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Challenges with the Monitoring of Safety of Operatives on the Construction Sites in Ghana

by

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DECLARATION

I hereby declare that this submission is my own work towards the MSc Construction Management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

Safety is particularly of high significance in the construction industry as it is to all branches of industry. It has always been a major issue as the construction industry is considered as among the most exposed sectors when it comes to occupational accidents. This study therefore seeks to investigate into the challenges with the monitoring of Safety of operatives on construction sites in Ghana. The objectives are to: identify the safety monitoring practices adopted on construction sites in Ghana, to identify the challenges with the adopted safety practices on construction sites and to find out the causes of the challenges to safety monitoring on construction sites in Ghana. Fifty-three (53) out of sixty-three (63) questionnaires distributed to the construction operatives in the Kumasi Metropolis, were retrieved representing a response rate of 84.13%. The data was analysed using descriptive analysis, mean score ranking and the Kendall's coefficient of concordance. The Kendall's coefficient of concordance was used to assess the level of agreement on the variables. The findings indicated that, having toolbox safety talk daily was the most frequent safety monitoring practice adopted by the construction operatives in Kumasi Metropolis, Ghana. It again revealed that "subcontracting practices resulting in unclear responsibility for maintaining safety" is a major challenge with adopting safety monitoring on construction sites. The study recommends that toolbox safety talks should be adopted frequently on construction sites daily before the start of operations and also responsibilities pertaining to maintaining safety should be clearly defined. The research study therefore suggested that, further research should be done on the strategies to help alleviate the causes of the challenges to safety monitoring practices of operatives on construction sites. Safety monitoring policy to help effective safety monitoring of sites on construction sites and safety monitoring programmes on construction sites should be adopted to help improve the situation.

Keywords: Challenges, Construction Site, Monitoring, Safety, Operatives, Ghana

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DEDICATION

This dissertation is dedicated to the Almighty God, the author and finisher of my life and my beloved wife, Mrs Juliet Addai.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In this era of globalization, there is the likelihood that the world's population would double in the next 40years (Berry and McCarthy, 2011). For the construction industry, this is good news because these extra people will need houses, schools and workplaces etc in relation to infrastructure developments. However, most importantly, some of these people will branch into construction as their professions, which means that the construction industry should be made more attractive for these new entrants and furthermore, accident -free zone as much as possible. Safety is particularly of high significance in the construction industry as it is to all aspects of the construction industry. This, particularly, has remained a common area of concern as the construction industry is listed amongst industries highly disposed to occupational hazards and accidents. The years have seen significant transformative improvements in performance, on safety to be exact; regardless, this industry persists as one of the highly hazardous industries in comparison to others.

The fact remains and points to the construction industry sitting atop as one of the elite dangers and accident-prone industries as evident from yearly statistics on injury and fatalities. And this statistic climbs higher in developing countries. Construction workers predisposition to fatal injuries overshadows the national fatality three times. It rates in injuries is 50% severer in comparison to the injury rates encountered in other industries (Charles et al., 2007). Hinze (2002) and Vredenburgh (2002) conducted studies which revealed that improvements in safety is only possible if the behaviours and attitudes of workers are altered and if adequate and alluring incentive schemes are put in proper place as motivation. One can be deduced from the

prevailing reality that these mentioned solutions haven't been given needed attention and effort to eradicate if not mitigate unsafe conditions on site. The most germane concern in this case is for employers and their employees to prioritize alleviating occupational injuries on construction sites.

In the Ghanaian construction industry, all the aforementioned causes may apply. Most of the construction workers are unskilled labourers and therefore it becomes very difficult in implementing the measures that could help curb this situation. A myriad of research findings has inextricably linked accidents on construction sites to negligence, carelessness, in adherent behaviour to professional and safety protocols on site. This research also established a solid connection between workers' safety consciousness and attitude to a safe construction site. Moreover, actors such perception of risk, risk management, established procedures and rules on safety, including workers' cultural background have been found to greatly influence their attitude and consciousness of safe conduct (Fogarty & Shaw 2010; Hassan et al., 2007). Differing perceptions, behaviours and actions exhibited by construction workers and operatives have led to serious accidents on sites and have been linked to different cultural backgrounds.

This has made it imperative that the behaviours, perception and cultural influences of construction workers towards safety is put under critical lenses. It is with this backdrop that this study seeks to look into the various challenges associated with the monitoring of safety of operatives on construction sites in Ghana.

1.2 PROBLEM STATEMENT

Globalization and internationalism have created an awareness of the menace posed by unsafe working environment for workers on construction sites and even in the industry. The alarming injury and fatality rates of the construction industry are closely related to the hazards and risks faced during construction activities. These are inclusive of such activities as working at higher altitudes, working with moving plant and inhabited areas, and working on installing services both underground and on the surface

(Hoonakker et al., 2005; Gittleman et al., 2010; Biggs et al., 2013). In response to these risks and subsequent injuries and fatal accidents, the pursuit is on for a betterment of the safety conditions and performance in the construction industry (CRC Construction Innovation, 2007; Hon et al., 2012).

Nonetheless, there exists a number of hindrances to achieving that goal. Few of these include demands on meeting performance and production goals, the intricate nature of the organisation in question, and crucial concerns of behaviour and cultural background. The employed workers may originate from varying regions of the country, conversant with differing languages, and an amalgam of conflicting cultures. The worker's cultural origin is a crucial player in his behaviour given that our culture defines the framework within which we identify ourselves in speech, conduct, in perceiving reality (Langford et al, 2000) and in construing the behaviours of another. A cultural mixture of people will reveal different lifestyles exhibited by different people. And this background also defines the filters through which they interpret the actions of others. As a result, ineffective communication and misunderstanding which arises from a cross-cultural interaction can have a significant influence on safety concerns on site.

The safety issues in the construction industry are not entirely secluded to any one country. It is a global problem and so requires a global coordination to find a remedy. Global cooperation here also implies the sharing of information, ideas, technologies, experiences and in learning from one another. Based on this premise, this study sought to identify the challenges inhibiting the monitoring of the safety of operatives on construction sites in Ghana.

1.3 RESEARCH QUESTION

Undertaking such a study, the following research questions were proposed.

1. What are the safety monitoring practices adopted on construction site in Ghana?

2. What are the challenges with the adopted safety practices on construction site in Ghana?

3. What are the causes of the challenges to safety monitoring of construction site in Ghana?

1.4 AIM

The aim of this research was to investigate the challenges with the monitoring of safety of operatives on construction sites in Ghana.

1.5 RESEARCH OBJECTIVES

In an attempt to achieve the above stipulated aim, the following objectives were put forward;

1. To identify the safety monitoring practices adopted on construction site in Ghana.

2. To identify the challenges with the adopted safety practices on construction site in Ghana.

3. To identify causes of the challenges to safety monitoring of construction site in Ghana.

1.6 SCOPE OF STUDY

The contextual scope of the study was focused on the safety monitoring in the construction site in Ghana. The geographical scope of this study was limited to the Kumasi metropolis. The choice of location was due to larger population of construction professionals found in that region. What this means is that you would find the prime variables in this location. Again, Kumasi metropolis was a central focus in this study because of its convenient proximity to the researcher in aiding the retrieval of information. Questionnaires were distributed to just the respondents that have the skills and knowledge regarding the research topic. The respondents constituted operatives on active construction site in Kumasi metropolis.

1.7 RESEARCH METHODOLOGY

In accomplishing the fore-stated objectives enumerated in this study, a logical and sequential structure was followed. Desk research which was based on library related books, scientific journals and periodicals and internet research, as well as a web-based search was used to review existing related literature. This study adopted the quantitative research method. Quantitative research entails the use of structured questions with possible responses provided and would engage many respondents. It is a process of making inquiries with the aim of testing a theory with variables, assessed using numbers, and analysed with statistical techniques.

Structured questionnaires were administered to relevant persons who have the experience and knowledge on safety in construction management. Statistical Package for Social Sciences (SPSS) and Microsoft Excel will be the statistical tools employed

for the organisation of the data presentation, description and analysis. The study was evaluated and recommendations for further research that are thought to be valuable will be well noted.

1.8 SIGNIFICANCE OF RESEARCH

This research study was necessitated from the need to cultivate an understanding by scrutinising the issue of unsafe conditions of construction sites in Ghana and to contribute to knowledge in this area. Addressing the issue of safety mu.st not be considered as an added restrictive policy. Construction companies should rather focus on the significant benefits and opportunities this creates on site for them, the employers, as well as their workers. Much forethought should be given to the reduction of accidents and litigation, workplace risks, and the elevated opinion from clients and partners, reduced absenteeism and with-it improved productivity and reduced costs. All these are a collective benefit from adopting safety measures on site.

1.9 STRUCTURE OF THE THESIS

This thesis was structured on five chapters. Chapter one, being the introductory part, also includes the problem statement, research questions, aim, objectives, scope of study, research methodology and significance of research. Chapter two will cover the review of relevant literature on the topic and an overview of Construction Safety especially in Ghana. Chapter three will focus on the methodology and procedure that will be used for the study. Chapter four will deal with the analysis of the data gathered as chapter five will present a summary of findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This section deals with previous researches done on construction safety. This chapter talks comprehensively about various literatures from different authors which the researcher used as a research tool. It reveals books on the issues on safety monitoring practices on construction sites, the challenges and the causes of the challenges in monitoring safe on construction sites in Ghana.

2.2 CONSTRUCTION IN GHANA

Construction industries in Ghana had high accident rates due to the nature of the work, management system, equipment used in the process, techniques used to perform the tasks, speed of the work and other relevant factors (Niskanen and Saarsalmi, 1983). Issues on safety have remained a common problem among industries in numerous countries. This issue is also their key concern. The range of 43% to 53% of all road related accidents in Ghana was reported by the National Road Safety Commission (NRSC) (2008) to include pedestrians and car occupants in that order.

Addo-Abedi (1999) revealed that construction businesses in Ghana are family based and operated accordingly. What this implies is that such businesses having an employee number exceeding 200 is extremely unusual. In the regard, they can be all categorized under SMEs having possessing similar qualities as they do. This study therefore provides a definitive framework describing an SME as domestic contractors operated family-based and family-operated and satisfying the following qualifying thresholds in the medium, small, and micro business context as pertains to construction:

1. Medium-sized businesses having an upper and lower threshold of 199 and 30 employees respectively.
2. 10 to 29 employees for small-sized businesses
3. Below 9 employees for micro businesses.

Although neither the developed nations or the developing nations can claim prerogative of this problem, the developed nations have however made a decisive effort in alleviating accidents in this industry. Unfortunately, this puts developing nations behind as is the case in many aspects. The Sub-Sahara African countries are especially lagging behind the fight to secure safe condition for workers in the construction industry. Industrialization is likely to further aggravate this canker which, as it stands, is already at an escalated level in developing countries. (Ha¨ma¨la¨inen et al., 2006). Notwithstanding, it still is a targeted goal of several construction companies and businesses, who have embraced a zero-accident policy, to reach it. Many of these companies have proceeded to execute effective practices that ensure safety (Hinze and Wilson, 2000). These accomplishments have been made possible because of the awareness created on the dangers posed by the industry's activities, and the focus and effort invested in securing a safe working environment. In spite of how critical the construction industry to the developing economy, its leaders and policy makers have failed to dole out the much need attention to it (Anaman and Osei-Amponsah, 2007).

Ghana construction industry records the highest number of occupational fatalities when compared to other industries in the country. 56 of the total 902 occupational injuries and accidents recorded in the 2000 result in deaths. This denotes 77.6 of every 100,000 workers lose their lives from undertakings onsite (International Labour

Office, 2012). In proper context, 1.5 of every 1,000 accidents in the industry was fatal as recorded by the European Union (EU) accidents statistics (European Commission, 2002). It is worthy of note that several accounts of site deaths in most developing nations are never reported and as such never accounted for in statistical data. This makes the factual stats a scary prospect with developing countries (Colak et al., 2004).

2.3 CONSTRUCTION OPERATIVES

A critical place susceptible to hazardous act and accident is the construction site. This is a result of the considerable number of employees required on site to undertake construction activities. Construction employment can be grouped into three namely; skilled work force, management and technical workforce and unskilled work force. Workers with high educational quality are undergone extensive training to instruct, design and manage the work process in construction. They are normally identified as the management and technical workforce. Skilled workforce are usually workers who possess experience and extensive knowledge on activities in construction. Semi-skilled and unskilled workforce consists of the labourers or workers with no or little construction experience and knowledge. All the workers including the skilled, semi-skilled and unskilled employees are all at risk of being hate on site. This can lead to injury, death or illness, even though the level of risk is different due to their different activities.

Effective safety management aims to create a safe, enabling environment, to secure an occupationally safe job, and to increase the conscious awareness of workers on the issue of safety conscious. Adequate training of personnel in the construction industry is expected to increase their perception of safety at workplaces. In recent years, there has been interest in improving the safety training in workplaces to increase employee motivation, awareness and safety performance in construction industries.

2.3.1 Skilled Workers in the Construction Industry

The construction industry has a delineated labour force with a structured consisting of skilled and unskilled workers (Griggs et al., 2016). Liepmann (1960) ranged the abilities of skilled workers as varying form apprentices to trades foreman or supervisors. An apprentice is amateur who committed to learning a unique trade and has begun the learning process acquiring the knowledge and skill in that trade as related to the construction industry. There are three common platforms to apprenticeship. These are the vocational training centres, schools, and finally, workshops and sites (Husseini, 1992). Bheemiah and Smith (2015) defines a skilled worker is a section of the work force who bring on board economically valuable skills set in the work they perform. The skilled worker is characterized within a framework of increased experience and expert level. His work comprises of complex and arduous task needing unique set of skills, experience, prior education and training, and the ability to think abstractly. Sweet and Meiksins (2017) compounded on this, asserting that to be a skilled worker is a function of your professional status and extent of training and not necessarily function of the academic degrees one possesses. Carpenters, plumbers, electricians, masons, painter, bar bender, plant operator, tillers, welder, steel fixer, and mechanics are all examples of the typical skilled worker in the industry (Uchitelle, 2009).

2.4 COSTRUCTION SAFTEY

Safety, health and welfare on construction sites, a training manual published by the International Labour Office in Geneva, International Labour Office (2012) states that high rate of accidents occurs in the construction industry than in the other manufacturing sector. However, the manual published by International Labour Office in Geneva International Labour Office (2012) emphatically stated that the work in

concern should be made safe and all existing conditions on site should mitigate threats and dangers to life and should enhance professional skills. Further, International Labour Office (2012) explains that employer needs to have safety norms and standards; there should be safety practices in construction sites to be followed by the employer. Effective safety management should create a safe working environment, a job free of mortal dangers and should incite a conscious awareness in workers. Currently, safety on construction site have been considered as a vital issue on construction site by the developed countries (Chen et al., 2011).

Both small and medium-sized firms, as revealed from research findings, encounter several hindrances to establishing formal systems in their aim to create systems securing safety in construction woks (Dawson et al., 1988; Eakin et al., 2000; Mayhew, 2000). Few instances of these entail the elimination of bureaucracy, informal management styles, and lean management structures. These traits can be well-seen in SMEs and they are a drawback to transparency and formal procedures that ensures safety management systems. (Argrilla, 1999; Helledi, 1999).

2.5 MANAGING SAFETY IN CONSTRUCTION FIRMS

Various literature on safety management points to conclusive evidence that there are differing standards for implementing safety on sites amongst SMEs because of common traits they possess. Baldock et al. (2005) undertook an investigative survey which was quite telling. It uncovered obvious disparities in the safety practices adopted by firms. Regardless, there were internal factors responsible for firms deciding to improve safety conditions on site. Amongst these are the size or number of employees, performance growth, managerial experiences including the age of the firm. Champoux and Brun (2003) also conducted their studies which intimated that safety and management are a feature of small businesses. Small businesses are also

influence to embrace and implement safety management practices because of their unique area they operate in. Regardless, businesses operating in any one particular industry can have noticeable differences in the safety practise they adopt. This is also dependent on the product and/or service provided. For instance, civil engineering contractors and building contractors had marked disparities in the measures implemented in ensuring health and safety (Birchall and Finlayson, 1996).

2.6 CAUSES OF POOR SAFTEY MONITORING PRACTICES ON CONSTRUCTION SITE

Possible causes of poor safety practices, that were identified from previous studies are summarised in Table 2.2. The identified possible causes of poor safety practices can be categorized into safety equipment, safety management, safety attitude of workers, safety training and others. In addition, "Low level of awareness toward using PPE" was also frequently identified as a possible cause of poor safety practices. This was identified, possibly, because unskilled workers, who have less educational levels, were found to be over presented among accident victims (Rameezdeen et al., 2003).

Failure to appoint a safety officer was often identified as a cause of scarcity of site safety. However, effects of "Safety attitude of workers" and "Safety training" have not often been studied, although "no willingness to follow safety norms" by workers was identified as a cause of poor safety practices. Tam et al. (2004) showed that workers in the construction industry are frequently mobile and tend to hop from one organisation and onward to another.

Further, Tam et al. (2004) found that 24% of contractors provide systematic training on safety for the first line workers, 65% of contractors offer occasional training, 11% of contractors provide training very rarely. It seems, in China, many organizations provide occasional training on site safety to workers.

Table 2.1: Causes of Poor safety monitoring practice

	CAUSES	REFERENCES														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	SAFETY EQUIPMENT																
	Low level of awareness on using PPE			X						X						X	
	Dislike to wearing PPE by unskilled labourers	X		X	X									X	X		
	Unavailability of PPE			X													
	SAFETY MANAGEMENT																
	Failure to appoint a safety officer							X			X				X		
	Poor safety awareness of project managers											X	X				
	SAFETY ATTITUDES OF WORKERS																
	No willingness to follow safety norms			X				X									
	Lack of awareness about site safety and regulations	X											X				
	SAFETY TRAINING																
	Poor understanding of job requirements			X													
	Lack of training facilities						X										X
	OTHER																
	Unsafe behaviour such as Operating without authority, Working with moving machinery, Wearing dangling clothes and unsafe lifting					X											
	Workers under the influence of alcohol and drugs			x													
	Fall	X	x														

A Rameezdeenet al (2003)-Sri Lanka, **B** Pendleburyet al (2006)-United Kingdom,**C** Farooquiet al (2008)-Pakistan, **D** Somasundaraswaranet.al (2006)-Sri Lanka, **E** Ahamad et al (2011) Sri Lanka,**F** Gunawardana and Jayawardana (2003) Sri Lanka, **G** Antonio et al. (2012) Spain, **H** Jeyakanthanand Ahamad (2012) Sri Lanka,**I** Abdul et al. (2003)Malayasia, **J** Charehzehi and Ahankoob (2012) Malaysia, **K** Shibani et al. (2013) United Arab Emirates,, **L** Zolfagharia et al. (2011) Malaysia, **M** Galappatti et al. (2013) Sri Lanka, **N** Vitharana et al (2013) Sri Lanka ,**O** Jackson et al. (2011)-Denmark, **P** Belel and Muhmud (2012)-Nigeria

Source: (Vitharana et al., 2015)

2.7 FACTORS AFFECTING SAFTEY PRACTICES

2.7.1 Cost of accident

The economic argument for safety has been around for some time and the first detailed study of the cost of occupational accidents came from (Heinrich,1959). Heinrich's work focused on the costs due to these accidents, both direct and indirect. The study stated that the indirect costs averaged around four times as much as the direct costs. Many researchers have since been inspired to check the validity of the findings of (Davies and Teasdale, 1994) but Heinrich (1959) emphasised that it was a purely statistical relationship. The results would differ between organisations, accident types and even departments of the same company. Further literature has extended this message and the cost of accidents to companies is raised by a leaflet produced for the Safety Executive. The leaflet described, how much accidents cost, and what is deemed an accident. It stated that an accident also included damage to property, equipment, materials, as well as, delays in production, and services. The costs of accidents vary, being contingent on both the type and size of the construction company.

2.7.2 Cost comparative to risk encountered

The risks encountered by employees in their work situations vary according to the trade or occupation they are carrying out but are very real. According to Fiora and Specht (1992), the level of risk acceptable differs from company to company and job to job. The costs of safety measures to reduce those risks are harder to quantify but there is a lot of best practice in the industry to suggest that there can be some quantification of costs. The other major factor that can influence safety costs is of course the legal requirement to comply with legislation. Comparing the costs of safety to the risks encountered by organisations is a sound business decision. He goes on to

explain that using financial principles is the best way to get safety implemented. He explains that you must identify what you spend your money on, compare it to the established standard, and therefore ensure compliance. This he explains ensures that not only do you protect the worker; you have a decrease in legal liabilities, legal fees and settlements, a decrease in prosecutions and an increase in good will.

2.7.3 Cost of safety during tendering

Cost is considered to be a major resource when managing projects. UK Contract Research Report 45 (1992) identified from respondents three major problems with the costing and allocating of resources to a project:

1. Safety issues are not addressed systematically at the tender stage. "There was a difficulty in pricing safety aspects of a project, since in many cases such aspects are inextricably linked to the desired method of construction, rather than the provision of discrete safety items.

2. Safety performance compromised because of inadequate tendering procedure. "Anecdotal evidence suggested that subcontractors may under cost or otherwise under resource the work. Where there is a chain of subcontracting, the current system does not explicitly provide a means whereby the safety requirements of subcontractors are necessarily incorporated in the bid to the main contractor."

3. Explicitly addressing safety would increase cost of tender. "The most common point made by respondents related to the financial and commercial repercussions of explicitly including safety requirements at tender stage, unless these had been specifically requested by the client.".

2.8 SAFETY RELATED ISSUES OF CONSTRUCTION OPERATIVES AT THE CONSTRUCTION STAGE

The construction industries and its attendant problem of safety concerns remains a talking point and priority for most countries, if not all. Safety issues have always been put forward as one of the major problems and primary concerns in construction industries in many countries. The U.S. Center for Construction Research and Training in 2005 stated that construction industries had the fourth highest fatality rate after agricultural, mining and transportation industry. Given the costs of occupational injuries and illnesses, the construction industry is considered as one of the most expensive industries. The most important issue that can be stated in accident occurrence is inadequate safety training in construction industries (Gervais, 2003). The results of Pinto et al. (2011) showed that lack of adequate knowledge concerning safety among senior and project managers and the poor safety culture was the main cause of poor safety performance. Safety studies revealed that the root of 85-95% of accidents is caused by unsafe acts were poor safety culture.

Safety related issues are chronic while some are acute, as categorised in **Table 2.1** below. Chronic issues usually develop slowly, and shall cause sickness or death after a certain period. For example, if a worker breathes small amounts of asbestos fibres, he may not notice the effect of that, because there are no acute effects. Workers neglect the safety hazards having chronic effects. Mostly reported chronic safety hazards is exposure to hazardous substances.

Table 2.2: Identified Safety related issues of construction operatives in the construction stage from literature review

	SAFETY RELATED ISSUES	REFERENCES							
		A	B	C	D	E	F	G	H
	Safety issues having Chronic effects								
1	Ionizing radiation (welding)		X						
2	Environmental with limited lighting(tunnelling)		X						
3	Corrosive materials (Concrete, brick acid)		X		X				
4	Contaminated land and materials (Old buildings, redundant gas works)		X						
5	Asbestos (insulation board, ceiling tiles, pipe lagging)		X						
6	Physical hazards (Noise, Heat, Humidity, Solar Radiation, Radiation from nuclear power plants)	X	X						
7	Improper housekeeping				X				
8	Skin sanitizers, irritants (Bitumen, acids, alkalis, cement)		X		X				
9	Vibratory tools		X						
10	Compressed air environment (Sewers and tunnels)		X						
11	Sewage (Dirty water)		X						
12	Hazardous substances	X	X	X	X				
	safety Issues having acute effect								
1	Fire and emergency	X							
2	Workers fall from height				X		X	X	X
3	Lifting, carrying or moving heavy tools or materials		X				X		
4	Plant and machinery, tool usage	X					X		
5	Protective clothing	X							
6	Roof work	X		X					
7	Ladder	X		X					
8	Harmful chemicals		X				X		
9	Excavating in deep trenches				X				
10	Electric shocks			X		X	X		

A Abdul et al. (2003)-Malaysia **B,** Pendlebury (2006)- United Kingdom, **C** Rameezdeenet al (2003)- Sri Lanka, **D** Farooquiet al (2008)-Pakistan, **E** Zhao et al. (2009)- United States, **F** Jackson et al. (2011)-United States, **G** Kaskutas et al. (2009)- America, **H** Kun HU et al. (2011)-America

Source: (Vitharana et al., 2015)

2.9 CHALLENGES WITH EFFECTIVE MONITORING OF SAFETY OF OPERATIVES

There are number of challenges that have been identified as a problem in monitoring the safety of construction operatives. The construction industry has long been considered to have unacceptably high injury and fatality rates (Choudhry and Fang, 2008). The Australian construction industry is quite scattered and perilous in operation, thus, attributable to 50 deaths annually (CRC Construction Innovation, 2007). Construction workers' susceptibility to fatality is thrice as much as those experienced-on average at the workplace and the higher rate of injuries is close to 50% as compared to those encountered elsewhere (Charles et al., 2007). The highly-transient and dynamic nature of construction presents its unique drawbacks to effectively managing of occupational health and safety risks (Lingard and Holmes, 2001). Existing research has shown that the high degree of injury experience in industry is primarily due to inadequate or non-existent OHS systems (Lin and Mills, 2001).

2.9.1 Cost Barrier

Cost is a critical serious factor that affect the performance of health and safety. The employment of safety staff and use of personal protective equipment (PPE) and adds to cost of undertaking construction projects (Kelloway et al., 2011). The financial fragility and instability of construction companies can impede the extent to which the good safety practices can be monitored. (Pinto et al., 2011). Because of the nature of construction industry, there is an unavailability of pressing facilities and resources needed to facilitate safe construction environment (Kelloway et al.,2011). In addition, the emphasis on safety in the construction industry is proportional to the company's

size and the project scale (Kartam et al., 2000). Business survival is the top priority for these companies at the expense of safety (Hon et al., 2012).

The financial benefits of safety investment are not obvious in the short term, making it less attractive for small construction businesses (Champoux and Brun, 2003). Furthermore, the competitive environment of tendering where the lowest bidder is awarded the contract, particularly in the public sector is major actor in driving down price quotations. Low prices lead to the sacrificing of safety practices on site (Kartam et al., 2000). Price cutting pressures are usually passed down to subcontractors (Smith-Jackson et al., 2011), causing many recurring quality and safety problems (Chiang, 2009). According to Wong et al. (2015), the following variables were identified as cost variables that act as obstacles to the monitoring of good safety:

1. Lack of expertise of resources
2. Lack of financial benefit in safety investment
3. Lack of bargaining power

2.9.2 Time Barrier

a. Tight Project Deadline

Tight project deadlines provide another barrier to effective OHS management. The industry strives to complete projects on time and neglects safety (Lazarevic and Perry, 2004; Silva and Wimalaratne, 2012). The problem of time pressures for safety is worsened due to poor design details, poor or inadequate planning, poor judgements, holding work in abeyance due to unfavourable weather conditions, and lastly, delay in delivery (Dawson et al., 1988; Zhou et al., 2011, Conchie et al., 2013). Subcontracting is performance-based method of payment. Payment in amount and schedule depends

on when and the extent to which work has been completed, not by the extent of time exhausted on site. The earlier works are completed, the earlier its equivalent payment is made. This incentive nudges subcontractors to press forward through hard work, overtime, but often disregarding safety measures in order to secure swift payment (Mayhew et al., 1997). Long working hours increase fatigue, result in poor concentration and decision making, and thus exacerbating the risk of injury (Haslam et al., 2005).

b. Long Training and Education Time

Due to the cost and time pressure of projects, there is a lack of Safety training and education, which significantly increases occupational risk (Kelloway and Cooper, 2011). Implementing training programs heavily assists site personnel to adhere to preventive measures and to create an enabling attitude on the subject of safety (Seppala, 1995). Training and induction procedures are often poorly structured in those organisations that experience poor safety performance (National Occupational Health & Safety Commission, 1999).

2.9.3 Lack of Safety awareness and Concern

a. The Fragmented Nature of Constructed Industry

Lack of safety awareness and concern is also a problem affecting safety performance. There is a correlative link existing between the level of commitment to managing safety and total performance of the project with regard to safety (Fang et al., 2004). However, the highly transient nature of the subcontracting workforce complicates the nature of employment relationships and causes ambiguity in the responsibility for maintaining safety (Loughborough University of Technology & UMIST, 2003). With small business, there is this apathy toward regarding safety management. Instead, they

often believe that risk control is the responsibility of employees (Lin and Mills, 2001). The ambiguity of safety commitment may also cause faulty decisions, misunderstanding from poor communication, irregularity in decision-making and adhering to established practices. This further aggravates poor safety on site (Mayhew et al., 1997).

b. Wrong Perception or Underestimation of Risk

Wrong perceptions or underestimation of risks often places individuals in unsafe environments. Some of the workers have an unhealthy confidence about the ability to work without appropriate safety precautions because of their smooth, uneventful years of experience and track record (Hung et al., 2013). These misperceptions and reluctance to take advice reduces the efficiency of safety training (ECOTEC, 2005). Some business owners tend to underestimate and even trivialise risk (Campoux and Brun, 2003). They believe risk is an inherent part of the work activity and that their employees are not in any significant danger because problems hardly ever occur (Campoux and Brun, 2003; Pinqing et al., 2006). Therefore, to achieve an excellent safety performance, emphasis should be made on the risk perceptions of both employers and employees as this affects risk behaviour and the probability of accidents and health injuries (Rundmo, 2000; Mohamed et al., 2009; Caponecchia and Sheils, 2011).

c. Onerousness and Variability of Legislation

The onerousness and variability of legislative enforcement within the individual disparate safety jurisdictions can hinder the effectiveness of safety practice (Charles et al., 2007). In Australia, for example, there are nine separate jurisdictions, creating uncertainty in terms of compliance (Biggs et al., 2005). The complications are in

addition aggravated by non-uniformity of safety regulations on the national front with regards to construction. In Foreign states for instance, each Federal government and State government have their unique regulatory framework on safety issues which add to the disparities (CRC Construction Innovation, 2007).

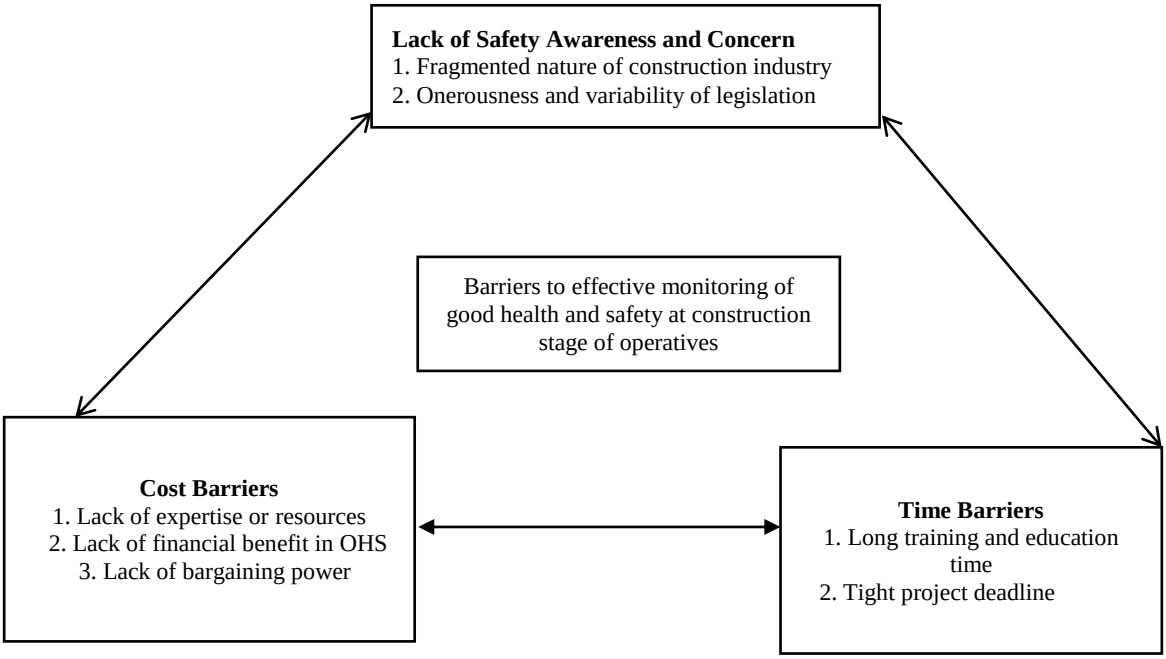

Figure 2.1: Proposed Interrelationship between variables
Source: (Wong et al., 2015)

2.10 EFFECTIVE SAFETY PRACTICES IN THE CONSTRUCTIN INDUSTRY

The management systems for safety has come up with a regulatory framework for alleviating safety risks and other hazards of the like on site. This is in response to strengthening control measures and the call for an efficient management system. In his report, Dawson et al. (1988) observed that the Great Britain has lagged behind in responding swiftly to embracing and implementing safety management systems in its construction industry. These regulations could be obligatory and by volition. Safety

Executive's regulatory guide is an example of an OHS management system used (Health and Safety Executive, 1997).

Successful project management does not only require performing work to specification but also considering safety (Belel and Muhmud, 2012). Charehzehi and Ahankoob (2012) added that it is not an impossible to task to secure high safety performance in construction. To improve site safety, construction site workers are entreated to create a working policy to enhance safety administration, create an avenue for safety training for its workers, amongst others. El-Mashale et al. (1010) added that, site workers are as well entreated to undertake regular meeting on safety at the project level, ensure adequate measures on safety, making available personal protection equipment (PPE), put up safety signs and posters, undertake regular safety inspections, establish a system for acknowledging and awarding safe conduct, etc. Mahalingam and Raymond (2007) acknowledged that mandatory enforcing measures like fining, as an effective approach to enhance safety performance on site. Charezehi and Ahankoob (2012) explained the contributing factors to health and safety development in construction. These include:

2.10.1 Risk Analysis in the Design Stage

The ability to forecast risk at the design stage has a great bearing on the reduction of people and property accidents. A full analysis on safety risk becomes possible when the client and designer sit together in collaboration. In order to implement this approach, there must be an assessment of the far-reaching tread that links the environment, stakeholders, the public and the eventual end users of the built asset. The main focus of this approach is in ascertaining the possibilities of what could happen, how that may take place, and why that is so when executing tasks. A

separation must be made in isolating bearable risks from those extreme. In order to create these classifications, the risk level will be extrapolated from the degree of the risk and then the likelihood of the risk. This allows for further analysis. Afterwards, to cap that off, to mitigate, eradicate, or nullify the risk, it becomes important to consider the options available to do so (Charezehi and Ahankoob, 2012).

2.10.2 Training Strategy

In order to enhance safety performance, it is becoming widely accepted that training opportunities given to workers go a long to this end. What it accomplishes is to make workers more safety conscious and aware on site. Moreover, providing adequate training enables workers to anticipate accidents before they occur to meet it with preventive measures. For safety performance to be expanded largely, it becomes the task of management to employ a solid system and acceptable approach to safety on site. The approach adopted should be elaborate, clearing delineating the measures to be followed for each hazardous undertaking, particularly in the design stage. Clarity and simplicity should the hallmark of these processes. The organization concerned should put in place orientation programs to educate and train their employees. Proper and adequate training ensures that workers become collaborative in tackling workplace incidents (Vredenburgh and Cohen, 1995).

2.10.3 Reward Policy

Besides adequate education and training, one effective way that gives added incentive for workers' adherence to safety protocols is establishing a reward system. An added benefit is that workers are motivated to report on accidents on site and on anything will likely jeopardize their safety. The organizational policy should focus solely on preventing accidents than punishing culprits or the causers of such occurrences. This

system of reward can range from a promotion to monetary benefits (Charezehi and Ahankoob, 2012).

2.10.4 Management strictness on Implementing of Safety Measures

The policy of choice that the manager settles on does have an influence on the levels of safety experienced in the organization. Clarity in procedure will aid in the smooth administration of the process. Representatives should be chosen by management for effectively apportioning the right human resource, competent and educated to each aspect of work. This is a responsive approach to problem solving in meeting the needs of workers (Charezehi and Ahankoob, 2012).

2.10.5 Contractor Comply with Safety Regulation

According to Charezehi and Ahankoob, (2012), any contractor who makes the effort to implement safety regulations on his site should be sort after. Clients looking to award contractors should consider the track record of the contractor with regards to safety performance. However, the conformity to safety regulations amongst contractors varies with range that dips between no total disregard to total compliance. This should make clients keener on prioritizing the contractor with a track record that depicts great regard for safety on site. The following strategies, according to Charezehi and Ahankoob (2012), should assist proper monitoring in securing an increased safety performance:

1. Develop rules and guidelines every contractor should conform to.
2. Create a permit-required sanction of tasks that carry hazardous potentialities.
3. Make it mandatory on every contractor to have in his employment a supervisor in charge of safety on site.

4. Create a schedule for regular discussion between the client and the contractor on safety issues.

5. Strict monitoring of proceedings to ensure adherence to safety measures.

2.10.6 Provision of Safety Equipment and Tools

In order to also ensure safety on site, the importance and contribution of safe facilities and machinery should never be overlooked. Given the radical technological transformations in the construction industry, innovative efforts to upgrade the machinery and plants used have been significant. The automatized nature of modern construction and the redesigning of its facilities owe it roots to the technological wave that has taken place over the years (Kjellen, 1990). This transformation has been beneficial in slicing down the occurrences of accidents and at the same time creating its own unique challenges. This challenge is seen more with untrained workers who are not conversant with its use and operation. The resulting effect creates further accidents on the site. The solution to this is the innovative idea of using the emergency switch which allows the workers to man operations without any incidents. This entails remote sensors that detects the presence of workers onsite. An alternative would be to properly layout the construction site, rightly allocation spaces for plant and materials. A good layout should ideally reduce the hazards on site.

2.10.7 Personnel Selection

The individual behaviour and attitude of workers onsite has a strong bearing on the accidents experienced on site. The various workers differ on the inclination to accidents. Some are more inclined to accidents than are others. Looking at it from a different perspective, it can also be inferred that some workers are more safety conscious than others. Some contributing factors known to cause these disparities

include impulsiveness, family instability, social notoriety, among others (Guastello, 1993).

2.10.8 Take a Responsibility to Report Near-Miss Accident

Near-misses are qualified as those incidents that could have led to injury or illness and held the potential to damage properties and the environment but didn't. Workers reporting on near-misses go a long way in preventing hazards. The accounts of these near-misses will form the basis for the formulation of preventive measures and safety protocols. On some project sites, the recording of new misses is usually disregarded as insignificant. However, important research has proven that to the contrary. It has shown that the occurrence of near-misses far outnumbers the actual accidents. This makes it pivotal that workers should induced to take the reporting near-misses seriously.

Table 2.3: Possible methods to help ensure better safety on construction site

	Possible methods to help improve safety	REFERENCES						
		A	B	C	D	E	F	G
	Safety management							
1	Identifying hazards		X					
2	Decide precaution		X					
3	Safety on site should be discussed at management meetings					x		
4	Implementation of total safety management at the organizational level in construction companies						x	
5	Plan pot short and long term safety budgets to ensure the adequacy of safety implementation on site				X			
6	Recording findings and updating in relation to the work condition		X					
7	Assess and evaluate risk		X					
8	Using coercive enforcement mechanisms such fines			x				
9	Creating safety regulations and policies	X	X					
	Workers attitudes on safety							
10	Increasing in workers awareness of risk factors will be useful to increase the productivity and reduce the risk associated with construction activities							x
11	Construction workers must identify unsafe conditions and behaviour and try to correct them					x		
	Safety Training							
12	Conduct weekly safety inspection	X						
13	Incentive programs should be developed					x		
14	Ensure that a very new employee on project site is given an appropriate orientation regarding safety and safety inspections					x		
15	Conduct weekly formal safety meetings at the project level	X						
	Safety equipment							
	Providing PPE to the workers always	X						
	Other							
	Reduce labour turnover rates to less than 25%	X						

A El-Mashaleh et al. (2010) Jordan, **B** Charezehi and Ahankoob (2012) Malaysia, **C** Mahalingam and Raymond (2007) India, **D** Chia-Kung Lee and Jaafar (2012) China, **E** Belel and Muhmud (2012) Nigeria, **F** Agwa et al. (2012) Nigeria, **G** Vitharana et al. (2013) Sri Lanka

Source: (Vitharana et al., 2015)

2.11 CHAPTER SUMMARY

This chapter has portrayed previous researches done on construction safety and its related issues. It has revealed the understanding of safety practices in the construction industry of Ghana. The chapter then delved into the challenges that are hindering the monitoring of safety of construction operatives at the construction stage as well as the safety related issues involves. The chapter finally revealed the causes of the challenges with the safety monitoring of the safety of operatives on construction sites.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This section depicts the method used for the research. It includes the research design, research approach, population, the sample size, source of data, how the data is collected and the chapter summary.

3.2 RESEARCH DESIGN

Research design is an integral feature of the research methodology. In a bid to solve a research problem, due diligence must be accorded to technically delineating and clarifying the relationship existing between variables or amongst them in any specific situation. Moreover, it also requires critically analyses of this relationship independent any foreign influences. Also, the option to adopt any specific strategy was contingent on the aim of the study, the needed information's type and availability for the research at hand (Naoum, 1998; Baiden, 2006). The main reason of a research design is to enable the researcher come out relevant evidence with little effort, time and money (Kothari, 2004). Yin (1994) came out that the research tools used for a study mostly dependent on the research purpose that is, exploratory, explanatory or descriptive. This research study adopted the exploratory research design. Exploratory research design has the intention to explore the research questions and does not offer final and conclusive solutions to existing problem (Singh, 2007). Singh (2007) further stated that the exploratory research design explores the topic with a varying level of depth. It is the initial research which forms the basis of more conclusive research. The research study then employed the exploratory research design in line with Singh (2007).

3.3 RESEARCH APPROACH

This study adopted the quantitative research approach. Quantitative research approach was used when the researcher wants to numerically present the findings as well as make meaning through objective measurement of the condition. The quantitative data was derived by administering questionnaire on construction safety to the workers and professionals in the construction industry concerning the construction stage.

3.4 POPULATON

Population is an important factor in collecting reliable responses from respondents. Population is the aggregate of all the objects, subjects or members that conform to set of specification (Polit and Hungler, 1999). Again, population is explained simply as complete set of people, cases, observations or data about which information is desired and is also of interest to a researcher **(**Passer, 2004; Kothari, 2004; Beins and McCarthy, 2011). Taylor-Powell (1998) further explained population as "a group or units of interest located in a geographic area of interest during the time of interest." The population for this study constituted an appropriate number of construction operatives including workers and professionals in the construction industry in the Ashanti region of Ghana, Kumasi Metropolis. The population size of the study was 75, consisting of the construction operative purposively on site (made up of project managers, safety officers and other operatives).

3.5 SAMPLING SIZE

A sample is a selected portion of the population under investigation, and is representative of the population as a whole. This sample of the population is used to make extrapolations and other holistic deductions that reflect on the entire population. According to Naoum (2012), when considering a larger population, the percentage of the sample size needs to be smaller and vice versa, that is, if the entire population is

smaller, the sample size should encompass a relatively lager proportion of the population. Polit and Hungler (1999) also added that, in order to attain a valid and accurate conclusion and a more concrete prediction, the researcher should consider using a larger sample than a relatively smaller sample. The study then adopted purposive sampling technique to select the construction operatives that can give reliable information concerning issues on safety unique to the construction industry in Ashanti region, Kumasi Metropolis.

In estimating for the sample size, the method employed was as used in Krejcie and Morgan (1970). Krejcie and Morgan (1970) employed this simple formula in ascertaining the sample size:

$s = X^2NP(1-P)/d^2(N-1)-X^2P(1-P)$

s = required sampling size

X^2 = the table value of chi-square for one degree of freedom at the desired confidence level.

N = The population size

P = the population proportion (assumed to be 0.50 since this would provide the maximum sampling size.

d = the degree of accuracy expressed as a proportion (0.05)

Krejcie and Morgan (1970) incorporated the formular to for a sampling estimating table.

Table 3.1: Krejcie and Morgan's Table showing relationship between population and sample size

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

The study used a population of 75 construction workers and professionals in Ashanti region employing a confidence level of 99% and margin error of 1%. The research study therefore adopted the use of 63 sample size based on the sampling estimating Table by (Krejcie and Morgan, 1970). The sample size could be significant, having a bearing on the research outcome, or it could otherwise insignificant with impactful outcome on the research (Amponsah, 2011). In the view of Amponsah (2011), a larger

sample size was advocated particularly in a closed population as this will enhance the accuracy of the results obtained. The study was then able to retrieve fifty-three (53) out of the 63 questionnaires distributed.

3.6 SAMPLING TECHNIQUE

One needs to use a sampling technique to help select a sample. Basically, sampling technique can be categorized into two forms; non-probability and probability sampling techniques (Sekaran, 2000). Non-probability (purposive) sampling methods was used in selecting research participants for this study. This included collection responses from the construction operatives in Ashanti region. Purposive sampling was a technique used in deriving a sample size that is subject to the researchers own discretion in his decision on who the participants of the target population should be. Black (2010) said that purposive sampling becomes necessary when "elements selected for the sample are chosen by the judgment of the researcher. Researchers often believe that they can obtain a representative sample by using a sound judgment, which will result in saving time and money." Some of the advantages of Purposive sampling is that it saves on time and cost. The purposive sampling technique is also beneficial in effectively exploring anthropological situations where greater clarity can be achieved from a more intuitive approach (Saunders et al., 2007). Despite the benefits, with purposive sampling, the researcher is susceptible to human errors in making defining judgment. It is susceptible to bias and has been known to record poor levels of reliability. One is also unable to generalize research findings from a purposive sampling technique study (Saunders et al., 2007). The research study therefore adopted the purposive sampling technique. The sites are purposively selected from the Kumasi Metropolis, Ashanti region.

3.7 UNIT OF ANALYSIS AND SOURCE OF DATA

Polt and Hungler (1999) defined data as information received in a course of a study. The study mainly used primary data collected from construction operatives in Ashanti region, Kumasi metropolis. Primary data is, data originated by the researcher specially to address the research problem (Malhotra and Birks, 2007). According to Walliman (2011), data serves as a raw material to help conclude the event being under study. There are two main sources of data that researchers depend on, namely secondary and primary sources and the event to be studied under the source to be adopted (Singh, 2006; Walliman, 2011). Primary data are first-hand information gotten for a research. Quantitative data was collected and the administering of a well-structured questionnaire containing open ended questionnaires. The primary data are collected from the construction operatives through the use of questionnaires.

study (Cohen et al., 2007; Beins and McCarthy, 2011).

The secondary source of data employed for this study was the appropriate literatures done on the innovation adoption. Secondary data refers to the data from another person's document collected for some different purpose, therefore making it less reliable (Gray, 2004; Saunders et al., 2007; Walliman, 2011). Cohen et al. (2007) added that, secondary data source lacks direct physical relationship to the research problem at hand, the researcher detailing the event which he was not actually present but obtained description from another person or source.

3.8 DATA COLLECTION INSTRUMENT

The study used structured questionnaire for data collection. Sekaran (2000) declares that a questionnaire is employed in the collection of data because it allows the researcher to assemble much information from the respondents within a short period.

The first part of the structured questionnaire was based on socio-economic and demographic characteristics. These included sex, age, highest education attained, marital status, income level, and religious status. These variables have been reported in literature to influence demand for the results.

Questionnaires are economical way of gathering the needed data from a possibly large pool of respondents (Fellows and Liu, 2003, Saunders, et. al. 2007). A questionnaire consists of number of printed or typed questions on a form or set of forms arranged in a definite format (Kothari, 2004). Questionnaire construction deals with framing of questions and asking for self – reported attitudes, knowledge, and statements of behaviour from respondents (Burnham et al., 2008; Beins and McCarthy, 2011).

3.8.1 Questionnaire Format

The questionnaire used for this study was basically in two main forms, namely PART A and PART B. The PART A consisted of background of the respondent, and PART B consists of questions to solve and meet the aim and objectives of the research base on the respondents' perceptions. A five-point Likert scale was adopted in this study to measure the response of each respondent. Scaling style was adopted because the data was primarily ordinal where 1= strongly disagree; 2= disagree; 3= neutral, 4=agree, 5= strongly agree. The type of questions used involves the use of close ended questions. These question formats can lead to a reduction in bias (Walliman, 2011). The research questionnaire used has three pages which made the questions easy to be responded.

3.9 DATA PROCESS AND ANALYSIS

According to Strydom et al. (2007), data analysis refers to the ways by which answers are found by means of interpreting the gathered data. Finding meanings and

explanation to the data refers to the interpretation. Processing of data can proceed once the data has been collected and gathered; it involves coding of the collected data for efficient analysis of the results (Burnham et al., 2008). Due to fact that explaining the raw data is either impossible or difficult, the describing and analysing of the data must first be done and then interpreting the analysis results (Strydom et al., 2007). Quantitative data analysis deals with statistics, that is data collected in the numerical form and their properties can be analyse using mathematical operations (Passer, 2004; Walliman, 2011).

The collected data from the questionnaire concerning the data was coded and analysed using the simple statistical tools such as the Statistical Package for Social Sciences (SPSS) version 20 or current version and Microsoft Excel. Tables were used for Interpretation of data to get valid meaning to the responses. The analytical tool used for further meaning include Mean Score Analysis. Means score Analysis was used to rank the dependent variables obtained to establish how the they are prioritized by the construction operatives.

3.10 CHAPTER SUMMARY

This chapter focused on the methodology used to attain the general objective of the study. Firstly, the study used exploratory research design and quantitative research approach to get reliable responses from the respondents. Secondly, the study sampled 50 construction operatives using purposive sampling. Thirdly, the data collected will be analysed using Mean score ranking and the variables will be graphically displayed using table after data collection.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter discusses the results in details of the data collected from field survey. The background of the respondents is analysed using descriptive statistics, which include percentages, frequencies, etc, whilst the dependent variables are analysed using the mean score ranking. All these tools are incorporated in the statistical package for social sciences (SPSS).

4.2 SURVEY RESPONSES

53 out of 63 questionnaires were collected successfully from the construction operatives in the Kumasi Metropolis, Ashanti region. 53 out of 63 mounted up to a response rate of 84.13%. A response rate of approximately 35% is known as academically satisfactory for studies aiming the workers on construction sites (Baruch, 1999).

4.3 ANAYSIS OF THE BACKGROUND RESPONSES

In other to ensure authenticity and credibility in the data collected, it was very important to analyse the background of the respondents. It helps to ensure trustworthiness and confidence in the outcome of the research study.

Table 4.1: Background Analysis of Respondents

Variables		Frequency	Percentage	Cumulative percentage
Gender	Male	51	96.2	96.2
	Female	2	3.8	100.0
	Total	53	100.0	
Category of operative in the firm	Project manager	25	47.2	47.2
	Health and safety officer	14	26.4	73.6
	Others	14	26.4	100.0
	Total	53	100.0	
Academic background	Diploma	3	5.7	5.7
	Bachelor's degree	42	79.2	84.9
	Master's degree	8	15.1	100.0
	PhD	0	0	100.0
	Total	53	100.0	
Professional certificate	Yes	9	17.0	17.0
	No	44	83.0	100.0
	Total	53	100.0	
Years in the firm	Less than 5 years	12	22.6	22.6
	5-10 years	19	35.9	58.5
	11-20 years	14	26.4	84.9
	Above 20 years	8	15.1	100.0
	Total	53	100.0	

Source: (Field Survey, 2018)

4.3.1 Gender

The purpose of the gender is to help show the number of males and females who responded to the questionnaires in the construction industry in Kumasi Metropolis. This is shown below on Table 4.1.

The results indicated on Table 4.1 shows that, out of 53 respondents, 96.2% were males and 3.8% were females. This means that, more males in the firm responded more than the females in the firm. This could be as a result of the high number of males in the construction Industry.

4.3.2 Category of Operatives in the Firm

Identifying the category of workers in the firms will make sure the targeted respondent actually answered the questionnaires. Validity of the information will depend on the information retrieved from this part.

The Table 4.1 indicates that out of 53 responses, 47.2% were project managers, 26.4% were health and safety officers and 26.4 % were from other workers such as site engineers, etc. whose positions were not indicated in the questionnaire but upon power of delegation were allowed to respond. According to the analysis, most of the project managers responded to the questionnaires.

4.3.3 Educational Background of Responses

This also depicts the academic background of the respondents. It has a great impact on the outcome of the research study. Table 4.1 Out of the 53 responses collected from the construction operatives on sites, 5.7% were having diploma certificate, 79.2% with bachelor's degree certificate and 15.1% having master's degree certificate. None of the construction operatives was having Doctor of Philosophy. The

result shows the workers with bachelor's degree certificate are dominating the construction industry in the Kumasi Metropolis.

4.3.4 Professional Certificate

This part shows the professional background of the construction operatives in the industry, Kumasi Metropolis. Respondents were asked whether they were holding professional certificate, with yes or no response. This can also add to the credibility of the data collated. **Table 4.1** shows that 17% of the respondents were having professional certificate from professional associations such as Ghana Institute of Surveyors, etc. whilst 83% were having no professional certificate. This reveals that majority of the respondents were having no professional certificate.

4.3.5 Years in the Firm

The number of years of in the Firm will have a great impact on the authenticity and credibility of the information given out. **Table 4.1** shows the years of existence of the Firm. Table 4.1 shows that, out of 53 responses collected from the firms, 22.6% have been in the firm less than 5 years, 35.9% have been in the firm 5 to 10 years of experience,26.4 % have been in the firm 10 to 20 years and 15.1% for more than 20 years. The table then concludes that, Majority of the respondents have been in the firm 5 to 10 years, thereby showing how reliable the information is.

4.4 DISCUSSION ON THE SAFETY MONITORING PRACTICES ADOPTED ON THE CONSTRUCTION SITE IN GHANA

One of the objectives of the research was to identify the safety monitoring practices adopted on the construction sites in Ghana. The practices were identified, and respondents were asked to rank the practice based on the 5-point Likert scale ranging from: 1- never, 2-seldom, 3-smetimes, 4-frequently and 5-always.

4.4.1 Mean Score Analysis

Means Score Analysis was employed to rank the dependent variables obtained to establish how the they are prioritized by the construction operatives. The ranking of the variables is shown on Table 4.2.

Table 4.2: Ranking of Safety Monitoring Practices Adopted on the Construction Site

Safety Monitoring Practices	Mean	Standard deviation	Ranking
Having "toolbox" safety talks daily	4.43	0.605	1
Conduct weekly safety inspections	3.64	0.710	2
Holding safety meetings regularly	3.64	0.762	3
Recording of near miss accident	3.55	0.867	4
Accident investigation	2.70	0.774	5
Safety record keeping	2.64	0.787	6
Having safety analysis regularly	2.02	1.028	7
Safety record review	1.91	0.946	8
Collecting safety data with tally sheet regularly	1.64	0.982	9
Safety auditing	1.49	0.823	10

Source: (Field Survey, 2018)

Table 4.2 depicts the variables for the safety monitoring practices ranked based on the responses from the construction operatives on construction sites, Kumasi Metropolis. From the Table 4.2, having toolbox safety talks daily was ranked the first (1^{st}) with mean score 4.43 by the respondents, whilst the safety auditing was ranked tenth (10^{th}) with a mean score of 1.43. It is then revealing that having toolbox safety talks daily

was the most frequent practice adopted on the construction sites in Kumasi Metropolis. This is consistent with the work of Hislop (1991) when he proposed toolbox safety talks as an important programme to help ensure efficient interactions with operatives daily on site. This research study therefore encourages the use of toolbox safety talks on site, as it is an efficient way of monitoring safety practices on site.

4.4.2 Test of Agreement on the Safety Monitoring Practices Adopted Using Kendall's Coefficient of Concordance

Kendall's Coefficient of Concordance is used to reveal the level of agreement between variables. The level of agreement portrayed is shown on Table 4.3.

Table 4.3: Test of Concordance using Kendall's coefficient of concordance

Population, N	53
Kendall's W[a]	0.684
Chi-Square	326.128
Df	9
Asymp. Sig.	0.000

a = Kendall's Coefficient of Concordance

Table 4.3 shows the level of agreement between the variables for the safety monitoring practices. The Kendall's coefficient of concordance for the test is 0.684, which shows that there is a level of positive strong agreement between the variables for the safety monitoring practices.

4.5 DISCUSSION ON THE CHALLENGES WITH THE ADOPETED SAFETY PRACTICES ON THE CONSTRCTION SITES

The next purpose of the research study is to identify the challenges with the adopted safety practices on the construction site in Kumasi Metropolis. The challenges were

sent out to the construction operatives in the Kumasi Metropolis (respondents) to be graded using the Likert scale ranging from: 1-very much agree, 2-agree, 3-neutral, 4-disagree and 5-very much disagree as indicated on the questionnaire.

4.5.1 Mean Score Analysis

Means Score Analysis was employed to rank the dependent variables obtained to establish how the they are prioritized by the construction operatives. The ranking of the variables is shown on Table 4.4.

Table 4.4: Ranking of challenges with the adopted safety practices on the construction site

Challenges	Mean	Standard deviation	Ranking
Subcontracting practices resulting in ambiguous or unclear responsibility for maintaining Safety	2.92	1.222	1
Lack of financial benefit in safety	2.68	1.052	2
Onerousness and variability of legislation	2.64	1.128	3
Language barriers of the illiterate workers affecting the efficiency of training	2.64	1.272	4
Lack of bargaining power	2.40	1.166	5
Fragmented nature of construction industry	2.38	1.701	6
Unable to take weekly or daily or monthly data	2.08	1.517	7
Lack of expertise or resource personnel	1.68	1.123	8
Lack of training and education	1.66	0.939	9
Tight project deadline	1.47	0.932	10

Source: (Field Survey, 2018)

From table 4.4, the challenges with the adopted safety monitoring practices were ranked based on the level of agreement from the respondents. The table then shows that subcontracting practice resulting in unclears responsibility for maintaining safety, with a mean score of 2.92 was ranked first (1^{st}) whilst the tight project deadline with a mean score of 1.47 was ranked tenth (10^{th}). This reveals that subcontracting practices was mostly agreed on among all the challenging variables to the adopted safety monitoring practices on construction site. This is consistent with Ahamad et al (2011)

research works in Sri Lanka, when they listed "subcontracting practice resulting in unclears responsibility for maintaining safety" as a major challenging factor to the safety monitoring practices on construction site. It is then suggested by this study that responsibilities in all directions must be clear enough and unambiguous to help effective monitoring of safety practices on construction sites.

4.5.2 Test of Agreement on the Challenges with the Safety Monitoring Practices Adopted Using Kendall's Coefficient of Concordance

Kendall's Coefficient of Concordance is used to reveal the level of agreement between variables. The level of agreement portrayed is shown on Table 4.5.

Table 4.5: Test of Concordance using Kendall's coefficient of concordance

Population	53
Kendall's W[a]	0.219
Chi-Square	104.227
Df	9
Asymp. Sig.	0.000

a = Kendall's Coefficient of Concordance

Table 4.5 shows the level of agreement between the variables for the challenges with the safety monitoring practices adopted on the construction site. The Kendall's coefficient of concordance for the test is 0.219, which shows that there is a positive weak agreement between the variables for the challenges, thereby agreeable by the respondents.

4.6 DISCUSSION ON THE CAUSES OF THE CHALLENGES TO SAFETY MONITORING OF THE CONSTRUCTION SITE IN GHANA

The last purpose of the research study is to identify the causes of the challenges to the safety monitoring of the construction sites in Ghana, Kumasi Metropolis. The causes were also sent out to the construction operatives in the Kumasi Metropolis

(respondents) to be graded using the Likert scale ranging from: 1-very much agree, 2-agree, 3-neutral, 4-disagree and 5-very much disagree as indicated on the questionnaire.

4.6.1 Mean Score Analysis

Means Score Analysis was employed to rank the dependent variables obtained to establish how the they are prioritized by the construction operatives. The ranking of the variables is shown on Table 4.6.

Table 4.6: Ranking of causes of the challenges to the safety monitoring of the construction sites in Ghana

Causes	Mean	Standard deviation	Ranking
Unavailability of PPE	3.32	1.465	1
Unsafe behaviour such as operating without authority, working with moving machinery, wearing dangling clothes and unsafe lifting	2.70	1.409	2
Dislike to wearing PPE by unskilled labourers	2.47	1.250	3
Low level of awareness on using PPE	2.42	1.737	4
Lack of awareness about site safety and regulations	2.21	1.433	5
Lack of understanding the job	2.11	1.187	6
Failure to appoint a safety officer	1.94	1.277	7
Lack of training facilities	1.83	1.139	8
Lack of safety monitoring policy	1.43	0.991	9
No willingness to follow safety norms	1.38	0.596	10

Source: (Field Survey, 2018)

Table 4.6 shows that unavailability of Personal Protective Equipment (PPE) with a mean score of 3.32 was ranked first (1^{st}) by the respondents whilst the last ranked cause (10^{th}) is the "no willingness to follow safety norms" with a mean score of 1.38. This then shows that unavailability of PPE is a major cause of the challenges to safety monitoring of construction site. This is in line with research done by Farooqui et al (2008) in Pakistan, where he stated Unavailability of PPE as the main cause of challenge for monitoring safety practices on construction site. This study suggests

that, PPE should be available always on site to help monitor safety practices on construction site effectively. This is supported by El-Mashaleh et al. (2010) when he proposed that PPE should be available on construction in Jordan based on his research works.

4.6.2 Test of Agreement on the Causes of the Challenges to Safety Monitoring Practices Using Kendall's Coefficient of Concordance

Kendall's Coefficient of Concordance is used to reveal the level of agreement between variables. The level of agreement portrayed is shown on Table 4.7.

Table 4.7: Test of Concordance using Kendall's coefficient of concordance

Population, N	53
Kendall's W[a]	0.208
Chi-Square	99.124
Df	9
Asymp. Sig.	0.000

a = Kendall's Coefficient of Concordance

Table 4.7 shows the level of agreement between the variables for the causes of the challenges to safety monitoring practices. The Kendall's coefficient of concordance for the test is 0.208, which shows that there is a level of positive weak agreement between the variables for the causes of the challenges to safety monitoring practices.

4.7 CHAPTER SUMMARY

The analysis and discussions of the results obtained from Field Survey were presented in this chapter. The authentication of credibility and reliability of the data retrieved was dependent on the background of the respondent analysed. The first objective of

the research project; safety monitoring practices adopted on construction site in Ghana was analysed using Mean Score and also the Kendall's coefficient of concordance. The second objective; challenges with the adopted safety monitoring practices on construction site was analysed using the Mean Score and Kendall's coefficient of concordance. The third objective was to identify the causes of the challenges to safety monitoring of construction site. The third objective was analysed using the means score ranking, as well as the Kendall's coefficient of concordance. Critical discourses or discussions were done on the results and findings, and consistency was established.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The research study was aim to investigate on the challenges with the monitoring of safety of operatives on construction site. This was then detailed in the chapter of this dissertation. The chapter two discussed the already research works done on study; the literature review. The chapter two detailed the available safety monitoring practices adopted on construction sites as well as identifying the challenges with the adopted safety practices on construction sites. Lastly, the chapter two discussed the causes from literature review of challenges to safety monitoring of construction sites. The chapter three revealed the methodology used in achieving the aim of the research as well as the analytical tool. The use of questionnaires was used to collect the data from the respondents. The chapter four discusses and analyses the result obtained from the respondents in the form of tables.

The last chapter summarizes all the ideas from chapter one to chapter four. It follows the following organizational structure: review of objectives, summary of findings, recommendations, limitations of findings and direction of future research. It also includes the major findings and the contributions to knowledge.

5.2 REVIEW OF OBJECTIVES

This shows the achievement of the established objectives. To achieve the aim of the research, the established achievement must be fulfilled:

5.2.1 First Objective

The first objective was to identify the safety monitoring adopted on construction sites in Ghana. This was established by asking the respondents to indicate how often the

identified safety monitoring practices are adopted on construction site based on a five-point Likert Scale ranging from: 1-never. 2-seldom, 3-sometimes, 4- frequent and 5-always as indicated on the questionnaire. Out of the 63 responses retrieved from the firms, it revealed that that having toolbox safety talks daily was the most frequent practice adopted on the construction sites in Kumasi Metropolis. This was consistent with the work of Hislop (1991) when he proposed toolbox safety talks as an important programme to help ensure efficient interactions with operatives daily on site. This research study therefore encouraged the use of toolbox safety talks on site, as it is an efficient way of monitoring safety practices on site.

Finally, Kendall's coefficient of concordance was used to assess the level of agreement between the adopted variables. The Kendall's coefficient of concordance for the test was 0.684, which shows that there is a level of positive strong agreement between the variables for the safety monitoring practices.

5.2.3 Second Objective

The second objective was to identify the challenges with the adopted safety practices on construction site. To attain this objective, extensive literature review was carried out to identify the challenges with safety monitoring practices on construction site. Ten (10) variables were identified and mean score analysis was used to rank them base on Five-point Likert scale ranging from: 1-very much agree, 2-agree, 3-neutral, 4-disagree and 5-very much disagree as indicated on the questionnaire. It was then revealed that "subcontracting practices resulting in unclear responsibility" was mostly agreed on among all the challenging variables to the adopted safety monitoring practices on construction site. This is consistent with Ahamad et al (2011) research works in Sri Lanka, when they listed "subcontracting practice resulting in unclears

responsibility for maintaining safety" as a major challenging factor to the safety monitoring practices on construction site. Finally, Kendall's coefficient of concordance was used to assess the level of agreement between the challenging variables. The Kendall's coefficient of concordance for the test was 0.219, which shows that there is a positive weak agreement between the variables for the challenges, thereby agreeable by the respondents.

5.2.3 Third Objective

The third objective was to identify the causes of the challenges to the adopted safety practices on construction site. To attain this objective, extensive literature review was again carried out to identify the causes of the challenges to the adopted safety practices on construction site. Ten (10) variables were identified and mean score analysis was used to rank them base on Five-point Likert scale ranging from: 1-very much agree, 2-agree, 3-neutral, 4-disagree and 5-very much disagree as indicated on the questionnaire. It portrayed that shows that unavailability of PPE is a major cause of the challenges to safety monitoring of construction site. This is in line with research done by Farooqui et al (2008) in Pakistan, where he stated Unavailability of PPE as the main cause of challenge for monitoring safety practices on construction site. Kendall's coefficient of concordance was used to assess the level of agreement between the challenging variables. The Kendall's coefficient of concordance for the test was 0.204, which shows that there is a positive weak agreement between the variables for the challenges, thereby agreeable by the respondents.

5.3 VALUE OF THE STUDY

The main purpose of this study was to identify the challenges with the monitoring of safety of operatives on construction sites in Ghana. Moreover, this study was done to address huge gab in Ghanaian construction industry in monitoring safety practices on

site. Due to analysis for this study, it revealed that having toolbox safety talks daily was the most frequent practice adopted on the construction sites in Kumasi Metropolis. It was consistent with the work of Hislop (1991) when he proposed toolbox safety talks as an important programme to help ensure efficient interactions with operatives daily on site. Again, the study added to knowledge that "subcontracting practices resulting in unclear responsibility" is the most challenging variables to the adopted safety monitoring practices on construction site. This is consistent with Ahamad et al (2011) research works in Sri Lanka, when they listed "subcontracting practice resulting in unclears responsibility for maintaining safety" as a major challenging factor to the safety monitoring practices on construction site. Lastly, the next contribution to knowledge by this paper is bringing out that unavailability of PPE is a major cause of the challenges to safety monitoring of construction site. This is in line with research done by Farooqui et al (2008) in Pakistan, where he stated Unavailability of PPE as the main cause of challenge for monitoring safety practices on construction site.

5.4 RECOMMENDATION

Safety monitoring practices is very important in the construction industry due to the risk of accident occurrences in on construction sites. In view of the above discussions on safety monitoring practices on construction sites in Ghana, Ghanaian policy makers should be committed to implement the following recommendations:

1. Toolbox box safety talks should be encouraged on construction sites for construction operatives. Apportioning few minutes talks to brief operatives on the use of safety materials will help to create awareness on safety.

2. Responsibilities pertaining to safety of construction operatives should be clear enough and unambiguous, as this will help to monitor the understanding of safety monitoring practices on construction sites.

3. Availability of PPE should be on construction site always to help effectively monitor safety practices adopted on sites.

4. Construction safety officers should liaise with the Ministry of Water Resources, Works and Housing (MWRWH) and the association of Association of Civil and Building Contractors, regularly visit construction sites to ensure:

    i. The enforcement of law governing the safety monitoring policy of construction operatives.

    ii. The creation of awareness among construction operatives the law governing their safety monitoring right.

5. There should be organization of safety monitoring programme and workshop for construction operatives. This can be done by established institutions such as Department of Construction Management and Technology and some relevant Non-Governmental Organizations (NGO).

6. Contractors of the various construction firms be motivated to setup Human resource and Safety department for the purpose of monitoring safety practices.

7. Educational and training programmes should be encouraged for the construction operatives on sites, including the use of films or slides show. This will help to improve the understanding of casual workers on sites with regards to safety monitoring practices.

8. The establishment of safety department will help monitor safety practices and enhance safety awareness.

5.5 DIRECTION FOR FUTURE RESEARCH

In the course of this study, it is proved that further research is very important on the following subjects:

1. Strategies to help alleviate the causes of the challenges to the safety monitoring practices of operatives on construction sites.
2. Safety monitoring policy to help effective safety monitoring of sites on construction sites.
3. Safety monitoring programme on construction sites to help create the awareness of safety monitoring practices of operatives.

5.6 CONCLUSION

The study aimed to investigate into the safety monitoring practices on construction site. This is a critical factor that needs to be considered in on construction sites. This study made use of quantitative approach, where responded questionnaires were collected from construction operatives from sites in Kumasi Metropolis. The study finally concluded that, toolbox safety talk should be encouraged daily on site to enable effective monitoring of safety practices. The study added again that "subcontracting practices resulting in unclear responsibility" is the most challenging variables to the adopted safety monitoring practices on construction site. It was finally concluded that responsibilities are to be made clear on site pertaining to safety.

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APPENDICES

APPENDIX A

Kwame Nkrumah University of Science and Technology

Kumasi

QUESTIONNAIRE

Challenges in monitoring the Safety of construction operatives at the construction stage of the Ghanaian Construction Industry.

Dear Sir/Madam,

This questionnaire is part of a study being conducted at the KNUST, Kumasi. The aim of the study is to asses Challenges in monitoring the Safety of construction operatives at the construction stage of the Ghanaian Construction Industry. **All information collected will be confidential and used only for academic purposes.** Please we would be grateful if you could answer this questionnaire to aid this study. Thank you for your time and valid contribution in advance.

Yours faithfully,

Mr. Francis Addai

Kwame Nkrumah University of Science and Technology

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SUPERVISOR

Dr Emmanuel Adinyira

Pleas kindly respond to the questions by ticking (√) the appropriate box for each item.

Please not that all information provided will be strictly confidential.

PART A: RESPONDENT PROFILE

1. What is your Gender?
    a. Male ( )
    b. Female ( )

2. Which of the following category in the firm do you belong to?
    a. Project manager ( )
    b. Health and Safety officer ( )
    c. Other (specify)…….

3. What is your highest educational background?
    a. Diploma ( )
    b. Bachelor's Degree ( )
    c. Master's Degree ( )
    d. Doctor of Philosophy (PhD) ( )

4. Do you any professional certificate?
    a. Yes ( )
    b. No ( )

5. If yes, state the qualification……

6. How long have you been operating in the firm?
   a. Less than 5 years ( )
   b. 5-10 years ( )
   c. 11-20 years ( )
   d. Above 20 years ( )

PART B: (I.) TO IDENTIFY SAFETY MONITORING PRACTICES ADOPTED ON CONSTRUCTION SITE IN GHANA;

From available literature review, several safety practices were identified. Please in your own opinion, rank the issues on the Likert scale on how often: **(Kindly tick (√) the appropriate box: 1- never, 2- seldom, 3- sometimes, 4- frequent, 5- always)**

Safety monitoring practices	**Degree**				
	1	**2**	**3**	**4**	**5**
1. Accident investigation					
2. Safety record keeping					
3. Safety record review					
4. Holding safety meetings regularly					
5. Having safety analysis regularly					
6. Recording of near miss accidents					
7. Collecting safety data with tally sheet daily					
8. Conduct weekly safety inspections					
9. Having “toolbox” safety talks daily					
10. Safety auditing					
Please state and rank any other					

PART B: (II) TO IDENTIFY THE CHALLENGES WITH THE ADOPTED SAFET PRACTICES ON CONSTRCUTION SITE;

The following are challenges with the monitoring of safety operatives on site. Please indicate your level of agreement or disagreement on a scale of 1-5 **(Kindly tick (√) the appropriate box: 1- very much agree, 2- agree, 3- neutral, 4- disagree, 5-very disagree)**

Challenges	**Degree**				
	1	**2**	**3**	**4**	**5**
1. Fragmented nature of construction industry					
2. Onerousness and variability of legislation					
3. Lack of financial benefit in safety					
4. Lack of bargaining power					
5. Lack of expertise or resource personnel					
6. Tight project deadline					
7. Lack of training and education					
8. Language barriers of the illiterate workers affecting the efficiency of training					
9. Subcontracting practices resulting in ambiguous or unclear responsibility for maintaining Safety					
10. Unable to take weekly or daily or monthly data					
Please state and rank any other					

(III.) TO IDENTIFY THE CAUSES OF THE CHALLENGES TO SAFETY MONITORING OF CONSTRUCTION SITE IN GHANA;

Below are the causes of the challenges to safety monitoring of construction site in Ghana. Please indicate your level of agreement or disagreement on a scale of 1-5 **(Kindly tick (√) the appropriate box: 1- very much agree, 2- agree, 3- neutral, 4- disagree, 5-very disagree)**

CAUSES	**DEGREE**				
	1	**2**	**3**	**4**	**5**
1.Low level of awareness on using PPE					
2.Dislike to wearing PPE by unskilled labourers					
3.Unavailability of PPE					
4.Failure to appoint a safety officer					
5.No willingness to follow safety norms					
6.Lack of awareness about site safety and regulations					
7.Lack of understanding the job					
8.Lack of training facilities					
9. Lack of safety monitoring policy					
10. Unsafe behaviour such as operating without authority, working with moving machinery, wearing dangling clothes and unsafe lifting					
Please state and rank any other					

Any further comments can kindly be indicated below:

……

……

……

……

Thank you