Application of Strategic Safety Practices in Construction Industry of Lafiya, Nasarawa State

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Abstract

This study aims to assess the application of strategic safety practices in the construction industry of Lafiya, Nasarawa state, to explore the benefits behind the strategic practice of safety and reduce the level of accidents in the construction industry. The construction industry in any country is associated with vital contributions to national economic development through strategic planning, design, and construction in transforming various production processes into constructed facilities. The study adopted a quantitative design, and data were collected through a questionnaire survey from randomly drawn professionals. Seventy-seven structured questionnaires were distributed to the professionals, the study adopted a simple random sampling technique, SPSS software version 22 was used for data analysis, and the results were presented in tables. The study reveals safety performance in Lafiya's construction industry, with major safety areas being design preparations, construction processes, meetings, and site safety. Major planning and control strategic safety practices include structure design, site investigations, plant operations, and construction work. The least controlled practices include site layout plans and risk identification. The least controlled practice is temporary structure stability control. This study also revealed that the independent variable strategic safety practices explained 31.0% medium effect size in safety performance, with significance at $p<0.001$. Therefore, the study also revealed that the beta coefficient showed that the planning, control and operation are the significant determinants of safety performance as indicated by the standardised beta coefficient of 0.278, 0.364 and 0.156 and t-statistics of 2.754, 3.611 and 1.584 which are significant at 0.007 and 0.001 significance level and insignificant at 0.117.respectively. The independent variable strategic safety practices explained 31.0% medium effect size in safety performance, with significance at $p<0.001$. The study concluded that the beta coefficient showed that the planning, control and operation are the significant determinants of safety performance as indicated by the standardised beta coefficient of 0.278, 0.364 and 0.156 and a t-statistics of 2.754, 3.611 and 1.584, which are significant at 0.007 and 0.001 significance level and insignificant at 0.117.respectively. It is recommended that the construction firms ensure that the safety of the workers must be given attention. This will lead to an increase in the workers' productivity. It is recommended that the contractors give attention to the maintenance of equipment or plant, which leads to the peration of strategic safety practices on the construction site. However, correct and sufficient safety warnings or precautions for workers on the construction site should be taken into consideration.

Introduction

The construction industry in any country is associated with vital contributions to national economic development through strategic planning, design, and construction in transforming various production processes into constructed facilities (Ogundipe, Owolabi, Olanipekun, Olaniran, Akuete, & Fagbenle, 2018). The industry is unique among all other sectors because it provides the necessary infrastructures that stimulate national development (Thacker, Adshead, Fay, Hallegatte, Harvey, Meller, & Hall, 2019).

In Nigeria, approximately 25% of Nigeria's workforce was attributed to the construction industry (Ugulu, Arewa, & Allen, 2019). The construction industry is also viewed as labour-intensive because labour costs amount to 40-65% of the overall cost of a project (Rao, Sreenivasan & Babu, 2015).

Therefore, the labour-intensive nature of the industry will demand more human involvement at the production stage. However, the industry, compared with other sectors of the economy, due to the calibre of casualty suffered in the execution of building projects across the globe, has made the construction industry the most dangerous or highly hazardous industry (Ugulu, Arewa & Allen, 2019). Ayangade (2000) indicated that the industry is a project-based firm comprising many parties working together to achieve a common goal. Moreover, the means of achieving this goal are characterised by hazards threatening workers' lives.

Muiruri and Mulinge (2014) noted that the complexities of activities required in the building production process pose different challenges to workers' safety and inherent risks in the production stage. Smallwood & Haupt, 2002) viewed accidents as part of the building production process that is unavoidable because the construction industry is inherently dangerous. Therefore, compliance or not to safety practices will forfeit the impact of health and safety regulations.

Factors adding to construction fatalities were known as the sector's uniqueness that differentiates it from other industries. This uniqueness includes the short life span of projects, location differences from time to time, high worker turnover, many unseasonal workers unfamiliar with construction processes, and a high rate of small firms and self-employed workers (Safety Manual for Construction Handbook). These accidents result in pain

and physical damage to the workers and reduce productivity, time, and quality performance, thereby threatening project success and escalating production costs (Muiruri & Mulinge, 2014).

Several codes and regulations have existed to provide succour in managing safety practices at work. Recently, the Nigerian National Building Code empowered registered builders to prepare health and safety plans, among other builder documents, in minimising and managing causes of accidents during construction. In the same vein, there are stand-out obligations explicitly highlighted in the Construction (Design and Management) Regulations on the stakeholder's engagement in the execution of project management, and it also seeks the support of the client, designer, CDM coordinator, and principal coordinator on construction projects.

The goal and essence of establishing safety practices' code and regulations on construction sites is to focus on preventing, eliminating, curbing, limiting and eradicating, if possible, the occurrence of accidents and injuries during and after the construction processes and as well as train site operatives on safety programmes that will put all of these into place. The degree of confidence that accidents will not occur throughout the duration of construction projects may not be ascertained from the inception. Still, compliance with these specified health and safety practices will enhance site safety. It will eliminate the causes and reduce the negative impact as well as the level of damage to the parties involved. Hinze (1997) asserted that enabling work settings enhances workers' productivity at a reduced cost but increases the profit margin.

Idubor and Oisamoje (2013) and Umeokafor, Umeadi and Jones (2014) contend that the numbers and magnitude of accidents occurring and recorded on construction sites in Nigeria underscored the low level of strategic safety practices. According to Dodo (2014), occupational health and safety is integral to construction operations due to the industry's uniqueness. Different trades and skills are needed to be carried out in a safe environment. However, individual contributions determine the successful outcome of the projects.

Construction accidents remained an ongoing concern in developing countries despite the level of awareness in promoting health and safety practices over the decades.

Health and Safety practice is anchored on workers' behaviour regarding safety provisions and conducts that guide workers' attitudes in carrying out their tasks at work in order to reduce or even eliminate accidental losses and injuries and maximise the nominated objective of the organisation (Umoh, 2013).

Perceived increments in the number of casualties and illnesses reported on project sites are unacceptably high considering the numerous regulatory standards and control systems for construction projects, thereby creating a serious menace to construction workers' safety at work. Thus, proactive steps must be taken to identify these factors and be averted accordingly.

Many studies have gone down the line on the subject of construction health and safety practices, safety provisions, practices and implementation/enforcement, etc., but the focus has been on the cause of accidents, condition of work settings, workers' attitudes, and provision of health and safety training (Aniekwu, 2007; Ismail, Doostdar and Harun, 2011; Olutuase, 2014; Umeokafor *et al*., 2014; Dodo, 2014). Alinaitwe, Mwakali and Hansson (2007) studied factors affecting the productivity of building craftsmen. The study revealed that improper supervision and inadequate skills among workers are the most significant factors affecting workers' productivity. However, limited studies exist on the examination of health and safety plans on construction sites. That is why Umoh (2013) lamented that in the construction industry, how health and safety practices affect workers' productivity are less documented, especially in developing countries like Nigeria.

Unsafe practices have been pronounced among the workers on construction sites. Clark (2006) reported that failure to adhere to the required health and safety procedures and take precautions against hazards, such as wearing safety wear, are standard on project sites. Awwad *et al.* (2016) added that health and safety practices lack necessary implementation due to the absence of a proper monitoring system, low level of safety awareness and inadequate support from safety managers. Che, Hassan, Basha, and Wan Hanafi (2007) and Shamsuddin *et al.* (2015) argued that workers' knowledge and understanding of health and safety in work settings remained vital in promoting safety among them on construction sites.

One of the top hills constantly confronted by any construction company is the frequent

occurrence of accidents during the construction stage. Abdelhamid and Everett (2000) and Shamsuddin *et al.* (2015) argued that workers' omission amounts to cause of construction injuries, and this explained as behaviour and human factor approach. The behaviour approach underscored that construction operatives are the original reason for fatality due to their unlimited number of costly mistakes at different stages of the building production process. However, the human factors approach argued that it was not because of individuals' unsafe behaviour. Instead, the emphasis was on the nature of workplace settings.

However, what remains unknown is how safety practices affect workers' output. The site operators must be protected against potential work-related dangers with sufficient safety equipment in addition to the other required safety training to assure the personnel's maximum productivity. However, worker-related hazard is not a new phenomenon at work, as this has been established in some of the past studies.

What remains new is the understanding of the impacts of influence factors of safety culture on the dimension of safety culture in the construction industry. Looking at the side effects of construction-related injuries on workers and the project success in Dutse, Jigawa State, health and safety practices should be integral to project management. The construction participants must give it a high priority to ensure human safety against the frequent occurrence of accidents on the construction site. This was set to be achieved by assessing safety maturity model indicators in the construction industry. From the above, the construction industry can be easily classified as one of the major global hubs for economic and social development.

Despite its strategic nature, there is ample evidence globally to illustrate that the construction industry has earned a notorious reputation as one of the most dangerous industrial sectors globally (Liao & Chiang, 2016). For instance, there were 35 fatal injuries to workers in the UK construction sector between 2014/2015 (HSE 2015); in the United States, the *National Safety Council* reported about 8,993 people deaths between 2003 and 2011 on construction work sites while Lingard *et al.* (2009) identified the accident rate to be 9.2 per cent 100, 000 workers in Australia.

Mahmoudi *et al.* (2014) observed that the trend associated with high fatalities in the construction industry is widely prevalent in many other countries. Regrettably, evidence

from past studies indicated that the situation is even worse in developing countries because of the general lack of concern as well as the dearth of statutory regulations that govern the industry in such climes (Jain, 2007; Musonda & Smallwood, 2008; Idoro, 2008). On a more general note, the International Labour Organisation (2005) estimated that 60,000 construction fatalities occur annually around the world. This suggests that the construction industry still requires appropriate strategies and tools for its safety practices and related operations.

Many studies on the application of safety in construction, such as examination of the application of health and safety plans on Construction sites in Lagos state, Nigeria by Adebayo and Emoh (2019), Building Construction Workers' Health and Safety Knowledge and Compliance on Site by Peter and Okechukwu (2016) but none of the study has holistically being carried out on accessing the application of the strategic safety practices in the construction industry of Lafia, Nasarawa state.

Therefore, the study will bridge the above gap by providing answers to the safety performance in the construction industry of Lafiya, Nasarawa state, the strategic safety practices used in the study area, the impact strategic safety practices on the safety performance in the study area and the relationship between strategic safety practices and safety performance in the study area.

Therefore, the study aims to assess the application of strategic safety practices in the construction industry of Lafia, Nasarawa state, to explore the benefits behind the strategic practice of safety and reducing the level of accidents in the construction industry. The study attempted to answer the questions: What is the safety performance in the construction industry of Lafiya, Nasarawa state? What are the strategic safety practices used in the study area? What is the impact of strategic safety practices on safety performance in the study area?

Literature Review

Contemporary project management research has made solid cases for examining the softer features of projects like communication, cultural, social and human aspects and their impacts on the project management process within organisations (Ochieng *et al.,* 2013; Hanisch & Wald, 2011). One lesson learned so far is that existing initiatives need to focus on the human and technical aspects of safety since

efforts from the human aspects come to the fore in any attempt to implement safety strategies within the construction industry effectively. Also, faced with the seemingly dismal safety performance within the construction industry, researchers and practitioners have constantly reflected upon existing safety management systems and recommended alternative initiatives. Another anticipated practical contribution is the need to continually examine the role of senior managers in safety (Flin, 2003; Wu *et al.,* 2016).

Therefore, senior project practitioners who act as facilitators for project teams can gain additional insights into how to create more optimum safety climates. It will equally enable managers to identify and regulate suitable safe behavioural styles before and during the commencement of future projects. This is especially relevant since findings of past investigation reports have given senior managers considerable discretion and immense safety accountabilities (Baker, 2007; National Commission, 2011).

Defining certain terms used in the health and safety field is important. According to the *Health and Safety Executive*, health and safety is defined as protecting people from illnesses and injuries (i.e. harm) triggered by work-related conditions or activities (HSE, 2003).

Hughes and Ferrett (2008) defined accidents as unplanned events that result in injury or ill-health of people, damage or loss to property, plant, material or the environment or a loss of a business opportunity. Although this definition only considers the occurrence of an adverse outcome as being the result of an accident, other definitions like Ridley and Channing (2003) and Stranks (1994) considered the occurrence of an adverse outcome as well as the non-occurrence of an adverse outcome to be among the consequences of accidents. Nonetheless, the common theme in most definitions of accidents provided in literature is that accidents are unplanned or unexpected events.

According to Mohamed (1999), construction accidents result in tragic human events that cause construction site disruptions, demotivate project personnel, hinder project performance, and damage the construction industry's reputation. The peculiarities associated with the construction industry and the emergence of regulations and international standards have driven several nations and organisations to

explore strategies for improving their safety performance.

Furthermore, in the wake of past catastrophic disasters (for example, the British Petroleum oil platform explosion in the Gulf of Mexico, the San Jose mine in Chile, and the Aegean Highway project in Greece), both developed and developing countries have further recognised the necessity of improving safety on heavy engineering construction sites, particularly to reduce the number of occupational accidents. As a result, Weibye (1996) and Kandola (1997) presumed that most forward-thinking organisations have moved from a reactive to a proactive approach towards safety. As highlighted previously, the emergence of regulations and international standards has driven several nations and organisations to explore strategies to improve their safety performance.

Nonetheless, because globalisation is an inevitable trend, just as construction safety is a global issue in that it is a concern wherever construction projects are undertaken, it might be unfeasible for individual nations to legislate in isolation because changes that once only affected their population and possibly their nearest neighbours now have more far-reaching consequences. Therefore, with the growing international activities in construction, there also has to be an increasing awareness of the importance of a better understanding of cross-cultural management and communication of safety-related issues.

So far, the literature review has revealed the existence of dramatic events occurring within the construction industry, thus highlighting the huge importance of safety performance. Therefore, the focus needs to be on the need to improve the safety process in the construction industry, taking into account a wider variety of factors. In addition, it is worth mentioning that, although compliance with regulations remains the key concern, the construction industry is starting to see a shift from strictly compliance-driven safety programs to those that emphasise the 'human side' of safety and stress the health and welfare of workers (Cesarini *et al.,* 2013).

Senior project practitioners can embrace and promote a safety philosophy throughout their operational network by eradicating dangers at construction sites through an approach that personalises safety and health. This approach modifies the traditional enforcement mentality,

threatening employees who violate standard safety rules with disciplinary action. Building a safer workplace and industry still requires constant effort and continual improvement, but the result is worth investing time, resources and money. The subsequent section provides a generic account of safety within the UK and Nigerian construction industry.

Site Health and Safety in Construction

The main health and safety site requirements in construction relate to tidy sites and decent welfare, falls from height, manual handling, and on-site transport. Site operatives are usually required to plan and organise their operations, ensure that they are trained and competent, know the unique risks of their trade and raise problems with their site supervisor or safety representative (HSE, 2009). The main personal protective equipment (PPE) in construction (including clothing affording protection against the weather) is intended to be worn or held by a person at work and protects him against one or more risks to his health or safety.

When considering control measures, PPE should be regarded as a 'last resort'. Other methods should be considered and used to reduce or eliminate the risk of injury. However, where PPE is the only effective means of controlling the risks of injury or ill health, employers must ensure that PPE is available. PPE should be worn at all construction sites. A typical construction site may require workers to wear a hard hat, coveralls, safety footwear, gloves, eye protection and high visibility vest. These must be provided to all employees.

Construction health and safety should primarily concern employers, employees, governments and project participants (Kheni, 2008). Thus, the main parties responsible for construction health and safety are the client, main contractor, regulatory agencies and employees. Health and safety duties of state and regulatory agencies: Government regulatory agencies often enact regulations to help ensure that a construction project is safe to build, use, maintain, and deliver good value.

Good health and safety planning also helps to ensure that a project is well managed and that unexpected costs and problems are minimised. Health and safety duties of employer: Clients greatly influence how work is done. Where potential health and safety risks are low, clients are required to do little. Where they are higher, clients need to do more.

Improvement Strategy on Health and Safety Practices in Construction Industry

The health and safety issues in construction projects should be a concern to every construction participant, especially client and their representatives. They need to avert the risk associated with their project right from the planning stage by adopting sustainable strategies to eliminate the possibility of accidents. However, any improvement strategy proposed must be capable of offering practical solutions in developing countries. Bust, Finneran, Hartley and Gibb (2014) stated that professionals' interests in health and safety practices must be enhanced.

Usage of awareness measures must be put in place and demonstrated by the operatives as one of the real needs to upgrade construction project safety. McDonald (2003) added that a safety manager must be employed on all construction sites to ensure both behaviour and operatives' practices conform to safety requirements thereby, positively influenced by their role. Hence, safety manager should be empowered to play their roles in ensuring a safety management system.

Mitropoulos, Cupido, and Namboodiri (2009) expressed why conventional use of the exterior way to deal with safety is good for making health and safety practices. It overlooks how the inside attributes of the individual and the associations impact the work practices and influence the likelihood of errors and injuries. Firstly, it doesn't represent the individual elements that, all in all, characterise a specialist's expectation for security. Then again, the approach does not represent the social components that shape the workplace.

Dedobbeleer and German (1987) assessed the connections between site operatives' safety performance files and attitudinal variables identified with safety. The study concluded that the inclining component alone clarified the vast majority of the variety in safety performance. The majority of workers under the age group of 26 years had generally low sense, moderately little information about health and safety and a troublesome state of mind towards safety performance. The researcher considered three elements: strengthening variables, empowering elements, and inclining elements.

Strengthening components measure the demeanours of different towards security; empowering variables measure the accessibility of safety elements (e.g. safety wears) at the workplace; inclining variables

measure the information and states of mind towards security of the individual specialist. Some different components, like statistics, were likewise utilised for connection. Agwu and Olele (2014) worked on fatalities in the Nigerian construction industry. The study believed that the inclusion of a positive safety culture by investing in machines and technology (sociotechnical investments) in the Nigerian construction industry would result in better safety performance of employees (reduced rate of unsafe acts) and the company (reduced rate of fatalities).

This was conducted for a year, with the respondents randomly selected from twelve construction industries, two each across the six geopolitical zones in Nigeria. There is a significant difference between poor safety culture and increased fatalities in the Nigerian construction industry. Agwu and Olele (2014) recommended regular staff training could improve hazard identification skills, engage managers and workers in addressing safety-related issues, regular site safety committees, eliminate potential workplace hazards and make hazard identification/reporting everyone's duties.

From the literature review, it is evident that health and safety measures are necessary in a workplace environment to ensure workers' safety and well-being to maintain and improve productivity and quality of work, minimise absenteeism and labour turnover, reduce indiscipline and accidents, improve employee motivation and morale, reduce spoilage and cost operations, and reserve the physical and mental health of employees.

But for this to be realised, a good health and safety management system and program should be put in place by providing a written statement of safety policy, organisation and allocation of responsibilities for health and safety matters, train employees in health and safety matters, establish safety committee, ensure first aid facilities, provide appropriate procedures and documentations to minimise accidents and to consult with employee representatives regularly.

Construction firms should have training and induction for all employees so that they are made aware of potential hazards and given instruction on how to avoid the possible risks. Risk control measures to be put in place with the aid of sound risk assessment procedures to identify specific hazards and quantify the risks attached with the aim of hazard elimination through design improvement and change, substitution through replacement, use of barriers, use of warning systems and use of personal protective clothing. Procurement

procedures and contract documentation can be a useful way to enhance health and safety in construction projects by ensuring compliance with existing legislation and with the terms and conditions of a project.

On the other hand, the government should intensify measures to strengthen the institutional framework and inspectorate activities to achieve a meaningful administration of the Occupational Health and Safety Act (2007). This, therefore, forms the thrust gaps of this work, which focuses on examining health and safety plans on construction sites in Lagos State, in which the research is designed to address the research gaps.

However, a close look at the literature synthesis shows some glaring lacuna, which the present study seeks to fill.

a. Authors on health and safety plans on construction sites indeed conduct studies. Still, none has exploited the concept of strategic safety practices concerning safety performance.
b. The application of health and safety plans in construction sites is far below international best practices; hence, more research needs to be done in this regard.
c. Presently, studies on the application of health and safety plans on construction sites have not been conducted in sufficient detail for construction sites in Nigeria, particularly building construction sites in Nasarawa state.

These gaps found in the literature will be filled by this study using an adapted conceptual framework by Suraji, Sulaiman, Mahyuddin and Mohamed (2006). The framework in Figure 1 suggests that safety performance depends on strategic safety practices, including construction planning, control, and operation factors.

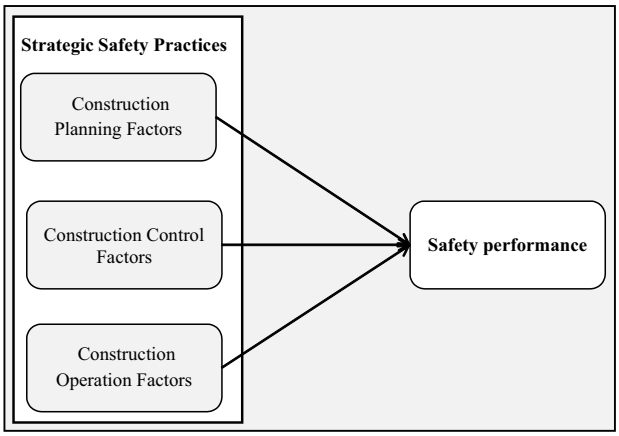

Figure 1: Conceptual framework adapted from Suraji, Sulaiman, Mahyuddin and Mohamed (2006)

Methodology

The study will cover the construction industries of Lafiya, Nasarawa state of Nigeria of which the survey will consider the strategic safety practice and safety performance in the construction industry where construction professionals such as builders, quantity surveyors, architectures and civil engineers will be the audience to the study in the case of the survey.

The study adopted descriptive and exploratory design because it would use objective methods to uncover facts about its background and problems. The most appropriate approach for this study is quantitative, as numerical data will be collected and analysed. A survey research strategy, which uses a questionnaire as an instrument of data collection, was adopted in this research. Hence, in accordance with a study by Kumar (2019), this research design is mainly quantitative (exploratory and descriptive).

The study adopted a mixed approach that is descriptive and exploratory design because it will use objective methods to uncover facts about its background and problems. The approach considered most appropriate for this study is quantitative, as numerical and qualitative data will be collected and analysed. A survey research strategy, which uses a questionnaire as an instrument of data collection, was adopted in this research. The target population for this study are the professionals in the construction industries, such as builders, quantity surveyors, architects and civil engineers in the study area. The sample frame is the total number of items of the study population.

The sample frame of this study will be some professionals in the construction industries, which include builders, quantity surveyors, architecture and civil engineers in the study area. In practice, the sample size to be used in a study is determined based on the expense of data collection and the need for sufficient statistical power (Lohr, 2019). The sample size for this study will be determined using Krejcie and Morgan table (1970). The questionnaire for this study was designed in consideration of the nature of the respondents, ease of reading and completion period. The design incorporated the use of only close-ended questions. Close-ended questions had more than one response option, and five (5) Likert scale was used for the variables items to ease the means of assessing the responses.

Statistical Package for Social Science (SPSS) will be used for statistical analysis of the data generated from the questionnaire survey. The data obtained using the questionnaire survey will be thoroughly screened, analysed and sorted out for

analysis depicting the information responses from the respondents, as the study contained descriptive in research questions 1 and 2 and then inferential questions in research question 3; hence, mean rankings and multiple regression analysis will be carried out.

Results

This discusses the results from the data analyses, starting from questionnaire validation and the pilot survey carried out. The response rate for the questionnaire administered is also discussed. Data analysis on demographic data using frequency was carried out. The reliability analysis for constructs is also carried out and presented. The descriptive and multiple regression analysis results were presented to answer the research questions.

Demographic of the Respondents

Table 1: Demographic information of the respondent

			Frequency	Percent
1	Gender	Male	72	93.5
		Female	5	6.5
2	Age	Less than 30 years	7	9.1
		31-40 years	29	37.7
		41-50 years	37	48.1
		51-60 years	3	3.9
		60 years and above	1	1.3
3	Educational qualification	Diploma/Certificate	27	35.1
		Degree/HND	31	40.3
		Masters degree/PGD	15	19.5
		Ph.D	4	5.2
4	Work position	Architect	25	32.5
		Quantity surveyor	19	24.7
		Civil engineer	18	23.4
		Builder	15	19.5
5	Years of Working experience	Less than 5 years	3	3.9
		5-10years	21	27.3
		11-15years	26	33.8
		16-20years	21	27.3
		20 years and above	6	7.8

The Table 1 result showed that the majority of respondents in the study were male, constituting the highest percentage of 93.5%. Most of them are within the range age of 41-50 years, constituting a percentage of 48.1%. Regarding educational qualification, most respondents hold degrees/HND, comprising 40.3%. Regarding work positions, most are architects, with a higher percentage of

32.5%. Finally, most have 11- 15 years of working experience, with a higher percentage of 33.8 in the study area.

Reliability Test

The study constructs' reliability was assessed using Cronbach's Alpha scale analysis.

Table 2: Reliability test

	Reliability Statistics		
Constructs	Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
Construction Planning Factors	.601	.596	12
Construction Control Factors	.327	.260	10
Construction operation factors	.791	.788	20
Safety performance	.621	.633	5

The Cronbach's alpha result was achieved for only construction operation factors above 0.7, as suggested by George and Mallery (2010). But all the remaining constructs' Cronbach's alpha results were below 0.7, respectively.

The safety performance in construction industry of Lafiya, Nasarawa state

Descriptive statistics based on the mean ranking were carried out to identify safety performance in the construction industry of Lafiya, Nasarawa state. The results were analysed by ranking the mean and standard deviation for every item in Table 3. The decision for mean ranking was taken based on the rating scale by Abd. Majid and McCaffer (1997) state that Very low ($1.00 \leq$ Mean < 1.50), Low ($1.50 \leq$ Mean < 2.50) (Moderate $2.50 \leq$ Mean < 3.50), High ($3.50 \leq$ Mean < 4.50) and Very high ($4.50 \leq$ Mean < 5.00). The result presented in Table 4 shows the results.

Table 3: Safety performance in construction industry of Lafiya

Safety performance	Mean	Std. Deviation	Ranking	Remarks
Safety in design preparations	4.56	.698	1	Very high
Safety in construction processes	4.38	.689	2	High
Safety during meetings	4.26	.923	3	High
General safety	4.18	.756	4	High
Safety of construction sites	4.12	.873	5	High

Table 3: Showed the results of safety performance in the construction industry of Lafiya. The major safety performance is safety in design preparations, safety in construction processes, safety during meetings, and general safety and safety of construction sites, with their highest mean values of M= 4.56, STD. Deviation = 0.698,

M= 4.38, STD. Deviation = 0.689, M= 4.26, STD. Deviation = 0.923, M= 4.18, STD. Deviation = 0.18 and M= 4.12, STD. Deviation = 0.873 ranked 1st to 5th respectively. This means that the safety performance in the construction industry of Lafiya is high.

The strategic safety practices used in the study area

Descriptive statistics based on the mean ranking were carried out to identify safety performance based on Construction Planning, control and operation factors in the construction industry of Lafiya, Nasarawa state. The results were analysed by ranking the mean and standard deviation for every item.

Table 4: Planning Strategic Safety Practices

A: Construction Planning Factors	Mean	Std. Deviation	Ranking	Remarks
Design of access to structures	4.34	.912	1	High
Site investigations	4.29	.886	2	High
Planning of construction works	4.22	.805	3	High
Planning/design of plant or equipment operations	4.21	.894	4	High
Development of method statements	4.19	.828	5	High
Planning & design of site services	4.19	.708	6	High
Structural design for temporary support structures	4.19	.828	7	High
Structural design for M & E installation works	4.16	.889	8	High
Preparatory training	4.04	.834	9	High
Site layout plans	3.99	1.006	10	High
Safety plans	3.95	.985	11	High
Identification and assessment of risks	3.94	1.004	12	High

Table 4: Showed the results of planning strategic safety practices. The major planning strategic safety practices are the design of access to structures, site investigations, planning/design of plant or equipment operations and planning of construction works with their highest mean values of M= 4.34, STD. Deviation = 0.912, M= 4.29, STD. Deviation = 0.886, M= 4.22, STD. Deviation = 0.805, M= 4.21, STD. Deviation = 0.894 ranked at 1st to 4th. The least planning strategic safety practices in the study area are site layout plans, safety plans and identification and assessment of risks with the mean values of M= 3.99, STD. Deviation = 1.006, M= 3.95, STD. Deviation

= 0.985 and M= 3.94, STD. Deviation = 1.004 ranked at 9th to 12th respectively.

Table 5: Control strategic safety practices

Construction Control Factors	Mean	Std. Deviation	Ranking	Remark
Control of material or component storage & handling	4.55	.804	1	High
Control of safety facilities and protective equipment	4.42	.676	2	High
Control of dangerous chemicals or substances	4.32	.924	3	High
Supervision of operative work	4.26	.768	4	High
Control of systems of works	4.21	.732	5	High
Control of plant or equipment operations	4.06	.817	6	High
Control of ground conditions	4.03	.888	7	High
Control of worksite condition (housekeeping)	4.03	1.026	8	High
Control or protection of weather effects	4.03	1.063	9	High
Control of the stability of temporary structures	3.96	.979	10	High

Table 5: Showed the results of control strategic safety practices. The major control strategic safety practices are control of material or component storage & handling, control of safety facilities and protective equipment, control of dangerous chemicals or substances and supervision of operative work, with their highest mean values of M= 4.55, STD. Deviation = 0.804, M= 4.42, STD. Deviation = 0.676, M= 4.32, STD. Deviation = 0.924 and M= 4.26, STD. Deviation = 0.768 ranked at 1st to 4th. The least control strategic safety practices in the study area are control of the stability of temporary structures with the mean value of M= 3.96, STD. Deviation = 0.979 ranked at 9th to 12th respectively.

Table 6: Operation strategic safety practices

Construction operation factors	Mean	Std. Deviation	Ranking	Remark
Maintenance of equipment or plant	4.40	.799	1	High
Appropriateness of construction procedures	4.39	.691	2	High
Adequacy of ventilation	4.38	.762	3	High
Correct plant or equipment operations	4.26	.818	4	High
Correct and su? cient safety warnings or precautions	4.26	.909	5	High
Correct and su? cient setting out	4.23	1.037	6	High
Site services reliability	4.23	.793	7	High
Availability of safety facilities	4.22	.898	8	High
Completeness and clarity of working drawings	4.18	.869	9	High
Reliability of tra? c control systems.	4.12	.873	10	High
Adequacy of illumination or lighting	4.09	.976	11	High
Compliance with regulations or codes of practice	4.09	.814	12	High
Adequacy of communication or coordination	4.04	.895	13	High
Appropriateness of instructions to operatives	4.04	.924	14	High
Proper stacking and routing of materials	4.03	1.038	15	High
Equipments or vehicle capability	4.01	.953	16	High
Adequateness of site layout	3.99	.966	18	High
Reliability of temporary support structures	3.96	.865	19	High
Maintenance of temporary structures	3.94	1.017	20	High
Tidiness of workplaces or poor housekeeping	3.94	1.116	21	High

Table 6: Showed the results of operation strategic safety practices. The major operation strategic safety practices are maintenance of equipment or plant, appropriateness of construction procedures, adequacy of ventilation and correct plant or equipment operations, with their highest mean values of M= 4.40, STD. Deviation = 0.799, M= 4.39, STD. Deviation = 0.691, M= 4.38, STD. Deviation = 0.762 and M= 4.26, STD. Deviation = 0.818 ranked at 1st to 4th. The least operational strategic safety practices in the study area are reliability of temporary support structures, maintenance of temporary structures, tidiness of workplaces, or poor housekeeping with the mean values of M= 3.96, STD. Deviation = 0.865, M= 3.94, STD. Deviation = 1.017 and M= 3.94, STD. Deviation = 1.116 ranked at 19th to 21st respectively.

Exploratory Factor Analysis (EFA)

Factor analyses are variable reduction techniques which identify the number of

latent constructs and the underlying factor structure of a set of variables or reduce the number of observed variables to a smaller number of principal components which account for most of the variance of the observed variables. Exploratory factor analysis (EFA) was carried out to determine the unidimensionality of this study's constructs.

Unidimensionality was measured by ensuring that all measuring items had acceptable factor loadings. This study also used it to identify the underlying data pattern in each construct. Results of EFA analysis show that the value OF 0.790 for the Bartlett test of sphericity is large and significant. In the same vein, all Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy are greater than 0.50, indicating the factorability of the correlation matrix of the constructs. The total variance explained by the components is 44.550, which indicates a good result.

The impact of strategic safety practices on the safety performance in the study area

The standard regression was carried out to assess the effect of strategic safety practices on safety performance in the study areas. The levels of significance for all inferential statistical tests were established at 0.05. The effect size was calculated based on Pearson's R^2 (Coefficient of Determination), which is a proportion of shared variability between two or more variables. It has a range from 0 to 1, usually expressed in percentage (Sullivan & Feinn, 2012). The effect sizes were categorised as "small = 1%," "medium = 10%," and "large = 25%" (Nandy, 2012).

Table 8: Impact of strategic safety practices on safety performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	df	F	Sig.
1	.557[a]	.310	.282	.740	3 73	10.930	.000[b]

a. Predictors: (Constant) strategic safety practices

b. Dependent Variable: Safety Preformation

Regression analysis was carried out to assess the influence of strategic safety practices on safety performance. The r^2 value of 0.310 shows how much of the variance in the dependent variable safety performance is explained by the independent variable of strategic safety practices. In this case, the value was $r^2 = .310, f(3, 73) = 10.930, p < .000$. This means that the independent variable strategic

safety practices explained 31.0% medium effect size in safety performance, with significance at $p<0.001$.

Table 9: Individual impact strategic safety practices on the safety performance

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.341	.516		2.599	.011		
	Planning	.248	.090	.278	2.754	.007	.926	1.079
	Control	.310	.086	.364	3.611	.001	.930	1.075
	Operation	.138	.087	.156	1.584	.117	.974	1.026

a. Dependent Variable: P4

The standardised predicted values versus standardised residuals showed that the data met the assumption of homogeneity of variance, and the residuals were approximately normally distributed. Therefore, the beta coefficient shows that the planning, control and operation are the significant determinants of safety performance as indicated by the standardised beta coefficients of 0.278, 0.364 and 0.156 and t-statistics of 2.754, 3.611 and 1.584, which are significant at 0.007 and 0.001 significance level and insignificant at 0.117.respectively.

Findings

The study revealed the safety performance in the construction industry of Lafiya in which the major safety performance are safety in design preparations, safety in construction processes, safety during meetings, and general safety and safety of construction sites.

The study revealed that the results of planning the major planning strategic safety practices are the design of access to structures, site investigations, planning/design of plant or equipment operations and planning of construction works. The least planning strategic safety practices in the study area are site layout plans, safety plans and identification and assessment of risks.

The study revealed the results of controlling strategic safety practices in the study area. The major control strategic safety practices are control of material or component storage & handling, control of safety facilities and protective equipment, control of dangerous chemicals or substances and supervision of operative work. The least controlled strategic safety practice in the study area is control of the stability of temporary structures.

The study revealed the results of operation

strategic safety practices. The major operation strategic safety practices are maintenance of equipment or plant, appropriateness of construction procedures, adequate ventilation and correct plant or equipment operations. The least operational strategic safety practices in the study area are reliability of temporary support structures, maintenance of temporary structures, tidiness of workplaces, or poor housekeeping.

This study also revealed that the independent variable strategic safety practices explained 31.0% medium effect size in safety performance, with significance at $p<0.001$. Therefore, the study also revealed that the beta coefficient showed that the planning, control and operation are the significant determinants of safety performance as indicated by the standardised beta coefficient of 0.278, 0.364 and 0.156 and t-statistics of 2.754, 3.611 and 1.584 which are significant at 0.007 and 0.001 significance level and insignificant at 0.117.respectively.

Conclusion

It is concluded that the major safety performances in the study were safety in design preparations, safety in construction processes, safety during meetings, general safety and safety of construction sites. It is also concluded that the major planning strategic safety practices in the study area were the design of access to structures, site investigations, planning/design of plant or equipment operations and planning of construction works. The least planning strategic safety practices in the study area were site layout plans, safety plans and identification and assessment of risks.

The study concluded that the control strategic safety practices in the study area were control of material or component storage & handling, control of safety facilities and protective equipment, control of dangerous chemicals or substances and supervision of operative work. The least control strategic safety practice in the study area was control of the stability of temporary structures. It is concluded that the major operation strategic safety practices in the study area were maintenance of equipment or plant, appropriateness of construction procedures, adequacy of ventilation and correct plant or equipment operations.

The least operational strategic safety practices in the study area were reliability of temporary support structures, maintenance of temporary structures, tidiness of workplaces, or poor housekeeping. It is concluded that the independent variable strategic safety practices explained 31.0%

medium effect size in safety performance, with significance at $p<0.001$. Also, the study concluded that the beta coefficient showed that the planning, control and operation are the significant determinants of safety performance as indicated by the standardised beta coefficient of 0.278, 0.364 and 0.156 and a t-statistics of 2.754, 3.611 and 1.584 which are significant at 0.007 and 0.001 significance level and insignificant at 0.117.respectively.

Recommendations

i. It is recommended that the construction firms ensure that the safety of the workers must be given attention on the construction site. This will lead to an increase in the workers' productivity on the construction site.
ii. It is recommended that construction firms ensure safety during meetings, and general safety in the construction process should be considered a motivating tool.
iii. It is recommended that the project contractors identify and assess the risk areas in the construction site so that the workers can plan a strategy for their own safety.
iv. It is recommended that the planning strategic safety practices should be applied at any stage of the construction project on the site.
v. It is recommended that the contractors control dangerous chemicals or substances and supervision of operative work is necessary to keep the construction site safe.
vi. It is recommended that the contractors be given attention to the maintenance of equipment or plant, which leads to the operation of strategic safety practices on construction sites.
vii. However, correct and sufficient safety warnings or precautions for workers on the construction site should be considered.

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