THE IMPACT OF SAFETY MANAGEMENT IMPLEMENTATION ON THE PERFORMANCE OF CONSTRUCTION PROJECTS IN GHANA

By

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgement has been made in the thesis.

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ABSTRACT

Generally, the success of completing any construction project is predicated on key performance indices such as timely delivery of project, construction time, defects as well as client satisfaction. However, what impact does the introduction of safety management has on construction project performance? This research sought to identify key safety management practices adopted in the construction industry, identify those used in the industry and their effect on performance of construction projects in the Ghanaian construction industry. To be able to achieve the specific objectives, 70 questionnaires were administered to site managers, project managers, safety officers as well as well as other site operatives. Fifty-five (55) completed questionnaires collated from the survey were examined using mean score ranking. The summation of findings from the survey revealed Provision of required PPEs as the most commonly safety management practice used in the Ghanaian construction industry. Also, total participation by top management in the sensitization and implementation of safety was identified by the respondents as a significant improvement measure for safety management during construction projects. The findings and recommendations listed in this study may be essential to clients as well as other construction professionals in facilitating the delivery of projects according to the defined standards and specifications. It will also be an added benefit for construction firms if a similar study is conducted to ascertain the effect of safety management on cost performance of construction projects in Ghana

KEYWORDS: Safety management, construction firms

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DEDICATION

I dedicate this piece of research to God Almighty for his love, benevolence and inexhaustible mercies upon my life. I also want to use this singular medium to dedicate this work to my family and all the brethren in NUPSG KNUST Local

LIST OF ABBREVIATIONS

PPE	Personal Protective Equipment
GDP	Gross Domestic Product
SMS	Safety Management Systems
KNUST	Kwame Nkrumah University of Science and Technology
FFH	Fall from Height

CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF STUDY

The construction sector is very vital to the economic functions of all nations. In Ghana, the construction industry's contribution alone to the Gross Domestic Product (GDP) has been approximately 8.2% per annum (Owusu-Manu and Badu, 2011), relative to 8%–10% in the United Kingdom and other resilient economies (Crosthwaite, 2000).

The industry also gives employment to a wide array of Ghana's workforce. This shows the huge impact this sector alone is making to Ghana's Gross Domestic Product (GDP). Many economies rely largely on this industry to boost the functionality of other sectors of the economy.

For instance, the world's population has been plummeting to higher heights in the few years. To accommodate this immense population, shift within the available land space, the construction of taller buildings is gaining more attention. With the construction of taller structures, we can accommodate the towering rates of human population. However, the construction of high-rise buildings poses severe threats and safety issues to the construction workers around the world (Feng, 2015). Consequently, construction workers are more prone to face a number of difficulties such as severe weather conditions as well as safety issues at higher elevations (falling from height, struck by objects at the site, etc.). These may cause severe occupational injuries among construction workers around the world (Nadhim, 2016).

Even though this industry provides immense benefit for the economy, the industry is laden with records of high occurrence of injuries and fatalities. Statistics shown by the

International Labour Organisation confirms the construction industry having a disproportionately high rates of recorded accidents (Muhammad et al., 2015).

High rates of incidents and in worst cases, accidents which may bring about negative outcomes such as worker absenteeism, decline in productivity, victim being incapacitated for life (Jha, 2014) plus increase in the entire cost of a project.

The construction industry is defined by its stratified framework encompassing various attributes of independent functions. The nature of construction operations is deemed as hazard-prone which makes the advocacy of health and safety of workers involved in the construction network a necessity. (Tam, et al., 2004)

The construction industry has underperformed in certain cardinal areas and has been a bother to the sector for a while now since safety is regarded as one of the key performance indicators (Abdulateef & Dorothy, 2015). The hazardous nature of this industry alongside the accident rate leading to cost repercussions, calls for safety to be strictly observed to minimise the rate of incidents.

For a number of years now, the sensitization and the awareness of safety management implementation within the construction sector has been amplified because of the betterment of health and safety culture. (Fung, et al., 2005), identified that, the right safety culture within engineering firms' aids in the reduction of cost and advancing the course of construction operations.

Jha (2014) and Muhammad *et al* (2015), as stated in their articles, the losses suffered by the industry, which include victim's medical overheads, loss of productivity, investigation time spent, inability to meet deadline, cost of training another individual to fill the position temporarily, disruption of the team, damage to equipment or facility and potential legal costs and penalties.

In the premise of recorded injuries and fatalities, project schedule and budget are hugely affected. These expenditures put together indicate that, it will be more prudent to incorporate safety management in the execution of construction projects rather than allowing them to first occur.

Although the implementation of safety management does not suggest the total elimination of an accident, however, the frequency together with the severity of the workstation occurrences will be decreased, when attention is given to life saving safety rules prior to the occurrence of an incident (Yankah, 2012).

Safety management as a terminology is the combination of processes such as arranging, coordination and monitoring of personnel and activities to complete an assignment with a strong attention to security. It is important to complete every undertaking with a sense of wellbeing and to recognize danger present in that undertaking. Risk management is not just necessary as a safety planning tool but it is key in determining the potential risks associated with the various tasks to be undertaken (Berg, 2010).

HSSE therefore has both economic as well as humanitarian considerations requiring the application of proper control management. One of the most invading and persuasive notion that has befallen this sector of the economy is that the implementation of safety practices in the course of execution of construction projects does come at a cost.

Construction professionals have this proclivity of sidelining the relevance of safety in the construction process because of the financial demands it is likely to pose, and hence lower the profit return to the contractor.

However, it has been proved that considerable involvement and participation in safety and health management causes a surge in the financial returns of the outfit by increasing

productivity rates, boosting the fervency and tenacity to work by project teams and decreasing the level of workforce reduction (Mohammed, 2003)

1.2 THE PROBLEM STATEMENT

The construction sector is attributed as one of the accident-prone engineering communities (Edwards & Nicholas, 2002). In order to be able to manage and effectively enforce project objectives, actions ought to be taken to eliminate the incidence of fatal accidents. Even with the implementation of the occupational health and safety Act of 1970, workers are to handle scare of increased fatality rates. (Bureau of Labor Statistics, 2011).

The Bureau of Labor Statistics (BLS) indicated that the sector recorded huge increase in the number of fatalities accounting for 19% of all fatalities (BLS, 2013). Fatalities hitting over 60,000 occurs in the sector every year. (Lingard, 2013).

Reports from the Bureau of Labour Statistics show that fatalities moved from 40 to 885 in terms of human count.

Death rates are higher in the construction sector than any other sector (Ringen et al., 1995).

Accident cost is probably the most vital influencer of safety research. Fatalities are high in construction than any other industry (Leigh & Robbins, 2004). Even with the high record of fatalities in construction, sufficient information is not available with regards to the cost associated with injuries and fatalities (Waehrer et al., 2007).

According to Rikhardsson and Impgaard (2004), accident cost are placed in three different typologies: variable cost, fixed cost and disturbance cost. Disturbance cost is dependent on the significance of the role of the injured person in the company whilst fixed cost characterizes both administration and communication expenses. Variable cost on the other hand keeps changing as the number of lost construction days.

In a project-based industry, such as the construction industry, accidents are prone to occur due to the dangerous nature of the activities involved in its operations but when proper safety management systems (SMS) are implemented and put in place, although it may not be eliminated completely, the rate at which they occur will be minimal on a more practical level.

The construction sector's occupational injury rate is 44.7 per 1000 persons, which is approximately double the all-industry rate (Lingard & Rowlinson, 2005). This situation, therefore shows the evasive nature of the accident rates but fortunately, with the implementation of the right safety practices and measures put in place, this can be reduced to the minimum.

Aside employing strict legal regulation to enforce these safety practises on site, contractors or project managers who are in direct contact with the various labourers on site can implement certain strategies on safety management to help curtail the incidence of these mishaps.

The reduction in the level of accident is not just going to benefit the project team only but will also help minimise cost which would have been used in catering for accidents and time wasted on legal charges. It is therefore everyone on the construction site's responsibility from the regular labourer to the contractor or the project manager to make safety their core mandate in any construction project.

According to Pareto principle on Accident-Cost relationship which indicates that 80% of costs are related to 20% of injuries, hence if the 20% of injuries can be managed, 80% of the cost can be controlled. Thus, it will be essential to obviate these accidents from happening to avoid the additional cost incurred during the project.

Emphasis is mostly based on getting work done at a construction site at the peril of the safety of its workers, thus, the issue of safety is mostly neglected.

The top priority of most construction firms is the ploughing of significant profits, whilst safety often have less significance because of limited resources (Gray & Sadiqi, 2015), hence the corresponding effect on the rates of accident occurrence..

According to Hefer (2016), safety management is key to enable organisations fast-track the delivery of their project deliverables as well as meeting the key performance indicators of the project spanning across defect cases, construction time and meeting defined specifications.

1.3 AIM OF THE STUDY

The aim of this study is to assess the impact of safety management in the performance of construction projects

1.4 RESEARCH OBJECTIVES

The specific research objectives are:

1. To identify safety management practices adopted by selected construction firms in Ghana;
2. To assess the impact associated with the implementation of the safety management practices within the selected companies.
3. To identify effective measures to improve upon safety management in construction projects in Ghana.

1.5 RESEARCH QUESTIONS

The questions related to the objectives of the research have been established to aid in assessing the impact of safety management in the construction industry.

1. What are some safety management practices being implemented by selected construction companies in Ghana?
2. What impact does incorporating safety management has on the performance of construction projects?
3. What effective measures can be put in place to improve on safety management amongst the selected construction firms?

These are all essential questions that need to be addressed and answered in order to understand the perspective on safety on construction projects.

1.6 JUSTIFICATION OF STUDY

The justification of the *The Impact of Safety Management on the Performance of Construction Projects in Ghana* is to examine the direct benefits of adopting proper safety practices in construction projects, assess the impact of the implementation of safety management practices amongst construction firms in Ghana and how they can help reduce the ratio of accidents on construction sites and also improve on the entire success of the project. Lingard & Rowlinson (2005) stated in their research that, the construction industry has been described as one major industries recording high levels of fatalities globally, hence there is the need to pay equal attention to the safety aspect of construction as given to cost, schedule and quality.

In order to lower the risk level associated with injury incidents within this industry and also improve the safety performance of site workers, project safety management practices need to be improved (Hefer, 2016). Safety should therefore be considered

amongst the triple constraint of a project; cost, scope and quality, to ensure the successful completion of projects since the measurement of safety performance cannot be restricted to these three.

All construction sites are susceptible to dangers of every kind either to the workers or damage of properties, but if safety is practised, productivity will be increased and accidents occurrence will decrease resulting in the cost involved in the total running of the project to be reduced.

Safety is also an indispensable project parameter which complements completing a project as planned, within the estimated cost, to the maximum quality expected without causing any harm to the environment or sustaining any damages to ensure that the project is completed successfully (Smallwood, 2005).

The background of this study also seeks to provide an insight into how safety management systems can be enhanced on construction projects and how these systems can be put into practice to decrease the potential of hazards and risk of hazards to enhance productivity and improve the performance of project.

1.7 SCOPE OF STUDY

The research seeks to look at safety practices, their impact on construction projects as well as improvement measures with regards to safety management implementation amongst construction firms in the Accra metropolis. This is because majority of contractors primarily operate in the Greater Accra Region. Hence, it is expected that the data obtained from the study would give a broader perspective of safety and its attending impact on project performance in the industry. The target respondents include all construction professionals who often assumed the position of site supervision in the

likes of site engineers, site foremen, project managers and safety officers. The number of construction firms required for the study is obtained scientifically.

The research seeks to look at safety management amongst building construction companies within the Accra Metropolis and the corresponding effects its implementation has on them

In the light of contextual scope, specific areas this research seeks to cover entails a brief introduction on safety management practices, impact associated with the implementation of these practices and how they can be improved upon.

The target population for the research includes personnel in the building construction industry, specifically contractors or project managers, SHEQ Managers and site superintendents in institutions like Pyramid Construction, EPSCo, Consar, EUDU, MetalCraft Engineering among others.

1.8 LIMITATION OF STUDY

The study is supposed to cover building construction companies in Ghana; however, a sample frame of selected companies in Accra will be chosen to represent the whole population sample, due to time and financial constraints. Nevertheless, the above-mentioned shortfalls will not obstruct the information contained in this research, because Accra is the capital city of the Greater Accra region as well as Ghana's capital city, thus making it an important commercial centre.

1.9 STRUCTURE OF THE THESIS

The research has been categorized into five main chapters and they are stated as follows:

- **Chapter one**: General Introduction: This chapter deals with the introduction covering background study, the problem statement, the defined objectives (general and specific), research questions, justification of the study, scope of

study, summary of methodology, limitations of the study as well as organization of the research

- **Chapter two**: Literature Review: This chapter provides a historical review from previous studies to identify the effects of poor safety management culture and its impact on the cost of construction projects. It provides an extended coverage on earlier works.
- **Chapter three**: Methodology: The chapter three shows the main methodologies used in earlier works and the methodology used in this research to achieve its stated objectives. It gives an overview of the identified area to be studied and describes the sources and methods of data to be collected to be used to facilitate the description of your project parameters in the study.
- **Chapter four**: Data Analysis and Discussion: This chapter tackles the presentation, analysis and discussion of data gathered on the field that answered all the research objectives and questions.
- **Chapter five**: Conclusion and Recommendations: The last chapter which is chapter five provides a brief of the entire research, the findings and conclusion of the study as well as recommendations for the way forward.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The objective of this chapter is to gather all relevant literature works done in relation to the topic under study thus, the impact of safety management implementation on the performance of construction projects in Ghana. This chapter also sought to throw more light on the various kind of safety management systems or practices adopted by organizations to facilitate the delivery of their project in accordance with defined specifications. The key words safety management and key performance of construction project is also explained in detail to throw more light on the import of the subject matter. The major objectives of this study are also tackled in this very chapter and some factors under each objective explained as well. The chapter finally comes to an end with the summary of related literature review. At the same time, the available information regarding the major points for consideration in the development of questionnaires will also be obtained from this literature.

2.2 OVERVIEW OF SAFETY MANAGEMENT IN CONSTRUCTION INDUSTRY

The construction sector is considered to be a major facilitator of the economy of a country. The sector has emerged as one of the most vital industries with regards to contributing massively to Gross Domestic Product (GDP) of a named country and its associated level of impact on health and safety of the working population. The construction industry is indeed the bedrock of nations due to the rapid transformation it brings to the country.

On the other hand, it is important to note that the sector is also typified as the most hazard prone. In countries that are well developed, recent modifications in the sector has contributed immensely to productivity in the industry, but has created also a risky environment replete with hazards.

Accidents and other fatalities caused to the workforce, properties, equipment and morale have culminated into negative effects on profit acquisition as well as productivity margins. In response to this increased safety management generated by technology improvement, the construction sector in developed countries have incorporated safety as a key part in the regulatory standards.

Standards have been generated to stabilize functions and lead organizations to delivering their project outputs with minimal or no level of injury.

In most developing nations, one is likely to observe that entities do not strongly adhere to proper safety practices.

This study ascertains safety management systems used by construction firms, safety awareness, patterns of accidents and requirements for increasing productivity. Construction industry in a country like Bangladesh for example is seen as more labor intensive than that in the developed countries. A lot of high octane organizations or firms do have a safety policy, carefully constructed and consolidated in a reference material, but the employees in general are oblivious of its function and implementation.

Major construction outfits have established various safety procedures undergirding the execution of any construction project. They can be described as safety manuals but they also do serve as a blueprint to guide safety experts in monitoring safety implementation in organizations.

Increasing profit for most organizations is the major concern. Many construction sites are susceptible to a wide range of hazards and possible injuries. In the event of this, employees are to learn from their own errors. To add to this, poor medical facilities, poor housing and inadequate resources occur at remote sites.

Common incidents recorded on construction sites are accidents as a result of cave-ins experienced while excavating pits of bigger depths and volumes, concrete works neglecting the use of gloves and boots, weak scaffolding to work at height, absence or inadequate personal protection equipment(PPE) on construction sites, continual exposure to temperature, bad housekeeping operations and poor sanitation on site.

The cardinal safety non-compliance practices found on sites are not utilizing safety boots, hand gloves, eye protector, ear plugs, face mask, safety helmet, losing grip of guardrails at scaffold platform, exposed openings which have not be cordoned off on site, timber with nails and tools or small machineries not kept properly. The major injuries faced are fall from height injuries, struck-by heavy material injuries, injuries as a result of wastage and raw material, heat stroke, head injuries as a result of collision, eye injuries and lacerations.

OSHA explains that the construction sector has to accentuate the need for identifying and involving key operatives, effective communication, managing building contractors and identifying to quantify hazards. Three aspects need to be added to site layout planning as proper temporary facilities, development of site circulation plan which carefully illustrates site access and organization of physical elements on site as well as the display of safety signage. Management ought to reject long time worker, child worker, non- hygienic working environment and explosive chemical.

There is to say that indeed there are strategies adopted including job study or observation, preventing accumulation of hazardous physical elements, reducing energy build up, separating individuals from energy, raising injury threshold, getting used to working condition change, controlling behavior.

Thorough safety principles should be followed such as safe way of doing job, remove unwanted incident, component failure should not cause property damage, material handling procedure, lighting and safety symbols. There should be smoke detectors available as well including heat detectors, flame detectors and as well as fixed automatic sprinklers and portable fire extinguishers, fire escape stairs, smoke proof tower, emergency lighting and exits, fire alarm and smoke venting system. All these systems are safety management systems that assist in safety management operations

The construction sector is seen as the foundation of the economy of many countries and often seen as a driver of economic growth especially in developing countries. 11% of gross domestic product (GDP) is being contributed typically by the construction sector in most developing countries (Giang and Pheng, 2010).

It can also be highlighted that many construction works are prone to a variety of safety and health risks such as working in excavated open pit, working at height on a scaffold, working in confined spaces and proximity to falling objects, handling load with bare hands, handling hazardous chemicals with no protection, dusts, fire, using plant and equipment, exposure to live cables and also bad housekeeping practice

In an urban space, safety and health accidents are relatively higher due to the fact that high rise buildings remain predominant with the fast-growing complexities of domain-wide construction projects to cope with modern city arena and high demand for housing, offices, services and other infrastructure.

In spite of its importance, therefore, the construction sector is described as laden with a high level of risk with rampant occurrences of fatal accidents and minor injuries, ill-health problems to practitioners, workers, and end users.

This is why it is needful to adopt safety management measures in order to mitigate these effects.). The main personal protective equipment (PPE) in construction (including clothing affording protection against austere weather) which is supposed to be worn or held by a person at work and which protects him against one or more risks to his health or safety. The main safety and health site requirements in construction relate to clearing of sites and decent welfare, manual handling, fall from height and mobilization on site. Site operatives are normally required to plan and structure their operations, ensure that they are trained with the level of competency and to be apprised of the risks of their trade and raise problems with their site supervisor or safety representative PPE should be regarded as a 'last resort' when considering control measure (HSE, 2009).

A typical construction site may require workers to wear overalls, hard hats, safety boots, gloves, eye protection and high visibility vest. These protective materials must be provided to all employees as long as they visit the site. Other methods should be considered and used that will reduce or obviate risk to injury. However, where PPE is the only effective means of managing the risks of injury or ill health, then employers are to ensure that PPE is available. PPE should be worn at all construction sites. Construction health and safety should be of great concern to employers, employees, governments and project participants (Kheni, 2008). Thus the individual parties responsible for construction safety and health are the main contractor, the client, regulatory agencies and the employees within the outfit.

Good health and safety planning also helps to ensure that a project is well managed and that unexpected costs and cases are utterly minimized. Safety and health responsibilities of state and regulatory agencies: Government regulatory bodies often implement regulations to help ensure that a construction project is safe to build, safe to use, and safe to maintain and delivers you good value. Health and safety duties of employer: Clients have massive influence over how work is done. Where potential health and safety risks are low, clients are required to do little. Where they are higher, clients need to do more. Employers must assess the work being undertaken and the environment his employees will operate in when determining the right kind of PPE to be worn.

Safety and health responsibilities of main contractor: Main Contractors must check that all subcontractors are conforming by providing PPE for all their employees (those who are self-employed for tax reasons, but who otherwise work in an employee – employer relationship are also entitled to receive PPE) free of charge. Health and safety responsibilities of employees: Employees are required to be cognizant of their responsibility to wear the required PPE appropriately, take care of equipment and report any defects or anomalies when they do identify some. They should also be informed that if they do not wear or misuse any PPE that has been appropriately issued that this could lead to disciplinary action meted against them. This set of equipment is provided for their protection.

Subcontracting: main contractors are to ensure that they visually check the safety and health performance of the subcontractors they plan to use; give subcontractors the health and safety guidance they require for the work; discuss the work with them before they commence; make sure that you have provided everything agreed (e.g., the right plant, right scaffold and access to welfare, etc.); and also monitor their performance and deal with shortcomings.

There are safety and health issues on almost all construction sites which relate to accident reporting, subcontracting and employing. Employing: all personnel who are employed to carry out construction work on site must be thoroughly trained, fit and competent to do the job safely and without putting their own or others' health and safety at risk; properly supervised and given clear instructions; have access to washing and toilet facilities; have the right equipment, plant and protective clothing; enlightened about safety and health issues with them (or their representatives); have arrangements for employees' health surveillance where required. Accidents: all accidents or work-related illness must be reported to the appropriate authorities within a suitable timeframe so that actions be taken as quickly as possible before it escalates.

The study by Kheni (2008) on safety and health practices among construction SMEs in Ghana revealed serious problems. The paramount issues identified by Kheni included inadequate government support for regulatory bodies, lack of skilled human resources and inefficiency in institutional frameworks responsible for implementing health and safety standards. Another issue highlighted was the significance of the Ghanaian socio-cultural value systems particularly, the extended family system and traditional religious value systems in health and safety management within Ghanaian construction SMEs. The research also provided insights into difficulties posed by the internal environment of SMEs to the effective management safety and health. Kheni (2008) provides a broad scope of understanding of health and safety in the construction sector in Ghana.

Safety and its implementation is essential knowledge area in a project management area which is recognized in The Guide to the Project Management Body of Knowledge (PMBOK Guide, cited by Cretu et al., 2011). Research in the past surrounding this area show clearly that construction projects create frequent threats to the lives of employees, and serious injuries and mortalities are frequent in the construction industry. Thus, the

consideration and management of safety, along with consideration to HSSE generally, is undeniably fundamental to any construction project. By proper safety and health planning, a plethora of safety and health risks in construction can be mitigated. Accordingly, accidents on the construction sites are principally attributable to hazardous human behavior (i.e. individual factors) and/or unsafe working conditions (i.e. system factors). Moreover, it is clear that there is a serious problem with falls, which problem is common throughout the global construction industry. Management of safety on construction sites is the set of processes or procedures used to recognize safety and health risks and implement actions to mitigate the possibility of a risk occurring and to diminish or eliminate the potential consequences of identified project safety and health risks.

Management of safety on construction sites is expected to take into of al consideration all kinds of accidents and risks that may possibly be expected that put project employees at risk. The health and safety (H&S) of any workplace is very important to mitigate such risks, legally and ethically, but in mainly dangerous contexts such as the construction industry, safety and health takes on important shape as daily activities of the industry are highly unsafe. It is therefore important to identify suitable safety activities and strategy, dealing with potential health and safety problems (Twort and Rees, 2011).

2.3 GENERAL OVERVIEW OF SAFETY MANAGEMENT

2.3.1 Safety Management Practices

The reasons why the construction trade is risky and prone to health and safety risks are because of the construction methods, physical environment of the work, nature of the construction work operations, construction materials used, heavy equipment used, and

physical properties of the construction project itself (see a study on perceptions of 30 Latino American workers on construction risks by Menzel and Gutierrez, 2010). However, the essential features of construction in developing countries are not the same as features of construction in developed countries (as explained in characteristics of construction projects in developing countries by Jaselskis and Talukhaba, 2000). Hence, Health and Safety policies and procedures may vary and needs to be in context.

Construction is widely accepted as an accident prone industry (as explained in a study of 100 individual construction accidents by Haslam et al., 2005 and a resource material on occupational health and safety in construction project management by Lingard and Rowlinson, 2005).

A health and safety management system (HSMS) is a systematic approach instituted by an employer to mitigate the risk of injury and illness. An effective HSMS is a vital component of any business; its complexity and scope will vary in accordance with the type of workplace and the nature of construction operations being undertaken. For both development and implementation of an HSMS to be a success, effective, and efficient, it needs to be predicated on a well-defined structure (Rankin, 2011). It also involves identifying, assessing, and mitigating risks to workers in all workplace operations.

Safety and health risk assessment in a construction site is an important measure towards reduction of hazards and injuries. According to HSE (2004), employers are needed to undertake an assessment of the health and safety risks to which employees and others are exposed on construction sites. The significant findings must be recorded and collated where five of more people are employed. In the context of health and safety, common definitions used for risk are that: risk is the probability of a substance to cause harm; and risk is a combination of the probability of an occurrence of a hazardous event

or exposure(s) and the severity of an injury or ill health that can be caused by the event or exposure. Since managing health and safety is different from managing any other aspect in construction there need to do a risk assessment to know about the risks, and to put effective measures in place to control them, and make sure they stay mitigated.

A written safety policy for their outfit must be worked out by the project manager setting out the safety and health standards which it is their major objective to achieve. The policy should name the personnel who is chiefly responsible for overseeing that the standards are achieved, and who has power to allocate responsibilities to management and supervisors at all levels and to see they are carried out. A safety plan should be developed and placed into a training program that's needed to be participated in by every site worker prior to partaking in any job found on the positioning irrespective of the roles simplicity. This is supposed to be run frequently as a site induction process. The absence of site meetings as established in this survey implies that workers are not given a forum to educate themselves on the various risks on the sites and supervisors equally do not have opportunities to communicate important health and safety matters to the workers. Site meetings are one of the ways of educating workers on their safety and health on the site and should therefore be held frequently.

Safety orientation and training are the essential rudiments of any effective safety management program. Any organisation which is keen on strengthening its management of safety must incorporate it in its policy to organise safety orientation training programs for new employees which will cover safety regulations, project safety policies, site orientation, personal protective equipment and OSHA required training (Yankah, 2012). Without information on potential hazards and how deal with them, it will be very difficult to manage it should it occur. Safety trainings give one an idea of what to expect, how to prevent it and the best way to mitigate it whenever it shows up.

Zekri (2014) indicated that, the most vital point in identifying safety deficiencies is by increasing the awareness and sensitization of everyone on a construction site. Safety trainings sessions can be organized during safety meetings with stakeholders of the project to understand their perspective as far safety is concerned. Regular safety meetings and tool box meetings are necessary for communicating safety information to all parties (Tam et al., 2004). For old employees, planned safety training sessions can be organized for them to obtain extra information about potential hazards and their mitigated measures, new skills to assume a more active role in implementing hazard control programs or to effect organisational changes that would better worksite management (Muiruri & Mulinge, 2014).

2.3.2 Safety inspections

Safety inspections on the construction site are one of the most effective means of identifying hazardous conditions at the worksite. Since management become familiar with the nature of safety conditions on site (Zekri, 2014), they are able to mitigate them before an incident occur and destroying the company's reputation. A study conducted by (Adu-boateng, 2014), indicated that former records of accidents and injuries are to be considered in determining if critical areas are to receive additional attention.

A study conducted by Lingard & Rowlinson (2005), revealed that inspection is a vital tool in recognising existing and potential errors and hazards in the workplace. The study went on further to state that inspections should be recorded and each hazard found during an inspection should be located and described, to provide the basis for establishing priorities and implementing corrective actions. Safety inspections will help identify hazards and create avenues before injury and accident can occur.

2.4 SAFETY MANAGEMENT MEASURES

2.4.1 Site Layout and Planning

Constraints due to space, particularly within the urban work sites, are nearly always the greatest limiting factor and a layout which caters best for the safety and health of workers may be seen to be difficult to work out with productivity in mind. A poorly planned site is the major cause of many accidents. This results from fall of material and collisions between workers and plant or equipment. Good planning by top management is an essential part of preparation and budgeting for the efficient running of operations on construction sites. There are many accidents due to slipping or falling or even tripping over equipment and materials which have been left exposed on the ground, and stepping on nails which have been left projecting from wood exposed on the ground.

2.4.2 Personal Protective Clothing (PPE)

Personal protective equipment (PPE) generally refers to equipment and apparels that a worn by a site worker or a visitor to a site to protect against injury or possible fatalities. Protective equipment used in construction include helmets, goggles, ear plugs, safety overalls and others. OSHA (2007) requires the use of personal protective equipment (PPE) to minimize employee exposure to hazards when administrative and engineering controls are not effective in minimizing these exposures to appreciable levels. The PPE required in the construction sites include; protection of the eye and face protection, hearing protection, respiratory protection, hand and arm protection, foot and leg protection, head protection and body and fall protection mechanisms. This program should address the hazards present; the selection, maintenance, and use of PPE; the training of employees; and monitoring of the program to ensure its ongoing effectiveness. According to the survey it was seen that construction workers on the sites lacked appropriate protective equipment for instance workers were noted carrying out

high risk activities such as excavations, concreting, painting among others without the right protective gear such as masks, helmets, ear muffs, goggles and overalls.

Muiruri & Mulinge (2014) referred to Personal protective equipment (PPE) as protective clothing, helmets, goggles or other garment or equipment designed to protect the wearer's body from injury by blunt impacts, electrical hazards, heat, chemicals and infections, for job-related occupational health and safety purposes. Zekri (2014) classified PPE into two categories; the first one which is the use of safety helmet, safety shoes and appropriate clothing; and the second one depending on the kind of work, like eye protection, protective gloves, ear protection and the safety harness. The use of protective clothing and safety equipment is crucial in mitigating the effects of accidents and fatalities on construction sites (Yankah, 2012). A study conducted in the United Arab Emirates (UAE) University found that around (2/3) of the hospital visits involved injuries on building sites due to lack of PPE or unsuitable PPE (Zekri, 2014). In some cases, safety equipment may be provided, but employees will be unwilling to wear it since there is no corporate culture encouraging its use. This is where safety personnel must enforce the safety rules.

Aside fulfilling the moral obligation of providing PPEs for workers, it is also an avenue of satisfying the legal obligations since it is enshrined in the constitution as Act of Parliament, that is according to the Labour Act 2003, Act 651, section 2(e), employers shall supply and maintain at no cost to the worker adequate safety appliances, suitable fire-fighting equipment, personal protective equipment, and instruct the workers in the use of the appliances or equipment.

According to Phil & Ferret (2007), the use of PPE shall only be suitable when it is appropriate for the risks and the conditions of use including the period for which it is worn. The state of health of the wearer and the characteristics of the workstation must

be taken into consideration. Most importantly, it should be capable of fitting the wearer perfectly, by adjustments if necessary. The use of protective clothing should however be regarded as the last point of resort when considering mitigating measures (Laryeah & Mensah, 2010), (Attabra-Yartey, 2012).

The drive behind the use of personal protective equipment is to minimize the exposure of employees to hazards or risks that cannot be reduced to the barest minimum. The use of PPE is needed when hazards exists. For PPEs to be effective, it must be inspected and maintained regularly and workers must be also trained on how to use it (Adu-boateng, 2014).

The petrifying injury and fatality rate of the construction sector has been considered unacceptable. The organisation of the construction industry does not offer itself to the implementations of hazard elimination procedures and mitigate risks to safety of workers to appreciable low levels. (Lingard & Rowlinson, 2005). Aside the fact that the irregularities of the industry escalate the risk of accidents, the organisation of work and physical condition in developing countries of which Ghana is no exception heighten safety problems (Kheni et al., 2007).

As a solution to these risks and fatal accidents, the construction industry has been working assiduously for enhancement in safety performance over the years. However, the culture of the construction industry in developing countries does not promote health and safety (Attabra-Yartey, 2012), thereby obstructing the success rate of safety management practices.

Attabre-Yartey (2012) observed in a study that, certain practices of the industry are a disincentive to the effective management of safety, but these practices should never be used as an excuse for the industry's poor performance because all these issues are manageable (Lingard & Rowlinson, 2005). It is therefore essential to identify the

critical issues that influence the success of safety performance negatively in order to improve upon them.

2.4.3 First Aid Kits and Accident Reporting

Construction sites are very fast-paced zones and first aid and rescue equipment should always be present. This provision ought to be made available to deal with the possibility of a fatal accident occurring. What is needed depends on the size of the construction site and the number of site works employed on site. On large sites with more than 200 people employed, there should be the presence of a properly equipped first aid room. On any construction site of that size, at least one person on every shift should have been trained in first aid to a nationally recognized standard. On day -to-day works activities on site, an accident log book should be kept at the site, and this will carefully keep inventory of all near misses and accidents as well, all types of minor injuries such as bruises, to major accidents like imputing disability and fatal should be recorded. This survey established that the construction sites that had first aid boxes were ill equipped with only one bandage, spirit and cotton wool.

2.4.4 Health and Safety Warning Signs

Safety Signs and Signals are key features that are to be present in a construction site. They are one of the main methods of communicating health and safety information. These includes hand and acoustic signals (e.g. fire alarms), the use of illuminated signs, spoken communication and the marking of pipework containing dangerous substances. Traditional signboards, such as prohibitory signs and warning signs, signs for fire exits, fire action plan notices (fire drills) and fire-fighting equipment are also considered to be Safety Signs.

It is critical that all safety signage can be easily understood by the average person. Where signboards are used in a workplace they should be sufficiently conspicuous and clear so that they can be easily seen and interpreted. Signboards also need to be durable, properly fastened and properly maintained to ensure they remain visible. Care must be taken to avoid using too many signboards in proximity, signboards are only effective if they can be seen and interpreted. If too many signs are condensed at one given location, there is a danger of perplexity or of important information being overlooked (HSE 2009)

2.4.5 Health and Safety Risk Assessment

Safety and health risk assessment in a construction site is a vital measure towards mitigating hazards and injuries. According to HSE (2004), employers are required to make a perfect evaluation of the health and safety risks to which employees and others are exposed on construction sites. The significant findings must be recorded where five of more people are employed. Since dealing with health and safety is in contrast with dealing with any other aspect in construction, there ought to be a risk assessment to ascertain the risks, and to put effective measures in place to mitigate them, and make sure they stay controlled.

In the context of health and safety, common definitions used for risk are that: risk is the probability of a substance to cause harm; and risk is also the aggregate of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or that can be caused by the event or exposure.

2.4.6 Health and Safety Training In Construction Sites

With regards to occupational health and safety, training constitutes instruction in hazard awareness and control measures, learning safe work practices and the use of personal protective equipment, and acquiring knowledge on emergency procedures and the application of preventive measures. Training also provides workers with ways to obtain added information about potential hazards and their control; they could gain acumen to assume a more active role in effecting hazard control programs or to implement organizational changes that would enhance worksite protection.

2.4.7 Risk Assessment

According to Muiruri & Mulinge (2014), risk can be defined as the probability of a substance to cause harm; and risk is a aggregate of the probability of an occurrence of a hazardous event or exposure(s) and the severity of injury or fatality that can be caused by an event or exposure. Risk assessment plays a vital role in the planning of any safety management system, due to risky nature of the construction industry. Phil & Ferret (2007) explained risk assessment as methods used to decide on priorities and to set objectives for obviating hazards and reducing risks wherever possible in the construction chain.

Since several stakeholders are major participants in the construction business, long working hours and interaction between organisational and technological complexity (Zekri, 2014) exists, some accidents are prone to occur no matter how strict safety measures are put in place, therefore if these risks cannot be eliminated completely, they must be mitigated by assessing and managing them through a structured risk assessment process.

In a risk assessment procedure, the organisation must be apprised of the fact that any accident or ill-health will result in both direct costs and indirect costs and incur an

insured and uninsured cost as well, hence, it is important to take into account when the full cost of an accident is being calculated (Phil & Ferret, 2007).

According to Phil & Ferret (2007), risk assessment procedure follows six basic elements which includes:

- ✓ Hazard identification
- ✓ Persons at risk
- ✓ Evaluation of risk level
- ✓ Risk control (existing and additional)
- ✓ Record of risk assessment findings and
- ✓ Monitoring and review

The study further elucidated on the following elements:

Hazard identification which is the first step in a risk assessment process was explained as conducting a review of accidents, incidents and ill-health records to assist in the identification and also giving significant hazards more attention than the trivial ones.

Staff who work on the construction site are most obviously exposed to risk since they come into contact with hazards often, thus, it will be judicious to check their competency to perform their tasks prior to the commencement of their work. Persons who visit the site may also be exposed to risk, thus, risk assessment must cover additional controls for them due to their vulnerability.

Evaluating the severity of a particular risk during risk assessment is made as to whether the risk level is high, medium or low. It is obvious that the higher the likelihood and severity, the higher the risk will be. The likelihood is determined by factors such as the control measures in place and the frequency of exposure to the hazard whereas the severity is influenced by the magnitude of the hazard.

Once the risk has been evaluated, measures are then put in place to control them. It may be necessary to strengthen existing procedures as part of the control mechanism. For an assessment to be relevant and suitable, substantial hazards and conclusions should be documented. It should also include existing control methods and their effectiveness.

It doesn't matter the number of workers working in the organisation, therefore, for an assessment to be 'suitable and sufficient', only the significant hazards and conclusions need to be recorded (Phil & Ferret 2007).

Monitoring and review of the risk assessment is conducted to ascertain how effective the risk assessment programme was and making the necessary revision to areas where necessary. An incident or a near miss provides a valid reason for risk to be assessed.

Managing safety is different from managing other aspects of construction, therefore, there is the need to undertake a complete risk assessment to find out about the potential or likely risks, and to put practical measures in place to control them, and make sure they are controlled (Muiruri & Mulinge, 2014).

2.4.8 First Aid

It is important to remember that accidents can occur at any time, therefore first aid provision needs to be available at all times. This is an important provision in the construction domain. It is a known fact that the most effective way to improve safety performance should be preventing accidents and uncertainty before it happens (Jha, 2014), but it cannot reinforce that accidents will never occur on site, therefore, it is necessary for every construction site to have suitable first aid tools in place as well as properly-trained individuals to help ensure better safety for everyone. Zekri (2014) explained first aid as the provision of primary aid for an injury as it is regularly carried out bywell trained and skilled first aiders to an injured person until a definite medical treatment can be reached or provided if required.

The provision of first aid is a lifesaving exercise which should not be relegated to the bottom (Muiruri & Mulinge, 2014). Even though hazards cannot be completely eliminated, fatalities will be prevented if first aid is provided which will not only facilitate recovery but save lives as well. The minimum first aid provision on any worksite is a suitable stocked first aid-box and an appointed person to take charge of first aid arrangements. Appointed persons should never attempt to give first aid for which they are not competent, only first aiders are required to do so. According to Phil & Ferret (2007), a first aider is someone who has undergone an HSE approved training course in administering first aid at work and holds a current first aid at work certificate. Safety officers on the construction site should be at least trained on the use of first aid and also other workers on site should be trained on basic first aid knowledge.

2.5 EFFECTS OF SAFETY MANAGEMENT ON CONSTRUCTION PROJECTS

2.5.1 Project Cost Performance

Project cost performance is used to indicate whether the project conforms to the agreed project budget or the contract sum (Cheung et. al., 2004). It is of great importance since more emphatically resources are often in limited quantities and cost overruns are to be eschewed. Project cost performance as defined by Odusami (2001) is measured in terms of cost overrun i.e. final; sum minus initial contract sum divided by the initial contract sum multiplied by 100. According to Kometa, Olowolaiye & Harris(1996) project with percentage cost overrun above 20% is deemed as a poor project in terms of cost performance project that lie between 10% and 20% regarded as average project in terms of cost performance.

2.5.2 Project Time Performance

Monitoring Project time is one of the many challenges for project participants. Time monitoring seeks to assess how well the project adheres to the planned schedule over a period of time. Schedule of a project is essentially one key parameter that clients over a particular project use as a metric for contractor evaluation. Projects have scheduled timelines and more often those timelines ought to be met. Therefore, schedule or time performance is calculated in terms of the percentage increase in the actual completion period over planned completion period. i.e. the difference between the actual completion time and planned completion time multiple by 100. Those projects whose percentage delay falls below 10% is regarded as an outstanding in terms by time or schedule performance, those that falls within 10% to 20% is regarded as average project while those above 20% is regarded as poor project. For this reason it is imperative that when factors such as safety implementation are considered, the schedule of a project is most likely to be met as planned.

2.5.3 Project Quality Performance

Project quality performance as a performance metric seeks to ensure that projects undertaken achieve the quality standard defined within the contract either by the client or by the project sponsor. Quality in perspective is defined as the point where characteristics and requirements are met in the course of execution of the project objectives. It is also clear that it is quite a herculean task to define quality since it is subjective. However, other authors have issued some objective measures of project success. Pinto & Stevin (2000) proposed 12 – factor model of project success, which was later referred to as project implementation diagram.

2.6 SAFETY IMPROVEMENT MEASURES

Safety measures ought to be continually improved need to deal with the ever-changing dynamics of construction.

A single incident can turn a small gain into a huge loss which may come in the form of direct and indirect costs and also incur an insured and uninsured cost (Phil & Ferret 2007) which may be manifested through increased medical costs, insurance costs and litigations (Yankah, 2012).

Different authors have summed up with measures to improve upon safety implementation in the construction sector. Some of these measures include:

- ✓ Provision for safety in procurement methods
- ✓ Procurement selection method
- ✓ Using KPIs as a metric to evaluate the performance of contractors
- ✓ Effective communication and good record keeping
- ✓ Employee involvement in safety and evaluation
- ✓ Safety orientation and training

A comprehensive study will be conducted to gather first-hand information from personnel working on construction projects like the project managers and site superintendents to throw more light on the abovementioned safety improvement methods.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Methodology gives us the sequential order of arriving at our different research values which affect the entirety of our work in meeting the desired output. Under each research method, there is a detailed description of the activities undertaken and how they affected the culmination of the results obtained.

This chapter elucidates on how the study was undertaken as well as the methods and procedure adopted. It defines the choice of approaches and design that was used in conducting the study. It also contains the target population, sources of data, sampling techniques, data analysis method and the research instruments used.

This chapter looks at the stages covered in fulfilling the objectives of this study. It discusses the strategy used in the overall research design. Research processes, designs and their relationships are looked at in this chapter. The statistical tools employed are also discussed

3.2 RESEARCH DESIGN

Research process defines the steps the researcher goes through when developing an appropriate methodology to effectively answer the research questions. It starts with expression of the view point of the research, which paves way for the correct selection of research approach and then the strategy adopted for the research. With the strategy chosen, a time horizon is identified and then data is collected for analysis to explain the problem at hand. The aim and objectives provided a clear point of focus for this research which led to the literature review. During which important literature relating to the

research was reviewed for the theoretical framework. Based on the literature, a research design was adopted for this work.

3.3 SOURCES OF DATA

For the study to be effectively conducted, two set of data were identified to be of relevance. Both the primary and secondary sources of data were employed in this study to heighten the quality of the research. The motive behind this was to have an extensive range of information from other peoples' work in relation to the objectives of the study and also investigate to find out what actually exists on the field in relation to the study.

3.3.1 Primary Data

Data collected directly from first-hand experience is termed as primary data (Attabra-Yartey, 2012). This study was designed to collect primary data through the distribution of questionnaires to the selected sample population and also observed the practices being observed on some construction sites. Questionnaire was used because it is an economical way of accumulating information from the target population and offers a quick way to get results. The researcher settled on the use of close-ended questionnaire because they are more specific, thus giving a definite and concrete answer for easy analysis. Yankah (2012) also indicated in a study that close-ended questionnaires are used to measure the respondent's ability to provide informed responses.

3.3.2 Secondary Data

Secondary data is data that has already been gathered and readily available from other sources (Attabra-Yartey, 2012). The researcher used multiple sources of secondary data to gain initial insight into the research problem. This includes published articles, thesis and journals of other authors. The secondary data was used to corroborate the reliability of the study

3.4 RESEARCH INSTRUMENT

According to Salvador (2018), a research instrument is a testing device for measuring a given phenomenon. The primary research instrument used for the study was a questionnaire, which was developed from the literature review based on research questions proposed for the study. The secondary research instrument used was works of other authors in relation to safety on construction projects.

3.5 RESEARCH POPULATION

Attabra-Yartey (2012) refers to a research population as an entire group that a study centres on. The target population of the study centred on project managers, site managers as well as safety officers who work collectively to ensure that project objectives with regards to safety are met.

The research population focused on those workers who are located in the Accra Metropolis. They are a group of individuals with some commonality, which is they working in the construction sector.

The population size for my research is basically undefined since obtaining a figure for the number of contractors or site management professionals is difficult considering the availability of resource materials and the limitation of time. The idea is that these organizations must have projects running so as to validate the strength of the research.

3.6 SAMPLE SIZE DETERMNATION

Population size determination is key because with this fundamental, we can derive our sample size to administer questionnaires for easy analysis of project variables. The sample size is a subset of the population as well.

A sample size of 70 was identified as the basis of the respondents for the research. It is also imperative to note that in cases where all respondents do not respond accordingly, the centre limit theorem is applied. With the centre limit theorem, sample size above 30 will display the same or similar binomial distribution characteristics. Hence if you identify more than 30 respondents even though the respondents are 70 as planned, the analysis can yield fairly accurate results.

3.7 SAMPLING METHOD

The non-probability sampling method and convenience type of sampling was adopted for this research. Convenience sampling was key because there was a need to consider a reasonable number of key professional across these construction firms in other to characterise the study.

Convenience sampling also known as availability sampling is a specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in study. In this type of sampling, the first available primary data source will be used for the research without additional requirements.

The sampling technique was selected because it creates samples that are very highly representative of the target population, therefore ensuring that each member in the population is key in affecting the outcome of the research. The respondents were made known about the purpose of the study and the questionnaire was thoroughly explained to them.

3.8 DATA COLLECTION PROCEDURE

Danso (2010) described the term data collection as a process of designing and collecting data, with the aim of obtaining relevant information for data storage, to make decision about critical issues and to transfer information on to others.

The structured questionnaires were self-administered and its retrieval was also done in person, whilst some of them were sent to the respondents through the use of goggle forms for quicker feedback. To deal with any inconsistencies in the mind of the respondents, the expected output of the study was made known to the respondents, and this made retrieving it easier.

The researcher also availed herself to the respondents to answer questions related to the study. The questionnaire is made up of four sections;

i. Background information of respondent
ii. Identifying safety practices in the organisation
iii. Assessing the impact associated with the implementation of the safety management practices
iv. Identifying improvement measures to safety management implementation for construction projects

3.8.1 DATA PROCESSING AND ANALYSIS

The data retrieved from the respondents were organised and edited for analysis before being recorded. Seventy (70) questionnaires will be distributed. The questionnaire will be sorted and categorised according to the patterns given by the respondents and the feedback from the questionnaires will be organised according to the presentation of the research questions.

The results to the items on the questionnaire will be analysed using frequencies and percentages, with the use of Statistical Package for Social Sciences (SPSS).

To ensure consistency, the responses in the questionnaire will be edited and coded. SPSS will be selected because it is considered to be user friendly (Adu-boateng, 2014). The responses will be grouped based on common ideas that the respondents shared.

3.9 SUMMARY OF CHAPTER

This section of the research highlighted the various techniques available in research methodology and advised on the reasons for the application of each methodology for this research. The conclusion part of this chapter addressed the research issues covered such as; source of data, the research population, design of questionnaire as well as questionnaire format, sample size calculation, data presentation and analysis.

Moreover, the various research approaches were discussed and the data collection method which was survey questionnaire were also discussed. The chapter concluded with the brief overview of the chapter thus, summarizing all relevant information discussed in this very chapter.

CHAPTER FOUR

OBSERVATION AND RESULT ANALYSIS

4.1 INTRODUCTION

The primary data collected from sixty (62) respondents within the Greater Accra Region for analyses are recorded in this chapter. Key respondents to the questionnaires comprising site foremen, site manager, site engineer and safety officer were chosen for the study. The study focused concentration on assessing the impact of safety management implementation on the performance of construction projects in Ghana. In performing the analysis, descriptive statistics like frequencies and percentiles were used. Also, the mean score ranking was adopted. Data analysis was performed and the outcomes illustrated according to the specific goals of the research namely: to identify safety measure employed in the Ghanaian construction industry in ensuring quality performance of construction projects, and to determine the impact of key supervision styles on quality performance of construction projects in the Ghanaian construction industry. 62 survey questionnaires were administered and 55 completed questionnaires were retrieved and were valid for analysis after data screening. This suggests a rate of response of 88.7%.

4.2 RESPONDENT PROFILE

In the analysis of the demographic data, descriptive statistics was employed using the IBM SPSS v23. In Table 4.1, the demographic profile of respondents is presented. Concerning respondents' occupation, 38.1% of the respondents were site foremen, 32.7% were measured as project managers, 29.1% were safety officers. This suggests

that, the study was dominated by site superintendents handling an array of projects, followed by project managers and finally the last on the record sheet, the safety officers.

Within the category of the highest academic qualifications of the respondents, HND and BSc holders constituted 20% and 67.3% respectively of the study. Meanwhile masters' holders comprised 10.9% of the study. PhD holders also recorded 1.8% of the study with none of our respondents were holders of the secondary school certificate. From these values, it is imperative to note that the characterization of the highest academic qualification was the Bachelor of Science certificate bracket.

Regarding the respondents' experience, 41.8% had 6-10 years of experience working in the Ghanaian construction industry, with 25.5% of the respondents having worked in the construction industry from 0-5 years. Also it was observed that 20%of the respondents have worked between 11-15 years in the construction industry of Ghana. The retrieved questionnaires indicated that 12.7% have had over 15 years of experience in participating in the execution of construction projects

Concerning the number of construction projects, the respondents have participated in, it was recorded that 16.4% of the respondents have participated in 0-5 projects, 18.2 % have also undertaken 6-10 construction projects. 34.5% have supervised over 11-15 projects. 23.6% and 7.3% have undertaken 15-20 projects and over 20 projected respectively. The respondents profile in Table 4.1 suggests that a large number of the respondents involved in

the process has been actively involved in projects numbering between 10 and 15. It is also important to highlight that just a select few have undertaken a considerable number of projects.

Table 4.1 Representation of demographic data of respondents

Characteristic	Frequency	Percentage
Occupation		
Site Manager	21	38.1
Project Manager	18	32.7
Safety Officer	16	29.1
Highest Academic Qualification		
Secondary	0	0
HND	11	20
BSc	37	67.3
Masters	6	10.9
PhD	1	1.8
Number of years worked in the Ghanaian construction industry		
0-5 years	14	25.5
6-10 years	23	41.8
11-15 years	11	20
Over 15 years	7	12.7
Number of projects undertaken		
0-5 projects	9	16.4
6-10 projects	10	18.2
10-15 projects	19	34.5
15-20 projects	13	23.6
Over 20 projects	4	7.3

4.3 SAFETY MANAGEMENT PRACTICES EMPLOYED BY CONSTRUCTION FIRMS IN GHANA

Under the second section, relevant information was garnered to identify the safety practices being observed in the various workplace of the respondents. The data available will strongly indicate the practices that are largely employed during safety implementation within the project execution chain.

Descriptive statistics was performed to assess the expected value statistics and standard deviations of all the practices variables in defining the importance of the items on the five point Likert scale of 1 to 5, where;

- **1** represents NOT SIGNIFICANT
- **2** represents LESS SIGNIFICANT
- **3** represents NEUTRAL
- **4** represents SIGNIFICANT
- **5** represents VERY SIGNIFICANT

The record of the number of respondents for each category is indicated in the tabular representation Fig 4.2. The results collated in that table was inputted in the SPSS software to generate the mean and standard deviations for the already defined safety management practices.

Table 4.2 Representation of the number of respondents and its associated rank for the different safety practices

No	Safety Management Practices	Ranking				
		1	2	3	4	5
1	Provision of PPEs for site workers	0	0	4	0	51
2	Provision of first aid kit and accident reporting	0	0	0	18	37
3	Provision of warning signs and safety signage on site	0	0	0	25	30
4	Site Circulation Planning	0	0	25	14	26
5	Risk Assessment	0	0	4	10	41
6	Development of safety management plan	0	1	5	17	32
7	Frequent toolbox meetings on site	3	1	3	11	37
8	Quality training for safety officers by management	0	1	2	17	29
9	Using safety management as a KPI for construction companies	0	0	2	9	44
10	Daily Safety Briefing and Orientation	0	0	17	13	25
11	Deploying safety officers on site to regulate safety implementation	0	0	0	20	35
	If others please specify and rank					
12						
13						

The outputs were then examined and presented in order of significance in the Table 4.3. In determining the level of importance of the variables on the five-point Likert scale rating, a success standard was taken as very significant if it acquired between 1 and 2 points on the scale. When two or more variables are observed to be having similar expected value scores, the standard deviation then becomes the equivalent parameter to rank the elements. The element having the smallest standard deviation is allocated

maximum significance rating (Ahadzie, 2007). This is because it is indicative of the fact that that element ideally doesn't disperse too far away from the expectation.

Also, the significance scale was pitched at 0.95 in line with orthodox risk gauges. The factor of standard deviation measures the level of consistency in responses by acquiring the distinction between the weightier value of the standard deviation and the minimum value of standard deviation. If the variance between them is small or somewhat infinitesimal, that is close to zero, the consistency is close to being achieved as far as the responses are concerned and conversely if vice versa is true.

Table 4.3 Ranking of safety management practices outlined

Safety Management Practices	Number of respondents	Mean	Standard Deviation	Ranking
Provision of PPEs for site workers	55	1.8545	0.5194	1
Using safety management as a KPI for construction companies	55	1.7636	0.4779	2
Provision of first aid kit and accident reporting	55	1.6727	0.5139	3
Risk assessment	55	1.6727	1.199	4
Deploying safety officers to regulate safety implementation on site	55	1.6364	0.5663	5
Provision of warning signs and safety signage on site	55	1.5455	0.9907	6
Development of safety management plan	55	1.4545	1.0609	7
Frequent toolbox meetings on site	55	1.4182	0.6419	8
Quality training for safety officers by management	55	1.3451	0.6545	9
Site Circulation plan	55	1.2	0.8634	10
Daily safety training and orientation	55	1.1455	0.6873	11

As shown in **Table 4.3**, the results revealed that there are eleven (11) key safety management methods used in the Ghanaian construction sector in influencing the performance of construction projects. These include provision of PPEs for workers,

using safety management as a KPI for construction companies , provision of first aid and accident reporting, risk assessment, deploying safety officers to regulate safety implementation on site, development of safety management plan, frequent toolbox meetings on site, quality training for safety officers by management, site circulation planning and daily safety training and orientation.

Our data analysis proves that indeed the provision of PPEs on site for site workers ranked first. This indicates that most Ghanaian companies employ this unique method as a safety management practice. This rank was predicated on a mean record of 1.8545. The higher the mean, the higher the rank on the scale.

Using safety management as a KPI for construction companies ranked second. Clients who award contracts to construction companies define safety management as a key performance index for contractors. With this, any contractor that earns a remarkable grade in this area is more likely to win more contracts because of the proclivity of the company to enforce safety in the project execution process.

Provision of first aid kid, risk assessment as well as deployment of safety officers on site records 3rd, 4th and 5th ranks respectively. Risk assessment is one cardinal elements project clients require of contractors. Before the execution of any project, there are essential documentations needed at the project initiation phase and risk assessment documentation is inevitable.

4.4 IMPACT OF SAFETY MANAGEMENT ON PROJECT PERFORMANCE

Under the third section, relevant information was garnered to identify the impact the implementation of safety procedures has on project performance as being observed in the various workplace of the respondents. Descriptive statistics was performed to assess

the expected value statistics and standard deviations of all the possible impact in establishing the importance of the items on the five point Likert scale of 1 to 5.

That way we can effectively conclude which of the impacts is more prevalent in these organizations by reason of the safety management implementation procedures employed during the project execution chain.

Table 4.4 Ranking of the impact associated with safety management implementation for construction projects

Impact of Safety Management on Project Performance	Number of respondents	Mean	Standard Deviation	Ranking
Quality Performance of construction project	55	1.9818	0.1336	1
Timely delivery of project	55	1.9091	0.2601	2
Reduction in potential project construction time loss	55	1.8909	0.317	3
Increase in project baseline cost	55	1.8727	0.384	4
Increase in overall project profit	55	1.4	0.4973	5
Maintenance of morale of construction site workers	55	1.5455	0.4545	6

As shown in **Table 4.4**, the results revealed that there are six (6) key safety management impact on performance of projects with emphasis on the Ghanaian construction industry. These include quality performance of construction project, timely delivery of projects, and reduction in potential construction time loss, increase in project baseline cost, and increase in overall project profit as well as maintenance of morale of construction site workers.

The data analysis proves that quality performance of construction is one of the most significant impacts of the safety management. This is because when safety is observed,

the contractor is sure to meet the defined specifications by the client or the project sponsor. When requirements are met by the contractor, quality is said to be have been achieved. This indicates that most Ghanaian companies have identified safety management as a key influencer in achieving quality on the entirety of project. This rank was predicated on a mean record of 1.9818. The higher the mean, the higher the rank on the scale.

Timely delivery of project was ranked second. This is to say that contractors and construction professionals believe strongly that if project objectives are to be met, there has to be a strong adherence to safety management as it facilitates the timely delivery of the project deliverables. Reduction in project construction time loss also clocked the 3rd position giving it eminence with regards to the impact project safety management has on overall project performance.

The respondents basically didn't see the maintenance of morale of site workers as a key impact of safety management. This is because the biggest determinant of the morale of a worker on site is the provision made in terms of welfare and remuneration for that individual. Many site workers don't rely on safety procedures to foster a strong passion for the work they do.

4.4 INDENTIFYING KEY IMPROVEMENT MEASURES

Under the fourth section, relevant information was garnered to identify the key improvement measures that can be implemented to help facilitate the performance of building construction projects. Descriptive statistics was performed to assess the expected value statistics and standard deviations of all the possible impact in defining the importance of the items on the five-point Likert scale of 1 to 5.

Table 4.5 Ranking of possible improvement measures for safety management implementation

Safety Improvement Measures	Number of respondents	Mean	Standard Deviation	Ranking
Top management commitment to safey management	55	1.9212	0.1416	1
Frequent site inspection	55	1.9091	0.3251	2
Proper Record Keeping	55	1.8727	0.4973	3
Total involvement of employee on safety implementation	55	1.8455	0.5513	4
Effetive communication	55	1.8309	0.2212	5
Inclusion of safety in the project bil for contractors	55	1.7677	0.311	6
Adoption of safety management as a metric for evaluation of contractors	55	1.699	0.4102	7

As shown in **Table 4.5**, the results revealed that there are seven (7) key safety improvement measures that affects the performance of projects with emphasis on the Ghanaian construction industry. These include top management in safety management implementation, frequent site visit, proper record keeping etc.

From our analysis, top management recorded the highest and was ranked first. Mot Ghanaian construction professionals have identified that many industries in that regard do not have active involvement of top management in the safety management process. It is therefore key that management reinforces and participate in this process. Site inspection was ranked second. The respondents believe that if we can initiate frequent site visits, we can actively ensure that safety procedures are followed adequately on site. Proper record keeping and total involvement of employee on safety implementation were ranked third and fourth respectively.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter finalizes the research. First, the attainment of the objectives and contributions to this research are illustrated. Further, recommendations are drawn and suggestions for future research are outlined. Finally, the conclusion is given**.**

5.2 ACHIEVEMENT OF RESEARCH OBJECTIVES

The outcomes obtained from the research are summarized in this section. Identify Safety Management Practices Used in The Ghanaian Construction Industry for the Performance of Construction Projects. In tackling this objective, various parameters were adopted in the questionnaire to identify key practices used in the Ghanaian construction industry in ensuring performance of construction projects. Literature review of valuable study resources on safety management styles were obtained which aided the researcher to identify eleven (11) practices worldwide. These variables were formulated into questions on the survey questionnaire inquiring respondents to rank their level of agreement of the safety practices. Analyzing respondents' responses, it was revealed that 5 out of the 11 variables are significant to the construction industry. These 5 key safety management styles are provision of PPEs, provision of first aid kit and record keeping, risk assessment as well as deploying safety officers on site to implement safety management procedures.

In a risk assessment procedure, the organisation must be apprised of the fact that any accident or injury will result in both direct costs and indirect costs and incur an covered and uncovered cost as well, hence, it is imperative to take into account when the full

cost of an accident is being calculated. Risk procedures relative to risk assessment was also highlighted to enable construction teams understand potential risk on their project.

5.3 CONCLUSION TO THE STUDY

Safety management implementation has direct impact on project performance. After conducting this research on the impact of safety management implementation on performance of construction projects in the Ghanaian construction industry, the research would like to make the following conclusions:

1. Principally most organizations adopt provisions of PPEs as an important safety procedure.
2. All the major site operatives are generally aware of the safety policies and the need to adopt safety within their organizations.
3. Like other developing countries, Ghana sees the need to apply more efficiently these safety practices as it has corresponding effect on the timely delivery of project as well as completion of a project within budget.

5.4 GENERAL RECOMMENDATIONS

Based on the derivatives of this study, the following recommendations are presented to researchers, stakeholders and professionals in the construction industry to aid foster performance of building construction projects through the implementation of safety management.

Construction companies must organize and take the initiative to educate their workers on the key safety practices and align them in that regard. I strongly recommend that enhanced training be given to all site operatives as well as safety officers in order to work out their roles in the course of execution of work.

Data must be gathered daily and incident reporting must be a standard of operation of these construction companies. Data log sheets can be provided on the site everyday with the safety officers taking data of near misses, potential incites, fatalities and occupational injuries.

Safety management is an all-inclusive initiative and requires the active participation of even top management within these construction firms. I will recommend that business owners or construction firm owners will be passionate about safety execution as a mantra of success of their business.

Clients that award contract to contractors must do so on the premise of many factors not disregarding a strong dedication of the contractor to implement safety in the course of the execution of the project.

5.5 AVENUES FOR FUTURE RESEARCH

Provisions for further studies still exist in accordance with this study, consider the outlined limitations. The research only highlighted on the impact of safety management on the performance of construction projects within the Greater Accra region. Further research can be conducted with these points under consideration

- Further studies on the effect of safety management on performance of construction projects in the Ghanaian construction industry could be extended to the other nine regions so as to generalize the outcomes.
- Further studies can also be granted in the light of the effect of safety management implementation on the cost performance of construction projects or quality performance of construction projects.

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APPENDIX

RESEARCH QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BUILDING TECHNOLOGY

MSC PROJECT MANAGEMENT

THE IMPACT OF SAFETY MANAGEMENT IMPLEMENTATION ON PERFORMANCE OF CONSTRUCTION PROJECT IN GHANA

This research is being conducted to collect data from building contractors and site workers on the impact of safety management on the performance of construction projects in Ghana. It is meant for academic purposes, your inputs will enable the researcher achieve his aim and objectives for the research.

Completion of the questionnaire is completely voluntary and returning the completed questionnaire will be considered as your consent to participate in the survey.

All data held are purely for research purposes and will be treated with strict **confidentiality.**

Project Student

Mr. Eric Oduro-Marfo

Tel No: 0557329827/0200612060

Email: ericmarfo225@yahoo.com

Section 1

Background information of respondent

1. Please indicate your gender:

   1= Male [ ] 2= Female [ ]

2. Please indicate your role or occupation in this firm?

   [ ] Site Superintendent

   [ ] Project Manager

   [ ] Safety Officer

   [ ] SHEQ Manager

3. Kindly indicate your highest academic qualification
   a. Secondary
   b. HND
   c. BSc
   d. MSc
   e. PhD
4. How many years have you worked in the Ghanaian construction sector?
   a. 0 – 5 years
   b. 6 – 10 years
   c. 10 – 15 years
   d. Over 15 years
5. Kindly indicate the number of construction projects you have been a part of?
   a. 0-5 projects
   b. 6-10 projects
   c. 10-15 projects
   d. 15-20 projects
   e. Over 20 projects

Section 2

II Identify the safety management practices employed by some construction firms in Ghana

In your opinion, how would you rank the following safety practices used in the Ghanaian Construction Industry in ensuring performance of construction projects? Rank on a Likert scale of 1-5.

1	2	3	4	5
Not Common	Less Common	Neutral	Common	Very Common

No	Safety Management Practices	Ranking				
		1	2	3	4	5
1	Provision of PPEs for site workers					
2	Provision of first aid kit and accident reporting					
3	Provision of warning signs and safety signage on site					
4	Site Circulation Planning					
5	Risk Assessment					
6	Development of safety management plan					
7	Frequent toolbox meetings on site					
8	Quality training for safety officers by management					
9	Using safety management as a KPI for construction companies					
10	Safety Briefing and Orientation					
11	Deploying safety officers on site to regulate safety implementation					
	If others please specify and rank					
12						
13						

Section 3

III Impact associated with the implementation of the safety management practices

Below are the impact that implementation of occupational safety management has on project construction sites:

Rank on a Likert scale of 1 to 5 the impact which is most influential and predominant in your organization

1	2	3	4	5
Not Influential	Less Influential	Quite Influential	Influential	Very Influential

No	Impacts Associated with Safety Management Implementation	Ranking				
		1	2	3	4	5
1	Quality performance of the construction project					
2	Increase in project cost baseline					
3	Reduction in potential construction time loss					
4	Timely delivery of construction project					
5	Maintenance of morale of construction personnel					
6	Increase in overall project profit					
	If others please specify and rank					
9						
10						

Section 4

IV Improvement measures to safety practices applicable to your organisation

Rank on a scale of 1 to 5 the level of significance of each of the following measures in Improving safety on site.

No	Improvement Measures	Ranking				
		1	2	3	4	5
1	Safety orientation and training					
2	Top management commitment and participation to safety management					
3	Proper Record Keeping					
4	Adoption of safety management as a metric for performance evaluation of contractors					
5	Provision of safety in project bill or quotation (procurement methods)					
6	Effective communication					
7	Total Involvement of Employee in Safety Management					
8	Frequent Site Inspection					
	If others please specify and rank					
9						
10						

Thank You