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ISSN: 1023-0564 • e-ISSN: 2415-0487

OPEN ACCESS

Received: January 2022
Peer reviewed and revised: April 2022
Published: June 2022

KEYWORDS: Accidents, construction health and safety, construction industry, safety behaviour

HOW TO CITE: Afuye, O., Aina, O., Oladimeji, O. & Mohammed, T. 2021. Perceptions of safety behaviour-modifying techniques in construction firms: Insights from Lagos, Nigeria. *Acta Structilia*, 29(1), pp. 59-85.

Published by the UFS
http://journals.ufs.ac.za/index.php/as

PERCEPTIONS OF SAFETY BEHAVIOUR-MODIFYING TECHNIQUES IN CONSTRUCTION FIRMS: INSIGHTS FROM LAGOS, NIGERIA

RESEARCH ARTICLE[1]

DOI: http://dx.doi.org/10.18820/24150487/as29i1.3

ABSTRACT

Unsafe behaviour is a major contributing factor to accidents on construction sites. Measures must be taken to instil safety behaviour in construction workers, in order to reposition the industry for greater safety and performance on construction sites. The article examined the safety behaviour-modifying technique (SBMT) adopted by construction firms in Lagos State with a view to increasing the likelihood of safe acts of workers in the study area. To achieve this aim, four major grouped components of SBMT (goals, training, feedback, and incentive) were identified consisting of 24 variables obtained from the literature. The literature informed the structured questionnaire that was administered to 106 representatives of construction firms within Lagos State. The SBMT positions within construction firms were ranked, using the mean score (MS), and independent t-test was employed to compare the techniques used within the firms. The results of the analysis revealed that the safety training component was the most widely used SBMT in both large and medium-sized businesses. It was also observed that construction firms pay less attention to feedback on

1 DECLARATION: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

safety performance and to providing incentives to personnel who carried out their work in a noted safe manner. The study recommended that, in addition to consistent safety training provided to workers, construction firms should set realistic and achievable safety goals, provide workers' safety feedback, and reward workers for safety behaviour on construction sites. This practice may reduce the rates of accidents and injuries on construction sites, leading to a safer construction industry with less work-place fatalities.

ABSTRAK

Onveilige optrede is 'n groot bydraende faktor tot ongelukke op konstruksieterreine. Maatreëls moet getref word om veiligheidsgedrag by konstruksiewerkers te vestig ten einde die bedryf te herposisioneer vir groter konstruksieterreinveiligheid en werkverrigting. Die artikel het die veiligheidsgedragwysigingstegniek (SBMT) ondersoek wat deur konstruksiefirmas in Lagos-staat aangeneem is met die oog op die verhoging van die waarskynlikheid van veilige optrede van werkers in die studiegebied. Om hierdie doel te bereik, is vier groot gegroepeerde komponente van SBMT (doelwitte, opleiding, terugvoer, en aansporing) geïdentifiseer wat bestaan uit 24 veranderlikes wat deur die literatuur verkry is. 'n Gestruktureerde vraelys gebaseer op die literatuur, is aan 106 verteenwoordigers van konstruksiefirmas in Lagos-Staat gestuur. Die SBMT-posisies in konstruksiefirmas is gelys volgens die gemiddelde telling (MS) en 'n onafhanklike t-toets is gedoen om die tegnieke wat binne die firmas gebruik word, te vergelyk. Die bevindinge toon dat die veiligheidsopleidingskomponent van die SBMT die meeste in beide groot en mediumgrootte besighede gebruik word. Daar is ook waargeneem dat konstruksiefirmas minder aandag gee aan terugvoer oor veiligheidsprestasie sowel as die verskaffing van aansporings aan personeel wat hul werk op 'n bekende veilige wyse uitgevoer het. Die artikel beveel aan dat bykomend tot konsekwente veiligheidsopleiding wat aan werkers verskaf word, konstruksiefirmas realistiese en haalbare veiligheidsdoelwitte moet stel, veiligheidsterugvoer aan werkers verskaf moet word en werkers beloon moet word vir veiligheidsgedrag op konstruksieterreine. Hierdie praktyke kan die ongelukke- en beseringskoerse op konstruksieterreine verminder wat lei tot 'n veiliger konstruksiebedryf met minder sterftes in die werkplek.

Sleutelwoorde: Ongelukke, konstruksiegesondheid en -veiligheid, konstruksiebedryf, veiligheidsgedrag

1. INTRODUCTION

The International Labour Organization (ILO) (2009) noted that the construction industry is a dangerous and highly hazardous industry because of the occurrence of accidents and fatalities compared to other manufacturing industries such as mining and agriculture. Despite the mechanisation of some activities, the industry is still labour intensive (Mhetre, Konnur & Landage 2016: 153). Internationally, construction workers are viewed as being two to three times more likely to be killed than workers in other industries, while the risk of serious injury is almost three times higher (Agwu & Olele, 2013: 432). The accident rate reports, as cited in Guo *et al.* (2019: 1), revealed that, in 2017, there were 1 967 fatal occupational injuries during goods production in the United States, with construction employees representing 49.4% (U.S. Bureau of Labour Statistics, 2020: 10). Fatal injuries in the main industries totalled 142 in Great Britain in 2020, and construction workers represented 27.4% (Health

and Safety Executive, 2021). In 2018, there were 909 labourer deaths in Japan, with construction workers accounting for 34.7% of the total (Japan Ministry of Health, Labour and Welfare, 2019). This situation is worse in developing countries and Nigeria, in particular, because there are no reliable sources of data for such accident records, as the industry does not always report accidents to the relevant authority (Agwu & Olele, 2013: 432).

According to his Domino theory of accidents, Heinrich (1959) proposed that construction accidents can be prevented by identifying the root causes of accidents. This is possible by means of accident investigation techniques such as theories of accident causation. He found that unsafe behaviour by human beings is the main cause of accidents, and eliminating this factor is a major tool to prevent accidents (Hosseinian & Torghabeh, 2012: 54).

Generally, several researchers also classified the causes of occupational accidents into unsafe conditions and unsafe behaviours, with the largest proportion (about 80%) of the accidents caused attributed to unsafe behaviours rather than unsafe conditions (Sadullah & Kanten, 2009: 924; Mat Zin & Ismail, 2011: 742; Oostakhan, Mofidi & Talab, 2012:21; Shin, Gwak & Lee, 2015: 298). Unsafe behaviour is any act that deviates from the generally recognised safe way of performing a task and increases the likelihood of an accident (Harsini *et al.*, 2020: 02; Shamsuddin *et al.,* 2015: 626). Meanwhile, Clark (2006: 315-327) reported that failure to adhere to rules and regulations, following safety procedures conscientiously, and taking precautions against hazards (such as wearing personal protective equipment) is common in many industries such as mining and construction. This depicts the situation of the Nigerian construction industry where violation of safety rules and procedures seems to be common practice while trying to make work more efficient, quicker, and more convenient. The reason for this is that most of the construction managers place more value on productivity than on safety (Enshassi, Choudhry & Abd-Abu Alqumboz, 2009: 140). Gurmu (2019: 2) opined that the occurrence of accidents has negatively influenced workers' productivity, resulting in project delays and increased construction costs.

Agumba, Pretorius and Haupt (2013: 70) support effective health and safety practice in the construction industry and demand proactive measures (safety-leading indicators as an intervention) that will control accident-causing behaviours before they finally result in accidents. Efforts at safety improvement have focused on behaviour-based safety management, with research on the subject of behaviour modification being reported from the UK, Hong Kong and Iran (Duff *et al.*, 1994: 67-78; Lingard & Rowlinson, 1998: 209-230; Geller, 2011: 109-114; Oostakhan *et al.,* 2012: 21-25). The Construction Owners Association of Alberta (COAA) (2013: 6) also affirmed that safety behaviour-modification (SBM) is a proactive process that helps

change a work group's safe behaviour levels before accidents occur. Furthermore, Boateng, Davis and Pillay (2019: 11) suggested measures such as management commitment, safety communication, workers' involvement, safety knowledge, as well as safety and health training as factors that can improve safety behaviour in construction workers. Although many researchers have suggested various ways to improve safety behaviour on construction sites, few researchers are investigating the level to which these techniques are adopted on construction sites in Nigeria.

It is thus important to go beyond the assessment of the traditional health and safety challenges to consider the proactive measures that focus on how efforts are directed towards modifying unsafe behaviours of workers in construction firms. The study assesses the safety behaviour-modifying techniques (SBMT) perceived to be adopted by construction firms in Lagos State.

2. LITERATURE REVIEW

2.1 Safety behaviour

The Institution of Occupational Safety and Health (IOSH) (2015: 3) defines behaviour as an individual action that is observable and measurable. Shamsuddin *et al.* (2015: 628) described safety behaviour as the behaviour that is designed to reduce potential accidents and that supports safety practices in the workplace. Thus, promoting safety behaviour on construction sites is crucial to reducing injuries as it indirectly influences the outcome of actions that cause injuries or accidents (Agnew, Flin & Mearns, 2013: 96). Several researchers have established a strong significant relationship between safety behaviour and safety climate that was discovered to be an important organisational factor influencing safety behaviour both in the workplace and on construction sites (Neal, Griffin & Hart, 2000: 99-109; Glendon & Litherland, 2001:157-188; Neal & Griffin, 2002: 67-76; Faridahwati *et al.*, 2015: 1-8). They observed that the existing safety climate within an organisation influences the safety behaviour of workers. Two dimensions of safety behaviour were postulated, namely safety participation and safety compliance. Safety participation implies the behaviours that do not contribute directly to an individual's personal safety, but that usually helps develop an environment that supports safety practices. These behaviours include activities such as helping colleagues with safety-related issues; putting an effort into improving safety in the workplace; participating in voluntary safety activities; promoting safety programmes; demonstrating safety initiative, and attending safety meetings regularly (Neal & Griffin, 2002). Safety compliance is the core activity that needs to be carried out by individuals, in order to maintain

safety in the workplace. These behaviours include adhering to standard work procedures; wearing personal protective equipment and other precautionary measures to be taken to prevent accidents from occurring at the workplace (Neal & Griffin, 2002). Lu and Yang (2011: 329) also identified behaviours such as maintaining safety awareness at work, always paying attention to safety, complying with safety rules and standard operating procedures as good compliance on site. Meanwhile, Faridahwati *et al.* (2015: 3) proposed that safety participation and safety compliance are insufficient to capture the expected safety behaviour to be demonstrated by workers in their workplace, adding that safety reporting will be a proactive behaviour expected by workers to maintain a safe working environment. Gyekye and Salminen (2010: 431) also noted that workers' perception of job satisfaction and safety enhances workers' compliance with safety rules at work. Meanwhile, the differences in individual workers' responses to safety behaviour was linked to their level of safety knowledge, skill (Boateng *et al.*, 2019: 1) and how they are motivated (Risath, Sivatharsan & Thishanth, 2017: 33). However, workers' response to safety behaviour depends on the priority given by the organisation to the safety climate at the workplace. Therefore, this research carefully summarised these safety features into the components of safety behaviour-modifying techniques, in order to assess their implementation in construction firms in Lagos State.

2.2 Safety behaviour modification (SBM)

The process of promoting safe behaviour at workplace is an important part of the management of health and safety, because behaviour turns systems and procedures into reality (Fleming & Lardner, 2001: 473). Although good systems on their own do not ensure successful health and safety management, their level of success is determined by how the organisation operates within the systems (Fleming & Lardner, 2001: 473). Currently, in the UK, different terms are used to describe an approach to promoting safety behaviour of the work group which includes safety behaviour modification (SBM), behavioural safety (BS), behaviour-based safety (BBS), behavioural safety management systems (BSMM), and safety observation systems (SOS). Although different terms are used for these techniques, they are all forms of behaviour modification that are effective in promoting safety behaviour among workers (HSE, 2000: 4). The effectiveness of this approach relies on engaging workers to understand (through effective training) how unsafe behaviours lead to injuries and how to eliminate them from the workplace. Thus, the approach focuses on observable and measurable behaviours that are critical to safety in a particular work environment (IOSH, 2015: 03).

2.3 Components of safety behaviour-modification techniques (SBMT)

Behavioural safety applies the principle of the ABC (antecedent, behaviour and consequence) behaviour model, *i.e.*, this technique focuses on two antecedents: training and goal-setting related to target safety behaviours and two types of consequences, namely feedback and incentive (Geller, 2011: 111; Talabi, Edum-Fotwe & Gibb, 2015:11). Although antecedents are necessary for a behaviour to occur, it is not sufficient to ensure that the behaviour is maintained over time. Therefore, to ensure the reoccurrence of behaviour, significant individual consequences will be required (HSE, 2000: 3). Thus, these components must be fully implemented on construction sites, in order to bring out the desired safety behaviour, as they are complementary to each other.

Research studies have investigated the importance of the various component parts of a SBMT to establish how they can be successfully combined. Ray, Bishop and Wang (1997: 29) assessed three components of behavioural safety, including altering antecedents only (*e.g.*, training); antecedents and feedback, and antecedents, feedback, and goal-setting. It was discovered that training alone failed to produce any significant change in safety behaviour or accident rates sustained by workers, whereas the introduction of group feedback through public posting of results led to measurably safer behaviour. In addition, after involving the union representative to set a 95% safe behaviour goal for themselves, it was also observed that the employees exceeded the set goal. The study concluded that safety training alone was not sufficient to change unsafe behaviour, whereas group feedback led to behaviour change and this effect was enhanced by goal-setting. The result of this study supports Geller's (2011) assertion. He noted that the impact of training is necessary to provide the needed skill to perform a task appropriately, but that it would be more beneficial to pay closer attention to consequences that drive the reoccurrence of behaviours.

Moreover, Sadayappan and Moayed (2010: 24-25) carried out a systematic review to study the relationship between feedback mechanisms and the reduced number of accidents, injuries, and illness in dynamic and static industries. The study showed that, in both static and dynamic industries, feedback or combinations of feedback reduce accidents, injuries, and illness in the workplace. The study concluded that feedback plays an important role in behaviour modification as it increases the level of safety and, in turn, reduces the number of accidents, incidents, and claims that need to be paid by the industries. Fugar *et al.* (2010: 11-16) assessed the opinions of site supervisors, site engineers, and the management team on the most appropriate methods for encouraging safe work behaviour of construction workers by using training and reinforcement. It was observed that training

to increase workers' knowledge and experience in the workplace and safety and health training provided to workers on the potential hazard to improve their safety knowledge would enhance construction safety by reducing workers' ignorance, increasing production efficiency, lowering the accidents rate, and increasing the self-confidence of workers. It was also noted that personal recognition, monetary rewards, promoting workers on their job, as well as close and strict supervision of workers were important in ensuring safe work practices among construction workers. However, the foregoing revealed that these components complement one another, as they cannot work in isolation. Focusing on one particular component and neglecting others may not produce the desired changes in workers' behaviour regarding safety. Therefore, an effort must be made to implement these components, in order to bring out the desired safety behaviour in the workers. In addition, Cooper (2010: 16) opined that the construction industry in the UK must implement the strategies of SBMT to reduce accidents, owing to the fact that its benefits outweigh its costs.

Based on the reviewed literature, this study will be limited to the four components of the SBMT (goal setting, safety training, safety performance feedback, and incentive) to assess its implementation in construction firms in Lagos State to aid workers' safety behaviour. The safety variables will be compared in large and medium-sized firms' categories because of their different organisational structures. Abdul-Rashid, Bassioni and Bawazeer (2007: 661) noted that the safety management systems in large construction firms are more likely to be well structured, documented, and applied than those in other firms because of their managerial ability to develop and implement some organisational policies. Meanwhile, Okoye and Okolie (2014: 23) supported this assertion by reporting that, although most of the large firms do have a written safety policy on paper, workers are not always aware of its existence. In terms of the manpower capacity, the workforce in large firms is always greater than that in small firms (Aksorn & Hadikusumo, 2008: 712). Therefore, the study will compare the operation of the SBMT across the two categories of firms.

2.3.1 Goal-setting

The safety goals on construction sites should give a clear picture, direction and focus for performing day-to-day activities, in order to achieve the desired results. The set-up goals must be realistic and achievable to aid progress towards accomplishing such goals and adequate measures can be taken for proper evaluation (Aksorn & Hadikusumo, 2008: 713). Sadayappan and Moayed (2008: 5) identified three kinds of goal-setting, namely participative, implicit, and assigned goals. According to the goal-setting theory developed by Locke (1968), it was reported that, when workers are allowed to participate in setting goals, they will work harder to

achieve them than when they are assigned goals. HSE (2000) also noted that, when workers are involved in setting challenging and achievable safety goals aimed at changing their behaviours, it adds to the positive effect of reinforcement and feedback. Meanwhile, Cooper (2008) affirmed that implicit and participative goal-setting has a greater impact on reducing injuries than the assigned goals. Therefore, workers must be afforded the opportunity to participate in setting goals that will positively influence the company's safety policy.

2.3.2 Safety training

El-nagar, Hosny and Askar (2015: 185, citing Cherrington [1995]) defined training as a process that enables people to acquire new knowledge, learn new skills, and perform behaviours in a new way. It was also noted that training provides individuals with specific skills and knowledge needed to perform a particular job. Carolyn *et al.* (2009: 6) reported that safety training instructs workers on the known hazards associated with their job, how to use available methods of protection, and educate workers on how to deal with potential hazards that may occur while performing their job. However, this training should cover the company's safety policies, safety regulations, site orientation, personal protective equipment, and other organisational health and safety (OHS) training as required (Amarh, 2014: 24). Fugar *et al.* (2010: 6) reported that training to increase workers' knowledge and experience in the workplace and safety and health training provided to workers on the potential hazard in order to improve their safety knowledge would enhance construction workers' safety behaviour. Various researchers also identified health and safety training as a key factor to improving safety behaviour and safety performance on construction sites (Eguh & Adenaiya, 2020: 12; Agumba *et al.*, 2013: 1; Boateng *et al.*, 2019: 6).

2.3.3 Safety performance feedback

Cooper (2001: 186) defines feedback as "the extent to which people can obtain information about the effectiveness of their behaviour in order to modify their subsequent behaviour to achieve the desired goals". It was also noted that the most effective feedback is derived directly from the job in hand as it progresses, rather than from an external source such as a supervisor on an occasional basis. The reason for this is that immediate feedback allows workers to instantly regain control over specific activities that might be causing errors. Thus, immediate feedback exerts a greater influence on workers' behaviour than delayed feedback. El-nagar *et al.* (2015: 185) also noted that regular feedback on workers' safety performance can best be communicated to employees through signboards, caution signs, and other indicators. The performance feedback of workers' safety will help the organisation maintain safety practice on

construction sites. Sadayappan and Moayed (2008:5) also identified four kinds of feedback mechanisms that can be used, namely briefing, verbal, written, and posted feedback mechanisms. Cooper (2008) affirmed that the combination of verbal, written, and posted feedback will be more effective in reducing injuries and causing behaviour changes.

2.3.4 Incentive

Incentive is one of the determinants that motivate workers to behave in a desired manner to safety regulations on site (Lee & Jaafar, 2012: 7; El-nagar *et al.*, 2015: 184). Based on the theory of operant conditioning by Skinner (1974, cited in Fugar *et al.* [2010: 5]), the study proposed four intervention strategies that managers can use to either encourage or discourage certain behaviours of workers. These strategies include positive reinforcement, negative reinforcement, punishment, and extinction.

Positive reinforcement provides workers with a reward for performing the desired behaviour. According to this theory, Teo, Ling and Ong (2005) stated that contractors should offer incentives such as praise, monetary rewards, and promotions on the job to motivate workers to perform their jobs in a safe manner. When positive reinforcement is used, the desired outcome is that behaviour is reinforced and that workers understand that the behaviour is desirable. They will as a rule repeat such behaviour in order to be rewarded.

Negative reinforcement encourages workers to perform the desired behaviour, in order to avoid a negative consequence. Therefore, to motivate workers to perform their jobs in a safe manner, contractors may use criticism or the threat of losing a job. Once the workers work in a safe manner, they stop receiving the undesired outcome (Teo *et al.*, 2005). According to Fugar *et al.* (2010: 5), negative reinforcement such as close and strict supervision of workers will only instil fear into workers and lower their morale for better performance. It was also reported that close and strict supervision will not totally eliminate unsafe behaviour. Rather, the unwanted behaviour may disappear when the supervisor is present but is likely to resurface when supervision is discontinued.

Punishment reinforcement gives workers a negative consequence so that they can stop performing undesirable behaviour (Teo *et al.*, 2005). These punishments may include pay cuts, temporary suspensions, demotions, and firing.

Extinction reinforcement withholds positive consequences to get the worker to stop performing undesirable behaviour. At the construction site, a worker who constantly flouts safety regulations may have his or her appointment terminated to curtail the unsafe practice.

In order to successfully change behaviour, one needs to understand the factors that give rise to and support safe and unsafe behaviours (Sulzer-Azaroff, 1987). HSE (2002) corroborated this assertion and noted that the emphasis on changing unsafe behaviour into safe behaviour will only be appropriate by paying attention to the factors that are responsible for unsafe behaviour in workers and by properly considering how workers are organised, managed, motivated, and rewarded in addition to changing their individual behaviour, which if not critically considered, will only imply treatment of the symptoms, while neglecting the root causes of unsafe behaviour in workers.

3. RESEARCH METHODS

3.1 Research design

The study assessed the perceptions of safety behaviour-modifying techniques used in construction firms in Lagos State. Quantitative research was used for this study, since the focus was to identify the component of the SBMT perceived to be operating in the study area. Data was collected using a closed-ended structured questionnaire, because researchers can generalise their findings from the sample frame (Bryman, 2012: 232). A quantitative research approach supports the use of Likert-type scales to assess data (Netemeyer, Bearden & Sharma, 2003). Four major group components of SBMT were identified, consisting of 24 variables from reviewed literature, and the mean scores from the Likert-scale ratings were used to calculate the central tendency to determine and describe the level of agreement with the operations of these variables in the respective construction firms. Inferential statistics was used to test for any significant differences in the implementation of the safety behaviour-modifying techniques between large and medium-sized firms.

3.2 Population, sampling, and response rate

The target population for this study included the registered construction firms that have either head offices or branch offices in Lagos, Nigeria. Large (over 200 workers) and medium-sized (50-200 employees) construction firms that are registered with the Federation of Construction Industry (FOCI) in Nigeria and that were, at the time of the study, engaged in an on-going construction project were considered for the study (Aksorn & Hadikusumo, 2008: 712). At the time of the research, the official website of the FOCI showed that 78 construction firms were registered members of the FOCI and that, out of the list, only 53 firms had head offices or branch offices in Lagos.

Hence, total enumeration was used for the study population, due to the limited number of firms available for sampling, resulting in a sample size of 53 registered construction firms.

In each firm, two contractors' staff members were selected through purposive sampling, resulting in a total of one hundred and six (106) respondents. Out of 106 copies of questionnaires administered on the representatives of the participating construction firms in the study area, eighty-eight (88) copies were correctly filled in and returned (response rate of 83.02%), which is significantly high and very appropriate for this study having met the requirement laid down by Fincham (2008: 48) who asserted that the result of a survey would be biased and of hardly any value if the return rate is lower than 50%. Table 1 provides information on the sample size (questionnaire administration) and the number of questionnaires that were correctly filled in and returned, respectively.

Table 1: Sample and response rate

Respondent	*Sample (N=106)*	*Firm*		*Total responses received*	*% responses*
		Medium	*Large*		
Project manager	20	8	11	19	21.59
Health and safety official	25	13	8	21	23.86
Site supervisor	20	7	8	15	17.05
Engineer	26	13	11	24	27.27
Quantity surveyor	15	5	4	9	10.23
Total	106	46	42	88	100

3.3 Data collection

Primary data were collected through a structured questionnaire between November 2016 and January 2017. The researcher and research assistant delivered and collected the questionnaire by hand.

The questionnaire was divided into two parts. The first part obtained demographic information of the respondents on academic qualification, role in the company, profession, and years of work experience. Company profile information was obtained on the nature of work of the organisation and their workforce capacity. The second part was a set of 24 Likert-scale statements on the four components of SBMT (goal setting, safety training, feedback, and incentive) which the researchers had empirically proven as model for behavioural change. These components were presented to the respondents to rate their level of agreement on a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' with the implementation of these components in their respective construction firms. The questionnaire made use of closed-ended questions for part 2. Alao and Jagboro (2017: 56) noted that it reduces the respondents' bias and enhances easy presentation of question and quick response.

3.4 Analysis and data-interpretation

Data analysis was done using the Scientific Package for Social Sciences (SPSS) version 25.0 software.

Descriptive statistics such as frequency distribution and percentages were used to analyse the respondents' demographic and company information. To measure respondents' agreement levels on the adoption of the components of SBMT in their firms, the 24 variables were rated on a five-point Likert scale and the mean score rating was calculated and reported. Likert-type or frequency scales use fixed choice response formats and are designed to measure perceptions, attitudes, or opinions (Wegner, 2012: 11). The following scale measurement was used regarding mean scores, where 1 = Strongly disagree (≥1.00 and ≤1.80); 2 = Disagree (≥1.81 and ≤2.60); 3 = Partially agree (≥2.61 and ≤3.40); 4 = Agree (≥3.41 and ≤4.20), and 5 = Strongly agree (≥4.21 and ≤ 5.00).

Inferential analysis in the form of an independent t-test with $p>0.05$ was done to test if there were any significant differences in the implementation of the safety behaviour-modifying techniques between large and medium-sized firms.

3.5 Limitation of the study

This study was carried out among large and medium-sized construction firms in Lagos; therefore, the findings cannot be generalised to construction firms across Nigeria.

4. RESULTS AND INTERPRETATION

4.1 Profile of the respondents

Table 2 shows that the vast majority (84.1%) of the respondents in both large and medium-sized firms had either a B.Sc. degree (64.8%) or a Higher National Diploma (19.3%) and the majority (69.3%) of them had a minimum of five years or more work experience. Over half (59.1%) of the respondents were trained as either civil engineers (37.5%) or builders/contractors (21.6%) and the others were almost equally trained as health and safety officers (13.6%), quantity surveyors (8.0%), building service engineers (8.0%), and architects (5.7%).The high proportion of respondents with post-secondary education proves that the respondents are qualified to work in the construction industry and have adequate experience to understand the questions in the questionnaire and to give reliable information that could help determine the safety behaviour-modifying techniques used in their firms.

The respondents were almost equally distributed between the firms, with 53.3% employed in large, and 47.7% in medium-sized firms. Except for

quantity surveyors, the respondents were almost equally employed as engineers (27.3%), health and safety officers (22.7%), project managers (20.5%), and supervisors (15.9%). Most of the projects (68.2%) in both large and medium-sized firms included building and civil engineering works. This gives an indication that the respondents were well experienced in building and civil engineering projects and that the information provided by them can be considered reliable, based on their involvement in various construction processes, workers' monitoring and supervision on construction sites.

Table 2: Personal and organisation information of the respondents

Demographic	*Category*	*Frequency (N=88)*			*%*		
		Large	*Medium*	*Total*	*Large*	*Medium*	*Total*
Education	OND	2	1	3	4.3	2.4	3.4
	HND	7	10	17	15.2	23.8	19.3
	B.Sc.	32	25	57	69.6	59.5	64.8
	M.Sc.	4	4	8	8.7	9.5	9.1
	Ph.D.	1	1	2	2.2	2.4	2.3
	No response	0	1	1	0.0	2.4	1.1
Current role in the company	Project manager	7	11	18	15.2	26.2	20.5
	Site supervisor	6	8	14	13.0	19.0	15.9
	Site engineer	13	11	24	28.3	26.2	27.3
	Quantity surveyor	4	4	8	8.7	9.5	9.1
	Health and safety officer	13	7	20	28.3	16.7	22.7
	No response	3	1	4	6.5	2.4	4.5
Profession	Structural/Civil engineer	16	17	33	34.8	40.5	37.5
	Builder/Contractor	6	13	19	13.0	31.0	21.6
	Health and safety officer	10	2	12	21.7	4.8	13.6
	Building service engineer	6	1	7	13.0	2.4	8.0
	Quantity surveyor	3	4	7	6.5	9.5	8.0
	Architect	1	4	5	2.2	9.5	5.7
	No response	4	1	5	8.7	2.4	5.7
Experience (years)	Below 5 years	14	12	26	30.4	28.6	29.5
	5-10 years	21	18	39	45.7	42.9	44.3
	11-15 years	4	7	11	8.7	16.7	12.5
	16-20 years	3	2	5	6.5	4.8	5.7
	Above 20 years	4	2	6	8.7	4.8	6.8
	No response	0	1	1	0.0	2.4	1.1
Nature of work	Building works	5	10	15	10.9	23.8	17.0
	Civil engineering works	3	3	6	6.5	7.1	6.8
	Building and civil engineering works	35	25	60	76.1	59.5	68.2
	Special project	3	4	7	6.5	9.5	8.0
Workforce of the organisation	50-200 workers	0	42	42	0.0	47.7	47.7
	Above 200 workers	46	0	46	52.3	0.0	53.3

4.2 Perceptions on safety behaviour-modifying techniques (SBMT) adopted in the construction firms

Table 3 shows the descriptive statistics of the SBMT components perceived to be in operation in the construction firms. Respondents in both large and medium-sized firms agreed that safety training (GM=4.36; GM=3.99, respectively) and goal-setting (GM=3.50; GM=3.30, respectively) were the top two most adopted safety behaviour-modifying techniques in their firms. In both large and medium-sized firms, incentive (reinforcement) (GM=3.38; GM=2.86, respectively) and feedback of workers' safety performance (GM=3.30; GM=3.11, respectively) were the least adopted.

Table 3: Ranking of the perceived safety behaviour-modifying techniques used in the different firms' categories

Components of safety behaviour-modifying techniques (N= 88) 1 = strongly disagree … 5 = strongly agree	*Large firm*				*Medium-sized firm*			
	MS	*Rank*	*GM*	*OGR*	*MS*	*Rank*	*GM*	*OGR*
Goal-setting								
Workers are allowed to participate in setting an achievable safety goal	3.87	3	3.50	2	3.64	3	3.30	2
Safety goals are assigned to workers to follow	4.17	1			4.05	1		
Workers are indirectly compelled to follow safety goals set by the management	3.87	3			3.19	2		
Safety goals are posted in prominent places for workers to follow	4.17	1			3.43	4		
Safety goals are not set in my company	1.43	5			2.19	5		
Safety training								
Workers are trained to enhance their skill and knowledge in the job they perform	4.20	2	4.36	1	3.90	2	3.99	1
Safety training is provided to workers on how to behave safely and avoid unsafe acts	4.52	1			4.07	1		

Components of safety behaviour-modifying techniques (N= 88) 1 = strongly disagree … 5 = strongly agree	*Large firm*				*Medium-sized firm*			
	MS	*Rank*	*GM*	*OGR*	*MS*	*Rank*	*GM*	*OGR*
Feedback of workers' safety performance								
Workers are brief about their performance during safety meeting	4.24	1	3.30	4	4.24	1	3.11	3
Workers' safety performance is written on the company's noticeboard	3.80	3			3.80	3		
Workers are being communicated on their safety performance	4.0	2			4.0	2		
Performance of workers is posted graphically in a prominent area	3.20	5			3.20	5		
Feedback is made available regularly	3.52	4			3.52	4		
Feedback is delayed	2.46	6			2.46	6		
Feedback on workers' safety performance is never made available	1.85	7			1.85	7		
Incentive (reinforcement)								
Monetary reward in the form of bonuses is provided for safety behaviour	3.41	5	3.38	3	3.02	7	2.86	4
Personal recognition given to worker for safety behaviour	3.74	3			3.40	3		
Worker is promoted for safety behaviour	3.15	7			2.98	9		
Other types of reward such as free lunch, extra vacation are giving to workers for safety behaviour	2.74	10			3.00	8		
Threat of losing job is given to workers to make them behave safely	3.65	4			3.33	4		
Close and strict supervision to make workers behave safely	3.93	1			4.12	1		
Workers are suspended from work for unsafe behaviour	3.87	2			3.48	2		
Demote workers for unsafe behaviour	3.13	8			3.10	6		
Imposed monetary fines for unsafe behaviour	2.89	9			2.86	10		
Terminate appointment for unsafe behaviour	3.30	6			3.29	5		

MS=mean score; GM=group mean; OGR=overall group rank

Respondents in the large firms, under the 'goal-setting component', ranked 'safety goals are assigned to workers to follow' and 'safety goals are posted in prominent places for workers to follow' the highest with

MS=4.17, while 'workers are allowed to participate in setting achievable safety goals' and 'workers are indirectly compelled to follow safety goals set by the management' were ranked second (MS=3.87). 'Safety goals are not set in my company' has the least mean value of 1.43. In medium-sized firms, 'safety goals are assigned to workers to follow' (MS=4.05), 'workers are allowed to participate in setting achievable safety goals' (MS=3.64), and 'safety goals are posted in prominent places for workers to follow' (MS=3.43) were ranked the top three and 'workers are indirectly compelled to follow safety goals set by the management' ranked fourth, with a mean value of 3.19. 'Safety goals are not set in my company' has the lowest mean value of 2.19. The result shows that assigning safety goals to workers is the mostly adopted strategy in both large and medium-sized firms to enhance workers' safety behaviour. In large firms, 'safety goals are posted in prominent places for workers' is another prominent technique adopted by the firms to modify their workers' behaviour towards safety. 'Safety goals are not set in my company' has the lowest mean value in both large and medium-sized firms, indicating that the vast majority of the firms have a safety policy in place with clearly defined safety goals.

Under the 'safety training component', respondents in both large and medium-sized firms strongly agreed that 'safety training is provided to workers on how to behave safely and avoid unsafe act' (GM=4.52; GM=4.07, respectively) and that 'workers are trained to enhance their skills and knowledge in the job they perform' (GM=4.20; GM=3.39, respectively).

In the feedback of workers' performance component, respondents in both large and medium-sized firms ranked 'workers are briefed about their performance during safety meetings' first (MS=4.24; MS=3.79, respectively). In large firms, ranked top two to four, respondents agreed that 'workers are communicated on their safety performance' (MS=4.0), 'workers' safety performance is written on the company's notice board', (MS=3.80); 'feedback is made available regularly' (MS=3.52), while they partiallly agreed that 'performance of workers is posted graphically in a prominent area' (MS=3.20) was ranked fifth. Only a few firms indicated that feedback on workers' safety performance is never made available (MS=1.85). Respondents from medium-sized firms, agreed that 'feedback is made available regularly' (MS=3.60), and 'workers are being communicated on their safety performance' (MS=3.55) were ranked two and three, while they partially agreed that 'workers' safety performance is written on the company's notice board' (MS=3.36) was ranked fourth. A few firms indicated that feedback of workers' safety performance is never made available (MS=1.95). The result shows that briefing workers on their safety performance is the most perceived technique used in the construction firms.

Under the 'incentive component', respondents in both large and medium-sized firms agreed that the top four most adopted safety-modifying techniques are 'close and strict supervision to make workers behave safely' (GM=3.93; GM=4.12, respectively), 'workers are suspended from work for unsafe behaviour' (GM=3.87; GM=3.48, respectively), 'personal recognition given to workers for safety behaviour' (GM=3.74; GM=3.40, respectively), and 'threat of losing a job is given to the workers to make them behave safely' (GM=3.65; GM=3.33, respectively). The least adopted technique in large firms was 'other types of rewards such as free lunch and extra vacation are given to workers for safety behaviour' (MS=2.74) and in medium-sized firms, it was 'imposed monetary fines for unsafe behaviour'(MS=2.86).

Comparing the safety behaviour-modifying techniques used by both large and medium-sized firms, Table 4 presents the statistical difference in the responses of both large and medium-sized firms in terms of the components of SBMT adopted by the construction firms.

Table 4: Independent t-test of the statistical difference in the firms' responses to the implementation of safety behaviour-modifying techniques in the study area

Components of safety behaviour-modifying techniques	*Large firm*			*Medium-sized firm*			
	N	*Mean*	*SD*	*N*	*Mean*	*SD*	*p*
Goal-setting	46	17.5217	2.7628	42	16.5000	2.6435	0.08
Safety training	46	8.7174	1.2049	42	7.9762	1.7736	0.02*
Feedback of workers' safety performance	46	23.0652	3.1013	42	21.3616	3.6161	0.06
Incentive (reinforcement)	46	33.8261	6.6242	42	32.5714	7.0957	0.39

*Significant at p>0.05; N=sample size; SD=standard deviation

The results indicated no statistically significant difference in the components of safety behaviour-modifying techniques used by the two categories of firms (p>0.05), except with respect to safety training (p=0.02). Accordingly, safety training as a behaviour-modifying technique was used more often in large firms (M=8.7174) than in medium-sized firms (M=7.9762) at p=0.02 level of significance.

5. DISCUSSION

The results in Table 4 indicate that the safety training component is the most perceived safety behaviour-modifying technique adopted by construction firms in Lagos State. This result is consistent with the study of Almustapha (2016) who reported that the mostly adopted human resource development strategy by construction firms is training programmes. This might be due to Carolyn *et al.*'s (2009: 6) assertion that safety training instructs workers

of the hazards commonly associated with their jobs, how to use available methods of protection, and educates workers on how to deal with potential hazards that may occur while performing their jobs. Likewise, Fugar *et al*. (2010: 9) noted that safety and health training provided to workers on the potential hazard in order to improve their safety knowledge, would enhance construction safety, by reducing workers' ignorance, increasing production efficiency, lower accidents rate, and increase self-confidence. Meanwhile, Olutuase (2014: 10) reported that, despite the fact that the Nigerian construction industry has a form of safety management in place, the firms are poorly organised and experience inconsistency in their operations. There must be consistency in the level of safety training provided to workers by the construction firms in order to inculcate safety habits in them. Olutuase (2014) noted that the component of safety system in the firm does not measure up to the minimum global performance benchmark. Therefore, to effectively modify workers' behaviour towards safety, safety training should be made available on a regular basis to the construction workers. Lam and Kam (2000: 286) also noted that effectiveness of safety training on workers' behaviour requires continuity, in order to modify workers' safety behaviour and enhance their understanding of the work's potential hazards so as to avoid them.

Moreover, it is very expedient for construction firms to have measurable safety goals that are reviewed and amended regularly. This will serve as a guiding principle for day-to-day safety practices. The availability of safety goals would give a clear picture, direction, and focus for performing day-to-day activities, in order to reach the desired results. When realistic and achievable goals are set up, the progress towards accomplishing such goals can be easily measured (Aksorn & Hadikusumo, 2008: 713). The results show that, in large firms, the mostly adopted goal-setting component is assigning safety goals for workers to follow and safety goals are posted in prominent places for workers. Likewise, in medium-sized firms, safety goals assigned for workers to follow was the most prominent adopted safety behaviour-modifying technique. It can be deduced from the results that both large and medium-sized firms are assigning safety goals for workers to follow, and this could be due to the inherent nature of man, which requires enforcement of laws and order in ensuring obedience and conformity. Meanwhile, Cooper (2008: 37) asserted that implicit and participative goal-setting has a greater impact on reducing injuries than the assigned goals. Workers should thus be given the opportunity to participate when taking decisions that would enhance their safety performance. This could include enlisting workers as members of the site safety committee, giving them the privilege to report any unsafe practice to the management, declaring a zero-accident on construction sites, and making demands for essential resources or materials such as personal protective equipment

that could assist their safety behaviour. These will give them a sense of belonging in the firm and thus enhance their safety behaviour.

Feedback on workers' safety performance was ranked third in medium-sized firms, while in large firms it was ranked fourth that is, the least adopted safety behaviour-modifying techniques. This study showed that the firms give less priority to the feedback of workers' safety performance. This implies that workers' safety behaviours are not duly put on record. Among the components of the performance feedback, 'workers are briefed about their performance during safety meetings' was the most adopted in both large and medium-sized firms. This result agrees with the study of Ismail *et al.* (2012: 580) who noted that, in the Malaysian construction industry, there were irregular audits of safety system to provide feedback which can aid continuous improvement in workers, and that the top management has no mechanism in place to gather safety-related information and measure safety performance which can enhance safety awareness of workers. Ray, Bishop and Wang (1997: 19) found that training alone could not produce any significant change in safety behaviour or accidents rates sustained by workers, but the introduction of group feedback through public posting of results could lead to measurable safer behaviour. Therefore, apart from providing safety training and involving workers in setting achievable safety goals, supervisors need to ensure performance monitoring of workers and note that reliable feedback of workers' safety performance can lead to safety behaviour in workers.

Incentives (reinforcement) in the form of either monetary or non-monetary reward are also an important component to encourage good safety behaviour in workers. Despite being a critical issue that needs to be recognised by the firms, in order to reinforce safety behaviour in workers, in large firms, there seems to be partial consideration for incentive (reinforcement) component as it ranked third, while medium-sized firms seem to have very low regard of the component of reward allocation, as these firms ranked it fourth. The mostly adopted incentive component by both large and medium-sized firms is 'close and strict supervision to make workers behave safe', while the least implemented technique is 'other types of reward such as free lunch and extra vacation given to workers for safety' in large firms. In medium-sized firms, imposed monetary fines for unsafe behaviour received the lowest rating. The result agrees with the study of Ismail *et al.* (2012), who noted that managers placed poor emphasis on the items of resource allocation in their current construction practices. The result agrees with the study of Agbede *et al.* (2016: 23) and Risath *et al.* (2017: 38). It was discovered that there was poor implementation of a rewarding system for safety behaviour in the South-West construction industry of Nigeria. Therefore, construction firms should ensure full implementation of the component, as incentives may be the reinforcement the construction

sector needs to address unsafe behaviour among construction workers and the occurrence of accidents on site which can increase the cost of the construction projects or even delay the projects' delivery.

In comparing the modifying techniques used by both large and medium-sized firms shown in Table 4, the result indicated no statistically significant difference in the components of safety behaviour-modifying techniques used by the two categories of firms, except with respect to safety training which was more often used in large firms compared to medium-sized firms. This could be due to Ahmed's (2012: 1) assertion that large construction firms place more priority on safety compared to other firms. Abdul-Rashid *et al.* (2007: 661) affirmed that the complexity of the type of projects being executed by large firms, the company's size based on the fact that large numbers of workers were employed and the existence of formal organisational structure with different departments that include the safety department and access to more resources might have contributed to their safety consciousness than other firms.

6. CONCLUSIONS

The study concluded that the respondents mostly use safety training to modify their workers' behaviour. Safety training is provided to workers on how to behave safely and avoid unsafe acts. Workers are trained to enhance their skills and knowledge in the jobs they perform, and it was revealed that feedback on workers' safety performance is not given priority in large firms, while medium-sized sreup mean score isoperation us,in term ofirefirms gave less priority to the safety behaviour-modyfying techniques itemised under the incentive (reinforcement) component. Generally, less priority was given to the consequence of safety behaviour-modifying techniques stated under the feedback of workers' safety performance and incentive component. This is the outcome of a behaviour that determines the possibility of such an action being repeated. The study serves as an indicator to construction firms and stakeholders on basic strategies that can improve workers' safety behaviour. The study assessed construction workers level of safety performance with a focus on modifying workers' safety behaviour.

The result of this study is limited, based on the available number of firms used for sampling and the number of variables used in assessing the implementation of the components of the SBMT, especially the safety-training components. Other safety measures can be assessed to ascertain their implementation in construction firms.

Based on the findings and conclusions drawn from this study, the following recommendations are made:

1. Total implementation of the components of safety behaviour-modifying techniques should be adopted on construction sites that involves safety training, goal-setting, feedback of workers' performance, and incentive components.
2. The management should be committed to providing training to workers, in order to increase their knowledge and level of experience at work. Safety training should be provided on a regular basis to increase workers' safety awareness, safety knowledge, and consciousness. Workers must also be taught the right behaviour to counter unsafe behaviours, and punishment should be imposed when rules and regulations are violated.
3. It is often stated that he who fails to plan, plans to fail; therefore, construction firms should set a realistic and achievable goal in which workers are allowed to participate. Contractors should work towards achieving the preferred result.
4. Regular feedback of workers' safety performance should be carried out to show workers' performance level which is a great tool in behaviour modification. Safety incentives should not be excluded, as they tend more to instil safety behaviour in workers and improve safety performance.

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