



ABSTRACT

The high alarming rate of industrial accidents in the construction industry has made the adoption of safety management practices strategic to improve the performance of projects. This study examined the effect of safety management practices on project performance. The major objectives include to; investigate how site-specific training program for workers and subcontractors affect project operating cost, examine the effect of pre-construction analysis of potential site safety hazards on project operating cost, examine the

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AFETY MANAGEMENT PRACTICES ON PROJECT PERFORMANCE

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Introduction

Safety issues have always been paramount in the construction industry, considering the level of technology that are in use, progressive work processes, and interaction between workers and equipment. The high number of occupational fatalities and injuries in the construction industry has made safety issues imperative wherever construction activities are to take place. The above implies then, that there will be a societal cost of occupational accidents and economic effect on project performance.

According to the Nigerian Ministry of Labor and Employment, 2.78 million workers die from occupational accidents and work-related diseases annually, while an additional 374 million suffer from non-fatal occupational accidents globally each year. Another report has it that the construction industry recorded the highest number of work-related accidents/injuries, accounting for over 39% of the total figures with the ICT and Telecom industry recording the least contribution of 0.26%. (NCPOSH, 2018). Hence, increasing project performance and lowering of project risk, safety practices must be initiated and implemented.

According to Smart Market Report (2019), the major drivers for investment safety programs in the construction industry include; worker health, insurance costs, and liability. Ayangade (2000) in his view, argued that the means of achieving an industry goal is characterised by hazards hence, posing threat to workers life. Factors adding to the occurrence of construction fatalities have been identified to include: short life span of projects, different job site locations, high workers turnover, and a large number of unseasonal workers which are not familiar with construction processes (Safety



relationship between site-specific training program for workers and subcontractors and project delivery, and value how pre-construction analysis of potential site safety hazards relate with project delivery. To achieve the specific objectives, the descriptive survey design was used with a targeted population of 243 selected via both the simple random and purposeful random sampling techniques. Questionnaire and interview were the major instruments used for the study. Data collected were analyzed using frequencies and percentages tables. T-Test and Z-test Statistics were used in testing the hypotheses via SPSS. Findings revealed that site-specific training program for workers and subcontractors affect project operating cost and that pre-construction analysis of potential site safety hazards significantly affect project operating cost. Findings equally revealed a significant relationship between site-specific training program for workers and subcontractors and project delivery. Also, it was found that pre-construction analysis of potential site safety hazards has a significantly relationship with project delivery. The study recommended among others that there should be strong enforcement of Health and Safety practices by the relevant authorities. The enforcement should target fostering mechanisms to audit Health and Safety practices in the construction industry for continual improvements because employees are the greatest assets.

Manual for Construction Handbook). Muiruri and Mulinge (2014) believed that occupational accidents do not only result in pain and physical damage to the workers, but also reduce productivity, time, and quality performance, thereby pose a threat to project success and escalate production cost.

Improving safety in the construction industry has remained a priority in almost every country around the globe. This is because the industry stands out among all other industries as the main contributor to severe and fatal accidents (Ahmed et al. 2016).

Several codes and regulations have been initiated across industries to provide succour in the management of health and safety at work. Freshly, the Nigerian National Building Code empowered registered builder to prepare health and safety plan among other builder's document in minimizing and managing causes of an accident during the construction stage.

Equally, there are stand out obligation explicitly highlighted in the Construction (Design and Management) Regulations on the stakeholders' engagement in execution of project management, and it also seeks the support of the client, designer, CDM coordinator, and principal coordinator on construction projects (Mojidi and Fidelis, 2019). The goal and essence of establishing safety practices' code and regulations according to Mojidi and Fidelis (2019) on construction site are to focus on preventing, eliminating, curbing, limiting and total eradication if possible the occurrence of accidents and injuries during and after the construction processes and as well train site operatives on safety programmes that will put all of these into place.

There is a range of approaches to safety management peculiar to the construction industry. They include; proper use of personnel protective equipment (PPE), analysis of potential site safety hazards during the pre-construction phase, open-door policy for workers to report accidents,



injuries, hazards and near misses, the appointment of safety coordinator, site-specific training programme for workers and subcontractors etc. (Smart Market Report, 2019; Onwudiwe Adolphus, and Ugwuegbu, 2018).

Occupational health and safety have some economic implications ranging from the medical cost of treatment which in some cases are borne by the company, working time lost by employees', the amount of compensation payable to mention but a few which will affect both the financial and non-financial performance of a corporate organization.

STATEMENT OF THE PROBLEM

The rate of occupational accidents across the industry is as the high rate. The data from NCPOSH (2018) on occupational accident/injury data in Nigeria has it that 238 fatalities occurred across different sectors of the economy with the construction industry accounting for 1358. The above can be attributed to some organizations not giving their workforce the adequate protection they deserve due to defect of awareness, capacity, and motivation, or limited staff resources. In recent years some workers have temporarily or permanently been disabled by work-related accidents as a result of inadequate safety knowledge on handling machines and equipment, neglecting to follow a simple procedure in accomplishing task or management not providing the right safety standards and resources for employees (Onwudiwe Adolphus, and Ugwuegbu, 2018).

Many studies have gone down the line on the subject of construction safety provisions, practices and implementation/enforcement but focus have been on the cause of accidents, condition of work settings, workers attitudes, and provision of health and safety training (Aniekwu, 2007; Ismail, Doostdar and Harun, 2011; Olutuase, 2014; Umeokafor *et al.*, 2014; Dodo, 2014). However, there exist limited study on the effect of safety management on project performance in the construction industry.

OBJECTIVE OF THE STUDY

The primary objective of the study is to investigate the effect of safety management on project performance in the construction industry of Nigeria. The specific objectives include to;

- i. Investigate how site-specific training program for workers and subcontractors affect project operating cost.
- ii. Examine the effect of pre-construction analysis of potential site safety hazards on project operating cost.
- iii. Examine the relationship between site-specific training program for workers and subcontractors and project delivery.
- iv. Evaluate how pre-construction analysis of potential site safety hazards relate with project delivery.

Research Question

- i. To what extent does the site-specific training program for workers and subcontractors affect project operating cost?
- ii. How does pre-construction analysis of potential site safety hazards impact on project operating cost?



- iii. To what extent does site-specific training program for workers and subcontractors relate with project delivery?
- iv. What is the relationship between pre-construction analysis of potential site safety hazards and project delivery?

Research Hypotheses

Ho₁: Site-specific training program for workers and subcontractors does not affect project operating cost.

Ho₂: Pre-construction analysis of potential site safety hazards does not significantly affect project operating cost.

Ho₃: There is no significant relationship between site-specific training program for workers and subcontractors and project delivery.

Ho₄: Pre-construction analysis of potential site safety hazards does not have any significantly relationship with project delivery.

Review of Related Literature

Health and Safety in the Nigerian Construction Industry

Based on Nigeria's position in Africa, its construction industry plays an important role in the African's economy. The construction industry of Nigeria has contributed significantly to the national gross domestic product and has employed a million workers. Regardless of the socio-economic significance of the construction industry, it has an enviable reputation in terms of occupational health and safety. Accident and injury rates in developing countries like Nigeria are generally considered to be higher than in the developed countries (Hämäläinen et al., 2010). This has been attributed to a lack of appropriate consideration of H&S (Health and Safety) management measures or practices in construction project delivery process (Belel and Mahmud, 2012). Despite being a party to the Geneva Occupational Safety and Health Convention 1981, Nigeria continues to lag in the implementation of occupational H&S practices (Adeogun and Okafor, 2013).

According to Idoro (2011) contractors with the best safety records in Nigeria still, record substantially high numbers of injuries on their sites. A survey of 42 Nigerian contractors revealed such poor performance with rates such as 5 injuries per worker and 2 accidents per 100 workers even among some of the best performing firms (Idoro, 2011). According to Ezenwa (2001), these figures are often even worse in practice as a result of a culture of under-reporting and concealment. Other studies have further highlighted a high prevalence of non-compliance with safety regulations that require organisations to report accidents (Diugwu et al. 2012). Whilst there have been occupational health and safety legislation governing work and work environments in Nigeria (e.g. Factories Act of 1990 and Employee's Compensation Act of 2011), some have attributed the poor safety performance to dysfunctional H&S laws and regulations (Diugwu et al. 2012). Compliance to and enforcement of occupational health and safety legislations have generally been described as poor (Idubor and Oisamoje, 2013; Okojie, 2010). Idoro (2004) also linked the country's poor H&S status to lack of concern, lack of accurate records and poor statutory regulations.



Causes of Accident on Construction Sites

Mojidi and Fidelis (2019), classified the causes of occupational into unsafe conditions and unsafe behaviour. Elufidipe (2009) in his view, believed that accidents occurrence at job sites can be attributed to either unsafe working conditions or unsafe acts. Elufidipe (2009) further stressed that some accidents occur by giving operatives task that they are not trained to undertake, such tasks could be summarized as follows:

- improper handling of tools or equipment,
- failure to use safety wears/personal protective equipment,
- Unsafe loading, arranging and placing,
- unsafe exposure to hazardous materials or tools.

In arguing the cause of accidents and injuries on projects sites, the artistic perceptions of the causes of accidents on construction sites were viewed in diverse opinions such as ‘accident is an act of God,’ ‘accident is as a result of unknown causes, unsafe conditions, and unsafe acts (Idubor and Oisamoje 2013), ‘accidents happen due to bad luck or people’s ignorance’ (Guldenmund, Cleal and Mearns 2013).

However, Oostakhan, Mofidi, and Talab (2012) and Solis-Carcano and Franco-Poot (2014) argued that though accidents occurred due to combination of various factors, the largest proportions of the causes of the accident are attributed to unsafe behaviours rather than unsafe conditions. Going further, Sherratt (2014) argued that people that operate in the industry are responsible for the problem of the industry.

The study of Aniekwu, (2007) on accidents and safety violations in Nigerian construction sites confirmed human factors as the major cause of the accident and it will require pro-activeness of safety managers to effectively coordinate both human and materials resources on site. However, the above view is contrary to that of Kolawole (2014) who sees occupational accidents at job sites as workers indiscipline, and inadequate communication.

Okolie and Okoye (2012) in his study, listed out the following: working barefooted, use of bamboo scaffolds, hand mixing of concrete without protective safety wear as some of the unsafe practices among workers on construction sites in Nigeria. In another dimension, Lehaney, Diugwu, Willemyns and Hosie (2017) and Dodo (2014), noted that the failed occupational health and safety system in Nigeria is traceable to weak statutory regulations and provisions, and contractors disregarded compliance with Occupational Health and Safety (OHS).

Safety and Health Management Approaches

According to the Occupational Safety and Health Association (OSHA), “a safety and health management system is a proactive, collaborative process to find and fix workplace hazards before employees are injured or become ill. The numerous benefits accruable for implementing safety and health management systems they include workers’ protection, saving an organization money in terms of medical and compensation, and in all, making an organization’s hazard-specific programs more effective and efficient” (Onwudiwe Adolphus, and Ugwuegbu, 2018).

Effective H&S management has been identified to have a direct impact on H&S performance and resultant reductions in the number of incidents (Lingard and Rowlingson, 2015). According to



Fewings (2013), good H&S performance in the construction industries of developed countries can largely be attributed to the systematic implementation of H&S management practices stipulated in H&S management systems (Fewings, 2013). Gallagher (2017) further identifies the need for the adoption of the following practices to improve H&S performance: high level of senior management commitment; occupational health and safety (OHS) responsibilities known; encouragement of supervisor involvement; active involvement of an H&S representative who has a broad role; effective OHS committees; planned hazard identification, risk assessment and hazard elimination control; and comprehensive approach in inspections. To effectively implement H&S management practices, there is a need for the adoption of an appropriate H&S management framework/system. One of the most commonly cited frameworks, as identified by Smart Market Report (2019), are:

- a. Site-Specific Training Program for workers and subcontractors
- b. Include Jobsite Workers in Safety Process
- c. Analyze Potential Site Safety Hazards in Preconstruction
- d. Establish an Open-Door Policy for Workers to Report Hazards
- e. Conduct Regular Project Safety Audits with Foremen/Workers
- f. Appoint/Assign/Authorize Project Safety Personnel
- g. Develop Site-Specific HASP (Health and Safety Plan)
- h. Conduct Thorough Near Miss and Incident Investigations

According to Onwudiwe Adolphus, and Ugwuegbu (2018), good safety and health management program has four components:

- a. Management leadership and employee involvement
- b. Analysis of the worksite to identify hazards
- c. Hazard prevention and control to protect workers from obstacle
- d. Safety and health training
- e. Personal Protective Equipment (Safety Wears)

Project Performance in the Construction industry: key Indicators

Projects had become a central activity in most organizations and companies and they are rapidly increasing their investment resources in projects such as new product development, process improvement, or building new services (Humaidi and Said 2015). However, many studies indicated that most projects do not meet time and budget goals, or fail to satisfy customer and company expectation (Mandisa, Clinton, and Wellington (2015). Notwithstanding, other factors also contributed to the failure of projects such as weaknesses in project mission and planning, lack of project knowledge, communications breakdown, lack of resources, a political issue, control issues, lack of top management support, lack of technical expertise, etc (Sausser and Eigbe 2017; Humaidi and Said 2015). Therefore the establishment of KPIs plays an important role in project delivery.

Key Performance Indicators (KPIs) are one of the factors that constitute construction project success criteria which is the reason while performance measurement on construction projects are usually carried out by establishing KPIs which offer objective criteria to measure project success. An assumption is made that if a project is completed on **time**, within the agreed budget and set **quality**, also referred to as the 'golden/iron triangle', then the project is deemed successful. Hence,



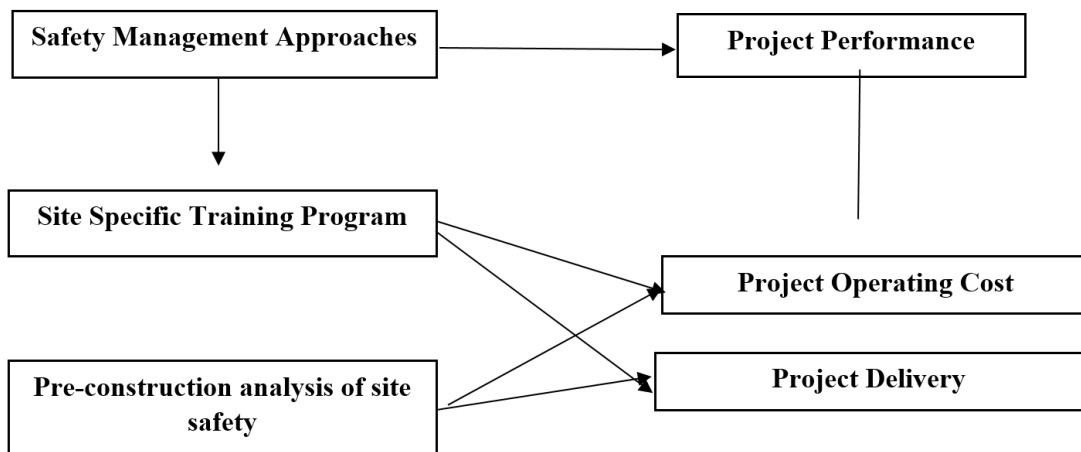
the construction industry needs to pay attention to critical success factors, besides the golden/iron triangle.

Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time cost, quality, client satisfaction, client changes, business performance, health and safety (DETR 2014; Cheung et al. 2015; Enshassi et al. 2017). Time, cost and quality are, however, the three predominant performance evaluation dimensions in the construction industry, also known as the “iron triangle”. Al-Tmeemy et al. (2010) and Garbharran et al. (2013) identified 13 critical success factors for building projects. These criteria included: cost, time, quality, safety, achieving scope, customer satisfaction, technical specifications, functional requirements, market share, competitive advantage, reputation, revenue and profits, and benefit to stakeholder. For the study, project operating cost will be used as the yardstick for measuring project performance.

Operational Framework

The above discussion on the relationship between safety management and project performance led to the following prepositions visualized in the model below.

Operational Model



Pre-construction analysis

Theoretical Framework

This study is anchored on the **Contractual Theory** as it supports the concept of safety management practices and project performance.

Contractual Theory

The contract theory was pioneered by Nofie in 2011. For a project to be awarded, some legal requirements regarding safety measures are expected to be met by the contactors. Thus, a legally bound contract will sets an institutional framework in which each party’s rights, duties, and responsibilities are clearly defined. The goals, policies, practices, and strategies on which the



arrangement is based are also specified in the contract. The contractual theory helps explain safety issues a contractor is expected to meet before embarking on any project. This is because, meeting such important criteria, will facilitate proper exchange of services between the two parties, prevent misunderstanding, prohibit moral hazards in a cooperative relationship, and protect each party's proprietary knowledge etc. Properly written contracts prevents risks arising from non-performance and misunderstanding, and also reduces uncertainty likely to be faced by firm decision making process. The contract sets a procedure for conflict resolution (Luo, 2002). Legal experts emphasize the need for comprehensive contract which can serve as a reference point specifying how the client and the vendor relate (Kem & Willcocks, 2000).

Empirical Review

Onwudiwe Adolphus, and Ugwuegbu (2018), studied the effect of safety and health management on organizational productivity in the Aluminum sector of Owerri, Imo State. A 16 item questionnaire was used to elicit responses from 40 respondents purposefully sampled by those who have the background knowledge of the study. Both descriptive and inferential statistics (T-Test) were used to analyze the data from the survey. The study established the relationship between safety and health policy and operating cost on the one hand and safety and health training on the other hand. The two tested hypotheses were statistically significant at 5% level. The study recommends that there is a need in making sure that Safety and Health management is accorded top priority in organizational activities as health is wealth.

Boustras, Hadjimanolis, Economides, Yiannaki and Nicolaides (2015) carried out a study on management of health and safety of micro-firms in Cyprus. The study looked at the determinants factors of safety performance at the work environment in small scale firms. The study was purposive in nature, therefore copies of structured questionnaire were used to gather data needed. Findings revealed that work settings safety in small scale firms can be improved by embracing "training", "risk assessment," and "safety policy formulation." The research findings equally showed that the nature and characteristic of management systems demonstrated in an organisation, methods designed for attaining work objectives, and resources available have a significant influence on small scale firm. The study contradicts some previous research outcome on the ground that the adoption of "quality management system" cannot be said to have significance collaboration with safety outcome in the final model.

Awwad, El, Souki, and Jabbour (2016) examined construction health and safety practices and challenges in a Middle Eastern developing country. Face to face survey was conducted using a structured questionnaire with the construction practitioners, insurance firms and government agencies. The findings of the study, however, showed the availability of construction labour safety law but lack necessary implementation, absence of monitoring, failure of safety awareness and inadequate support from the entire participant concerned with implementations of safety practices on construction sites. This study called for appropriate awareness within the construction firms' which might help curb these challenges.

Kolawole (2014) assessed health and safety measures on building sites: a case study of Minna, North Central Nigeria. The study examined the safety approach adopted in Minna construction firms, it also evaluated if the implementation of safety regulation will reduce workers claim for an



accident on sites or motivate them for better performance. The population needed for the study were randomly selected among building construction firms through copies of a structured questionnaire. The result from the analysis noted that site workers embraced “safety training” as this enhances their performances and reduced accidents on-site and also government did not have well-defined safety act for construction activities. The study recommended training and re-training of their workers on the relevance of safety practices, while the government should develop and enact “safety act” for controlling site based injury.

Idoro (2011) studied the effect of mechanization on Occupational Health and Safety (OHS) performance of the Nigerian construction industry. This study evaluated the level of mechanization and its relationship to the Occupational Health and Safety (OHS) performance in the industry and also established the impact of mechanisation on OHS performance and implored the commitment of contractors to effective OHS management. A questionnaire was adopted and analysed by percentages, means, t-tests and Spearman’s correlation tests. The results of the study indicated that an increase in mechanisation also increased the rates of accident and injury occurrences. This study concluded that failure to effectively manage mechanisation worsen OHS performance on project sites. However, construction managers should devise means of effective measures that will implement control of OHS performance before using new or additional safety wears.

Okoye, Ezeokonkwo, and Ezeokoli (2016) studied building construction workers’ health and safety knowledge and compliance on sites in Anambra State, Nigeria. The research employed Mean Score Index and Pearson’s Product-moment Correlation Coefficient (r) to analyze the data randomly sampled from the fifteen (15) selected construction sites in the study area. However, the outcome of the research showed that, low health and safety awareness and compliance among the sites operatives, this resort into low project performance. The study recommended that knowledge and compliance with health and safety practices alone cannot achieve optimum project performance, it would require safety culture which encompassed other factors are as follows: management commitment, workers involvement and strict enforcement of safety regulation should be adopted.

Akinwale and Olusanya (2016) studied the implications of occupational health and safety intelligence in Nigeria via cross-sectional research design and risk society and Sense-making theories’. The study conducted 15 in-depth interviews range from the managers and senior staffer of the selected organizations in Lagos State, Nigeria. Data were subjected to content analysis and ethnographic technique. However, the study affirmed that managers and employees are the major target of occupational health hazards, such as loss of man-hours, productivity, and job security. High level of awareness on the importance of occupational safety was recorded but inadequate investment in the capacity building on safety’ programmes in the organisation. The study, therefore, recommends good policy on occupational health with adequate investment in precautions and safety intelligence will enhance individual and organizational development in Nigeria.

RESEARCH METHODOLOGY

Research Design

The study employed a descriptive survey design. This design seems appropriate and helpful in determining the perception and attitude of respondents on how safety management affects project performance.



Study Population

The study targeted 6 contractors (Construction Companies) and one state agency (Imo State Ministry of Works) that are currently handling projects for the Imo State government from 2018 to date.

The study considered a total target population of 151. Table 3.1 and 3.1 summarized the sample frame and list of project construction locations. The sample frame for this study, therefore, comprises of professionals, contractors and artisans (both skilled and unskilled) randomly selected from the study area.

Table 3.1 Sample Frame

S/n	Company	Staff Position		Total
		Permanent	Contract	
1	Arab Contractors	9	35	44
2	Imo State Ministry of Works	37	55	92
3	Zerock Construction	5	16	21
4	China Harbour Engineering Company (CHEC)	6	14	20
5	Peer and Partners Ltd	7	13	20
6	Marachi Engineering	5	16	21
7	Vin Pat Group	7	18	25
	Total Population			243

Source: Companies Profile.

Table 3.2 Project Locations

S/n	Company	Project Location
1	Arab Contractors	Ahanjoku Conference Center, Expansion of Aba Road
2	Imo State Ministry of Works	World Bank Road, Expansion of Owerri Port-Harcourt Road.
3	Zerock Construction	New Owerri Road by Federal Secretariat, off Port-Harcourt Road.
4	China Harbou Engineering Company (CHEC)	Mother and Child (former New Market) end of Douglas road to Poly Junction Aba Road.
5	Peer and Partners Ltd	Avu Street
6	Marachi Engineering	Onukaogu Street, Egbukole Stree, and Eni Njoku Street.
7	Vin Pat Group	SUBE- Road World Bank.

Source: Public Bureau of Procurement, Imo State.



3.2.1 Sample Size Determination

Using the Taro Yamane’s formula, the sample size was determined. The formula is stated as follows:

$$n = \frac{N}{1+N(e)^2}$$

$$n = \frac{243}{1+243(0.05)^2} = \frac{243}{1+0.6075} = \frac{243}{1.6075}$$

n = 151

Sampling Procedure

Both the simple random and purposeful random sampling techniques were adopted for the study. Professionals and management staff of the companies were purposively selected while the simple random sampling was used in selecting the artisans (unskilled workers).

Research Instrument

Questionnaire and interview were the major instruments used for the study. The research drops and pick method. The construction sites were visited and the questionnaire/interview administered immediately. The study applied primary data (questionnaire and interview) to describe safety management in the construction industry. At the same time, secondary data in this research were also used to affirm primary data collected. Data collected were analyzed using frequencies and percentages tables. T-Test Statistic and the Z-test statistical techniques were used in testing the hypotheses with the aid of statistical Package for Service Solution (SPSS).

ANALYSIS AND DISCUSSION

A total of 151 questionnaires were distributed to construction companies handling projects within the target environment of Owerri, Imo State via hand delivery. A total of 147 questionnaires were returned. This represents 97.3% of the correctly filled questionnaire.

The categories of the respondents are presented in Table 4.1. From the responses, a sizeable number of the respondents were contract staff (unskilled labourers) representing 61.9%, site managers (11.5%), and project managers (8.1%). Others that responded were Health and Safety supervisors/managers (6.8%), and directors of the various organizations (6.1%).

Table 4.1: Respondents Background

Respondents Role	No.	%
Company director	8	5.4
Construction manager	9	6.1
H & S supervisor/manager	10	6.8
Project manager	12	8.1
Site manager	17	11.5
Casual Workers	91	61.9



Total	147	
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Source: Field Survey, 2020

Factors Driving the Adoption of Current Safety Management Practices

The study sorted the opinion of the respondents on factors driving the adoption of safety management in the construction industry.

From the responses in Table 4.2, the most influencing factors driving safety management practices in the construction industry are; insurance/medical cost (25.1%), concern about workers health and well-being, and avoiding potential ongoing project disruption (21.1%). Others include; the desire to improve productivity/competitive advantage (11.1%), regulatory requirements (8.1%), and industry leadership in overall safety culture (2%).

It can equally be concluded that higher injury rates can certainly be a cause of expensive liability, medical cost payments and higher insurance rates. The above can lead to work stoppages.

Table 4.2: Factors driving the adoption of safety management

Driving Factors	Frequency	%
Concern About Worker Health and Well-Being	34	23.1
Insurance/Medical Cost	37	25.1
Avoiding Potential Business Disruption	31	21.1
Regulatory Requirements	12	8.1
Desire to Improve Productivity/Competitive Advantage	17	11.5
Past Incidents Involving Worker Health and Well-Being	3	61.9
Industry Leadership in Overall Safety Culture	13	2.0
Total	147	

Source: Field Survey, 2020

Top Influential People Impacting Improvement of Safety Management Practices

Table 4.3 revealed top influential people impacting the improvement of safety management practices in the construction industry. Respondents report owners (33.3%), company leadership (27.8%) and job site workers as most influential in driving safety improvements at their firms. The above could be the fear of revoking lenience or lawsuits. The finding illustrates that effective implementation of safety practices and programs requires a strong conviction on the part of leaders; therefore, they must be convinced of the business benefits.

Table 4.3 Top People influencing Safety Management Practices

Driving Factors	Frequency	%
Company Owners	49	33.3
Company leadership (management)	41	27.8
Jobsite workers	28	19.0
Safety personnel	17	11.5
Project management team	12	8.1



Total	147	
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Source: Field Survey, 2020

Safety Management Practice in use in the Construction Industry

Safety management practices differ across industries. Hence the type or types to adopt, must be industry-specific and based on the organization's need. Respondents reported wide use of site-specific safety management practices, demonstrating their understanding of how important it is to have a safety program that recognizes the unique challenges posed by each project.

The respondents identified five (5) most adopted and used safety management practices in the construction industry. That demonstrates the importance of management creating a safety culture in the organization. The respondents (34.0%) ranked analyzing potential site hazards in preconstruction as the most used safety management practice in the industry. The above implies that Pre-construction planning has been recognized by the industry to significantly impact worker protection and reduce injuries. The pre-construction planning enables the organization to identify possible hazards in a particular job site hence, mitigating it on time.

Another most used safety practice in the construction industry is the establishment of effective, site-specific training programs for workers and subcontractors (29.2%). The respondents equally identified the method of training peculiar to their organization to include; on-the-job training, company's in-house training, expert, third-party trainer, online/e-learning site, and authorized Jobsite workers.

Table 4.4 Safety Management Practice in use in the Construction Industry

Safety Management Practice	Frequency	%
Analyze Potential Site Safety Hazards in Preconstruction	50	34.0
Site-Specific Training Program for Workers and Subcontractors	43	29.2
Include Jobsite Workers in Safety Process	15	10.2
Conduct Thorough Near Miss and Incident Investigations	17	11.5
Conduct Regular Project Safety Audits with Foremen/Workers	22	19.9
Total	147	

Source: Field Survey, 2020

Effect of Safety Management Practices on Projects Performance

Table 4.5 assessed the opinions of the respondent on the effect of safety management practices on project performance. It was gathered that safety practices improve an organization's reputation. The response of 78.1% (strongly agreed and agreed) demonstrates that firms recognize the business value of safety. Because, improved reputation in the industry is likely the result of many of the other benefits of a good safety program—including reduced injury rates, reduced costs as a result of reduced risk, less rework, more on-time completion of projects, improved employee morale and enhanced productivity.

On the area of workplace injury, 74.7% (strongly agreed and agreed) reported that the use of safety practices has minimized workplace injury rates. The response reveals that firms are highly concerned about taking steps to reduce injury rates by adopting zero-tolerance policies to any



safety violations. A significant percentage of the respondents (82.2% and 64.5%) report their firms' safety practices as having positive business outcomes in terms of increased ability to contract new work and improve project quality. This finding is critical because it demonstrates how many firms view their safety practices as providing them with a competitive advantage.

Table 4.5 Effect of Safety Management Practices on Projects Performance

S/n	Statement	Strongly Agree (SA)	Agree (A)	Disagree (DA)	Strongly Disagree (SD)
1	Reputation in the Industry	47 31.9%	68 46.2%	19 12.9%	13 8.8%
2	Workplace injure minimized	71 48.2%	39 26.5%	16 10.8	21 14.2%
3	Ability to Contract New Work	68 46.2%	53 36.0%	16 10.8%	10 6.8%
4	Project Quality	57 38.7%	38 25.8%	40 27.2%	12 8.1%
5	Minimized medical bills and litigations.	67 45.5%	59 40.1%	9 6.1%	12 8.1%
6	The reduced overhead cost of insurance payments.	51 34.6%	71 48.2%	11 7.4	14 9.5%
7	Reduced hidden costs such as employee replacement costs and OSHA citations.	81 55.1%	28 19.0%	15 10.2%	23 15.6%
8	Decrease in project schedule due to the adoption of safety practices.	79 53.7%	47 31.9%	13 8.8%	8 5.4%
9	Decrease in project budget due to the adoption of safety practices.	68 46.2%	44 29.9%	14 9.5%	21 14.2%
10	Increased in ROI as a result of safety practices.	78 53.0%	69 46.3%	- -	- -
11	To reduce cost and enhance productivity, Job-specific health and safety training/education must be provided to all employees before starting a new job.	65 44.2%	71 48.2%	11 7.4%	- -
12	Safety and health management practices increase employees' morale and turnover	53 36.0%	69 46.9%	14 9.5%	11 7.4%
13	Safety practices decreases project schedule by one week or more.	56 38%	81 55.1%	10 6.8%	- -
14	Schedule improvement due to safety practices can have a significant impact on a contractor's bottom line.	79 53.7%	47 31.9%	9 6.1%	12 8.1%
15	Delivery projects on time influences reputation with client	71 48.2%	51 34.6%	25 17%	- -

Source: Field Survey, 2020



It was gathered equally that safety practices by the firms in the construction industry have significantly minimized medical bills and litigations arising from lawsuits. The cost savings achieved will have multiple effect on both ROI and project schedules. From the respondents (53.0% and 46.3% respectively) agreed that safety practices have increased the return on investment (ROI) by the firms. This is also important, especially given the fact that 85.6% and 76.1% find specific improvements to project schedule and project budget. The level of schedule improvement can have a significant effect on a contractor's bottom line, as well as on their reputation with clients since the schedule is typically a key measure by which a client gauges the effectiveness of a construction firm. The robust safety programs adopted by firms, have led to injury-free projects, reduce or eliminate the need to pay workers compensation and also result in lower insurance rates. These are all key factors that lead to decreases in project budgets over the long run.

Test of Hypotheses

Hypothesis One

Ho: Site-specific training program for workers and subcontractors does not affect project operating cost.

The above hypothesis was tested using the mean of question 7, 6, 8, 9, 11 and 12.

Table 4.6 One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Site-specific training program for workers and subcontractors does not affect project operating cost.	6	3.954	.19787	.09924

Field Survey, 2020.

Table 4.6 and 4.7, reveals the effect site-specific training program for workers and subcontractors has on project operating cost. Indication in both Tables shows a strong and significant effect. Thus, the earlier hypothesis one stated in this study is not supported by statistical evidence as can be seen in Table 4.7. Safety management practice with operating cost is strong and significant with a T value (t_{cal}) of 44.258 which greater than the T_{Tab} of 3.183 at 0.005 level of significance.

Table 4.7 One-Sample Test

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Site-specific training program for workers and subcontractors does not affect project operating cost.	44.258	5	0.000	3.954	3.6274	4.2526

Field Survey, 2020.

Also, the P-value of 0.000 is less than 0.005 so we reject the null hypothesis and accept the alternative which state that site-specific training program for workers and subcontractors does affect project operating cost.

The above findings are in line with the finding of Onwudiwe Adolphus, and Ugwuegbu (2018) that found a significant effect of safety and health management on organizational productivity in the



Aluminum sector of Owerri, Imo State. The study's finding is equally supported by the findings of Boustras, Hadjimanolis, Economides, Yiannaki and Nicolaides (2015) that found a significant effect of management of health and safety of micro-firms in Cyprus.

Hypothesis Two

Ho₂: Pre-construction analysis of potential site safety hazards does not significantly affect project operating cost.

The above hypothesis was tested using the mean of question 1, 2, 5, 6, 7, 8 and 9.

Table 4.8 One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Pre-construction analysis of potential site safety hazards does not significantly affect project operating cost	7	3.967	.19799	.09956

Field Survey, 2020.

Table 4.9 One-Sample Test

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Pre-construction analysis of potential site safety hazards does not significantly affect project operating cost	45.478	6	0.000	3.967	3.6274	4.2526

Field Survey, 2020.

Table 4.8 and 4.9, reveals a strong and significant effect of pre-construction analysis of potential site safety hazards on project operating cost. The earlier hypothesis two stated in this study is not supported by statistical evidence as can be seen in Table 4.8 & 4.9. Pre-construction analysis of potential site safety hazards on project operating cost is strong and significant with a T value (t_{cal}) of 45.478 which is greater than the T_{Tab} of 3.761 at 0.005 level of significance. Also, the P-value of 0.000 is less than 0.005 so we reject the null hypothesis and accept the alternative which state that pre-construction analysis of potential site safety hazards has a significant effect on project operating cost.

The above findings were consistent with the study of Akinwale and Olusanya (2016), Okoye, Ezeokonkwo, and Ezeokoli (2016), and Kolawole (2014) who studied the effect of health and safety management on performance and found a positive and significant effect.



Hypothesis Three

Ho₃: There is no significant effect of site-specific training program for workers and subcontractors on project delivery.

The above hypothesis was tested using the mean of question 2, 3, 8, 9, and 14.

Table 4.10 Test of Significance (n=147)

Z_Statistics	P-value	Cohens_d	Sample_mean	Population Std. Dev	Population mean
17.58272	0.0000	2.30872	4.72	0.754	3.00

Source: SPSS Z-test output. Number of cases:1, Number of cases listed:1

From the result, in Table 4.10, the Z calculated was 17.58272 while the Z critical value was 1.96. More importantly, is our P-value ($0.000 < 0.005$). Therefore, we conclude that the sample mean significantly higher than the expected mean of 3.0. We, therefore, reject Ho and conclude that there is a significant relationship between site-specific training program for workers and subcontractors and project delivery.

Hypothesis Four

Ho₄: Pre-construction analysis of potential site safety hazards does not significantly relationship with project delivery.

The above hypothesis was tested using the mean of question 1, 2, 8, 12, and 15.

Table 4.11 Test of Significance (n=147)

Z_Statistics	P-value	Cohens_d	Sample_mean	Population Std.Dev	Population mean
26.51417	0.0000	3.48148	4.88	0.54	3.00

Source: SPSS Z-test output. Number of cases:1, Number of cases listed:1

From the result, in Table 4.11, the Z calculated was 26.51417 while the Z critical value was 1.96. More importantly, is our P-value ($0.000 < 0.005$). Therefore, we conclude that the sample mean significantly higher than the expected mean of 3.0. We, therefore, reject Ho and conclude that there is a significant association between Pre-construction analysis of potential site safety hazards and project delivery.

Conclusion

Improving safety remains one of the greatest challenges facing the construction industry today due to the alarming rate of industrial accidents. While the issue of improving safety has been an industry need for decades, this is a particularly exciting time to examine how safety management practices are being implemented and are perceived by the industry, as well as the benefits of a safety program. The construction industry is changing in ways that have strong implications for site safety and project performance.



The study identified the high rate of industrial accidents in the construction industry to be caused by; improper handling of tools or equipment, failure to use safety wears/personal protective equipment, unsafe loading, arranging and placing, and unsafe exposure to hazardous materials or tools.

Findings from the study revealed the construction industry has a high awareness of safety management practices, however, the implementation of those practices and an inclusive and comprehensive safety program varies widely, especially by firm type and size. The findings further revealed that project performance in the area of project operating cost and project delivery are greatly influenced by site-specific training program for workers and subcontractors and pre-construction analysis of potential site safety hazards. These two approaches have significantly reduced project operating cost and project delivery.

Recommendations

From the findings and conclusions of the study, the following recommendations were made.

- a) To encourage the overall project safety, contractors (mechanical and electrical contractors) should be involved during the design and preconstruction phases. This is believed to help avoid some hazards and mitigate others that are unavoidable.
- b) There should be strong enforcement of Health and Safety practices by the relevant authorities. The enforcement should target fostering mechanisms to audit Health and Safety practices in the construction industry for continual improvements because employees are the greatest assets.
- c) Strategic leadership should be provided by the management of construction companies through the provision of sensitive materials like safety audio, video and visual displaying gadgets on-site to demonstrate safety consciousness among workers.
- d) There is a need for an in-house health and safety training, provision of safety booklets in various languages for workers. With this, accidents on job sites can be reduced to the barest minimum.

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