Current Health and Safety practices and their impact on accidents on Nigerian Construction Sites

Abstract

Accidents on construction sites in Nigerian have caused and still cause devastating effects on property and the lives of workers, as well as affecting the delivery of projects on time and within budget. However, little has been done to address this critical issue. A study was thus carried out on the perceptions of professionals on the current Health and Safety practices on Nigerian construction sites. A quantitative method was used where a survey questionnaire was administered to potential respondents. A minimum of 30 responses was set as a threshold that would enhance statistical analysis. 150 questionnaires were administered and 100 responses were ultimately collected; representing a response rate of 66.6%. The data was analysed by descriptive and inferential statistics to reveal that poor Health and Safety (H&S) practices are evident at Nigerian construction sites, particularly: the lack of commitment to safety by stakeholders, lack of Governmental support, little or no diligence while enforcing safety regulations on site and lack of safety education programmes on site. Also, accidents can be attributed to many sources, chiefly: non-compliance with safety regulations, carelessness of workers, weak coordination of workers on site and ineffective safety culture. The safety performance of many projects in Nigeria is still below par. As the causes of accidents in Nigerian construction are many, likewise efforts by many stakeholders are needed to address the issue. Government and professional bodies and contractors can play leading roles in bringing improvements.

Keywords: Accidents, Construction projects, Construction workers, Health and Safety, Occupational hazards, Safety regulations.

1.0 INTRODUCTION

The Construction industry around the world is considered as one of the most hazardous (HSE 2011; Manu 2012). This is evident through statistical records, which show that, not less than 60,000 fatal accidents occur each year on construction sites (Fewings, 2013). This view conforms to the global Injuries board's records (Injuries Board, 2009). Nevertheless, the construction industry is recognized as one of the most significant sectors of an economy due to its contribution to the Gross Domestic Product (GDP) of a Nation (Al-Kilani, 2011). Indeed, the construction industry is economically and socially indispensable because, it provides valuable facilities for everyday use like homes, buildings and transport infrastructure (Lingard and Rowlinson, 2004). However, the rate of accidents in construction-centered activities is very alarming as it highly surpasses any other industry (Kadri *et al.*, 2014).

A number of studies have revealed that accidents and injuries in construction in many developing countries such as Nigeria are far higher and worse than in developed countries such as the UK, US, China and Australia (Idoro, 2007) because, the later have active and fully functioning health and safety regulatory bodies and employ innovative and workable safety methods on construction sites. According to Awodele and Ayoola (2005) several hundreds of construction workers are killed each year on Nigerian construction sites, with many more rendered temporarily or permanently disabled. Dodo (2014), reported that accidents on Nigerian construction sites still cause devastating effects on the lives of workers, properties, project delivery times, and have also undercut the completion of projects within defined budgets and achievement of specifications. This calls for immediate efforts to identify and explore innovative ways of promoting safety on construction sites.

An important aspect of safety is accidents (Bashir, 2013) which can disrupt productivity and cause damages (Kadri *et al.*, 2014). Accidents are often unplanned and unexpected, and mostly attributable to human mistake (Aniekwu, 2007). These mistakes may emanate from the designer's negligence, contractor's lack of coordination, the project manager's lack of planning, the lack of control by relevant authorities and the recklessness of workers (Ward, 1979). In addition to people, systems and environments contribute to causing accidents (Kadri *et al.*, 2014, p.67). It is against this understanding that the research discussed in this paper sought to investigate the current health and safety practices on Nigerian construction sites and their inherent impact on the prevalence of accidents. Before the findings of the research are presented, a literature review is provided as well as a research methodology. The results are then presented and discussed before wrapping up.

2.0 LITERATURE REVIEW

2.1 Health and safety in the construction industry

Health and Safety (H&S) is defined as organized efforts and procedures to reduce the amount of accidents and exposure to harmful situations and substances in every workplace (Lingard and Rowlinson, 2004). In construction, it is mainly a way of preventing people from being injured or killed on site through providing appropriate precaution and a satisfactory working environment (Okeola 2009). From these definitions, it is clear that H&S is an inevitable aspect of every project that involves human participation and particularly the built environment, which consists of conglomerations of people from different disciplines and backgrounds working together at each stage of a project in order to deliver it successfully. However, the nature of onsite construction work makes its management of H&S more difficult than other industries.

Poor safety practices on construction sites impact on the working population in both developed and developing countries. For instance, in 2001, the National Safety Council (NSC) in the United States of America revealed that injuries in the construction industry accounted for 11% of all work related injuries and 30% of all fatalities (Eppenberger and Haupt, 2003). This situation was compounded by the inadequate use and supply of Personal Protective Equipment (PPE) to workers. Likewise, Gibb *et al.*, (2006) indicated that in the UK construction industry, which is regarded by some scholars as one of the safest in Europe, one-third of all work fatalities happen during construction activities, and employees in construction are six times more likely to be killed onsite than employees in other sectors. The UK Health and Safety Executive (HSE) which was created to help enforce H&S policies and regulations on construction sites reported that 94% of accidents that occur on site are due to inadequate risk management prior to or during construction work (Donaghy, 2009).

In developing countries such as Pakistan, Ghana and Nigeria, construction activities are more labour intensive when compared to many developed countries (Al-Kilani, 2011). This means that accidents are more prone to occur in these places. In addition, most construction companies in developing countries are not duty bound to establish a management system that could improve the safety standards on sites. This is worsened by the lack of Governmental support in controlling and enforcing safety regulations on site. For instance, in 2005, a four-storey building under construction collapsed in Port Harcourt city in Nigeria which led to the death of more than twenty workers (The Punch, 2005). After this incidence, it was reported that even though the building collapsed due to poor structural specifications, the situation could have been less severe if the workers were properly equipped with PPE or if there was adequate safety control in place by the authorities. Furthermore, in 2006, a crane accident in a

proposed High Court Building in Abuja, the capital of Nigeria, also claimed the lives of six workers (International Labour Organization, 2006). After investigation by the Federal Ministry of Labour and Productivity, the accident was attributed to lack of regard to H&S issues and lack of technical knowledge of the workers. These examples of accidents were preventable and the losses of lives were equally avoidable if more effective management and control systems had been implemented. A better aim however is to proactively prevent the occurrence of accidents rather than reactively investigate accident cases and pay compensation to the victims affected.

Besides impacting on human health, accidents pose a great threat to the industry's sustainability and economy as well because, they lead to loss of time and productivity and additional costs are incurred on projects through workers' compensation, medical treatment, higher insurance cost, litigation costs and implementation of rehabilitation programmes (Abdelhamid and Everett, 2000; Shafer *et al.*, 2008; Bashir, 2014). Consequently, Aniekwu (2007) stated that the Nigerian construction industry continues to incur huge financial losses due to the cost of accidents on sites. Thus, the prevention of accidents has now become an increasingly important conundrum to Nigerian industry professionals and researchers as well.

2.2 Health and safety regulations in the Nigerian construction industry

In Nigeria, H&S regulations at work dates back to 1958 when the Factories Act was established to ensure that the systems and structures for the inspection of safety procedures and reporting of accidents are adequately put in place (Dodo, 2014). The Act also defined the nature of punishments for acts of non-compliance. In 1987 the Factory Act was replaced with the Factories Decree No. 16 and Workman's Compensation Decree No. 17 (now Employee's

compensation Act). The aforementioned safety Acts became effective in 1990 (Nigerian Factories Act, 2002).

The Nigerian Health and Safety Commission is responsible for the enforcement of these regulations. The commission has representatives from various ministries such as; the Federal Ministry of labour and productivity, the Ministry of Works and Transport, the Ministry of Health, and the Ministry of Internal Affairs (Aniekwu, 2007). In the Nigerian context, a ministry is a Department of Government which helps the Executive to govern and administer. Agwu and Olele (2014) also added that, the Employee's Compensation Act is responsible for the enforcement of the welfare and safety regulations in Nigeria by appointing safety officers to inspect work in progress. In spite of these provisions and efforts made by the Nigerian Government, the enforcement of these laws has not been effective in identifying safety violators. Consequently, contractors are left to do as they please in managing safety matters regarding construction activities; accordingly the lack of stringent implementation of functional safety practices on site is bound to lead to an increase in the number of accidents and fatalities (Agwu and Olele, 2014). It is in the context of this state of affairs that the research being reported sought to explore the current H&S practices on Nigerian construction sites and their impact on the prevalence of accidents.

2.3 Health and safety practices in Nigeria

Various studies have been undertaken regarding the H&S practices in the Nigerian construction industry, and this has served as a benchmark for further investigations, especially the study being reported in this article. Oluase (2014) made use of key components of an effective safety management system to ascertain the safety practices of construction companies located in Jos city of Nigeria. He randomly drew a sample of 111

from a population of 244 senior management and junior staff. The components he studied were corporate safety leadership, risk management, safety training, operational control and effective response. The findings from Olutuase's (2014) research revealed that the level of safety commitment by the senior and middle management of a typical Nigerian construction company is far below acceptable global standards. This conclusion was attributed to inadequate and untimely supply of Personal Protective equipment (PPE) to workers and in most cases there was little or no investment in safety wares. This conclusion was substantiated by Agwu and Olele (2014) who stipulated that accidents on Nigerian construction sites are predominantly due to lack of PPE, failure to wear PPE, use of defective tools and failure to secure and warn against inherent hazards. Furthermore, Olutuase (2014) stressed that majority of construction companies in Nigeria lack the potential to identify all conceivable risk factors and hazards before or during construction activities. This implies that there is no practical preventive ability to plan and mitigate the occurrence of accidents. Likewise, it was reported that, more than 70% of workers in the Nigerian construction industry do not receive safety training on site (Olutuase, 2014). This obviously shows a lack of obligation and concern by the senior management and authorities.

A study conducted by Dodo (2014) on the application of H&S plan in Nigerian construction firms revealed that, the senior and middle staff of most Nigerian construction companies hardly comply with any health and safety plans during construction. This conclusion was also supported by Agwu and Olele (2014) who posited that, construction companies in Nigeria mostly push safety to the bottom rung of priorities when undertaking projects. Thus, in most cases, workers and contractors tend to ignore even the basic safety rules and regulations.

The absence of proper health and safety insurance for workers on Nigerian projects has also contributed to the deterioration and disregard to human lives and properties. When workers

are injured on a Nigerian construction site, their fate is left at the mercy of the top management to decide what they should be given as compensation. In most cases the workers' compensation may not even be enough to cater for their medical bills let alone sustain them during their recovery period. This is a situation of helplessness because "the position of the worker in relation to the contractor is similar to that of the contractor when he is dealing with the government" (Aniekwu, 2007, p. 82). In a situation where the authorities are not willing to take preemptive steps to tackle the issue of accidents, the professionals should be duty bound to incorporate a safety management system that aims at preventing accidents. This is because, the human lives involved in any fatal accident are irreplaceable, and likewise the loss of man-hours, materials and project progress. Griffith and Howarth (2001) advised that the best way to achieve a safe working environment is to make sure that H&S issues are properly assessed, planned, monitored and audited throughout the life cycle of a project (i.e. from inception to completion). Given the low level of implementation of H&S precautions in Nigerian construction, as discussed above, a research was undertaken to examine the issues further and to explore what can be done to improve practices in the country.

3.0 RESEARCH METHODOLOGY

A quantitative methodology was employed in this study to obtain empirical data. According to Fellows and Liu (2015), the quantitative method is usable for making generalisations across a population. The aim of the research being reported was to extend on previous studies and generalize the findings regarding the current H&S practices in the Nigerian construction industry. Hence the quantitative approach was adopted.

The primary data consisted of first-hand information collected from architects, builders, contractors, project managers, civil engineers and supervisors in the Nigerian construction industry. This was done with the aid of a structured questionnaire. According to Creswell (2013), structured questionnaires are particularly great in obtaining the relationship among sets of variables.

Prior to the distribution of the questionnaire, secondary or desktop data were collected from relevant literature including journals, books, research papers, conference papers, government reports and relevant electronic data, which informed the empirical study. Also, ethical permission was sought from the UK higher education institution where the research was carried out. This ethical procedure involved offering assurances by the researchers that no detrimental information will be sought and that respondents will not be embarrassed by participating in the study. The researchers also submitted the questionnaires to an officer of the institution for checking and approval before they were allowed to administer it.

A non-probability sampling approach was adopted where in particular, purposive and convenience samplings were used to access potential respondents. The selection of the aforementioned professionals for participation in the research (Purposive sampling) was based on relevance to the questions being asked in the study and the availability, accessibility and convenience to the researcher (convenience sampling). Further, Snowball sampling was also used to expand the sample size through the recommendations of some of those who had completed the questionnaire. Potential respondents that were receptive were asked to recommend someone else whom they thought could be approached for participation, thus intense snowballing was employed. A total of 150 questionnaires were ultimately distributed to professionals in the Nigerian construction industry, in three major cities, i.e. Abuja, Lagos

and Kano. These three cities were purposively chosen because of the numerous construction activities taking place there and thus availability of many potential respondents.

A researcher visited the offices of known professionals in the three cities and also attended professional conferences to distribute the questionnaire. Many phone calls and e-mail reminders to the respondents were made in a bid to generate many responses. This multi-approach worked, where 100 responses were ultimately collected back as valid responses, representing a 66.6% response rate. After the 100th response was obtained, the investigators felt that sufficient data had been collected to enable reasonable conclusions to be drawn from the data, so the research moved on to the analysis at that stage. According to Richardson (2005), response rates of 60% or more in social research surveys are both desirable and achievable. Thus, the 67% response rate in this survey was deemed acceptable and could be relied upon for generalisation.

The descriptive statistics generated provided clarity and understanding of the characteristics of the respondents as well as their underpinning impact on the opinions proffered on H&S. As the constructs assessed in the questionnaire were univariate, frequency distributions could be employed (De Vaus, 2002) to show how frequently each variable occurred on the basis of its scores (Denscombe, 2014). The measures of central tendency (i.e. mean and median) and dispersion (i.e. standard deviation) were used to analyse the relative comparisons between variables and allocation of priorities.

The respondents were asked to rank attributes on a scale of 1-5. The mean of the scores of the respondents for each attribute was calculated and used to rank the variables in this study, while the standard deviation (SD) was calculated to assess how far the scores were spread

from the mean. In an interim assessment, the SD may serve as a measure of agreement or reliability between the raters (Carr *et al.*, 1996). The mean and standard deviation scores of the rating of each H&S practice were assessed by the formulae (Leedy and Ormrod, 2015):

- Mean (M) = $\frac{\sum X}{N}$; where X is the score of an attribute by each respondent and N is the number of respondents.
- The Standard Deviation (SD) = $\sqrt{\frac{\sum(X-M)^2}{N}}$, where X, M and N are as given above.

While the analyses could be done manually, the Statistical Package for Social Sciences software (SPSS) and Microsoft Excel were utilized. These analytical tools are well known to provide accurate results.

3.1 Background of the respondents

Figures 1 and 2 indicate the percentage distribution of the respondents' years of experience in the built environment and the number of employees in their organization respectively. Figure 1 shows that 12% of the respondents' have 1-2 years of working experience, 27% of them have 3-5 years of experience, 38% have 6-10 years of working experience, 21% of the respondents have 11-15 years' working experience and, 2% of the total respondents have over 15 years of experience in the built environment. Effectively 61% of the people have experience in excess of 5 years and could report on H&S or accidents which happen regularly in construction. Hence, the information collected from most of the respondents can be sufficiently relied upon with confidence.

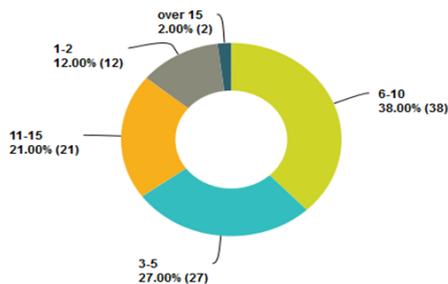


Figure 1: Duration of a respondent's experience (in years)

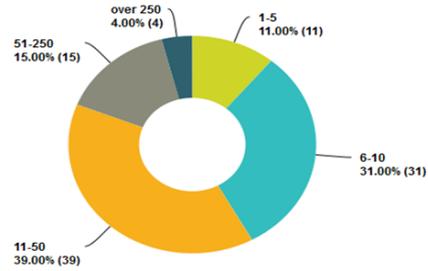


Figure 2: No of employees in the organizations where the respondents work

Figure 2 shows that, none of the respondents works in a one-man organisation and only 11% of them work in a company that employs less than 6 people. Thus the respondents are directly in contact with a moderate or large size workforce and can give credible information on their current safety practices.

Furthermore, the analysis showed that 47% of the respondents possess a Bachelor's degree, 28% have a Master's degree, 17% have studied up to HND level and 8% have a Doctorate Degree. So the respondents are educated and on face value could understand and answer the questions posed. On the issue of professional status, 70% of the respondents do not belong to any professional association while 30% belong to professional organizations such as the Council of registered engineers in Nigeria (COREN), Nigerian Institute of Building (NIOB), Nigerian Institute of Architects (NIA), Council of Registered Builders of Nigeria, International Project Managers Association of Nigeria (IPMAN), Nigerian Institute of Quantity Surveyors (NIQS) and Nigerian Society of Engineers (NSE). Overall, the respondents seem well informed.

4.0 MAIN RESULTS

4.1 Implementation of Health and Safety practices on Nigerian construction sites

One Table in the questionnaire listed H&S practices in the construction industry and asked the respondents to 'please rank them on a scale of 1-5 in terms of how they are often practiced in the Nigerian construction industry'. Five was the highest score in this regard. Table 1 concerns the informed views of the respondents where the top-5 ranked H&S practices on the basis of mean scores (M) were: 'effective communication among workers on site', 'provision of adequate shelters, employment of skilled workers, compensating accident victims and having safety policies within construction firms. However, the respondents identified that there is 'inadequate use of PPE', 'lack of proper safety training on site', 'lack of adequate supply of PPE', and 'non-introduction of innovative means of preventing accident on site'.

Furthermore, 'lack of H&S insurance', 'lack of sufficient governmental support in enforcing safety regulations on site', 'lack of safety commitment by stakeholders', 'lack of safety education program on site', and 'lack of alcohol and drug test were found to be at the bottom rung of H&S priorities in the Nigerian construction companies.

Table 1: Implementation of Health and Safety Practices on Nigerian Construction Sites

Health and Safety Practice	Response count	Score			Standard Deviation	Rank
		Minimum	Maximum	Mean		
Effective communication process	99	1.00	5.00	2.55	1.20	1
Provision of adequate workers shelters	99	1.00	5.00	2.51	1.09	2
Employment of skilled workers	99	1.00	4.00	2.39	0.83	3
Giving compensation to accident victims on site	100	1.00	4.00	2.36	0.70	4
Presence of safety policy within construction firms.	100	1.00	5.00	2.35	0.88	5
Provision of adequate sanitary stations	100	1.00	5.00	2.30	0.91	6
Adequate housekeeping throughout the site	98	1.00	5.00	2.27	0.96	7
Adequate design of safety equipment	100	1.00	4.00	2.26	0.80	8
Proper design of workplace prior to commencement of construction work	100	1.00	5.00	2.24	1.04	9
Provision of appropriate medical facilities	99	1.00	4.00	2.19	0.87	10
Adequate safety supervision on site	100	1.00	5.00	2.17	0.86	11
Proper investigation of accident by supervising contractors	100	1.00	5.00	2.17	0.54	11
Enforcement of safety policy on site	100	1.00	5.00	1.99	0.95	12
Adequate report of accident cases to relevant authorities	99	1.00	5.00	1.98	0.92	13
Adequate risk management and assessment before the commencement of construction work	99	1.00	5.00	1.88	0.93	14
Use of Personal Protective Equipment at all times during construction work	100	1.00	5.00	1.87	0.93	15
Provision of proper safety training on site	100	1.00	4.00	1.83	0.80	16
Adequate supply of personal protective equipment.	100	1.00	4.00	1.75	0.77	17
Introduction of innovative means of preventing accidents on site.	98	1.00	4.00	1.69	0.81	18
Provision of health and safety insurance	100	1.00	5.00	1.68	0.75	19
Sufficient Governmental support in enforcing safety regulations on site	100	1.00	4.00	1.58	0.75	20
Safety commitment	100	1.00	5.00	1.56	0.90	21
Organizing safety education programs	100	1.00	4.00	1.46	0.77	22
Carrying-out of alcohol and drug test	99	1.00	4.00	1.26	0.66	23

4.2 Causes of accident in the Nigerian construction industry

The questionnaire posed this question: *Below are major causes of accidents on sites. Please rank on a scale of 1-5 your level of agreement with the following statements in relation to*

Nigerian construction sites. Table 2 shows the causes of accidents given to the respondents for rating as well as the evaluation of their views. The top-5 ranked causes of accidents on Nigerian construction sites were: non-compliance to safety regulations, ‘carelessness of workers’, ‘poor coordination of workers’, ‘Poor safety culture’ and ‘lack of safety equipment’. At the other end, the least contributory causes of accident were identified to be environmental/weather effects, financial pressure, time pressure and the fragmented nature of the industry.

Table 2: Causes of Accident on Nigerian Construction Sites

Causes of Accident	Response count	Score			Standard Deviation	Rank
		Minimum	Maximum	Mean		
Non-compliance with safety regulations	100	2.00	5.00	4.64	0.56	1
Carelessness of workers	100	1.00	5.00	4.58	0.74	2
Poor coordination of workers	99	2.00	5.00	4.57	0.68	3
Poor safety culture	100	1.00	5.00	4.46	0.77	4
Lack of safety equipment	100	2.00	5.00	4.19	0.64	5
Poor work method	100	1.00	5.00	4.12	0.91	6
Poor housekeeping	99	1.00	5.00	4.05	0.72	7
Poor management	99	2.00	5.00	4.01	0.82	8
Poor risk management	99	2.00	5.00	3.97	0.63	9
Unsafe behavior	100	2.00	5.00	3.94	0.86	10
Poor attitude towards safety	99	2.00	5.00	3.93	0.74	11
Misuse of equipment	100	2.00	5.00	3.89	0.63	12
Poor site supervision	100	2.00	5.00	3.80	0.69	13
Recklessness	98	1.00	5.00	3.68	0.80	14
Lack of leadership	100	2.00	5.00	3.48	0.72	15
Poor safety performance	100	1.00	5.00	3.42	0.80	16
Poor communication	100	2.00	5.00	3.37	0.69	17
Error of judgment	100	2.00	5.00	3.26	0.67	18
Fragmented nature of construction work	100	1.00	5.00	2.83	0.84	19
Time pressure	99	1.00	5.00	2.40	0.83	20
Financial pressure	100	1.00	4.00	2.35	0.83	21
Environmental/weather effect	100	1.00	5.00	2.30	0.85	22

5.0 DISCUSSION OF THE RESULTS

5.1 Health and safety practices

From the result in Table 1, it can be argued that, in Nigeria, the enforcement of safety regulations, procedures and welfare of workers on construction sites has not been fully effective. Agwu and Olele (2014) had indicated that the enforcement of safety regulations by the relevant authorities in Nigerian is ineffective and thus safety violators are not punished. The result from this survey seems to also confirm an assertion by Olutuase (2014) that, lack of safety education programs to sensitize workers on their safety rights is the main problem.

According to Table 1, lack of proper safety training was identified among the least implemented practices. This finding conforms to Olutuase's (2014) assertion that, more than 70% of workers on Nigerian construction sites do not receive safety training prior to or during construction work. This shows a lack of regard and commitment to safety issues by stakeholders, which was also identified in this study as a potential weakness in the Nigerian construction industry. Consequently, the lack of concern about safety issues is most likely to bring about a domino effect of undesirable practices such as lack of adequate supply and use of PPE, low regard to alcohol and drug test, and lack of enthusiasm to introduce conventional or innovative means of preventing accidents on site. These aforementioned poor safety practices all feature in the bottom part of Table 1.

5.2 Causes of accidents

Table 2 shows the respondents agreeing that many factors score high in terms of contributing to accidents. Specifically, 36% of the causes of accidents were rated with a mean that was over 4.00 and only 18% of the causes had a mean that was less than 3.00, meaning that most of the causes contribute highly to the prevalence of accidents.

It can be observed in Table 2 that all the major causes of accident such as ‘non-compliance to safety regulations’, ‘carelessness of workers’, ‘poor coordination of workers on site’, ‘Poor safety culture’, ‘lack of safety equipment’, ‘poor work method’, and ‘poor housekeeping’ are mostly managerial or behavioral factors (i.e. unsafe acts) that constitute violations of acceptable procedures. Ridley and Channing (2003) had posited that most accidents are caused by unsafe acts. The finding of the current research shows that the problem still exists in Nigeria. Therefore, a solution where the management and coordination of workers are adequately addressed is useful for minimizing accidents on Nigerian construction sites.

The complexity and unique nature of construction activities increases the chances of frequent accidents on site because it involves activities that are associated with high physical labour, and use of techniques and machineries that expose employees to different forms of hazards. Accidents on sites are attributable to human mistakes (Abdul Hamid *et al.*, 2008). In order to address the issue of mistakes, the problem solver must know the underlying factors involved. Thus assessing and understanding the root causes of accidents on construction sites is quite important.

The result of Table 2 is consistent with other studies: Kadri *et al.* (2014), Kolawole (2014), Kolo (2015) and Orji *et al.* (2016). Kadri *et al.* (2014) reported the major causes of accidents on Nigerian sites to include: sheer carelessness, failure to adhere to safety rules and a poor safety culture. Similarly, Kolawole (2014) and Kolo (2015) identified a poor safety culture and shortage of safety equipment as the major causes of accidents on Nigerian construction sites. Furthermore, Orji *et al.* (2016) posited that the major factors that cause accidents on Nigerian sites were the use of unsafe/incorrect construction methods, lack of coordination of

workers on site, and poor housekeeping. As these are all recent studies, which corroborate each other, it seems that far reaching solutions to address H&S malpractices in the Nigerian construction sector are highly needed.

6.0 CONCLUSIONS AND RECOMMENDATIONS

On the issue of H&S practices on Nigerian construction sites, many poor practices were confirmed from the questionnaire survey. These included the lack of: ‘safety commitment by stakeholders’, ‘sufficient governmental support in enforcing safety regulations on site’, ‘alcohol/drug tests’ and ‘safety education programs on site’. These top causes have been proven in literature to have an undesirable domino effect on downstream causes and safety practices, because, when safety is pushed to the bottom rung of priorities, workers and contractors will tend to ignore even the basic safety rules and regulations. Consequently, the major causes of accidents on Nigerian construction projects were found to emanate from poor management related issues and behavioral factors, i.e. ‘non-compliance to safety regulations’, ‘carelessness of workers’, ‘poor coordination of workers on site’, ‘poor safety culture’, ‘lack of safety equipment’, ‘poor work method’, and ‘poor housekeeping’. To tackle these sorts of problems, it is more appropriate to employ an integrated system that concentrates more on management, training and coordination of workers.

Several recommendations, models and framework have been proposed in literature regarding H&S practices on Nigerian construction sites. Despite all these prevention strategies, accidents still cause devastating effects on property and the lives of workers and consequently impact negatively on project time and budget. This is because, the prevention strategies previously developed are rather theoretical, in the sense that they do not provide

practical step-by-step approaches on how to prevent accidents on site and also because their solutions concentrate only on safety prevention without taking into account other organizational drivers of time, cost and quality. Hence more and immediate efforts to explore innovative ways of promoting safety on construction sites are needed, because the human lives and time lost due to accidents are irreplaceable. Thus the following recommendations towards better and practical applications of H&S standards are proposed:

1. Appropriate authorities in Nigeria should tighten the enforcement of Health and Safety practices as well as develop mechanisms to inspect H&S on construction sites for continual improvement.
2. Safety training and awareness programs should be organized strategically before and during onsite construction activities in order to improve workers' skills in identifying hazards.
3. Contractors and other stakeholders should not only be inclined to maximizing profits from projects but rather committing themselves to maintaining utmost H&S standards.
4. All professionals in the Nigerian built environment disciplines need to employ innovative means of preventing accidents on site.
5. Many construction workers in Nigeria should belong to professional bodies.
6. Professional bodies in the built environment sector of Nigeria should play more proactive roles in advancing H&S in site practices. Things they could do include: the sanctioning of members who fail to implement H&S standards, the updating of H&S standards in Nigeria to match others like the CDM regulations in the UK, and to exert pressure on Government (bodies) so that the later can enforce H&S implementation fully in construction.

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