



# Evaluation of Safety Performance of Nigerian Construction Industry - A Case Study of the Niger Delta Region

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## Authors' contributions

This work was carried out in collaboration among all authors. Author TPU managed data storage, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors EON and CPE supervised the study, managed the analyses of the study and reviewed the drafts. Author EON designed the study, managed the literature searches. All authors read and approved the final manuscript.

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## ABSTRACT

The Construction industry contributes greatly to the socio economic development of any nation. Despite its importance, the Construction industry has been ranked as one of the most hazardous industries across the globe. This research evaluated the safety performance of Construction companies in the Niger Delta region of Nigeria and the effect of management commitment to safety management implementation on safety performance. Qualitative and Quantitative research survey method was deployed. The study population comprises nine construction companies in the Niger Delta, selected through stratified sampling method. 190 respondents were purposively selected from the nine construction companies for questionnaire administration. The collected data was analyzed descriptively to determine the safety performance of the industry. Pearson Moment correlation statistics was used to establish the relationship between management commitment to safety management implementation and safety performance in the industry. Obtained results revealed a moderate level of safety performance at leading indicators with average mean of 3.23

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$\pm 1.22$  in Construction industry in the Niger Delta region of Nigeria and poor level of safety performance at lagging indicators with average mean of  $3.42 \pm 1.26$ . Interestingly, a strong, positive correlation was identified between Management Commitment and Safety performance for leading indicators, which was statistically significant ( $r = .506$ ,  $n = 190$ ,  $p = .005$ ). A strong negative correlation however was seen between Management Commitment and Safety Performance for lagging indicators, which was statistically significant ( $r = -.408$ ,  $n = 190$ ,  $p = .003$ ). This implies that where top management is committed to implementation of occupational health and safety management in such organization, there would be better safety practices and reduced rate of accidents.

*Keywords: Safety performance; construction industry; Niger Delta; management commitment; health and safety.*

## 1. INTRODUCTION

The construction industry contributes to the growth and development of any nation. Activities in this industry are vital to the socio-economic development goals of the nation by providing shelter, infrastructure and employment. The construction industry contributes an average of over 3% to the annual gross domestic product and an average of about one-third of the total fixed capital investment in Nigeria according to Oladinrin et al. [1]. However, the construction industry has been ranked among the highest hazardous industries in the world. In countries with sufficient statistical data, for instance, Great Britain, fatalities in the construction sector covers 38% and is recorded to be the highest as compared to other sectors i.e. 29% for agriculture; 15% for both transport and storage, and manufacturing; and 12% for waste [2,3]. The industry alone produces 30% of all fatal industrial accidents across the European Union (EU), yet it employs only 10% of the working population [4]. In other countries like The United States of America (USA), the construction industry accounts for 22% of all fatal accidents, in Japan 30%-40% and in the United Kingdom (UK) 25% of the overall industrial accidents [5,6]. The report is even worse in developing countries like Nigeria where there are no reliable sources of data for such accident records [7]. Agwu & Olele [7] further asserted that constructions workers are three times more likely to be killed and two times more likely to be injured than their counterparts in other industries. Previous scholars have asserted that no reliable data on accident cases exists in Nigeria construction industry because contractors neither report accidents appropriately nor keep proper records on accidents [7,8].

Above assertions indicate a need for an insight into the health and safety practices in the

construction industry. Evidence have shown in many nations of the world that the level of safety attained in any working environment is affected by level of investment in safe working environment by the employers, employees and favorable government policies to ensure that every party play their own roles appropriately [9]. Recognizing the importance of adequate Health and Safety at construction worksites, Yakubu and Iyagba, (2011) stated the European Union enacted the "control of hazard on temporary and mobile construction sites directive that requires member states to adopt national laws to formalize a process to ensure that construction site safety is considered during the construction process [10]. According to Ezenwa (2011) as reported by Dodo [10], on any construction site, appropriate Health and Safety methods should be considered and used that will reduce or eliminate risk to death or injury. In Nigeria, the first effort in regulating and controlling Health and Safety at work was the Factories Act of 1958, but unfortunately there is lack of provisions for the enforcement of Health and Safety standards in construction industry [10]; This Act was repealed in 1987 and replaced with the Factories Decree No. 16 and Workman's Compensation Decree No. 17. Both were signed into law on 12th June, 1987, but became effective in 1990. The Federal Ministry of Labor and Productivity is responsible for the enforcement of the safety and welfare regulations in Nigeria. the state of occupational health and safety in industries. However, in Nigeria, Health and Safety has not been given the required attention to reduce or prevent hazards and accidents in construction sites, thereby posing serious threats to workers and even non-workers, creating the need for a quick solution for the issue to be addressed [10,11]. Previous studies have evidenced the unregulated nature of the Nigerian construction industry in terms of occupational health and safety as among the factors responsible for the poor state

of construction health and safety in Nigeria [12,8,13,14]. Some researchers revealed that most Nigerian based construction companies use construction safety management which does not comply with Occupational Health and Safety Management System (OHSMS) standard, poorly implemented, ineffective and poorly documented [11,15]. Accidents and injuries can be reduced in this industry if companies improve on safety practices. Other researchers revealed a poor safety culture in construction industry [7,11]. According to Agwu & Olele [7] a significant relationship exist between poor safety culture and increased rate of unsafe acts in the Nigerian construction industry. The researchers also revealed a significant relationship between poor safety culture and increased rate of fatalities in the Nigerian construction industry was identified by the study.

The International Labour Organisation (ILO) highlighted that implementing an occupational health and safety management system (OHSMS) is a way to improve the safety culture in organizations and at the same time comply with occupational health and safety regulations (Dias, 2005). However, the success of the OHSMS depends on the leadership, commitment, and participation of all levels and functions of the company [16]. According to O'Toole (2002), the management commitment and leadership to safety is among the highest factor that influences employee's perception of the safety and health management system in an organization. In view of the above, Silva (2020) asserted that it was important that future studies focus should be on issues related to the top management of the companies. Hence, this study seeks to evaluate the effectiveness of OHS management system on the level of safety performance in construction industry in Niger Delta, Nigeria with focus on the influence of management commitment to OHSMS.

### 1.1 Statement of the Problem

Despite the poor reporting system in Nigeria, recent studies have revealed a high rate of accidents and injuries in construction firms in the nation [11,12,2]. Unfortunately, the efficacy and accountability of The Federal Ministry of Labor and Productivity in the enforcement of occupational health and safety regulations in Nigeria are evidently questionable and poor [13]. Accidents in the industry can result to huge costs ranging from loss of life of dear family members, temporary and permanent disability which can

result to loss of job, compensation costs, and loss of reputation among others. These accidents can be prevented when organizations implement and comply to OHSMS standard.

### 1.2 Aim

The aim of this study is to evaluate the level of safety performance of Construction companies in Niger Delta region of Nigeria and the effect of management commitment to implementation occupational health and safety management system on the safety performance.

### 1.3 Objectives

The objectives set to achieve this aim include:

1. To evaluate the Safety performance of construction companies in Niger Delta
2. To determine the effect of management commitment to OHS management system on Proactive safety performance in construction industry.
3. To determine the effect of management commitment to OHS management system on Reactive safety performance in construction industry (i.e. accidents and injury rates)

### 1.4 Research Questions

1. What is level of safety performance in construction industry?
2. How does management commitment to safety affect Proactive safety performance in construction industry?
3. How does management commitment to safety affect accidents and injury rates in construction industry?

### 1.5 Hypothesis

#### Hypothesis 1

Ho: There is no relationship between management commitment to safety and Proactive safety performance in construction industry

H<sub>1</sub>: There is a relationship between management commitment to safety and Proactive safety performance in construction industry

#### Hypothesis 2

Ho: There is no relationship between management commitment to safety and the

rate of accidents and injuries in construction industry

H<sub>1</sub>: There is a relationship between management commitment to safety and the rate of accidents and injuries in construction industry

## 2. METHODOLOGY

### 2.1 Study Area

The study was carried out in the Niger Delta region of Nigeria. The Niger Delta region consists of nine oil producing states in the federation that include Rivers, Bayelsa, Delta, Edo, Akwa-ibom, Cross river, Ondo, Abia and Imo. The Niger Delta region is Nigeria's largest wetland, and the third largest wetland in the world, with a steadily growing population now put at over 40 million [17]. The presence of Oil and Gas industry has attracted huge economic growth and development of infrastructure thereby increasing the number of construction companies found in this region. High hazardous nature of the industry has put a lot of people at risk of OHS issues thereby making it necessary to carry out the study in this area.

### 2.2 Research Design

Qualitative and Quantitative research survey method was used for the study. Qualitative research survey design was used to provide a complete, detailed description of the research topic while Quantitative research survey was employed to generate numerical data or information that can be converted into numbers for statistical analysis. A descriptive research design was used for questionnaire administration to respondents purposively selected from nine construction companies. The questionnaire was designed to obtain a fair representation of the opinions of the sampled respondents using a five-point Likert scale type of values 1-5 whereby 1 represents never and 5 represents always. 238 copies of the questionnaire were distributed both manually and through online survey; 190 was retrieved (75% completion rate) and used for data processing.

Data collected from the questionnaire were analyzed using Excel spreadsheet and SPSS. Average criterion mean of the responses was calculated for each criteria/statement. Pearson Moment Correlation analysis was performed to evaluate the relationship between Management commitment to OHS management system

implementation and Safety performance of the industry.

Cronbach Alpha reliability test was done to test the instrument for consistency and precision. The questionnaire was considered reliable with a test score of 0.85.

### 2.3 Sampling Method

Stratified sampling was used whereby the study area (Niger Delta region) was divided into three sub regions (or Strata) based on the geographical locations. Sub-region 1 comprises of Edo, Delta, Ondo states; sub-region 2 comprises of Rivers, Bayelsa, Imo states while sub-region 3 comprises of Akwa ibom, Cross river and Abia states. Three construction companies were randomly selected from each sub region. A total number of nine (9) companies participated in the study. The respondents for this research were selected from top management and employees of the nine construction companies. Sample size was calculated using Taro Yamane formula.

$$n = \frac{N}{1 + Ne^2}$$

Where

n is the calculated sample size

N is the population size e is the level of significance (0.05),

It is assumed that responses obtained from the sample respondents would be representative of the opinions of all construction employees in Niger Delta region, Nigeria on safety performance in the Nigerian construction industry.

### 2.4 Variables

#### 2.4.1 Safety performance

Safety performance was evaluated using both Proactive and Reactive indicators. Proactive (Leading) indicators measure events leading up to injuries, illnesses, and other incidents and reveal potential problems in given safety and health program [18]. Some examples include HSE Training Hours, HSE Inspections, HSE Meetings, Emergency Drills, Management Meetings. Reactive (Lagging) indicators measure the occurrence and frequency of events that occurred in the past [19]. Such events are

accidents, injuries, fatalities etc. and they are measured as Fatal Accident FAT, Lost Time Incidences – LTI, First Aid Cases – FAC, Restricted Work Case – RWC, etc.

**2.4.2 Management commitment**

Management commitment to safety is a specific and critical component of safety climate, which refers to workers' perceptions of the degree to which their managers value and support safe working and are dedicated to workers' safety [20,21]. Management commitment is a major requirement of ISO45001:2018 standard implementation. According to Zohar [22] Managers communicate the relative priority of safety in light of competing demands to their employees, which affects employees' behaviors and ultimately, the likelihood of employee injuries.

**3. RESULTS AND DISCUSSION**

**3.1 Demography**

The distribution of sample respondents from the nine selected construction companies in Niger Delta region of Nigeria is as shown in Table 1 below. The results indicate that 20 (10.5%) of the respondents were Project managers, 89 (46.8%) of the respondents were Project supervisors 45(23%) of the respondents were employees from health and safety department and 36 (18.9%) of the respondents were from other departments.

**3.2 Safety Performance in Construction Industry**

Table 2 and Table 3 showed results on the safety performance in construction industry employing proactive and reactive indicators. Table 2.0

shows the criterion means of responses on each of the statements for Proactive indicators. High performance was indicated in 'OHS hazards are often reported by workers' with mean of 3.48 ± 1.28; and 'Emergency response drills are performed at planned intervals' with mean of 3.40±1.32. Construction companies are inconsistent with holding trainings on OHS for workers with an average mean of 3.38 ± 1.35, which agrees with [11] who asserted that lack of training of workers on OHS was a major problem in construction industry. The importance of OHS training to safety behavior was also reiterated by the researchers. Adequate helps workers to acquire the knowledge and skills required for their tasks, and informs them about potential workplace hazards [23]; such training is very effective in reducing the number of unsafe acts. Low performance was seen at 'Incidents are always reported when they occur' with mean of 2.55±1.22. This is in line with previous studies which reported that incidents are not usually reported in Construction industry in Nigeria [24,8] (Kostis et al., 2014). With an average criterion mean of 3.23 ± 1.22, the result indicates a moderate level of safety performance in construction industry. This however contradicts the reports of previous researchers that safety performance is poor in construction firms in Nigeria [7,2,15]. The reason for the contradiction could be that this study was done in a region where there is high presence of Oil and Gas industry so there is more awareness on OHS which is making the construction firms in the region improve on OHS practices. International Oil Companies in Niger Delta region are certified to OSHAS 18001and ISO 45001 standards which require that organizations ensure compliance of contractors to OHS practices. Contractors hence strive to improve on safety in their operations to remain competitive in the industry.

**Table 1 Distribution of respondents**

Companies	No of respondents	Project managers	Project supervisors	Health and safety	Other depts
Const 1	26	4	12	6	4
Const 2	23	3	13	5	2
Const 3	28	4	14	5	5
Const 4	17	1	8	4	4
Const 5	15	1	6	3	5
Const 6	18	1	10	3	4
Const 7	22	2	8	7	5
Const 8	14	2	6	3	3
Const 9	27	1	12	10	4
	<b>190</b>	<b>20 (10.5%)</b>	<b>89(46.8%)</b>	<b>45 (23%)</b>	<b>36 (18.9%)</b>

However, Table 3 revealed results for safety performance in Construction industry considering reactive indicators. This measures safety performance in term of frequency of accidents, injuries, equipment damage and fatalities. The responses were measured in a 5 points Likert scale, and the mean value calculated for each industry whereby the range it falls determines the level of performance [25]. The level of each item is determined by the following formula: (highest point in Likert scale – lowest point in Likert scale)/the number of the levels used [26]. For instance a 5 point Likert scale will be  $(5 - 1)/5 = 0.80$  whereby industries with scores from 1-1.8 (Never) reflects very high performance, 1.81-2.6 (Rarely) reflects high performance, 2.61-3.40 (Sometimes) reflects moderate performance from 3.41-4.20 (Very often) reflects poor performance, from 4.21-5 (Always) reflects very poor performance [26].

The result reveals an average mean of  $3.42 \pm 1.26$  which is a poor safety performance. This means that employees of construction companies agreed that accidents and incidents do occur at a high frequency in their organizations which supports the findings of Idoro [2] and Windapo & Jegede [3], that there is high rate of accidents and injury rate in Nigerian construction firms. The firms are not certified to any of the standards but operate based on their client's and DPR's safety requirements. Belel &

Mahmud [7] asserted that accidents and injuries can be reduced in construction industry if companies improve on safety practices. This is further supported by Agwu and Olele [7] study which revealed a significant relationship between safety culture and accident rate in Construction industry in Nigeria. Organizations that implement OHSMS standard (i.e. ISO 45001:2018) are likely to have reduced work-related accident and fatal accident rates according to ISO [16]. Yoon et al. [27] revealed that work-related accident were found to be significantly reduced by 63% by implementing OHSMS in study companies.

The (5 points) Likert scale is measured as an interval scale, this makes the mean very important. By definition, from 1-1.8 (Never) means very low performance, 1.81-2.6 (Rarely) means low performance, 2.61-3.40 (Sometimes) means moderate performance, from 3.41-4.20 (Very often) means high performance, from 4.21-5.0 (Always) means a very high performance [26].

The (5 points) Likert scale is measured as an interval scale, this makes the mean very important. By definition, from 1-1.8 (Never) means very high performance, 1.81-2.6 (Rarely) means high performance, 2.61-3.40 (Sometimes) means moderate performance from 3.41-4.20 (Very often) means low performance, from 4.21-5 (Always) means very low performance [26].

**Table 2 Safety performance in construction industry (Proactive)**

S/N	Criteria	Mean	N	Std. Dev.	Min	Max
1	OHS review meetings are held quarterly	3.22	190	1.30	3.00	3.40
2	OHS hazards are often reported by workers	3.48	190	1.28	3.25	3.71
3	Risk assessments are carried out in units before commencing any task	3.29	190	1.36	3.15	3.54
4	Tool box meetings are held before we start work	3.17	190	1.30	2.90	3.23
5	Trainings on OHS are conducted for workers	3.38	190	1.35	3.24	3.56
6	Emergency response drills are performed at planned intervals	3.40	190	1.32	3.20	3.66
7	Incidents are always reported when they occur	2.55	190	1.20	2.25	3.30
8	All incidents are investigated and duly documented	3.23	190	1.22	2.89	3.59
<b>Total</b>		<b>3.23</b>	<b>190</b>	<b>1.29</b>	<b>2.99</b>	<b>3.52</b>

**Table 3 Safety performance in construction industry (Reactive)**

S/N	Criteria	Mean	N	Std. Dev.	Min	Max
1	Near misses occur at my workplace	3.29	190	1.3	3.15	3.45
2	First Aid Cases occur in my workplace	3.8	190	1.25	3.30	4.15
3	Accidents that lead to lost time injuries occur in my work place	3.45	190	1.21	3.15	3.75
4	Accidents that lead to damage to equipment and property occur in my work place	3.3	190	1.29	2.98	3.43
5	Fatalities from accidents occur at my workplace	3.25	190	1.26	3.20	3.36
	<b>Total</b>	<b>3.42</b>	<b>190</b>	<b>1.26</b>	<b>3.16</b>	<b>3.63</b>

**Table 4 Correlation of management commitment and safety performance**

	Correlations	Management commitment	Safety performance (Proactive)	Safety performance (Reactive)
Management commitment	Pearson Correlation	1	.506*	-0.408*
	Sig. (2 tailed)		0.005	0.003
	N	190	190	190
Safety Performance (Proactive)	Pearson Correlation	0.506*	1	0.453*
	Sig.(2 tailed)	0.005		0
	N	190	190	190
Safety Performance (Reactive)	Pearson Correlation	-0.408*	0.453*	1
	Sig.(2 tailed)	0.003	0	
	N	190	190	190

*\*Correlation is significant at 0.05 level (2 tailed)*

### 3.3 Effect of Management Commitment to OHSMS on Safety Performance in Construction Industry

Management commitment as a clause in OHSMS standard implementation was correlated with Safety performance to evaluate the relationship between the two variable. Table 4.0 revealed result from Pearson moment correlation performed between management commitment and proactive safety performance. There was a strong, positive correlation between Management Commitment and Safety performance (Proactive), which was statistically significant ( $r = .506, n = 190, p = .005$ ). Therefore, we reject the null hypothesis and accept the alternate which states that “there is a significant relationship between Management Commitment and Proactive Safety Performance”. This indicates that better management commitment to OHSMS implementation yield positive safety outcome. This agrees with previous studies Olutuase [15] and Windapo & Jegede, [3] who argued that management commitment should be a determining factor for OHS improvement in the industry. Management commitment can be exhibited through provision of resources for OHS training and PPE purchases, attending OHS

review meetings, encouraging incident reporting through incentives etc.

However, a strong negative correlation was seen between Management Commitment and Reactive Safety Performance i.e. rate of accidents and injuries which was statistically significant ( $r = -.408, n = 190, p = .003$ ); hence we reject the null hypothesis and accept the alternate which states that “There is a relationship between management commitment to safety and rate of accidents in construction industry”. This indicates that improved management commitment to OHS implementation will result in reduction of accidents, injuries and fatalities. This finding agrees with Liu et al. [28] findings of both the regression and correlation analysis which indicated that there is a moderately strong negative and significant relationship between Occupational Health and Safety Management Frameworks (OHSMF) and workplace accidents and occupational injuries. Podgórski [29] identified negative safety management as one of the factors that causes higher rate of occupational injuries and ill-health [30]. Also, Baldacconi [31] and Slowey [32] opined that commitment from top management is required to

improve the safety outcome in manufacturing industry.

#### 4. CONCLUSION AND RECOMMENDATION

The paper has discussed safety performance in the construction industry in the Niger Delta state of Nigeria. It assumes that management commitment to implementing OHS management system will positively affect safety performance in the industry. Major findings of the study include:

- There is a medium level of safety performance in the construction industry in Niger Delta.
- There is a significant relationship between management commitment to safety and proactive safety performance (good safety culture) in the construction industry in Niger Delta.
- There is a strong negative significant relationship between management commitment to safety and rate of accidents, injuries and fatalities in the construction industry in Niger Delta.

Following the findings of this research, the following recommendations are made to ensure visibility of top management commitment to organizational safety issues:

- Top management should have safety policies in place, duly signed and ensure its implementation in the organization
- These policies should be communicated and made available to their workers in an easy to understand language
- Top management should provide resources necessary for training of employees in relevant areas of needs
- Top management should attend OHS meetings frequently for continual improvement of the process
- Management should encourage involvement in OHS issues through awareness campaigns and incentives
- Top management should make funds available for provision of personal protective equipment for workers.

#### CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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