



## HEALTH AND SAFETY MANAGEMENT EFFORTS AS CORRELATES OF PERFORMANCE IN THE NIGERIAN CONSTRUCTION INDUSTRY

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**Abstract.** This study investigates the level of efforts made by Nigerian contractors to maintain a healthy and safe work environment. The objectives are to determine the level of management efforts made by contractors on H&S and their correlation with H&S performance. To achieve these objectives, a field survey involving a sample of 40 contractors selected by stratified random sampling from the contractors registered with the Federation of Construction Industry of Nigeria was carried out. For the study, 6 H&S management variables and 7 H&S performance variables were selected. The H&S management variables are in compliance with H&S regulations, provision of H&S facilities, structures for managing H&S in head and site offices, provision of PPE and H&S incentives, while the H&S performance variables are respondents' assessment of the performance of structures for managing H&S in head and site offices, accident, injury, accident per worker, injury per worker and injury per accident rates. Data were collected using structured questionnaires and analysed by mean and Spearman correlation test. The results reveal that contractors' efforts on structures for managing H&S on site are the best correlates of H&S performance, but their level is low. The levels of contractors' efforts in provision of PPE, compliance with H&S regulations are high, but these efforts are not correlates of H&S performance. The levels of contractors' efforts in structures for managing H&S in head office and provision of H&S incentives are low and they have low correlation with H&S performance. The study considers these results as indication that the management efforts made by Nigerian contractors to ensure a healthy and safe work environment are yet to have meaningful impact. It suggests increased efforts on local H&S regulations, structures for managing H&S in both head and site offices and provision of H&S incentives as measures for improving safety in the Nigerian construction industry.

**Keywords:** H&S management efforts, objective H&S performance measurement, subjective H&S performance measurement.

### 1. Introduction

The construction industry is understandably one of the most hazardous industries in most economies (Edmonds and Nicholas 2002). The situation in developing countries like Nigeria is worst than what prevails in developed countries because of lack of concern, accurate records and statutory regulations on health and safety (H&S). Idoro (2004) maintains that Nigeria lacks statutory regulations on H&S and that those regulations that serve as points of reference are either British or American ones. As a colonised nation, it is understandable for Nigeria to depend upon the laws of her colonial master, but what cannot be understood is the inability of the country to have even local versions of those regulations, not to mention new ones since the independence in 1960. H&S in the manufacturing industry is regulated by the Factory Act of 1990, which is a local version of the Factory Act of 1961 of Britain. The provisions of this act have made the Federal Government of Nigeria to put in place statutory practice and structures for inspecting the H&S condition of factories, for reporting accidents and injuries in factories and for sanctioning non-compliance with statutory H&S condition and standards. Such regulations, practice and structures do not exist in the construc-

tion industry therefore; contractors are left to use their discretion on such important issues. The consequences are that contractors commit little resources to maintaining a healthy and safe construction work environment; they do not keep accurate records of accidents and injuries on site and they do not report or release such information. The existing scenario cannot improve the H&S status of the industry.

Previous studies have focussed mainly on accidents and injuries. They have their limitations because of 2 reasons. First, since it is not mandatory for contractors to keep records and report accidents and injuries that occur on their sites and since such records give a negative image, information relating to them that is supplied by contractors is likely to be inaccurate. Second, such information is reactive therefore; the results may not bring about any improvement (Marosszeky *et al.* 2004).

A better approach is to focus on proactive efforts dealing with the factors responsible for such accidents and injuries and how to control them. Therefore this study regards the management efforts made by contractors to maintain a healthy and safe work environment as being mainly responsible for their H&S performance. It assumes that the H&S performance of contractors is related to the H&S management efforts made and that any

improvement in the latter will bring about improvement in the former. Thus the study evaluates the H&S management efforts of Nigerian contractors and their correlation with their H&S performance.

## 2. Aim and objectives of the study

The main aim of the study is to ascertain the impact of the management efforts of contractors on their H&S performance. The objectives that emanate from this aim are to determine the level of management efforts made by contractors to maintain a healthy and safe work environment and their correlation with H&S performance.

## 3. Hypotheses of the study

In order to understand those management efforts of contractors that influence their H&S performance and the nature of their influence, 6 hypotheses are postulated. The first hypothesis states that contractors' efforts at complying with H&S regulations have no significant correlation with their performance. The second hypothesis states that contractors' efforts at providing H&S facilities have no significant correlation with their H&S performance. The third hypothesis states that contractors' efforts on structures for managing H&S in the head office have no significant correlation with H&S performance. The fourth hypothesis states that contractors' efforts on structures for managing H&S on site have no significant correlation with H&S performance. The fifth hypothesis states that contractors' efforts on provision of PPE to their workers do not have significant correlation with H&S performance, while the sixth hypothesis states that the efforts of contractors on provision of H&S incentives to their workers do not have significant correlation with H&S performance.

## 4. Variables of the study

Two groups of variables, namely H&S management efforts and H&S performance, were selected for the study. H&S management efforts consist of 6 variables namely: compliance with H&S regulations, provision of H&S facilities, structures for managing H&S in head office, structures for managing H&S on site, provision of Personal Protective Equipment (PPE), and H&S incentives. In view of the limitations that researchers have identified in the use of accidents and injuries, regarded as objective measurements of H&S performance (Trethewy *et al.* 2000; Mohammed 2000; Marosszky *et al.* 2004), attempt was made to ensure that both objective and subjective measurements of H&S performance were selected for the study. Based on this reason, H&S performance is defined by 7 variables namely: respondents' assessment of the performance of the structures for managing H&S in head and site offices which are subjective measurements and accident, injury, accident per worker, injury per worker and injury per accident rates in 2006 which are objective measurements.

## 5. Conceptual framework

The attempts to determine those H&S management efforts of contractors that are correlates of H&S perform-

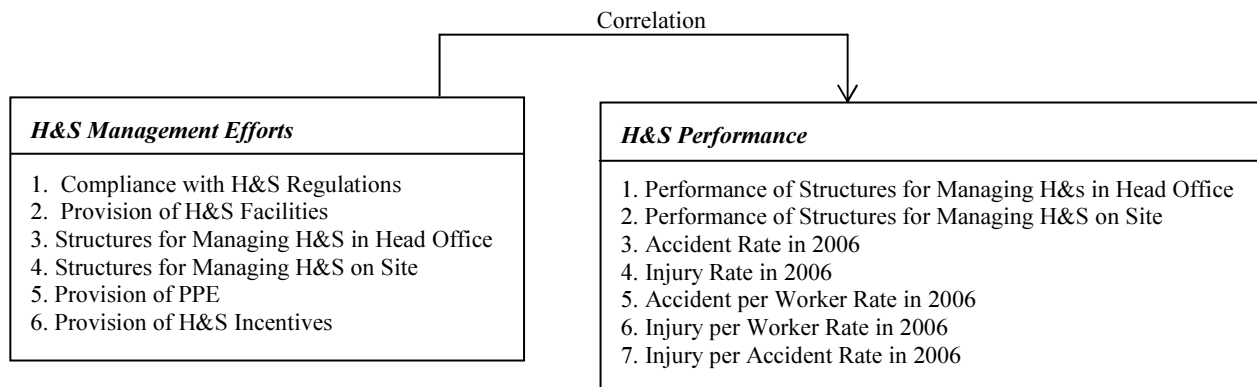
ance prompted a conceptual framework. Since the effectiveness of contractors' efforts can also be described as their H&S performance, the study equally attempts to ascertain whether or not the H&S management efforts of construction contractors are effective. The variables of H&S management selected represent contractors' efforts while those of H&S performance which reflect the H&S condition of the work environment represent the effectiveness of these efforts. The results of H&S management efforts are expected to manifest in a healthy and safe work environment. Based on this understanding, a conceptual framework (Fig. 1) was developed for the study. The framework shows that the variables of H&S performance which represent the effectiveness of contractors' H&S efforts or the H&S condition of work environment are influenced by those of H&S management which represent contractors' H&S efforts.

## 6. Health and safety regulations

Research studies trace the origin of H&S regulations generally to the UK and US (Galbraith 1989; Fellows *et al.* 2004). Nigeria as a former colony of Britain depended solely on standards and regulations of her colonial master before and even after independence. As a result, almost all existing regulations of reference on H&S in Nigeria originated from foreign countries (Idoro 2004). The existing Factory Act of 1990 is an adaptation of the UK Factory Act of 1961. The Occupation Safety and Health Act of 1970 is an American legislation. The Control of Substance Hazardous to Health Regulations of 1988, the Personal Protective Equipment at Work Regulations of 1992, the Management of Health and Safety at Work Regulations of 1999 are all British laws and are applicable in European countries. The Manual Handling Operations Regulations of 1992, the New Construction Design and Management Regulations of 1994 also originated from foreign countries. Except the Factory Act, all the H&S regulations in Nigeria are yet to have Nigerian versions.

## 7. Personal protective equipment

HMSO (2002) describes PPE as any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards. Two notable regulations namely: Factory Act of 1990 and the Personal Protective Equipment (PPE) Regulations of 2002 are specifically concerned with regulating the use of PPE. The Factory Act of 1990 is the Nigerian version of the Factory Act of Britain. It is enacted and came into force in 1990. Articles 47 and 48 contain regulations on the provision of PPEs for workers. The provisions of the Act do not apply to the construction industry because the provisions of Article 87 define a factory to include premises in which articles are made or prepared incidentally to the carrying on of building operations or works of engineering construction, not being premises in which such operations or works are being carried on (Federal Government of Nigeria 1990). By this provision, construction site and the activities therein are excluded from the coverage of the Act.



**Fig. 1.** A Conceptual Framework for comparing Health and Safety Management Efforts and Performance of Construction Contractors.

The PPE regulation of 2002 is an Act of the European Communities, which came into force on 15<sup>th</sup> May 2002. The Act revoked 4 regulations before it, namely: the PPE (EC Directive) 1992 and its amendments of 1993, 1994 and 1996 and it applies in the member states of European Union (HMSO 2002). The Act is only a reference document in Nigeria because a Nigerian version does not exist. The provisions of the Act deal mostly with the design and manufacture of PPE, therefore construction activities are not specifically covered in them (Idoro 2007).

The provisions of these 2 important regulations discussed above imply that construction operations are excluded in the existing H&S regulations. The efforts of construction contractors and workers on provision and use of PPEs are therefore discretionary and unregulated.

### 8. Health and safety performance

Safety performance describes the H&S status of construction work environment. The measures used by researchers for H&S performance can be classified into 2 categories namely: objective measurements which are mostly concerned with accident and injury and subjective measurements which are based on stakeholders' perception of healthy and safety status of work environment. The commonest measures of H&S performance used by researchers are objective measurements that is, rates of accidents and injuries (HSS 2001 & 2003; Bhutto *et al.* 2004; Kartam 1997; OSHA 1999; Koehn *et al.* 2000; HSE 2002; Carrigan 2005). 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. Indeed, the rates of accidents and injuries are the commonest measures of H&S performance since they indicate the level of safety on site. However, researchers have criticised these measures and suggest the use of subjective measures. Trethewy *et al.* (2000) and Mohammed (2003) opine that these 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, Marosszky *et al.* (2004) suggest a shift

of focus towards detailed management oriented measurements such as the subjective performance rating used by Jasekris (1996); the Site Safety Meter which is based on traditional site inspection developed by Trethewy *et al.* (2000) and access to heights, housekeeping and personal protective equipment used by Marsh *et al.* (1995) that have the potential of influencing the processes of the project being assessed.

### 9. Research methods

To achieve the objectives of this study, a field survey involving a sample of 40 construction contractors was carried out. The sample was selected from the population of contractors that were registered members of the Federation of construction industry of Nigeria which is the umbrella body of construction contractors in Nigeria. Attempt was made to ensure that the sample covered multinational, national, regional and local contractors therefore; the sample was selected by stratified random sampling. Data were collected on each of the variables of the study using structured questionnaires.

On regulations, 16 H&S regulations namely: Factory Act (1990), H&S at Work Act (1974), Occupational H&S Act (1992), Manual Handling Operations Regulations (1993), Personal Protective Equipment at Work Act (1993), Construction Design & Management Regulations (1992), Control of Substances Hazardous to Health Act (1998), Construction (Head Protective) Regulations (1989), Construction (Lifting Operations) Regulations (1961), Construction (General Provisions) Regulations (1961), Construction (Working Place) Regulations (1996), Provisions & Use of Work Equipment Regulations (1992), Safety Representatives & Committees Regulations (1977), Noise at Work Regulations (1989) and Construction (Health & Welfare) Regulations (1966) were selected for investigation.

For PPE, 6 protectors namely: protective clothing, helmet, safety boot, hand glove, eye and ear protectors were selected. The level of compliance with the above regulations and the level of provision of PPE were measured using 5 ranks namely: nil, low, average, above average and high. The ranks were weighted 0.2, 0.4, 0.6, 0.8 and 1.0 respectively. The level of compliance with H&S regulations of respondents was derived as  $\sum_1^{16}(\text{RLC})/16$ ,

where RLC represents respondent's level of compliance with H&S regulation while the level of provision of PPE was derived as  $\sum_1^6$  (RLP)/6, where RLP represents respondent's level of provision of PPE.

7 H&S facilities namely: toilet, canteen, water supply, waste disposal, first aid facilities, site cleanliness and work environment safety condition were selected to represent H&S facilities. The level of provision of these facilities was measured using 5 ranks namely: poor, fair, average, good and excellent. The ranks were weighted 0.2, 0.4, 0.6, 0.8 and 1.0 respectively and the level of provision of H&S facilities of respondents were derived as  $\sum_1^7$  (RPF)/7, where RPF represents respondent's level of provision of H&S facilities.

5 variables namely: OHS budget, H&S committee, OHS medical department, OHS training and awareness department and OHS emergency department were selected to represent structures for managing H&S in head office, while another 5 variables namely: H&S representative, H&S committee, H&S plan, work method statement and OHS awareness programme unit were selected as structures for managing H&S on site. 4 variables namely: safety bonus, safety award, safety gift and promotion were selected as H&S incentives. Where a variable was present or absent, it was recorded as 'yes or no' and weighted as 1 or 0 respectively. Respondent's level of efforts on structures for managing H&S in head and site offices were derived as total score/5 while respondent's level of provision of H&S incentives was derived as total score/4.

On H&S performance, respondents' assessment of the performance of structures for managing H&S in head and site offices were measured using 5 ranks namely: poor, fair, average, good and excellent and were weighted 0.2, 0.4, 0.6, 0.8 and 1.0 respectively. Respondent's assessment of the efforts on structures for managing H&S in head and site offices was derived as  $\sum_1^5$  (RMSP)/5, where RMSP represents respondent's assessment of the performance of structures for managing H&S. Data were also collected on the number of workers employed, accidents and injuries recorded in 2006 by respondents. The data collected were analysed using mean and Spearman correlation test.

## 10. Results of data analysis

The results obtained from the analysis of the data collected are presented as follows:

### 10.1. Ranking of the level of H&S management efforts

In order to compare the level of management efforts made by contractors to maintain a healthy and safe work environment, the variables that represent these efforts in the study are measured in ratios with the highest score in the 6 variables being 1. The ranking of the level of the 6 management efforts is carried out using mean score. The results of the analysis are presented in Table 1.

The results in Table 1 show that the provision of PPE ( $\bar{X} = 0.872$ ) ranks first in contractors' efforts at achieving a healthy and safe work environment. Efforts to comply with existing H&S regulations ( $\bar{X} = 0.770$ ) ranks second while efforts to provide facilities that make

the construction environment healthy and safe ( $\bar{X} = 0.763$ ) ranks third. Efforts on structures for managing H&S on construction site ( $\bar{X} = 0.405$ ) and in head office ( $\bar{X} = 0.344$ ) rank fourth and fifth respectively. Efforts on provision of incentives to encourage the adoption and practice of good H&S habits and work attitude among workers ( $\bar{X} = 0.316$ ) ranks last (sixth).

**Table 1.** Ranking of the level of contractors' H&S management efforts

Contractors' H&S management efforts	N	Mean	Std. Dev.	Rank
Provision of PPE	43	0.872	0.1652	1
Compliance with H&S regulations	39	0.770	0.1479	2
Provision of H&S facilities	43	0.763	0.1285	3
Site office H&S management structures	43	0.405	0.2708	4
Head office H&S management structures	43	0.344	0.2153	5
Provision of H&S incentives	42	0.316	0.2473	6

The above results indicate that contractors' efforts on H&S are concentrated most in the provision of PPE. However, these efforts by their nature are only directed at preventing or reducing injuries arising from unhealthy and unsafe events such as accidents and perhaps complying with mandatory regulations. Such efforts do not deal with the causes of the events therefore; they may be unable to bring about improvement in H&S performance especially accident rates.

The next in the level of contractors' efforts on H&S are their efforts to comply with regulations. Although these regulations are concerned with maintaining a healthy and safe work environment, the non-existence of local regulations implies that the efforts are discretionary and unregulated. Although any contractor who shows high commitment to complying with regulations may have good H&S performance, however, the high profit motive of most contractors coupled with lack of structures and inability to enforce such regulations constitute major drawbacks to these efforts.

The third in the efforts of contractors on H&S is in the provision of facilities such as toilets, water, canteen and first aid that make the construction work environment healthy and safe. These efforts are directed at environment-related causes of poor H&S and they contribute significantly towards a H&S compliant work environment. These causes do contribute significantly to H&S performance and the high level ( $\bar{X} = 0.763$ ) of efforts made by contractors in this respect may reduce these causes, their effects and bring about improved H&S performance although, a H&S compliant environment is not the only determinant of performance.

The structures for managing and enforcing H&S in head office and construction site by contractors are vital to H&S performance. Such structures are responsible for formulating H&S policies, defining H&S practice, maintaining H&S compliant work environment and providing motivation for the adoption and enforcement of H&S practice. Efforts in this direction deal with a variety of

causes (environment, workers and project-related and non-compliance with H&S regulations), so they tend to compliment other efforts and have considerable influence on H&S performance. The low level of these efforts on site ( $\bar{X} = 0.405$ ) and in head office ( $\bar{X} = 0.344$ ) may therefore serve as drawback to other efforts that they compliment and their impact on H&S performance of Nigerian contractors.

H&S incentives serve as self-motivators to workers. They are directed at encouraging the spirit of self-willingness to adopt and/or comply with positive H&S habits and practice and promoting self-appraisal among workers. They can be used to control workers related causes of poor H&S performance and reduce the reliance on sanctions in enforcing H&S practice. The low level of efforts ( $\bar{X} = 0.344$ ) made by Nigerian contractors in this direction may result in poor motivation, lack of concern and willingness to comply with H&S practice on the part of workers.

**10.2. Correlation between contractors’ efforts on compliance with H&S regulations and H&S performance**

The attempt to determine whether or not contractors’ efforts to comply with H&S regulations are correlates of H&S performance involves the test of the first hypothesis of this study. The hypothesis states that contractors’ efforts at complying with H&S regulations have no significant correlation with H&S performance. The hypothesis is tested using Spearman correlation test at  $p \leq 0.05$ . The results are presented in Table 2.

**Table 2.** Results of Spearman correlation between contractors’ compliance with H&S regulations and H&S performance

Variables compared	N	Corr. coeff.	p-value	Decision
<b>Compliance with H&amp;S regulations and</b>				
Assessment of H/O H&S mgt structures” performance	39	0.346	0.031	Reject
Assessment of S/O H&S mgt structures” performance	38	0.297	0.071	Accept
N of accidents recorded in 2006	15	0.274	0.323	Accept
N of injuries recorded in 2006	20	0.064	0.788	Accept
Accident per worker rate in 2006	15	-0.183	0.514	Accept
Injury per worker rate in 2006	20	-0.219	0.354	Accept
Injury per accident rate in 2006	13	-0.151	0.622	Accept

N = Number; Corr. coef. = Correlation coefficient; H/O = Head office; S/O = Site office

The results in Table 2 reveal that the p-values for the test of correlation between contractors’ efforts at complying with H&S regulations and contractors’ assessment of the performance of structures for managing

H&S on site (0.071), contractors’ accident rate in 2006 (0.323), injury rate in 2006 (0.788), accident per worker rate in 2006 (0.514), injury per worker rate in 2006 (0.354) and injury per accident rate in 2006 (0.622) are greater than the critical p-value (0.050), therefore the hypothesis is accepted. The results imply that there is no significant correlation between contractors’ efforts at complying with H&S regulations and the above 6 variables of H&S performance. However, the p-value (0.031) for the test of correlation between contractors’ efforts at complying with H&S regulations and contractors’ assessment of the performance of structures for managing H&S in head office is less than the critical p-value (0.050), therefore the hypothesis is rejected. This result indicates that the efforts made to comply with H&S regulations have significant correlation with contractors’ perception of the performance of the structures for managing H&S in head office.

This result tends to indicate that contractors use the level of their efforts at complying with H&S regulations to assess the performance of the structures put in place in the head office to ensure a healthy and safe work environment.

**10.3. Correlation between contractors’ efforts on provision of H&S facilities and H&S performance**

Analysis to determine whether or not contractors’ efforts at providing H&S facilities are correlates of H&S performance involves the test of the second hypothesis which states that contractors’ efforts at providing H&S facilities have no significant correlation with H&S performance. The hypothesis is tested using Spearman correlation test at  $p \leq 0.05$ . The results are presented in Table 3.

**Table 3.** Results of Spearman correlation between contractors’ provision of H&S facilities and H&S performance

Variables compared	N	Corr. coeff.	p-value	Decision
<b>Provision of H&amp;S facilities and</b>				
Assessment of H/O H&S mgt structures” performance	42	0.521	0.001	Reject
Assessment of S/O H&S mgt structures” performance	41	0.551	0.001	Reject
N of accidents recorded in 2006	16	-0.131	0.628	Accept
N of injuries recorded in 2006	21	-0.331	0.142	Accept
Accident per worker rate in 2006	16	-0.302	0.256	Accept
Injury per worker rate in 2006	21	-0.396	0.075	Accept
Injury per accident rate in 2006	14	-0.086	0.771	Accept

The results in Table 3 show that the p-values for correlation between contractors’ efforts at providing H&S facilities and accident rate in 2006 (0.628), injury rate in 2006 (0.142), accident per worker rate in 2006 (0.256), injury per worker rate in 2006 (0.075) and injury per accident rate in 2006 (0.771) are greater than the critical

p-value (0.050), therefore the hypothesis is accepted. The results imply that there is no significant correlation between contractors' efforts at providing H&S facilities and the 5 objective measurements of H&S performance. In other words, contractors' efforts at providing H&S facilities are not correlates of accident and injury rates. However, the p-value for the test of correlation between contractors' efforts at providing H&S facilities and contractors' assessment of the performance of structures for managing H&S in both head office (0.001) and site (0.001) are less than the critical p-value (0.050), therefore the hypothesis is rejected. This result indicates that the efforts on provision of H&S facilities have significant correlation with contractors' assessment of the performance of the structures for managing H&S in head and site offices.

These findings tend to indicate that contractors use the level of their efforts at providing H&S facilities to assess the performance of the structures put in place in the head and site offices to ensure a healthy and safe work environment.

#### 10.4. Correlation between contractors' head office H&S management structures and H&S performance

The study also investigated the correlation between contractors' efforts on structures for managing H&S in head office and H&S performance. The investigation involves the test of the third hypothesis which states that contractors' efforts on structures for managing H&S in head office have no significant correlation with H&S performance. The hypothesis is tested using Spearman correlation test at  $p < 0.05$ . The results are presented in Table 4.

**Table 4.** Results of Spearman correlation between contractors' head office H&S management structures and H&S performance

Variables compared	N	Corr. coef.	p-value	Decision
<b>Contractors' H/O H&amp;S management structures</b>				
Assessment of H/O H&S mgt structures' performance	42	0.280	0.063	Accept
Assessment of S/O H&S mgt structures' performance	41	0.090	0.576	Accept
N of accidents recorded in 2006	16	-0.207	0.442	Accept
N of injuries recorded in 2006	21	0.159	0.492	Accept
Accident per worker rate in 2006	16	-0.275	0.303	Accept
Injury per worker rate in 2006	21	0.019	0.935	Accept
Injury per accident rate in 2006	14	0.505	0.066	Accept

The results in Table 4 show that the p-values for correlation between contractors' efforts on structures for managing H&S in head office and contractors' assessment of the performance of the structures for managing H&S in their head office (0.063) and site office (0.576),

accident rate in 2006 (0.442), injury rate in 2006 (0.492), accident per worker rate in 2006 (0.303), injury per worker rate in 2006 (0.935) and injury per accident rate in 2006 (0.066) are all greater than the critical p-value (0.050), therefore, the hypothesis is accepted. These results indicate that the number of management structures put in place by Nigerian contractors in their head office to ensure that the work environment is healthy and safe do not influence their H&S performance.

#### 10.5. Correlation between contractors' site office H&S management structures and H&S performance

Analysis is also done to determine whether or not contractors' efforts on structures for managing H&S on site are correlates of H&S performance. The investigation involves the test of the fourth hypothesis which states that contractors' efforts on structures for managing H&S on site have no significant correlation with H&S performance. The hypothesis is tested using Spearman correlation test at  $p < 0.05$ . The results are presented in Table 5.

**Table 5.** Results of Spearman correlation between contractors' head office H&S management structures and H&S performance

Variables compared	N	Corr. coef.	p-value	Decision
<b>Contractors' S/O H&amp;S management structures</b>				
Assessment of H/O H&S mgt structures' performance	42	0.392	0.010	Reject
Assessment of S/O H&S mgt structures' performance	41	0.333	0.033	Reject
N of accidents recorded in 2006	16	-0.513	0.042	Reject
N of injuries recorded in 2006	21	-0.604	0.004	Reject
Accident per worker rate in 2006	16	-0.313	0.238	Accept
Injury per worker rate in 2006	21	-0.466	0.033	Reject
Injury per accident rate in 2006	14	0.007	0.981	Accept

The results of the test of the hypothesis in Table 5 reveal that only the p-values for correlation between structures for managing H&S in site office and accident per worker rate in 2006 (0.238) and injury per accident rate in 2006 (0.981) are greater than the critical p-value (0.050), therefore the hypothesis is accepted. The results tend to indicate that those contractors' efforts (that is the number) on structures for managing H&S on site are not correlates of the number of accidents per worker and injuries per accident.

The test further shows that the p-values for correlation between contractors' efforts on structures for managing H&S on site and contractors' assessment of the performance of the structures for managing H&S in head office (0.010) and site (0.033), accident rate in 2006 (0.042), injury rate in 2006 (0.004) and injury per worker rate in 2006 (0.033) are less than the critical p-value

(0.050), therefore the hypothesis is rejected. These results tend to imply that contractors’ efforts (the number of structures) on structures for managing H&S on site have significant correlation with contractors’ assessment of the performances of the structures for managing H&S in both head and site offices and their accident and injury rates. The results imply that contractors’ efforts on structures for managing H&S on site are correlates of both objective and subjective measures of H&S performance and they have greater impact than those efforts on structures for managing H&S in head office which are not correlates of the two measures of H&S performance.

**10.6. Correlation between contractors’ efforts on provision of PPE and H&S performance**

The correlation between contractors’ efforts on provision of PPE and H&S performance is determined by testing the fifth hypothesis of this study. The hypothesis states that contractors’ efforts on provision of PPE to workers do not have significant correlation with H&S performance. The hypothesis is tested using Spearman correlation at  $p \leq 0.05$ . The results are presented in Table 6.

**Table 6.** Results of Spearman correlation between contractors’ provision of PPE and H&S performance

Variables compared	N	Corr. Coef.	p-value	Decision
<b>Contractors’ efforts on provision of PPE</b>				
Assessment of H/O H&S mgt structures” performance	42	0.366	0.017	Reject
Assessment of S/O H&S mgt structures” performance	41	0.271	0.087	Accept
N of accidents recorded in 2006	16	0.003	0.992	Accept
N of injuries recorded in 2006	21	-0.258	0.259	Accept
Accident per worker rate in 2006	16	0.018	0.947	Accept
Injury per worker rate in 2006	21	-0.288	0.206	Accept
Injury per accident rate in 2006	14	-0.148	0.613	Accept

From the results of the test of the fifth hypothesis in Table 6, the p-values for correlation between contractors’ efforts on provision of PPE to workers and contractors’ assessment of the performance of the structures for managing H&S on site (0.087), accident rate in 2006 (0.992), injury rate in 2006 (0.259), accident per worker rate in 2006 (0.947), injury per worker rate in 2006 (0.206) and injury per accident rate in 2006 (0.613) are all greater than the critical p-value (0.050) therefore, the hypothesis is accepted. These results reveal that the efforts of contractors at providing PPE to workers have no correlation with their assessment of the performance of the structures for managing H&S on site and both accident and injury rates. This result implies that the efforts of contractors on the provision of PPE to workers are not correlates of accident and injury rates, an indication that these efforts are ineffective.

Table 6, however, shows that the p-value for the test of correlation between contractors’ efforts on provision of PPE to workers and contractors’ assessment of the performance of structures for managing H&S in head office (0.017) is less than the critical p-value (0.050), therefore the hypothesis which states that contractors’ efforts on provision of PPE have no correlation with H&S performance is rejected. The result is an indication that the efforts at providing PPE to workers are used by contractors in assessing the effectiveness of the structures for managing H&S in head office. It is, however, a surprise that the same is not used for assessing the performance of the structures for managing H&S on site. Perhaps, the head office is responsible for the supply of PPE to workers.

**10.7. Correlation between contractors’ efforts on provision of H&S incentives and H&S performance**

The sixth of the efforts of contractors to maintain a healthy and safe work environment are concerned with the provision of H&S incentives. The study investigates the correlation between these efforts and H&S performance by testing the sixth hypothesis of this study. The hypothesis states that contractors’ efforts on provision of H&S incentives to workers do not have significant correlation with H&S performance. The hypothesis is tested using Spearman correlation test at  $p \leq 0.05$ . The results are presented in Table 7.

**Table 7.** Results of Spearman correlation between contractors’ provision of H&S incentives and H&S performance

Variables compared	N	Corr. coef.	p-value	Decision
<b>Contractors’ efforts on provision of H&amp;S incentives</b>				
Assessment of H/O H&S mgt structures” performance	41	0.412	0.007	Reject
Assessment of S/O H&S mgt structures” performance	40	0.233	0.147	Accept
N of accidents recorded in 2006	16	-0.377	0.150	Accept
N of injuries recorded in 2006	21	-0.236	0.302	Accept
Accident per worker rate in 2006	16	-0.308	0.245	Accept
Injury per worker rate in 2006	21	-0.282	0.215	Accept
Injury per accident rate in 2006	14	-0.159	0.586	Accept

The results in Table 7 reveal that the p-values for correlation between contractors’ efforts on provision of H&S incentives to workers and contractors’ assessment of the performance of the structures for managing H&S on site (0.147), accident rate in 2006 (0.150), injury rate in 2006 (0.302), accident per worker rate in 2006 (0.245), injury per worker rate in 2006 (0.215) and injury per accident rate in 2006 (0.586) are all greater than the critical p-value (0.050), therefore the hypothesis is accepted. These results reveal that the efforts of contractors to pro-

vide H&S incentives to their workers have no correlation with their assessment of the performance of the structures for managing H&S on site and both accident and injury rates. This result implies that the efforts of contractors on provision of incentives on H&S to workers are not correlates of accident and injury rates. This is an indication that these efforts are ineffective.

The results in Table 6 further reveal that the p-value for the test of correlation between contractors' efforts on provision of H&S incentives to workers and contractors' assessment of the performance of structures for managing H&S in head office (0.007) is less than the critical p-value (0.050), therefore the hypothesis which states that contractors' efforts on provision of H&S incentives have no correlation with H&S performance is rejected. The result is an indication that the efforts at providing H&S incentives to workers is used by contractors in assessing the effectiveness of the structures for managing H&S in head office. The same efforts are, however, not used for assessing the performance of structures for managing H&S on site. Again, the result tends to imply that the head office is likely to be responsible for the formulation and implementation of H&S incentives to workers generally.

## 11. Discussion of findings

The results of the study reveal that the efforts of Nigerian contractors to make the construction work environment healthy and safe are concentrated most in the provision of PPE. The purpose of PPE implies that these efforts are directed at preventing injuries only. These efforts can neither prevent accidents which are the causes of injuries nor the causes of accidents. These are limitations which will reduce the impact of these efforts on H&S performance. These limitations are confirmed in the results of the test of the fifth hypothesis of this study, which reveal that of all the variables of H&S performance, the efforts on provision of PPE influence only contractors' perception of the performance of the structures for managing H&S in head office.

The next in the efforts of contractors on H&S is directed at complying with H&S regulations. Although, the level of these efforts is high, however, the non-existence of local H&S regulations which in turn makes the enforcement of H&S regulations difficult, constitute a great hindrance to the effectiveness of these efforts. This is revealed in the results of the test of the first hypothesis of this study which indicate that contractors' efforts at complying with H&S regulations only have significant correlation with their assessment of the performance of the structures for managing H&S in head office. The inability of these efforts to influence contractors' efforts on structures for managing H&S on site, accident and injury rates is a major limitation in the effectiveness of the efforts.

Other efforts of contractors on H&S that also rank high are directed at providing facilities that will make work environment healthy and safe. The limitation in these efforts is in their impact which is revealed in the test results of the second hypothesis. These efforts are discovered to be correlates of only subjective measures of H&S performance selected in this study. They are not

correlates of objective measures which are by their importance the major indicators of H&S performance.

The efforts of contractors on H&S that have the highest influence on H&S performance are the structures for managing H&S on site. These efforts are correlates of both subjective and objective measures of H&S performance. However, the level of these efforts on the part of Nigerian contractors is below average. The low level of these efforts is considered as a limitation which may be the reason why these efforts have no influence on accident per worker and injury per accident rates.

The study also reveals that the efforts of Nigerian contractors on structures for managing H&S in head office have no impact on H&S performance at all. It also discovers that the level of these efforts is very low, that is to say that the structures for managing H&S in head office that are not in place are more than those in place. These two results are seen as limitations in the impact of these efforts. Perhaps the low level of these efforts may be the reason why they do not have any impact on H&S performance.

One of the efforts of Nigerian contractors on H&S that is very important at least to workers is on provision of incentives for motivating workers to adopt and practice good H&S habits. The level of these efforts is discovered to be very low, that is Nigerian contractors provide only few incentives on H&S to workers. Furthermore, these efforts influence only contractors' assessment of the performance of structures for managing H&S in head office. These two results also constitute limitations to the impact of these efforts on H&S performance.

## 12. Conclusions

This study has revealed that many of the efforts of Nigerian contractors on H&S are correlates of H&S performance. The structures for managing H&S on site are discovered to be the best correlate of H&S performance. However, the level of these efforts is discovered to be low. The levels of contractors' efforts on provision of PPE, compliance with H&S regulations and provision of facilities to ensure a healthy and safe work environment are very high but their correlation with H&S performance is limited to only contractors' perception of the performance of structures for managing H&S in head office. The levels of contractors' efforts on structures for managing H&S in head office and provision of incentives on H&S are very low and they also have little or no correlation with H&S performance.

The conclusion from these results is that almost all the efforts of Nigerian contractors are correlates of H&S performance; however, they have one limitation or the other which make their expected impact on H&S performance not to be fully achieved. These results call for efforts that will increase the level of contractors' efforts on H&S and their correlation with H&S performance. Such efforts include enacting and enforcing local regulations on H&S, putting in place necessary structures for managing H&S in both head and site offices and implementing more incentive schemes that will encourage the practice of good H&S habits among construction workers.



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## SVEIKATOS IR SAUGOS DARBE VALDYMO PASTANGOS NIGERIJOS STATYBŲ PRAMONĖJE

G. I. Idoro

S a n t r a u k a

Mokslinio tyrimo tikslas buvo gerinti sveikatos ir saugos darbe realizavimą Nigerijos statybų pramonėje. Straipsnyje nagrinėjamos Nigerijos rangovų pastangos išlaikyti sveiką ir saugią darbo aplinką. Siekiant šių tikslų, buvo atliktas praktinis tyrimas, kuriame dalyvavo 40 rangovų, atsitiktinai parinktų iš Nigerijos statybų pramonės federacijos registro. Buvo išrinkti šeši sveikatos ir saugos darbe valdymo kintamieji ir septyni sveikatos ir saugos darbe realizavimo kintamieji. Sveikatos ir saugos darbe valdymo kintamieji siejami su sveikatos ir saugos taisyklėmis, paslaugomis, valdymo struktūromis administracijoje ir statybos aikštelėse, asmens saugos priemonėmis, sveikatos ir saugos darbe skatinimu. Sveikatos ir saugos darbe realizavimo kintamieji yra respondentų sveikatos ir saugos darbe valdymo struktūros realizavimo įvertinimas tiek įmonės administracijoje, tiek statybos aikštelėse. Tai nelaimingi atsitikimai, susižeidimai, nelaimingų atsitikimų skaičius vienam darbuotojui, susižeidimų skaičius vienam darbuotojui ir sužeidimų skaičius per nelaimingų atsitikimų dažnį. Duomenys buvo renkami naudojant apklausas ir analizuojami naudojant vidutinę ir Spearman koreliacijas. Rezultatai parodė, kad rangovų valdymo kintamasis, sveikatos ir saugos valdymo struktūra valdyboje ir statybos aikštelėje geriausiai koreliuoja su sveikatos ir saugos darbe realizavimu, tačiau jų lygis yra žemas. Rangovų pastangos aprūpinti asmeninėmis saugos priemonėmis siejasi su sveikatos ir saugos darbe taisyklėmis, tačiau jos nekoreliuoja su sveikatos ir saugos darbe realizavimu. Teigiama, kad rangovų pastangos yra menkos. Šio tyrimo rezultatai laikomi kaip požymiai, kad Nigerijos rangovų pastangos užtikrinti sveikatą ir saugą darbą turi didelę įtaką. Siūloma laikytis sveikatos ir saugos taisyklių ir administracijoje, ir statybos aikštelėse, gerinti Nigerijos statybose dirbančių žmonių saugą.

**Reikšminiai žodžiai:** sveikatos ir saugos darbe valdymo pastangos, objektyvūs sveikatos ir saugos darbe realizavimo matai, subjektyvūs sveikatos ir saugos darbe realizavimo matai.

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