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ASSESSMENT OF CONTRACTOR HEALTH AND SAFETY PERFORMANCE ON CONSTRUCTION PROJECTS IN ABUJA

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Abstract

The failure of health and safety management systems and the lack of safety culture within contractor organisations have been highlighted as factors responsible for the high rate of construction accidents in developing countries. The study aimed at assessing contractors' health and safety performance on construction projects. Purposive sampling technique was adopted in the selection of contractors. Data were collected using structured questionnaire and analysed by mean score and Spearman correlation test. Result revealed that Personal Protective Equipment, safety communication, emergency response plan and first aid and welfare facilities with an average percentage of 94.23, 88.46 and 86.54 respectively are the health and safety practiced mostly performed by contractors on construction projects. Correlation result revealed that p-value was <0.05 implying that there is a significant relationship between contractor efforts at providing H&S facilities with only one variable which is assessment of the performance of structures for managing H&S on site office. While a non-significant relationship existed between the other five variables (accident rates, injury rates, accident per worker rate, injury per worker rate and injury per accident rate) having a p-value of >0.05. It was concluded that the level of effort made by contractor is low and have little or no correlation with health and safety performance. It is recommended that adequate facilities necessary

Keywords:
Construction, Contractor, Health and Safety, Safety Performance and Safety Practices.

for the improvement of H&S performance be provided on construction site for each project in order to maintain a safe site. The study will help stakeholders in the construction industry to better understand the management of health and safety using both lagging and leading indicators to maintain a healthy and safe work environment.

Introduction

The construction industry is known as the most hazardous industry and has always been plagued with accident for a long time (Abas *et al*., 2020). Improving safety in construction remains a major concern in almost every country all over the world, because the construction industry stands out among all other industries as the leading contributor to severe and fatal accidents (Awwad *et al*., 2016). The occurrence of incidents or accidents at construction sites have caused numerous drawbacks of project performance, such as increase in project cost, delay in completion of project, and reduce productivity and creating negative impressions about the business (Abas *et al*., 2020). The failure of health and safety management systems and the lack of safety culture within contractor organisations have been highlighted as factors responsible for the high rate of construction accidents in developing countries (Okonkwo, 2019).

The construction industry employs about seven percent of the global workforce but accounts for between 30 and 40 percent of all occupational fatalities, with developing countries recording more fatalities when compared to developed countries (Okonkwo, 2019). The situation in country like Nigeria which is a developing countries is worse than what prevails in developed countries due to inadequate statutory regulations on health and safety (H&S), deficiency in accurate records and lack of concern (Idoro, 2008 and Jimoh *et al*., 2017). Idoro (2011) conducted a survey on 42 contractors in the Nigerian construction industry in 2006, the best record on safety was 5 injuries per 100 worker and 2 accidents per 100 workers. The health and safety status of the Nigerian construction industry cannot improve with the above situation.

Improving safety performance in the construction industry is crucial because it represents not just the excellence of the executed projects, but more importantly the protection of life for people who work in the field (Amartey, 2014; Abas *et al*. 2015; Awwad *et al*. 2016). The importance of evaluating safety performance is to gauge the effectiveness of construction firms' management in accident prevention by setting out safety objectives and targets (Abas *et al*., 2020). The study aim at assessing contractors' health and safety performance on construction projects in Abuja with a view of maintaining a healthy site. As such the study will examine contractors' health and safety practices on construction sites and to evaluate the level of contractors' health and safety performance efforts on construction projects.

Literature Review

Construction Safety Performance Measurement

Health and safety performance is the effectiveness of effort made to achieve safety, also regarded as the quality of the safety related work (Idoro, 2011 and Nawi *et al*., 2016). The

measurement of health and safety performance in any management process is a key step, as it provides information to identify the critical areas that require actions to achieve continuous improvement (Pera *et al*., 2023). There are various measures of safety performance for construction projects. They are generally classified as subjective or leading indicators or reactive measures and objective or lagging indicators or proactive measures (Cooper and Phillips, 2004 and Idoro, 2011).

Occupational Safety and Health Adminstration (OSHA (2019) defined leading indicators as proactive, preventive, and predictive measures that provide information about the effective performance of safety and health activities. They measure events leading up to injuries, illnesses, and other incidents and reveal potential problems in safety and health programme. In contrast, lagging indicators measure the occurrence and frequency of events that occurred in the past, such as the number or rate of injuries, illnesses, and fatalities (OSHA, 2019 and Pera *et al*., 2023). These two measurements can be described as mandatory measures as emphasized in some H&S regulations such as the Factory Act which stipulate that such cases should be reported (Idoro, 2008). Indeed, the rates of accidents and injuries are the commonest measures of H&S performance, since they indicate the level of safety on site (Idoro, 2008).

However, researchers have criticised these measures and suggest the use of subjective measures or leading indicators. Trethewy *et al*. (2000); Mohammed (2003); Lingard *et al*. (2017) and Pera *et al*. (2023) opined that the lagging measures suffer from 3 drawbacks: they measure what happens after an event and are reactive in terms of management response; in the absence of any proactive measure, causal relationships cannot be established; they are negative in nature and are acknowledged as being unsuccessful measures of safety performance. In view of these drawbacks, Lingard *et al*. (2017) and Ali *et al*. (2022) suggested a shift, towards detailed management oriented measurements such as the subjective performance rating, the site safety meter which is based on traditional site inspection and access to heights, housekeeping and personal protective equipment that have the potential of influencing the processes of the project being assessed. Leading indicators allow timely and effective intervention in the event of possible non-compliance with the management system even before the negative consequences of such situations, such as accidents at work, occur (Podgorski, 2015). With this in mind, leading indicators appear more useful for driving change by providing early warning signs of potential failures that might turn into accidents and injuries (Ali *et al*., 2022).

By evaluating safety performance using leading indicators and observing the outcome using lagging indicators, the potential hazards can be identified at an early stage and therefore unnecessary losses in life and cost can be avoided (Ng *et al*., 2012). In general, there is no single measure of safety performance can be said to be superior to others. The choice of safety performance measures or indicators relies upon the purpose of measuring and resources availability (Feng, 2011). This study engaged both the lagging

and leading indicators. This study intends to evaluate contractor's health and safety management practices on construction projects.

A Review of Safety Management Practices in Construction Industry

Safety practices are parameter to measure successful project delivery which is most paramount to the client because they greatly influence in achieving efficiency and effectiveness amongst professionals and even workers in the construction industry (Famakin & Fawehinmi, 2012). Safety practices are processes within the construction industry, which is a series of activities that help comprehend, avoid, and inspect unsafe activities and hazards (Cheng *et al*., 2012). Danquah, (2019) termed safety management practice as the implementation of the safety management systems or the measures taken prior to the occurrence of an accident. In order to continually improve safety performance on site, the identification of occupational health and safety management practices in construction industry is of necessity. Table 1, presents some health and safety management practices in construction projects identified by researchers.

Table 1. Health and Safety Management Practices in Construction Project

S/N	Health & safety management practices in construction	Authors/Year
1	Safety inspection, safety meeting, safety regulation enforcement, safety education and safety communication	Fang *et al*. (2004)
2	Project management commitment, hazard management, information, training, and promotions, administrative and management commitment, H&S training, selection and control subcontractors, safety review, accident record and legislation, codes and standards	Ng *et al*. (2005)
3	Management commitment and involvement and employee involvement and empowerment through risk assessments, inspections, audits, training, hazard reporting and completing corrective actions.	Fernandez-Muniz *et al*. (2007)
4	Safety inspection, Head Quarter (HQ) Management attitude towards safety, safety regulation enforcement, safety communication, safety meeting and safety training and education.	Lee & Jaafar (2012)
5	Work environment, safety signals, signs and barricades, project cost, the role of government and engineering societies, and PPE. safety and health policy, risk assessment, and safety and health inspection which should be more valuable for the rest of categories.	Zekri (2013)

6	Provision of first aid box, provision of personal protective equipment, keeping of safety record keeping and follow-ups, provision of procedures for investigating accidents and near misses and Existence of formal health and safety policy.	Shittu *et al.* (2016)
7	Inadequate Personal protective equipment (PPE); lack of communication between manager and workers; Lack of supervision; not well educated; differences in age; with different level of awareness, and no safety briefing/ toolbox meeting.	Nawi *et al.* (2016)
8	Poor safety awareness among top management and insufficient promotion of safety awareness, lack of experienced project managers and lack of personal protective equipment, provision of a safe site environment and lack of technical guidance, ineffectiveness of current safety policies.	Durdyev *et al.* (2017)
9	Management commitment, safety training, worker's involvement, safety communication and feedback, safety rules and procedure, safety promotion and policy	Razali *et al.* (2018)
10	Insufficient communication of safety programmes'; 'lack of workers' self-protection and awareness'; 'contractors ignoring safety due to the time pressures of the project schedule'; 'poor personal attitudes towards safety', and 'ineffective laws and lack of enforcement'.	Agyekum *et al.* (2018)
11	Personal protective equipment, role of government and engineering societies, signs, signal and barricades, safety educating and training, and emergency planning and preparation	Wong & Son (2019)
12	Safety training, implementation of safe working environment, implementation of safe working plant and equipment and safety review for site safety policy.	Abas *et al.* (2020)

Research Methodology

Quantitative research was adopted for the study in form of questionnaire survey for the collection of data. Survey was described by Collins and Hussey (2003) as a positivistic methodology that draws a sample from a larger population in order to draw a conclusion about the population. A well-structured questionnaire was developed and administered to seek the opinion of construction contractors which are professionals such as project managers, Quantity surveyors, site Engineers, Health and Safety managers who managed and supervised construction projects in Abuja.

The study adopted purposive sampling technique for the collection of data from contractors. Purposive sampling technique, which is described as a non-probability method used in choosing cases for a study based on the judgment of the researcher for the appropriate cases, such as selecting a variety of types of cases for in-depth investigation (Blaikie, 2010). The choice of purposive sampling technique hinged on its ability to provide a representative sample of the sampled elements based on certain specified criteria, such as the possession of precise knowledge and experience required by the study (Patton, 2001). Respondents sampled were those who were accessible and willing to participate in addition where having on-going building projects or projects that were completed within two years. This was because the questions in the questionnaire were based on building construction projects which is the unit of analysis for the study.

Method of Data Collection

The questionnaire was designed to assess contractors' health and safety practices on construction sites and to evaluate the level of contractors' health and safety performance efforts on construction projects. The questionnaire comprised of three sections. The first section captured information on the respondent's background which include: Academic qualification, year of experience and size of work force. While the second section examined contractors' health and safety practices on construction sites and the third section evaluated the level of contractors' health and safety performance efforts on construction projects. The respondents were asked to rank the second sections using a scale of 1-2 where 1=Yes and 2= No, for contractor's health and safety practices on construction projects. The third section was to evaluate the level of provision of health and safety facilities by contractors' on construction sites, a Likert scale of 1-5, where 1= Nil, 2= Low, 3= Average. 4= above average, 5=High. Ninety eight (98) copies of questionnaire were distributed to respondents and a total of fifty-two (52) questionnaire were retrieved representing a responses rate of 53.06%.

Data Analysis

Data was analysed using descriptive and inferential statistics, inform of mean score and Spearman's rank correlation analysis. The mean score ranks respondents responses according to the central tendency. While Spearman correlation measures the strength and direction of relationship between variables. These relationships can be either positive or negative, or they can simply not exist (Hair *et al*., 2010).

Results and Discussion

Analysis of respondents' profile

The basic information concerning the respondents' background is presented in this section, as shown in Table 2. Result on respondent's profile on the academic qualification of respondents reveals that 55.77% holds either a Master's Degree or a PHD, while 44.25%

are HND/Bachelor degree holders. This infers that the respondents are well educated to provide appropriate information required for the study. On the professional membership of respondent, 34.62% of the respondent are members of Nigeria Institute of Quantity Surveyor (MNIQS), 23.08% of the respondent are members of other profession not captured. 15.38% of the respondent are members of Nigeria Society of Engineers (MNSE), 13.46% of the respondent are members of Nigeria Institute of Architecture (MNIA) and Nigeria Institute of Builders (MNIOB). 23.08% of the sample were classed as 'others' these were respondents from professions such as health and safety and project management. This shows that respondent are competent to provide reliable information for the study. Result on the working experience of respondent, 1.93% had less than 5years experience, 36.54% had 5-10years experience, 32.69% had 11-14years experience and 28.85 had more than 15years experience. This indicates that the respondent are well experienced and suitable for the study.

Table 2. Background information of respondents

Parameter	Variables	Frequency	Percentage
Highest qualification of respondent			
	HND/BSc/ BTech	23	44.23
	MSc/MTech	28	53.85
	PhD	1	1.92
Professional membership of respondent			
	MNIQS	18	34.62
	MNIA	7	13.46
	MNIOB	7	13.46
	MNSE	8	15.38
	Others	12	23.08
Year of experience in construction industry			
	<5 years	1	1.92
	5 - 10 years	19	36.54
	11 - 14 years	17	32.69
	More than 15years	15	28.85

Contractors' Safety Performance in Respect to Accident Occurrence

This section presents result of safety performance of respondents in respect to occurrence of accident on projects executed as shown in Table 3. The result of respondents rating of accident occurrence on projects revealed that 39 of the respondents (73.58%) agreed that accidents has occurred on projects they executed, while 14 of the respondents (26.42%) have not witness accident in their projects.

Table 3. Rating of Accidents Occurrence on Projects by Respondent

Rating of Accidents Occurrence on projects.	Frequency	Percent
Occurred	38	73.08
Not occurred	14	26.92
Total	52	100

Examination of Contractors' Safety Practices on construction Projects

This section examined the available health and safety management practiced by contractors on construction projects. Fifteen contractors' safety performance effort on building projects were identified from literature and the top mostly performed effort by contractors on construction projects where assessed as presented in Table 4. Result of the findings revealed that Personal Protective Equipment was first with an average percentage of 94.23%. Second was safety communication with an average percentage of 88.46%. Third was Emergency response plan and first aid and welfare facilities with an average percentage of 86.54%. Fifth was health & safety manager/officer with an average percentage of 76.92%. The least health and safety management practiced by contractors on construction projects was formal safety incentive programme with an average percentage of 34.62%.

Table 4. Contractors' Health and Safety Practices on construction Projects

SN	Health and Safety Practices on construction projects	H&S Practices available on site	H&S Practices not available on site	(%) of H&S Practices available on site	Rank
1	Personal Protective Equipment	49	3	94.23	1st
2	Safety Communication	46	6	88.46	2nd
3	Emergency response plan	45	7	86.54	3rd
4	First aid and welfare facilities	45	7	86.54	3rd
5	Health & safety manager/officer	40	12	76.92	5th
6	Written health & safety policy	39	12	75.00	6th
7	Insurance cover for sites	39	12	75.00	7th
8	Health and safety budget	33	19	63.46	8th
9	Top management involvement	32	20	61.54	9th
10	Documented hazard analysis and risk assessment programme	31	21	59.62	10th
11	Health & safety training program	30	21	57.69	11th
12	Formal health & safety training program	29	23	55.77	12th
13	Accident investigation and reporting system	27	24	51.92	13th

14	Safety audit	21	27	40.38	14th
15	Formal safety incentive programme	18	32	34.62	15th

Evaluation of the Level of Contractors' Health and Safety Performance Efforts on Construction Projects

The relationship between contractor health and safety practice and the level of safety performance on construction projects was assessed in this section. Hypotheses was tested using Spearman correlation, with respect to the influence of contractors' efforts at providing health and safety facilities in construction projects on the H&S performance of such projects. The results in Table 5. reveal that the p-value for the test of correlation between contractors' provision of H&S facilities and the performance of structures for managing H&S (0.002) was less than the critical p-value (0.050), therefore hypothesis H_{O2} was rejected in the case of structures for managing H&S.

However, the test of correlation between contractors' provision of H&S facilities and the accident rate (0.382), injury rate (0.703), accident per worker rate (0.772), injury per worker rate (0.905) and injury per accident rate (0.322) are greater than the critical p-value (0.050), therefore the hypothesis was accepted in the case of these five variables. The results imply that there is no significant correlation between efforts of contractors towards providing H&S facilities and these five variables of H&S performance. This finding was supported by the very weak values of the coefficient of determination (commonly known as the R^2 value). For all of the six correlations carried out and reported in Table 5, the R^2 values were not higher than 18.4%; this implied that no more than 18% of the variations in the six variables of H&S performance could be attributed to the influence of contractors' provision of H&S facilities.

Table 5. Correlation results on the provision of H&S facilities and H&S performance

x1	x2	N	Correlation Coefficient	R^2 (%)	p-value	Strength of correlation	Decision
Provision of H&S Facilities	Performance of Structures for Managing H&S	52	0.429	18.40	0.002	Very weak	Reject
Provision of H&S Facilities	Accident Rate	52	-0.124	1.54	0.382	Very weak	Accept
Provision of H&S Facilities	Injury Rate	52	-0.054	0.29	0.703	Very weak	Accept
Provision of H&S Facilities	Accident per Worker Rate	52	-0.041	0.17	0.772	Very weak	Accept
Provision of H&S Facilities	Injury per Worker Rate	52	-0.017	0.03	0.905	Very weak	Accept

Provision of H&S Facilities	Injury per Accident Rate	52	0.14	1.96	0.322	Very weak	Accept

Discussion of Findings

The fifteen variables of health and safety management practiced by contractors on construction projects was examined. The top mostly performed effort by contractors on construction projects revealed by the study, were provision of Personal Protective Equipment. The findings of the study is in line with Idoro (2008)and Nawi *et al*. (2016) who established that personal protective equipment is one of the measure mostly provided by contractors in project. Safety communication, this is in agreement with the findings of Nawi *et al*., (2016) who asserted that Poor safety communication during construction can cause accidents, misreporting and delays in form of extensive cost and time.

Emergency response plan, the current study agrees with previous studies (Ng *et al*., 2005 and Wong and Soo, 2019) that emergency planning and preparation is an important health and safety management practices that will improve health and safety performance in the construction industry. A proper emergency planning and preparation is essential in minimizing the harmful consequences of an accident that happened on the construction site. First aid and welfare facilities, the findings of Okeola (2009) and Shittu *et al*. (2016) supports the findings of this study which reveals that first aid and welfare facilities are very significant health and safety management practices. The provision of first aid kit on site and good welfare facilities improve efficiency.

The study further evaluated the level of contractors' health and safety performance efforts on construction projects. Hypotheses was tested, with respect to the influence of contractors' efforts on providing health and safety facilities in construction projects on the H&S performance of such projects. The result of the findings revealed that contractor efforts at providing H&S facilities only have significant relationship with their assessment of the performance of the structures for managing H&S on site office. The inability of these efforts to influence contractor efforts on the five variables (accident rates, injury rates, accident per worker rate, injury per worker rate and injury per accident rate) is a major limitation in the effectiveness of the efforts. This result is in agreement with the findings of Idoro (2008) who discovered that only subjective measures of H&S performance were correlated to contractor's efforts on H&S while objective measures were not correlated to contractors H&S performance efforts.

Conclusion and Recommendation

The study revealed that the most performed health and safety management practiced by contractors were personal protective equipment, safety communication, emergency response plan and first aids and welfare facilities. It was observed that the proactive health and safety practices are not fully utilized in most of the construction projects. The relationship between contractors' efforts on providing health and safety facilities in

construction projects on the H&S performance of construction projects was assessed. It was observed that the efforts made by the contractors are related to health and safety performance but more effort is required to attain a safe work environment. It was concluded that the level of effort made by contractor is low and have little or no correlation with health and safety performance.

It is recommended that adequate facilities such as personal protective equipment, an effective safety communication and emergency response plan as well as first aid and welfare facilities necessary for the improvement for H&S performance be provided on construction site for each project in order to maintain a safe working environment. Further study should evaluate other variables such as compliance with H&S regulation, provision of PPE, structure for managing H&S head offices and sites offices and their relationship with the level of safety performance on construction projects. The study will help stakeholders in the construction industry to better understand the management of health and safety using both lagging (reactive) and leading (proactive) indicators to maintain a healthy and safe work environment.

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