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Perceived Implications of Non-Compliance with Safety Practices in Construction Projects: Construction Professionals' Awareness Level

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Abstract

Despite the numerous implications of non-compliance with safety practices in construction projects, there are still reports of a low level of compliance with safety rules on construction sites. The study seeks to investigate the awareness level on the implications of non-compliance with safety practices among professionals in construction projects. From the existing literature, two major types of implications namely; direct and indirect cost implications of non-compliance with safety rule were investigated. Questionnaires were used to elicit information from respondents. A hypothesis that examines the differences in the level of awareness on the implications of non-compliance with safety practices among construction professionals was postulated. Kruskal-Wallis test was used to test the hypothesis. The findings show that the awareness level on the implications of non-compliance with safety practice among each professional is high and that there are significant differences in the level of awareness on six implications of non-compliance with safety practices; 'physical injury/fatality to persons', 'workmen's compensation', 'liability insurance premiums', 'low morale of supervisors and workers', 'costs of delay' and 'time of cost'. The study concludes that professionals are aware of the implications of non-compliance with safety practices and their professional background affects the awareness level of six of the implications of non-compliance with safety practices. The study contributes to knowledge by identifying the six implications of non-compliance with safety practices where disparity exists in the awareness level among construction professionals. In cases where disparity exists in the awareness level among professionals, construction firms should adopt group discussion as a means of sensitisation to increase awareness levels.

Keywords: Construction professionals, construction project, implications, non-compliance, safety practices

1.0 INTRODUCTION

Compliance with safety rules and regulations is important for the avoidance of accidents and the general well-being of workers on construction sites. Compliance with safety practices is conforming to the rules, standards, specifications, or laws of health and safety in the construction industry. Although compliance with safety rules could be difficult due to new construction techniques, a diverse workforce and an aging workforce, yet it is important for improvement in production and quality, better employee morale, improved employee recruiting and retention and a good image and reputation (OSHA, 2016). It is also important for the reduction of accidents (Subramaniam et al., 2016). To ensure compliance with safety practices on site, there is a need to plan, organise, control, monitor and review safety rules and regulations (HSE, 2006).

Despite the enormous effort towards compliance with safety practices and procedures in the construction industry, the occurrence rate of accidents on construction sites remains high. ILO (2005) reported that every year at least 60,000 fatal accidents occur on construction sites. Furthermore, 25% to 40% of work-related death occur on construction sites. In Nigeria, ILO (2017) reported that the construction industry accounts for 39% of the total number of work-related accidents/injuries in all industries between the years 2014 and 2015. This implies that the construction industry in Nigeria reported the highest number of work-related accidents/injuries between the years 2014 and 2015. In addition, Adekunle et al. (2018) reported increases in the fatality rate of accidents from 2001 to 2015. A total of 4,777 fatalities in construction industry in Lagos state were reported with 68% occurring in non-residential construction. Various literature identified the reasons for the high rate of accidents in Nigeria (Falana & Ghazaly, 2019). Among the reason is non-compliance with safety rules by construction workers (Okoye et al., 2016; Falana & Ghazaly, 2019). Okoye et al. (2016) reported a low level of compliance with health and safety practices among construction workers in Nigeria while Dodo (2014) concluded that health and safety practices in Nigerian construction firms are yet to be fully implemented. The main reasons associated with the low level of compliance in Nigeria include lack of commitment from management, lack of monitoring and enforcement, cost of compliance and lack of awareness (Adebiyi et al., 2020). In other countries, the reasons for the low level of compliance are; lack of knowledge or understanding of health and safety practices by

construction workers, profit maximisation and motive (Windapo & Oladapo, 2012). Others include negligent attitudes by workers on site and most contractors and designers regard the cost of compliance as an unnecessary additional financial burden (Windapo & Oladapo, 2012). Furthermore, Zin and Ismail (2012) identified the behaviour of workers as the reason for non-compliance with safety practices. This calls for a need to consider the compliance level of contractors with safety rules on site and the awareness level of construction professionals on the implications of non-compliance with safety practices.

The implications of non-compliance with safety practices are enormous, although non-compliance with safety practices has been identified as a major cause of accidents (Zin & Ismail, 2012). Diverse literature identified various consequences of non-compliance with safety practices (Hedayat & Shaniani, 2017; Othman 2012), however, sparse research effort has been made towards determining the awareness level of implications of non-compliance with safety practices among construction professionals. Previous literature focused on different aspects of safety practice compliance. Windapo (2011) investigated the influence of factors such as site location, building type, project value, attitude and disposition of site manager/agent on compliance with health and safety legislation on construction sites. Zin and Ismail (2012) identified employers' behavioural safety compliance factors that encourage employees toward the behaviour of safety compliance. Windapo and Oladapo (2012) investigated the level of compliance with safety regulations and motivation by contractors in South Africa and found that the level of compliance is low. Also, Okoye et al. (2016) examined the level of compliance of building construction workers on site with safety rules and regulations in Nigeria. A low level of compliance was observed among the workers. Focusing on the consequences of non-compliance, Hedayat and Shahniani (2017) examined the costs of non-compliance with safety rules while Othman (2012) investigated the causes and effect of contractors' non-compliance with health and safety procedures. Although Hedayat and Shaniani (2017) and Othman (2012) investigated the consequences of non-compliance with safety rules, the two studies failed to examine non-compliance with safety rules from the perspective of professionals' awareness of the implications. Simard and Marchand (1997) concluded that micro organisational factors such as workgroup characteristics are the primary determinants of compliance with safety practices. Construction professionals are workgroups on construction sites and since workgroups are determinants of compliance with safety behaviour, it is important to investigate the consequences of non-compliance among them. Thus, this study aims at investigating the awareness level of professionals on the implications of non-compliance with safety practices in construction projects. The specific objectives are; to investigate the awareness level of direct and indirect implications of non-compliance with safety practices in construction projects; to examine the differences in the perception of construction professionals on the awareness level of the implications of non-compliance with safety practices.

Although Zin and Ismail (2011) identified behavioural safety compliance factors required of employers, it is also important that emphasis is made on the implications of non-compliance with safety practices to serve as warnings to non-compliant workers. Understanding the awareness level of the implications of non-compliance with safety practices among construction professionals will reduce the occurrence rate of accidents through the development of safety compliance behaviour. Furthermore, knowledge of the awareness level will help identify the training needs, especially in the area of the consequences of non-compliance with safety practices.

■2.0 LITERATURE REVIEW

2.1 Non-Compliance with Safety Practices in Construction Projects

The issue of safety in the construction industry has received a lot of attention, yet the occurrence rate of accidents is high. One of the major factors responsible for the high rate of accidents on construction sites is the issue of non-compliance with safety rules (Windapo, 2011). Developing compliance safety behaviour will encourage compliance with safety rules. Safety behaviour is the conduct of an individual towards safety practices and activities (Zin & Ismail, 2012). Positive conduct towards safety practices will encourage compliance with safety practices while a negative attitude will result in non-compliance with safety practices. Management responsibility and safety precautions influence employees' safety attitudes and perceptions on overall safety (Ratnasingam et al., 2010). It is thus necessary to emphasise the influence of management in the development of the safety behaviour of employees. Simard and Marchand (1997) identified micro organizational factors such as workgroup characteristics, supervisor characteristics and work processes and risks as the key determinants of propensity to safety compliance behaviour. Ugwu et al. (2020) echoed that transformational leadership behaviour will increase compliance with safe work behaviour, while managerial safety practices are less significant in complying with safe work behaviour. Zin and Ismail (2011) identified employers' behavioural safety compliance factors as management commitment, organisational commitment, safety communication, safety leadership, effective safety training, safety motivation, safety management system, safety rules and regulation, safety and health officer and personal protective equipment. While factors for safety compliance behaviour exist in the literature, so also do factors for non-compliance behaviour. Ugwu et al. (2015) stated that personality type A, accident optimism and fatalism relate to non-compliance with safety behaviour.

Non-compliance with safety practices is unsafe work practices (Ratnasingam et al., 2010), which is due to different factors. Umeokafor (2020) argued that one of the major reasons for non-compliance with safety rules in Nigeria is that legislation, standards and measures are copied, transposed and adopted from developed countries in which there is no enabling environment for their functionality. Also, personnel responsible for enforcing safety compliance fails to comply with some occupational safety and health regulations in their organisation (Umeokafor et al., 2014a). This, indeed reveals that the responsibility for non-compliance does not only lie on the workers, professionals and management of construction firms but also on regulating bodies and clients. Umeokafor et al. (2014b) identified client influence, inadequate enforcement, lack of regulations as factors responsible for non-compliance with safety regulations. Thus, it is pertinent that activities of regulating bodies be checked for proper enforcement. While authors like Umeokafor et al. (2014a; 2014b) focused on regulating bodies and clients as key factors responsible for non-compliance, authors (Ugwu et al., 2020; Windapo, 2013) focused on the contractors as the main source of non-compliance with safety rules. Windapo (2013) adduced the reason for low compliance

with safety practices to the cost of compliance. In other words, contractors see the money spent in complying with safety rules as an unnecessary cost. Adeyemo and Smallwood (2017) reiterated that contractors are more profit conscious than securing the safety of their workers. Ugwu et al. (2020) identified work pressure as a reason for low compliance with safety behaviour. The implications of non-compliance must be examined to encourage contractors not to consider complying with safety rules as an unnecessary cost.

2.2 Implications of Non-Compliance with Safety Practices

Different terms like cost of accidents (Smallwood & Haupt, 2006), consequences of non-compliance with safety (Hedayat & Shaniani, 2017) and effect of non-compliance with safety (Othman, 2012; Udo et al., 2016) are used to describe implications of non-compliance with safety rules. Despite the various terms used for describing non-compliance, the fact remains that failure to comply with safety rules and requirements will result in accidents. The implication includes payment of compensation by contractors to ensure compliance by workers on safety measures on site. According to Li and Poon (2009), most victims of accidents are compensated under the loss of earnings, pain suffering and loss of amenities. Furthermore, the implications are not only on the contractors but also on the victim. Hrymak and Pérezgonzález (2007) reported a wide range of implications of accidents. The implications were majorly divided into two; employers and employees. On the part of the employers, they discovered that financial costs varied from €0 to over €3.8 million. The costs include; salary costs for replacement staff or overtime payment, loss in production and productivity, retraining costs, etc. Employee financial costs varied from less than €1,000 to €112,000. Apart from financial costs, employees endured pain and suffering and they suffer negative psychological consequences. Furthermore, family and friends were indirectly affected. Teo and Feng (2011) discovered that average insured accident costs, average uninsured accident costs and average total accident costs account for 0.15%, 0.1% and 0.25% of the contract sum of a project respectively.

According to European Commission (2011), the implications of work-related accidents are not always easy to identify. They increase the company costs, decrease revenues and hinder economic growth. In addition, the implications of work-related accidents go beyond the workplace and are partly shifted to society and individuals. Asanka and Ranasinghe (2015) summarised three types of cost models, namely; Singapore accident cost model, European cost model and Australian cost model. In the model, the cost bearers of accidents were identified. In other words, those that bore the implications of accidents were identified. In the Singapore cost model, the employers, workers and community bear the cost while individuals and their families, employers and government/community bear the cost in European cost models. The cost bearers in the Australian accident cost model are the workers, employers and society. Despite the cost model, the implications on the bearer are either direct or indirect implications.

While authors like Arunkumar and Gunasekaran (2018) and Ahmed (2019) generally identified the implications of non-compliance with safety rules, others like Hrymak and Pérezgonzález (2007) classified the implications of non-compliance into two namely; costs to employer and employee. European Commission (2011) classified the implications of accidents as 'non-tangible or 'tangible'. Examples of non-tangible implications are pain and suffering, lifestyle changes, strain on relationships, lowered self-esteem while tangible implications are loss of salary and premiums, medical costs, loss of time due to medical treatment and reduction of professional capacity. Tang (2004) examined the financial and social costs of construction accidents. He defined financial cost accidents as losses incurred by contractors due to the occurrence of accidents on site. Examples include; loss due to the injured person, loss due to fines and legal expenses, loss of productivity of other employees. Social costs of construction accidents are losses incurred by society due to the occurrence of construction site accidents (Tang, 2004). Smallwood and Haupt (2006) categorised the implications of non-compliance with safety rules into two direct costs and indirect costs. Arunkumar and Gunasekaran (2018) concluded that the most effects of accidents due to non-compliance with safety practices are; costs of medical expenses, time loss of project execution, productivity loss, distrust of firm and cost of training given to new workers. Likewise, Ahmed (2019) identified five major effects of accidents which are also due to non-compliance with safety practices as loss of human lives, demotivation of workers/reduce morale, conflict with workers, loss of productivity of project and delay in work progress. These costs could be categorised into direct and indirect costs and at the same time have impacts on employer and employee.

2.2.1 Direct Cost Implications

Smallwood and Haupt (2006) defined direct cost as "cost associated with the treatment of the injury and any unique compensation offered to workers as a consequence of being injured and covered by workmen's compensation insurance premiums". They are sometimes referred to as insured costs (Teo & Feng, 2011). In other words, direct costs are costs implications require in the treatment of victims and any other compensation. Direct costs are costs that are easily identified (Pillay & Haupt, 2008) and they include, physical injury/fatality to person, property damage, workmen's compensation, liability insurance premiums, low morale of supervisors and workers, money paid annually to victims of work-related accidents (Othman, 2012; Smallwood & Haupt, 2005, 2006). In addition, direct costs can be determined from historical records (Pillay & Haupt, 2008). Research conducted by Othman (2012) shows that 14% of the effect of non-compliance is due to repair of damages and 11% due to insurance and compensation of affected parties. Haupt and Pillay (2016) discovered that R10,087,350 were attributed to direct costs of accidents.

2.2.2 Indirect Cost Implications

Indirect cost implications are costs borne by contractors (Smallwood & Haupt, 2006). They are hidden costs that usually exceed the direct costs and are difficult to access due to non-capturing or quantifying of information as it accrues (Pillay & Haupt, 2008). Indirect costs include costs due to reduced productivity, clean-up costs, replacement costs, costs due to delay, costs related to rescheduling, transportation and wages paid to victims while idle (Othman, 2012; Smallwood & Haupt, 2006). 14% of the indirect effect of non-

compliance is due to repair of damages, 11% is due to loss of productivity during accident and loss of productivity by the injured party (Othman, 2012). Azman et al. (2019) discovered that the ratio of direct cost to indirect cost for permanent disability is 1:1.94 while that of temporary disability is 1:1.19. When the costs of permanent and temporary disabilities are combined, the ratio of direct and indirect costs is 1:1.28. Furthermore, the ratio of direct and indirect costs for overall construction accidents is 1:1.23 (Azman et al., 2019). Haupt and Pillay (2016) explained that R22, 890,850 was attributed to indirect costs of accidents in South Africa. Azman et al. (2019) discovered that the ratio of direct cost to indirect cost for permanent disability is 1:1.94 while that of temporary disability is 1:1.19. When the costs of permanent and temporary disabilities are combined, the ratio of direct and indirect costs is 1:1.28. Furthermore, the ratio of direct and indirect costs for overall construction accidents is 1:1.23 (Azman et al., 2019). Haupt and Pillay (2016) explained that R22, 890,850 was attributed to indirect costs of accidents in South Africa.

2.3 Theoretical Framework

Empirical research on the relationship between different independent variables and compliance level with safety requirements as a dependent variable abound in the literature. For example, Windapo (2011) tested the relationship between four independent variables namely; location, building type, project value, site manager's attitude and level of compliance to health and safety requirements achieved on site. The result shows a significant relationship between building type and site manager's attitude and level of compliance to health and safety requirements achieved on site. Dahl and Olsen (2013) examined how workers' perception of leadership involvement affects the level of safety compliance. Leadership involvement in daily work operations has a significant positive influence on the level of safety compliance. Smallwood (2004), and Smallwood and Haupt (2005, 2006) examined the perception of engineers, designers and project managers on health and safety regulations from the perspective of direct and indirect costs while Othman (2012) examined the implications of non-compliance with safety on construction project performance from the perspective of direct and indirect cost. However, empirical research on the level of awareness on the implications of non-compliance with safety rules among construction professionals (architects, builders, quantity surveyors and engineers) is sparse. This study, therefore, proposes that:

H_1: There is no significant difference in the level of awareness on the implications of non-compliance with safety practices among professionals in construction projects.

Figure 1 shows the effect of professions (Architecture, Building, Structural Engineering, Quantity Surveying, Service Engineering) on the awareness level of implications of non-compliance with safety practices. The dependent variable which is the awareness level of implications of non-compliance with safety practices is broadly divided into two latent variables; direct cost implications and indirect cost implications. The independent variables are the major professions on construction sites namely; architecture, building, quantity surveying, structural engineering and service engineering.

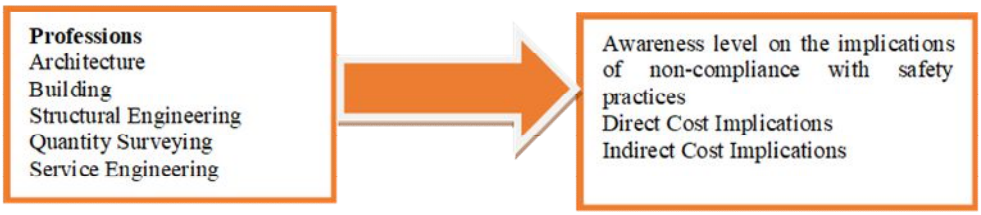

Figure 1 Effect of professions on the level of awareness of non-compliance with safety practices' implications

■3.0 METHODOLOGY

3.1 Data Collection

A survey research design and quantitative research approach were employed in eliciting the perceptions of professionals on the implications of non-compliance with safety practices. A quantitative research approach was adopted because it explains the phenomenon of non-compliance with safety practices through the gathering of data in numerical form (Apuke, 2017). Five categories of construction professionals namely, architects, builders, quantity surveyors, structural engineers and service engineers working on construction sites in Lagos state were the target respondents. Lagos state was chosen as the study area because it is the commercial capital of the country and as such major construction works are carried out there. Furthermore, Adekunle et al. (2018) reported a total number of 4777 fatalities in Lagos State in the year 2015. This shows a high occurrence rate of accidents on construction sites in Lagos state. Respondents were first asked to indicate whether they have been involved or witness accidents on construction sites. Thereafter, the ones that indicated 'yes' were asked to participate in the survey. This is because they would know the implications due to their involvement or witnesses of accidents. The data collection instrument adopted was a structured questionnaire. A total of 300 questionnaires was purposely distributed to the named professionals working directly on construction sites and 200 questionnaires were retrieved and valid for analysis representing a 67% response rate. Purposive sampling technique is a technique where respondents are deliberately adopted as samples due to meeting the criteria of research purposes (Gupta & Rangi, 2011). In purposive sampling, researchers only seek information from those who in their opinion are likely to have the required information and willing to share (Kumar, 2011). Thus, the questionnaires were purposely distributed

because respondents who had the required information about accidents and their implications and willingly gave their consent were requested to participate in the survey.

3.2 Measures of Variables

The variables for the study were adapted from Othman (2012). 21 observable variables describing the implications of non-compliance with safety practices were divided into two major latent variables namely direct and indirect implications. Respondents were asked to state their level of awareness on the implications of non-compliance with safety practices using 1 for very low, 2 for low, 3 for moderate, 4 for high and 5 for very high. The reliability of the research instrument was measured using Cronbach's alpha, which gave values of 0.947 and 0.943 for direct and indirect implications respectively. The values are within the acceptance value of 0.7 (Field, 2009). The convergent validity of the research instrument was achieved by calculating the factor loadings for the items using principal component analysis with varimax rotation. The factor loadings for all the items are above the threshold value of 0.04 (Field, 2009). Table 1 presents the factor loadings and Cronbach's alpha values for the items. Kruskal-Wallis test was used in testing the hypothesis. Kruskal-Wallis test is a non-parametric test and it is used when the dependent variable is measured on an ordinal scale and the independent variable has three or more different groups (Gupta & Rangi, 2011). Since the dependent variable (non-compliance with safety practices) for this study was measured on an ordinal scale and the independent variables are 5 groups of construction professionals, hence the use of the Kruskal-Wallis test for testing the hypothesis.

Table 1 Factor loadings for implications of non-compliance items

S/N	Factor Analysis	Direct Cost	Indirect Cost
	Cronbach Alpha	**0.947**	**0.943**
1	Physical injury/fatality to persons	0.696	
2	Damages to property	0.848	
3	Workmen's compensation	0.868	
4	Liability insurance premium	0.872	
5	The low morale of supervisors and workmen	0.778	
6	Attractiveness to the client as a result of perceived holistic quality	0.804	
7	The socioeconomic loss to families of the deceased or injured	0.719	
8	Money paid annually to victims of work-related accidents	0.854	
9	Public liability insurances	0.884	
10	Replacement costs of lost workers		0.800
11	Cost of supervision		0.751
12	Reduced productivity by the returned workers and the workforce		0.824
13	Clean up costs		0.800
14	Cost of delay		0.716
15	Time cost		0.821
16	Cost related to rescheduling		0.846
17	Cost of transportation for the injured party		0.841
18	Wages paid for an unproductive injured party		0.805
19	Damages to and loss of materials		0.836
20	Damages to the environment		0.828
21	Uninsured cost which is invariably included in the contractor's cost structure		0.764
	Extraction Method: Principal Component Analysis.		
	Rotation: Varimax		
	KMO = 0.931, Barlett's Test = 2030.373, Df = 66, Sig = .000		

■4.0 RESULTS OF ANALYSIS

A total of 200 professionals participated in the survey. Table 2 shows the demographic details of the respondents.

Table 2 Demographic profile of respondents

Respondents' Profile	Frequency	Percentage
Profession		
Architect	24	12
Builder	123	61.5
Structural engineer	25	12.5
Quantity surveyor	11	5.5
Service engineer	17	8.5
Total	200	100
Academic background		
OND (Ordinary National Diploma)	15	7.5
HND (Higher National Diploma)	57	28.5
BSc (Bachelor of Science)	92	46
PGD (Postgraduate Diploma)	17	8.5
MSC (Masters of Science)	19	9.5
Total	200	100
Professional affiliation		
NIA (Nigerian Institute of Architecture)	24	12
NIOB (Nigerian Institute of Building)	116	58
NIQS (Nigerian Institute of Quantity surveying)	22	11
NSE (Nigeria Society of Engineers)	34	17
Others (Project Management Institute)	4	2
Total	200	100
Site Experience		
≤ 5 years	65	32.5
6-10years	89	44.5
11-15years	38	19
16-20years	7	3.5
≥ 20 years	1	0.5
Total	200	100

61.5% of the respondents in Table 2 are builders by profession while 12.5% are structural engineers. A greater percentage of the respondents are builders because the majority of the tasks are on site. A greater percentage (46%) of the respondent possesses a Bachelor of Science (BSc) as a qualification while a smaller percentage (7.5%) have an Ordinary National Diploma (OND) as a qualification. This shows that the respondents are well informed and can give reliable information on the implications of non-compliance with safety rules on site. The respondents are not only academically qualified, but they are also professionally certified. 58% have affiliation with the Nigerian Institute of Building (NIOB) while 12% are affiliated with the Nigerian Institute of Architect (NIA).

4.1 Awareness Level on Implications of Non-Compliance with Safety Practices

The awareness level of all professionals on the implications of non-compliance with safety practices is presented in Table 3. The result shows that the awareness level of direct and indirect implications of non-compliance with safety rules is high, although, indirect implication (3.98) has a higher awareness level than direct implications (3.85). The awareness level on all the 9 sub-variables of direct implication is high with ‘physical injury/fatality to persons’ and ‘damages to property’ having the highest mean value of 4.03. Also, the

awareness level of all the 12 sub-variables of indirect implication is high with 'cost of transportation for injured party' having the highest mean value of 4.08.

Table 3 Awareness level on Implications of non-compliance of safety practices

S/N	Implications of non-compliance	1	2	3	4	5	TS	MS	RMK
A	**Direct Implication**	**7**	**16**	**37**	**81**	**59**	**200**	**3.85**	**High**
1	Physical injury/fatality to persons	7	18	10	93	72	200	4.03	High
2	Damages to property	3	4	44	82	67	200	4.03	High
3	Payment of workmen's compensation	4	25	48	61	62	200	3.76	High
4	Purchase of liability insurance premiums	9	22	39	68	62	200	3.76	High
5	The low morale of supervisors and workers	5	8	48	90	49	200	3.85	High
6	Attractiveness to client as a result of perceived holistic quality	5	9	45	83	58	200	3.90	High
7	Socio-economic loss to families of victims	2	25	24	90	59	200	3.90	High
8	Money paid annually to victims of work	13	13	45	83	46	200	3.68	High
9	Public liability insurances	13	20	33	75	59	200	3.74	High
B	**Indirect Implication**	**3**	**12**	**38**	**81**	**66**	**200**	**3.98**	**High**
1	Replacement costs of lost workers	10	23	20	77	70	200	3.87	High
2	Costs of supervision	4	13	37	88	58	200	3.92	High
3	Reduced productivity by the returned workers and the workforce	2	7	36	93	62	200	4.03	High
4	Clean up costs	2	9	46	91	52	200	3.91	High
5	Costs of delay	2	24	26	80	68	200	3.94	High
6	Time cost	2	2	54	72	70	200	4.03	High
7	Costs related to rescheduling	0	14	35	89	62	200	4.00	High
8	Costs of transportation for injured party	2	11	37	70	80	200	4.08	High
9	Wages paid for unproductive injured party	2	16	28	89	65	200	4.00	High
10	Damages to and loss of materials, plant and ….	2	10	46	69	73	200	4.01	High
11	Damage to the environment	3	13	44	78	62	200	3.92	High
12	Uninsured costs which are invariably included ….	5	2	48	81	64	200	3.99	High

Note: MS = Mean Score, TS = Total Score, RMK = Remark, 1.00-1.49 = *very low*; 1.50-2.49 = *low*; 2.50-3.49 = *moderate,* 3.50-4.49 = *high* and 4.50-5.00 = *very high*

4.2 Differences in Awareness Level on the Implications of Non-Compliance with Safety Practices among Professionals

The differences in awareness level among professionals on the implications of non-compliance with safety practices were determined by testing the hypothesis, 'there is no significant difference in the perception of professionals on the implications of non-compliance of safety practices in construction projects. The hypothesis was tested using the Kruskal-Wallis test. The results are presented in Table 4.

Table 4 Differences in professionals' perception of the awareness of non-compliance with safety practices

Implications	1		2		3		4		5		Kruskal-Wallis		
	MR	M	MR	M	MR	M	MR	M	MR	M	X^2	df	p-value
Direct Implications													
Physical injury/fatality to persons	114.02	4.5	104.35	4	99.18	4	83.55	4	66.47	4	10.197	4	0.037
Damages to property	114.19	4	98.24	4	101.22	4	108.14	4	91.5	4	2.419	4	0.659
Payment of workmen's compensation	138.1	5	96.12	4	100.76	4	95.05	4	82.26	3	13.629	4	0.009
Purchase of liability insurance premiums	135.9	5	97.83	4	95.5	4	98.23	4	78.65	3	12.866	4	0.012
The low morale of supervisors and workers	119.88	4	97.46	4	108.26	4	120.45	4	70.79	3	10.523	4	0.032
Attractiveness to the client as a result of perceived holistic quality	107.1	4	98.53	4	115.06	4	85.05	4	94	4	3.4	4	0.493
The socio-economic loss to families of the deceased/injured	119.69	4	98.68	4	100.32	4	111.64	4	79.65	4	6.109	4	0.191
Money paid annually to victims of work-related accidents	124.08	4	96.79	4	108	4	84.45	4	93.41	4	6.645	4	0.156
Public liability insurances	127.42	4	98.02	4	100.72	4	99.73	4	80.62	3	8.107	4	0.088
Indirect Implications													
Replacement costs of lost workers	111.63	4	100.78	4	94.7	4	112.05	4	83.79	4	3.337	4	0.503
Costs of supervision	120.67	4	98.69	4	106.78	4	96.82	4	78.29	3	6.648	4	0.156
Reduced productivity by the returned worker(s) and the workforce	106.73	4	105.35	4	99.42	4	88.5	4	65.94	3	8.897	4	0.064
Clean up costs	124.1	4	98.45	4	103.48	4	103.82	4	75.47	3	8.479	4	0.076
Costs of delay	118.75	4	97.56	4	106.86	4	126.14	4	70.09	3	11.041	4	0.026
Time cost	122.13	4.5	98.09	4	105.7	4	114.59	4	70.62	3	10.045	4	0.040
Costs related to rescheduling	118.27	4	98.08	4	101.76	4	103.32	4	89.24	4	3.605	4	0.462
Costs of transportation for injured party	118.54	4.5	102.91	4	90.66	4	89.41	4	79.26	4	6.721	4	0.151
Wages paid for an unproductive injured party	114.85	4	100.28	4	95.14	4	120.68	4	76.62	4	6.776	4	0.148
Damages to and loss of materials, plant and equipment	129.02	5	97.19	4	100.26	4	103.14	4	82.82	4	8.728	4	0.068
Damage to the environment	113.21	4	100.53	4	95.22	4	107.5	3	85.59	4	2.949	4	0.566
Uninsured cost which are invariably included in the contractor's cost structure	126.88	4.5	101.83	4	87.28	4	104.05	4	70.82	4	12.247	4	0.016

Note: MR = Mean Rank, M = Median, X^2 = Chi-square, df = difference, 1 = Architect, 2 = Builder, 3 = Structural Engineer, 4 = Quantity Surveyor, 5 = Service Engineer

A Kruskal-Wallis test was conducted to determine whether the awareness level on the implications of non-compliance with safety practices varies among construction professionals; architects, builders, quantity surveyors, structural engineers and service engineers. The result in Table 4 reveals that of the 9 sub-variables of direct implications, 4 sub-variables are significant namely; 'physical injury/fatality to persons', 'workmen's compensation', 'liability insurance premiums' and 'low morale of supervisors and workers'. Thus, the test rejects

the hypothesis for the four sub-variables. There was a significant difference in the level of awareness of physical injury/fatality to persons among professionals, (4) $X^2 = 10.197$, $p \leq 0.05$, $r = 0.72$ with a mean rank of 114.02 (median = 4.5) for architects, 104.35 (median = 4) for builders, 99.18 (median = 4) for quantity surveyors, 83.55 (median = 4) for structural engineers and 66.47 (median = 4) for service engineers. The implication is that architects tend to be more aware of physical injury/fatality to persons (M=4.5) compare to other professionals. According to Cohen's criteria (Field, 2009), when an effect size is ≥ 0.5, then it is classified as a large effect size. Thus, the effect size of differences in the level of awareness on the implications of physical injury/fatality to persons is high. Also, there was a significant difference in the level of awareness of workmen's compensation as an implication of non-compliance with safety practice, X^2 (4) = 13.629, $p \leq 0.05$, $r = 0.96$ with a mean rank of 138.10 (median = 5) for architects, 96.12 (median = 4) for builders, 100.76 (median = 4) for quantity surveyors, 95.50 (median = 4) for structural engineers and 82.26 (median = 3) for service engineers. This implies that the awareness level of workmen's compensation is high among architects compare to other professionals and the difference is high based on Cohen's criteria. There was a significant difference in the awareness level of liability insurance premiums as an implication of non-compliance with safety practice among the various professions, X^2 (4) = 12.866, $p \leq 0.05$, $r = 0.91$ with a mean rank of 135.90 (median = 5) for architects, 97.83 (median = 4) for builders, 95.50 (median = 4) for quantity surveyors, 98.23 (median = 4) for structural engineers and 78.65 (median = 3) for service engineers. Again, architects reported a high level of awareness compare to the other professionals and the difference is high from the effect size calculated. A significant difference existed in the awareness level of the sub-variables 'low morale of supervisors and workers', X^2 (4) = 10.523, $p \leq 0.05$, $r = 0.74$ with a mean rank of 119.88 (median = 4) for architects, 97.46 (median = 4) for builders, 108.26 (median = 4) for quantity surveyors, 120.45 (median = 4) for structural engineers and 70.79 (median = 3) for service engineers. This means that the level of awareness on 'low morale of supervisors and workers' as an implication of non-compliance with safety practice is low among service engineers compared to other professionals. For the four significant direct variables, it implies that the level of awareness of the four sub-variables varies among construction professionals.

Furthermore, the results in Table 4 show that 2 sub-variables namely; 'costs of delay' and 'time of cost' out of the 12 indirect implications of non-compliance with safety practices are significant. The test, therefore, rejects the hypothesis for the two sub-variables. There was a significant difference in the awareness level of 'costs of delay' as an indirect variable of non-compliance with safety practice, X^2 (4) = 11.041, $p \leq 0.05$, $r = 0.78$ with a mean rank of 118.75 (median = 4) for architects, 97.56 (median = 4) for builders, 106.86 (median = 4) for quantity surveyors, 126.14 (median = 4) for structural engineers and 70.09 (median = 3) for service engineers. Also, there was a significant difference in the awareness level of 'time of cost' as a sub variable of indirect non-compliance with safety practices, X^2 (4) = 10.045, $p \leq 0.05$, $r = 0.71$ with a mean rank of 122.13 (median = 4.5) for architects, 98.09 (median = 4) for builders, 105.70 (median = 4) for quantity surveyors, 114.59 (median = 4) for structural engineers and 70.62 (median = 3) for service engineers. This implies that the level of awareness of the cost of delay and time of cost as implications of non-compliance with safety varies among construction professionals.

■5.0 DISCUSSION

The 22 variables measuring implications of non-compliance with safety practices measured under two major categories of direct and indirect implications were determined using a mean score. The results in Table 2 show that the level of awareness of professionals on the implications of non-compliance with safety practices is high. This implies that professionals are aware of the consequences of non-compliance with safety rules, yet the compliance level with safety rules and regulations is low as reported by Okoye et al. (2016). The reasons for the non-compliance with safety rules even when the awareness level of the implications is high could be due to the negligent attitude of management or profit maximisation as stated by Windapo and Oladapo (2012). While most of the reasons cited for non-compliance fall within management in construction firms (Windapo, 2011; Windapo & Oladapo, 2012), Okoye et al. (2006) reported a moderate knowledge of safety practices among construction workers and Adebiyi et al. (2020) concluded that on average, construction workers have knowledge of health and safety information but demonstrated a low level of compliance. This shows that workers are aware of safety practices as well as the consequences of not complying with safety rules. Thus, the enforcement of penalties for non-compliance with safety rules must be given utmost consideration.

On whether profession affects the level of awareness of implications of non-compliance with safety practices, the result reveals that profession affects the level of awareness of 'physical injury/fatality to persons', 'workmen's compensation', 'liability insurance premiums', 'low morale of supervisors and workers', 'costs of delay' and 'time of cost'. Architects reported a high awareness level in the areas of 'physical injury/fatality to persons', 'workmen's compensation', 'liability insurance premiums', 'low morale of supervisors and workers', 'costs of delay' and 'time of cost'. The high awareness level could be due to the call from previous literature such as Smallwood and Haupt (2007) on the need to make construction health and safety more prominent in architectural education and training. Furthermore, the differences could be due to various sources of acquisition of health and safety. This supports Smallwood and Haupt's (2004) conclusion that health and safety knowledge acquisition is due to different sources such as experience and the workshop attended which is informal. In addition, Chaswa et al. (2020) concluded that the awareness level of risk associated with accidents is affected by factors such as expert knowledge, personal knowledge and educational level. Thus, differences in the awareness level of certain implications of non-compliance with safety practices may be due to expert knowledge of the professionals and their individual knowledge.

Differences in the level of awareness on implications of non-compliance with safety practices suggest a disparity in the training of construction professionals on safety practices in construction projects. This calls for the management of construction firms to train professionals equally on the implications of non-compliance with safety practices. Regardless of professional background, awareness level on implications of non-compliance with safety rules should be equal among professionals working on construction sites. It is thus important that there should be no disparity in training especially in the area of compliance with the safety rules by all professionals involved in construction projects. Simard and Marchand (1997) suggested a social relationship that influences management in developing a

safety program and joint regulation mechanisms. Social relationships will encourage interaction among professionals on construction sites which will promote group discussion. Ijaola et al. (2021) identified group discussion as a significant training delivery method. Hence, group discussion must be encouraged among professionals on construction sites for proper dissemination of information on the consequences of non-compliance with safety rules on site.

■6.0 CONCLUSION

The study sought to investigate the awareness level of construction professionals on the implications of non-compliance with safety practices. A hypothesis which states that there is no significant difference in the level of awareness among construction professionals on the implications of non-compliance with safety practice was postulated. Mean score was used to analyse the level of awareness while the Kruskal-Wallis test was conducted to test the hypothesis. The results of the analysis show that the awareness level on implications of non-compliance with safety practice is high among construction professionals. Furthermore, the awareness level on six of the implications ('physical injury/fatality to persons', 'workmen's compensation', 'liability insurance premiums', 'low morale of supervisors and workers', costs of delay' and 'time of cost') of non-compliance with safety practice varies among construction professionals. The study, therefore, concludes that the awareness level of professionals on the implications of non-compliance with safety rules is high and there is disparity among them on the awareness level of certain implications. Thus, professional background affects the awareness level of 'physical injury/fatality to persons', 'workmen's compensation', 'liability insurance premiums', 'low morale of supervisors and workers', costs of delay' and 'time of cost' as implications of non-compliance with safety practices. This study contributes to knowledge by identifying six implications of non-compliance with safety practices where disparity exists in the awareness level among construction professionals. In cases where disparity exists in the awareness level among professionals, construction firms should adopt group discussion among various professionals involved in construction projects as a means of sensitisation to increase awareness level.

6.1 Implications for Practice

Despite the high level of awareness on the implications of non-compliance with safety practices in construction projects, the occurrence level of accidents is high. Management of construction firms should enforce compliance among workers on site. Furthermore, knowledge of the high awareness level and the implications of non-compliance among construction professionals should propel regulatory agencies to focus on the enforcement of safety compliance by management in construction firms. Construction firms should also adopt the six implications of non-compliance with safety practices in their safety curriculum and training programme since there is a disparity in the level of awareness among professionals.

6.2 Recommendations for Future Research

The awareness level on the implications of non-compliance with safety practices has been established in this study using questionnaires, which are known for their limitation in terms of reliability and validity. Although Cronbach's alpha and convergent validity were calculated to check these limitations, future studies should adopt other survey methods such as interviews to validate the result of this study. Also, future studies should examine the implications of non-compliance with safety practices from a case study perspective and quantify the implications in monetary terms.

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