

**THE ROLE OF PROJECT MANAGERS IN CONSTRUCTION HEALTH AND  
SAFETY IMPLEMENTATION IN GHANA**

KNUST

By

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**Degree of**

**MASTER OF SCIENCE**

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## DECLARATION

I hereby declare that this submission is my own work towards the MSc. Project Management and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text. However, it is likely for the readers of this work to identify some errors or omissions. In view of this, I duly accept been responsible in that regard.

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Date

## **DEDICATION**

This work is dedicated to my lovely wife, Harriet Akorfa Senaya and my baby girl, Shanice

Ewoenam Alormene

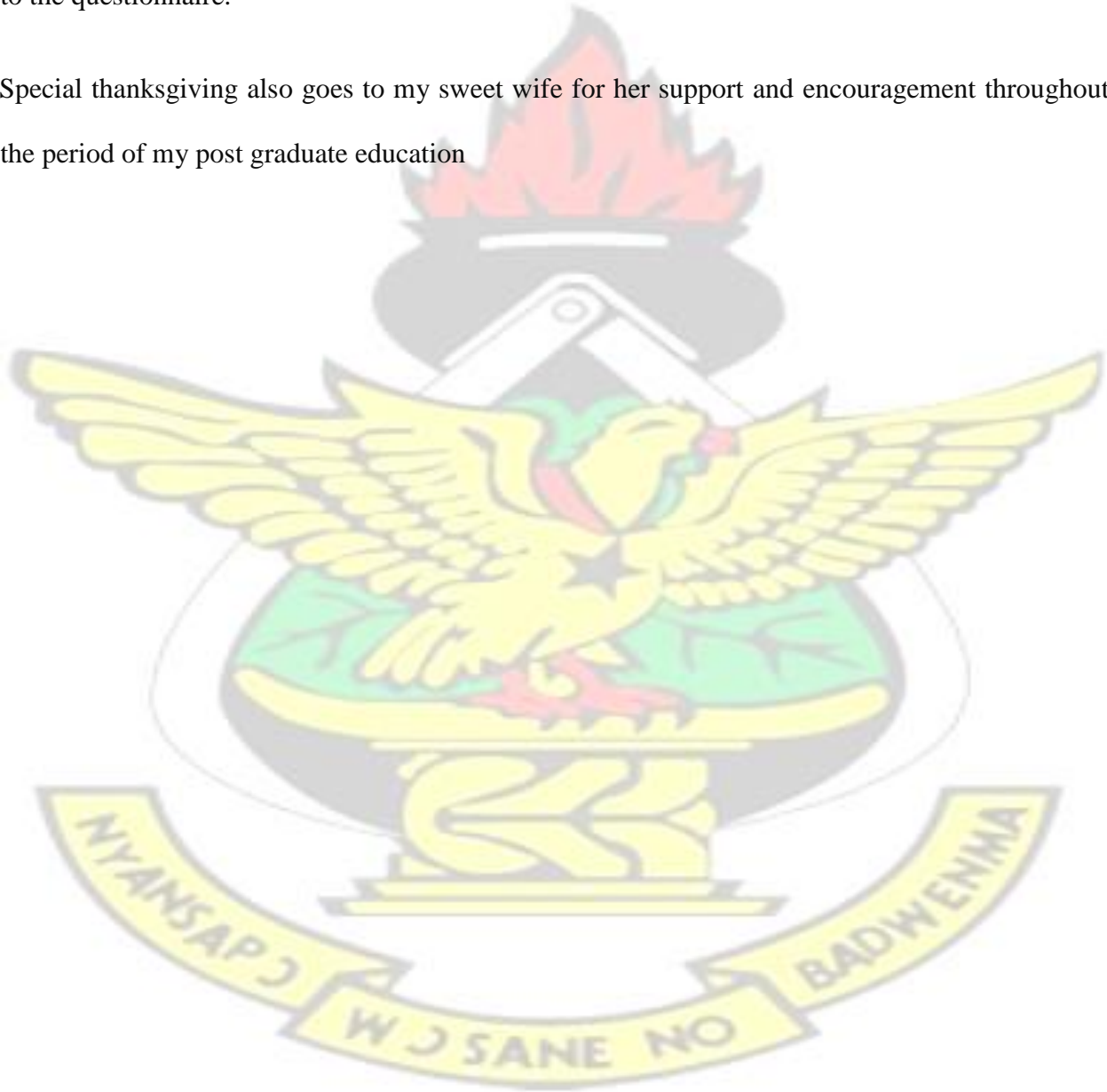


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## ABSTRACT

Project performance measurement has moved from the traditional key performance indicators of time, cost and scope (quality) to include safe delivery of projects. The objectives of the study were to identify health and safety practices in the construction industry in Ghana; the importance of health and safety and other project parameters to PMs. Additionally, the study examined the frequency at which PMs consider health and safety relative to various design activities; and the frequency at which various procurement related situations, which affect health and safety, are treated by PMs. Purposive sampling technique was used to select 48 licensed PMs involved in construction projects in Ghana. Data was collected with the help of structured questionnaires. Data was analysed using relative importance index, means and standard deviation with the help of SPSS. The study found out that most construction firms in Ghana had specific budget for health and safety for most construction projects. The study revealed that PMs allocated between 1% to 5% of the total project cost to health and safety. The study revealed that a number of accident cases at the construction sites go unreported to the appropriate agencies of state. In fact, the study established that most accident cases at the construction sites are handled internally. The study established that client satisfaction was the most important parameter to consider in project management. It was revealed that, PMs made reference to health and safety at various stages of the project relative to design activities. Structural frame, method of fixing, edge of materials were the key design activities that caused PMs to make frequent reference to health and safety. It was further established that PMs referred to health and safety when confronted by all the procurement related situations. The study recommended that resourcing of the factory inspectorate department with vehicles and personnel to carry out its mandate and PMs must be re-oriented to consider health and safety as being critical for project success.



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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 BACKGROUND TO THE STUDY**

Project management have traditionally been concerned about three key project parameters of cost, quality and time (Frimpong, et al., 2003; Hwang & Low, 2012; Marhani, et al., 2012; Sousa, et al., 2014). In fact, the Project Management Body of Knowledge pays minimal attention to health and safety (Project Management Institute, 2009, 2013). However, the many reported cases of construction occupational fatalities, injuries and diseases and their consequent effects on the three project parameters places health and safety at the centre of project management. Accidents result in considerable human suffering and affect, not only the worker, but also their families and communities and contribute to the national cost of medical care and rehabilitation (Cooney, 2016; Gadd & Collins, 2002; Nasrun et al., 2016; OSHA, 2016; Otieno, 2012; Smallwood & Venter, 2002).

Available statistics globally shows a worrying trend in the number of casualties of workplace accident. For instance, in the USA, annual recorded accidents from construction sites have consistently remained highest compared to the accidents from manufacturing, agriculture, forestry, fishing, hunting and transportation (Bureau of Labor Statistics (BLS), 2015). According to the BLS (2015), the construction industry in the United States recorded the highest count of fatalities from the year 2010 to 2015. Historically, the construction industry in the US has been the worst sector in terms of the number of recorded accidents. For instance, in the year 2015, the construction sector recorded 828 workplace injuries compared to 733 injuries in transportation and warehousing. Similar trends are observed in the preceding years, making the construction sector the most hazardous industry in America. Similarly, a survey by the South African Reserve Bank (SARB)



(2016) and the Compensation Commission (2017) indicated that South Africa recorded in excess of 15,700 accidents at construction sites resulting in various degrees of injuries and sometimes death. In fact, as many as 203 lives were lost, 657 cases resulted in permanent disablement, 5038 resulted in temporary disablement and 9808 sought medical attention for minor injuries. The economic lost to the economy was estimated at about US\$4.2 Billion (SARB, 2016). The situation in Ghana is even more worrying as work place accidents are under reported making available data scanty and unreliable. However, media report of construction accidents are rife and have brought untold hardships to the victims and their families.

In fact, not adhering to strict health and safety measures comes with huge cost burden to both the contractor and the clients. Empirical study by Smallwood & Venter (2002) shows overlooking safety and health issues in construction comes with both direct and indirect costs. Smallwood & Venter (2002) explains that the direct costs of accidents are associated with the treatment of the injury and any unique compensation offered to workers as a consequence of being injured and are covered by workmen's compensation insurance premiums whereas indirect costs include: reduced productivity for both the returned worker(s) and the crew or workforce; clean-up costs; replacement costs; stand-by costs; cost of overtime; administrative costs; replacement worker orientation; costs resulting from delays; supervision costs; costs related to rescheduling; transportation, and wages paid while the injured is idle.

It is therefore important to develop a health and safety management system, which involved the introduction of processes designed to decrease the incidence of injury and illness at the construction sites. To successfully implement health and safety in project management, there is the need for firm commitment from the organisation through the effective allocation of resources, and a high level participation of employees. The onus for the integration of health and safety

management system at the construction site lies on the project manager. The project manager often represents the interest of the client, with authority over the progression of the project and site supervision (Construction Safety Association of Ontario, 2016). The PM served as the link between the field supervisors and the company's Management for critical aspects of the job such as the promotion of health and safety. A proactive project manager, who puts measures in place to prevent injuries and illness can ensure that scheduling, cost, productivity and safety are all well managed for project success. The PM can attain this by emphasising the health and safety requirements in the bid package for subcontractors; ensure workers, including subcontracted employees, have all mandatory training; assisting site supervisors with their health and safety responsibilities; check for compliance of statutory legal requirements; enforce compliance; and resolve health and safety disputes in compliance with the law and the company's health and safety policy. This makes the work of the project manager enormous.

Nonetheless, for a project manager seeking to minimise the repercussions of accidents from lost time, insurance cost, negative media coverage, cost of retraining, bartered reputation and untold employee hardships must necessarily implement health and safety management system from the design phases of the project to the close out phase. While it cannot be guaranteed that accidents will never occur at the construction site, paying attention to health and safety has the potential to minimize both the number of workplace accidents and the severity of the accidents. It is for these reason that this present study seeks to examine the role of project managers in construction health and safety.

## **1.2 PROBLEM STATEMENT**

The above discussions have reveal some of the vital information regarding how health and safety issues have been treated in the construction over the years. One thing that is clear is the fact that

the construction industry has laid down some rigorous legislation to control and manage health and safety at the construction sites. Nonetheless, various degrees of accidents continue to occur at the construction sites. Accidents at construction sites can be so devastating that it can lead to permanent incapacitation to the victim or loss of life causing major human, social and economic problems (Björgvinsson, et al., 2012; Djokoto, et al., 2014; OSHA, 2016; Rahman, et al., 2014; Smallwood & Haupt, 2009).

In fact, the occurrence of accident at project sites is so common it cannot be limited to only one phase of the project. Empirical evidence from many researchers shows that the construction subsector continues to encounter serious accident during all project phases despite the efforts of contractors to integrate health and safety in project management. Project performance measurement has moved from the traditional key performance indicators of time, cost and scope (quality) to include safe delivery of projects. At the end of the project, the most important question to ask is how safe was the project to client, the site workers and third party users. Central to every project delivery is the issue of safe execution of contract. It is therefore important for contractors to prioritise health and safety from the early planning stage of the project to the close out stage. Unfortunately, available evidence shows that contractors and project managers in developing countries do not prioritise health and safety as much as they consider project parameters (Smallwood, 1999; Smallwood & Venter, 2002). Hence the first problem that needs investigation is why project managers in Ghana elevates other parameters of project at the expense of health and safety.

This notwithstanding, Behm, (2005); Weinstein, et al. (2005) are of the view that identifying health and safety concerns at the beginning of each project and examining those concerns can lead to better health and safety records. For this reason, project conceptualisation and design phases are



equally as important as the construction and execution phase when it comes to promoting health and safety. This is because, project designers develop the concept, execute the detailed design, provide specifics and specify materials all of which influence the materials, methods and processes employed during construction and subsequently influence construction health and safety. That said, variations from original designs at a later date can be the catalyst that triggers a chain of events from designer through to worker that culminate in a serious accident (Smallwood, 1999). Unfortunately, what pertains in Ghana is that Project Managers are often isolated from the project design stage and are only brought in during the construction phase ostensibly to help complete the project within budget, or at the required quality and on time (Kheni, et al. 2008). However, serious accidents at the construction site can derail the attainment of any of these traditional project parameters. Additionally, procurement processes in Ghana are such that contractors often find themselves in precarious position (Amoatey, et al. 2015). This is because, should they make the necessary allowances for health and safety, they run the risk of losing the tender or negotiation to a less committed competitor. All these situations put the project manager at a very disadvantaged position. Given the increasing cases of accidents at the construction sites and the influence of health and safety on other project parameters, there is the need to refocus attention on the unique role project managers can play in promoting construction health and safety.

### **1.3 OBJECTIVES OF THE STUDY**

The general aim of the study was to examine the role of project managers in construction health and safety in Ghana.

Specifically, the study sought to fulfil the following research objectives:

1. Health and safety practices in the construction industry in Ghana
2. Identify the importance of health and safety and other project parameters to project managers.
3. To determine the frequency at which project managers consider health and safety relative to various design activities.
4. Determine the frequency at various procurement related project managers encounter situations, which affect health and safety.

#### **1.4 RESEARCH QUESTIONS**

In order to fulfil the research objectives above, the researcher sought answers to the following research questions:

1. What are some of the health and safety practices in the construction industry in Ghana?
2. What are the importance of health and safety and other project parameters to project managers?
3. What are the frequency at which project managers consider health and safety relative to various design activities?
4. What are the frequency at which various procurement related situations that affect health and safety are encountered by project managers

#### **1.5 SCOPE OF THE STUDY**

This study was delimited both geographically and conceptually. Geographically, the study was limited to the Greater Accra region of Ghana. The region is seen as the fastest growing region in Ghana and it is experiencing a construction boom. The local economy has made it possible for many organizations and government alike to embark on massive infrastructure development in the



region. This situation presents a unique challenge how to ensure safe execution of projects. In the wake of many workplace accidents and building collapse in Ghana, it is important to ask whether the right things are being done in the nation's capital, where it appears to be the construction hub of Ghana. The conceptual scope of the study was limited to the role played by project managers in upholding health and safety standards at the construction sites.

### **1.6 SIGNIFICANCE OF THE STUDY**

The construction subsector is undoubtedly one of the most vibrant sectors in every emerging economy. It employs significant number of human resources and contributes greatly to the GDP of Ghana. However, lack of adherence to health and safety standards have made the sector one of the most accident prone sectors in the country. More disturbing is the apparent lack of official reporting of workplace accidents to the relevant statutory authorities. In most circumstances, the project managers pay little or no attention to health and safety and this has led to many incidents of workplace accidents, which have brought untold hardships to the victims and their families. In fact, not adhering to strict health and safety measures comes with huge cost burden to both the contractor and the clients. It is for this reason that this study is so timely in the construction sector, as the findings will provide practitioners, government agencies and industry players with information about the critical role of project managers in promoting health and safety throughout the project life cycle.

Additionally, this study is very relevant to academia. Many studies on construction health and safety have looked at causes and effects of accidents at the workplace without necessarily looking at how work and safety standards can be integrated into the work of the project manager. That said, this current work seeks to fill the gap in literature regarding the importance of health and safety and other project parameters to project managers; the frequency at which project managers

consider health and safety relative to various design activities; the frequency at which project managers consider health and safety during the design and construction phases of project; and the frequency at various procurement related situations which affect health and safety are encountered by project managers. The findings from this study will be a relevant source of reference material for future researchers in construction health and safety.

### **1.7 OVERVIEW OF THE METHODOLOGY**

This study used descriptive research design to investigate the role of project managers in construction health and safety. The study used quantitative methods of research enquiry to investigate the nature and scope of construction accident in Ghana and the role of project managers in construction health and safety. The study therefore gathered the views of both the project managers on construction health and safety. Both primary and secondary data were used for the study. Primary data for this study were obtained from project managers on various construction projects in Accra, whereas secondary data on the other hand, included relevant legislations, health and safety policies. The study population included only registered project managers in Ghana, which numbered four hundred and two (402). The sample frame for the study comprised licensed project managers in Ghana. A sample size of forty-eight (48). This number represented more than 10% of the total population. The main instrument for primary data collection was structured questionnaires. Data analysis involved the compilation of the survey data and entering into SPSS. Descriptive statistic like Relative Importance Index (RII), means and standard deviations were used to report some of the data. Findings from the survey were presented in the form of frequency distribution tables, charts and graphs.

### **1.8 STRUCTURE OF THE STUDY**

This study is structured into five separate chapters. The first chapter is the introductory chapter. It discusses the background to the study and explains the research problem. The chapter also contains information about the objectives of the study, research questions, scope of the study, significance of the study and overview of the methodology.

Chapter two of the study is a comprehensive review of literature on the role of project managers in construction health and safety. Specifically, the study reviewed literature on the importance of health and safety in project management, health and safety regulations and practices in the construction industry in Ghana, frequency at which project managers considers health and safety during the design and construction phases of projects, and the frequency at which various procurement related issues which affect health and safety and encountered by project managers.

The third chapter is a detailed description of the research methodology. Among the issues considered in the methodology included the research design, research method, target population, sampling technique and sample size, methods and instrument for data collection and the data analysis tools.

Chapter four is a presentation of research findings and discussions. The result of the empirical survey will be reported in this chapter and each finding will be supported with the findings of existing scholarly works. The analysis was done to reflect the research objectives. Lastly, the last chapter will summarise the whole work and make conclusions based on the findings made. In addition, the study made critical recommendations for academia, industry and government.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

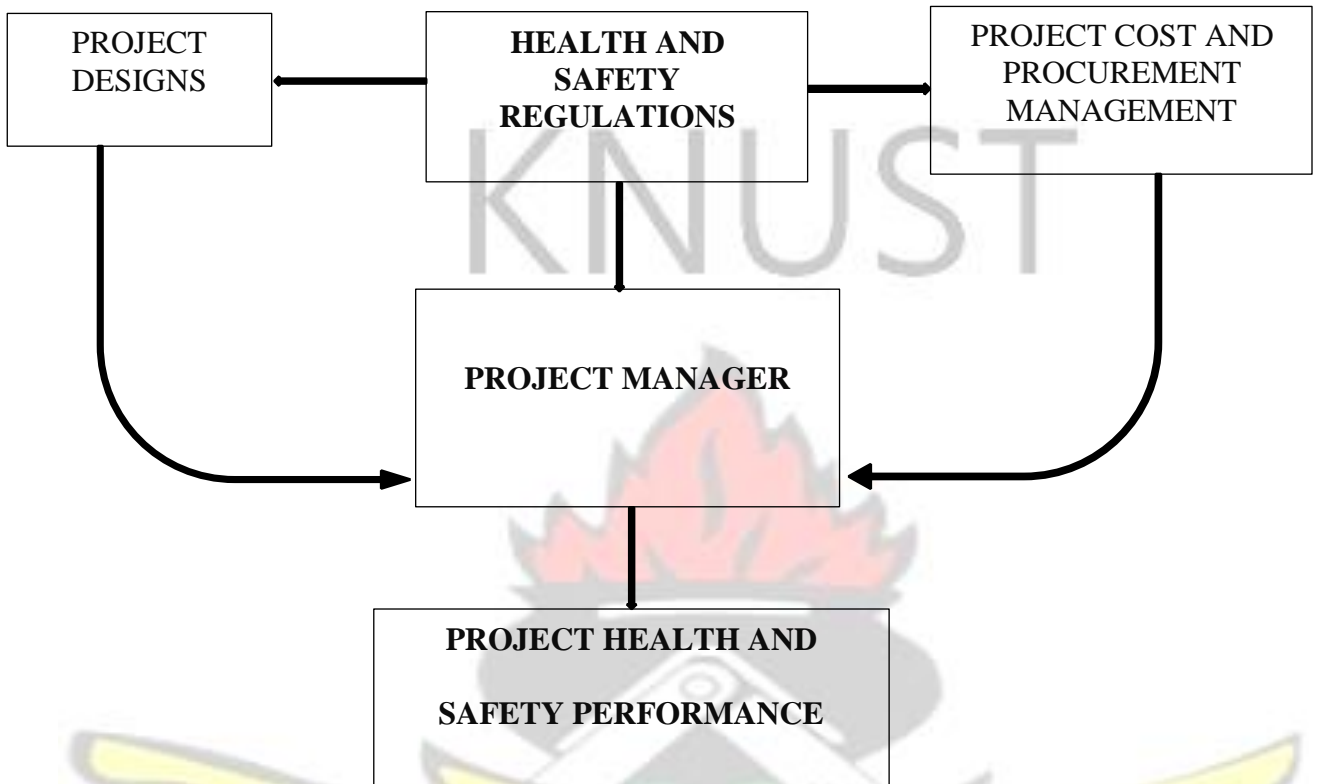
#### **2.1 INTRODUCTION**

This chapter looks at the review of critical literature on the role of project managers in construction health and safety. The review identified the similarities and differences in opinions in existing scholarly writings on the subject matter. Among the themes identified in this chapter include the importance of health and safety in project management; health and safety issue in project design and construction; the role of procurement in advancing health and safety concerns.

The chapter also contains the conceptual framework of the study.

#### **2.2 CONCEPTUAL FRAMEWORK**

This conceptual framework examines the role of the project manager in design and procurement related issues and how these issues affect project health and safety in the construction industry. The conceptual framework reveals a linkage between the project manager, project designer, and project health and safety. This framework aligns the themes of health and safety in project management and success in projects. The conceptual framework with the alignment of the constructs opens up a new gap of research which is the relationship between health and safety in project management and project design and procurement. Figure 2.1 shows the conceptual framework for the study.



**Figure 2. 1 Conceptual Framework of the Role of Project Manager in Construction Health and Safety**

**Source: Author's Own Construct, 2018**

The conceptual framework above shows the relationship between health and safety regulations, project designs, cost and procurement matters. What the framework seems to explain is that, the existence of health and safety regulations in a country influences project designs and procurement. The type of materials to be purchased can be properly regulated by government regulations to avoid the use of sub-standard materials. The project manager has a responsibility to ensure strict adherence to health and safety standards from the beginning of the project to the completing stages. In this case, the project manager has to keep record of daily safety inspections on the project. This situation is critical in meeting the project's health and safety performance indicators. According to Smallwood (2011), project managers will be successful in their activities if they approach health and safety in a holistic manner, as it is impossible to reasonably extricate safety from project



performance. Project managers are in a unique position as they influence health and safety indirectly in their capacity of project leaders and coordinators, and also through architects, engineers and designers who design and detail, and specify materials and processes.

### **2.3 THE IMPORTANCE OF HEALTH AND SAFETY IN CONSTRUCTION WORK**

One of the earliest works in construction health and safety was by Smallwood (1999) who explained that construction fatalities, diseases and injuries have devastating effects on the lives of construction workers and their families. Indeed, workplace injuries have led to significant loss of government revenue through overburdened cost of medical care and rehabilitation (Zou & Sunindijo, 2013). Ensuring safety in the construction environment, even though comes with huge cost implications, saves the clients from possible law suits and insurers from potential insurance claims. In fact, neglecting health and safety precautions may rather prove to be costly for organization through unexpected damage to the environment, non-conformance to quality standards and schedule overruns (Muiruri & Mulinge, 2014). Additionally, workplace accidents negatively affect the image of the contractor and the client. In all these discussions, the role of the project managers is central in ensuring project safety, in their capacity as project leaders and coordinators (Smallwood, 1999).

Available statistics globally shows a worrying trend in the number of casualties of workplace accident. For instance, in the USA, annual recorded accidents from construction sites have consistently remained highest compared to the accidents from manufacturing, agriculture, forestry, fishing, hunting and transportation (Bureau of Labor Statistics (BLS), 2015). According to the BLS (2015), the construction industry in the United States recorded the highest count of fatalities from the year 2010 to 2015. Historically, the construction industry in the US has been the worst sector in terms of the number of recorded accidents. For instance, in the year 2015, the construction sector

recorded 828 workplace injuries compared to 733 injuries in transportation and warehousing. Similar trends are observed in the preceding years, making the construction sector the most hazardous industry in America. Similarly, a survey by the South African Reserve Bank (SARB) (2016) and the Compensation Commission (2017) indicated that South Africa recorded in excess of 15,700 accidents at construction sites resulting in various degrees of injuries and sometimes death. In fact, as many as 203 lives were lost, 657 cases resulted in permanent disablement, 5038 resulted in temporary disablement and 9808 sought medical attention for minor injuries. The economic lost to the economy was estimated at about US\$4.2 Billion (SARB, 2016). The situation in Ghana is even more worrying as work place accidents are under reported making available data scanty and unreliable. However, media report of construction accidents are rife and have brought untold hardships to the victims and their families.

In fact, not adhering to strict health and safety measures comes with huge cost burden to both the contractor and the clients. Empirical study by Smallwood & Venter (2002) shows overlooking safety and health issues in construction comes with both direct and indirect costs. Smallwood & Venter (2002) explains that the direct costs of accidents are associated with the treatment of the injury and any unique compensation offered to workers as a consequence of being injured and are covered by workmen's compensation insurance premiums whereas indirect costs include: reduced productivity for both the returned worker(s) and the crew or workforce; clean-up costs; replacement costs; stand-by costs; cost of overtime; administrative costs; replacement worker orientation; costs resulting from delays; supervision costs; costs related to rescheduling; transportation, and wages paid while the injured is idle.

A number of studies have identified different ratios between the indirect and direct costs: 1.67 times for non-minor injuries and more than 5 times for minor injuries with direct costs less than US\$50 (Hinze, et al. 2013), and 20 times (Leung, et al. 2012). Research indicates the total cost of accidents to constitute, inter alia, 6.5% of the value of completed construction (Chong & Low, 2014) and approximately 8.5% of tender price (Huang & Hinze, 2003).

According to Sousa, et al. (2015), health and safety conscious contractors are more efficient, and health and safety complements quality, which in turn complement technical performance and efficiency of execution respectively. Misnan & Mohammed (2007) also maintain that health and safety conscious contractors are more attractive to clients. A further aspect is that improved morale as a result of health and safety complements the practice of management, and consequently the organisation. Shenhar, et al. (2001) also maintain that customer satisfaction should be reviewed relative to four stakeholders: client; developer; project team and end user. Benefits to the four stakeholders include, inter alia, reduced construction cost and completion on schedule and to quality requirements (clients, developers and end user), and less complications and enhanced constructability (project team).

With respect to „best practice“ which engenders customer satisfaction, the Outstanding Professional Excellence in Building Award, Australia recognised the importance of the construction process, the ability to think laterally, and to provide solutions that does not only satisfy customers“ requirements, but which exceed them. All the projects involved unique and special challenges, inter alia, health and safety which was included as a criterion (Chartered Institute of Building (CIOB), 2006)

The above discussion clearly shows the importance of health and safety in the construction sector.

The overriding benefit of health and safety is the reduction of direct cost to incurred from injuries



and workmen compensation, and indirect cost through reduced productivity for both the returned worker(s) and the crew or workforce; clean-up costs; replacement costs; stand-by costs; cost of overtime; administrative costs; replacement worker orientation; costs resulting from delays; supervision costs; costs related to rescheduling; transportation, and wages paid while the injured is idle. Having identified the importance of health and safety to construction, it is important to examine some of the safety practices in the construction industry.

## **2.4 HEALTH AND SAFETY REGULATIONS IN THE CONSTRUCTION INDUSTRY IN GHANA**

The protection of workers from injuries and fatalities at the construction site is one of the greatest concerns of the project manager. People working at a construction site are badly exposed to hazardous working conditions (Demirkesen & Arditi, 2015). According to Alhajeri (2011), the unique, dynamic, and complex nature of construction projects likely increases workers' exposure to hazardous working environments. Hinze, et al. (2013) explains that construction site safety is one of the project's success factors, along with time, cost and quality. Many advanced nations such as the United Kingdom, Singapore and Hong Kong have adopted a self-regulatory approach to safety, whereby proprietors (including contractors) are required to develop, implement, and maintain safety management systems to identify potential hazards at an early stage so as to help avoid unnecessary losses in life and cost (Hinze, et al., 2013; Zin & Ismail, 2012).

Ghana's occupational health and safety regulations were inherited from the British legal and institutional framework upon the attainment of independence. The first regulation for the protection of the health and safety of workers was introduced in the year 1952 by the then colonial powers to protect employees of the mining and wood processing industry. This legal framework was known as the Factory Ordinance (S. Laryea, 2010). The Factory Ordinance was operational

for twelve (12) years until its repeal in the year 1970. This was replaced with the more expanded Factories, Offices and Shops Act [Act 328 of 1970] (Cooney, 2016; S. Laryea, 2010).

The Factories, Offices, and Shops Act of 1970 caters for factories, offices, shops, ports, and construction. The Act provides for the minister for manpower, development and labour to make regulations in respect of construction works to address specific hazards including imposing duties on persons in respect of the hazards. Section 57 of the act relates to building and civil engineering works. Other sections relevant to building and civil engineering works specified in section 57 (1) of the Act include: sections 6 to 8, 10 to 12, 19, 20, 25 to 31, 33 to 40, 43 to 54, and 60 to 87. Under the Act, construction businesses are required to register their sites (sections 6-8) and to report workplace accidents and dangerous occurrences to the Factory Inspectorate Department. It also requires them to provide wholesome drinking water on their sites (20), toilet facilities on the sites (19), and personal protective equipment for their workers (25), and to take preventive measures to control or prevent specific hazards on sites. The hazards named are; noise, vibrations, manual handling (26 and 27), and fire (31).

The Act also requires medical supervision of the health of employees where necessary. Businesses are required to take measures at the workplace in respect of access and egress to the factory (site), the construction and design of structures to ensure the safety of workers, and users of facilities (33-35). Fencing and safeguards are required to be provided or constructed and maintained for the safety of persons at the factory (site) (38-40). Records of lifting machines and appliances are required to be kept and they must be of sound construction, properly maintained and precautionary measures taken during their operation (37 and 43-47). Construction businesses are required to take precautionary measures to prevent injury and explosions because of dust, gas, and vapour, present in the work environment (48 and 49). Steam boilers, receivers and containers, and air receivers are



required to be of sound construction, properly maintained and precautionary measures taken to ensure their operation (50).

The Act provides for training of machine operators and persons employed in processes likely to cause injury (36). The Minister may make regulations to protect the health, safety, and welfare of workers (30 and 51). Other sections of the Act which relate to construction works include: •

Sections 52-54 set out the authority of inspectors in ensuring health, safety and welfare of persons at workplaces and the role the courts play in such matters;

- Sections 60-73 set out the offences under the Act and legal proceedings;
- Sections 74-77 relate to the administration of the Act; and
- Sections 78-87 relate to general matters.

There are a number of concerns regarding the implementation of the Act. First, regulations are needed to set standards for specific situations of the act. In the absence of these standards, employers wishing to comply with the requirements of the law will adopt standards which are very subjective. There is no law defining funding mechanisms for implementing occupational health and safety. Lastly, establishing compliance and enforcement networks is not covered by the Factories, Offices, and Shops Act which is the main occupational health and safety law of the country.

In addition to the above legislation, the Government of Ghana in the year 1987 passed the Workmen's Compensation Act to impose liability on employers to pay compensation to employees incapacitated by accidents arising out of and in the course of their employment. Compensation payment to accident victims is independent of negligence on the part of the employer or fellow-worker. The employer is also required to bear the hospital expenses of the injured worker. In cases

where the injured worker only requires treatment, he or she is entitled to his or her earnings while undergoing treatment for injuries he or she sustained through an accident arising out of, and in the course of his/her employment. There are exceptions to employers' liability to pay compensation. These exceptions are: where the injury is due to the workman having been under the influence of intoxicating liquor or drugs at the time of the accident or where the injury was deliberately self-inflicted or where the workman knowingly misrepresented to the employer that he was not suffering or had not previously suffered from that or similar injury. The law applies to persons employed by both public and private organisations. The Act sets out modalities for calculation of the earnings of workers and payments of compensations to workers who sustain injuries.

In more recent time, the Parliament of Ghana passed the Labour Act 651 of 2003, which comprehensively addressed labour issues in Ghana. Part XV of this Act specifically deals with the health and safety and environment of workplaces. Under this Act, it is every employer's duty to ensure employees work under satisfactory, healthy and safe conditions. Other sections of the Labour Act which impact on health and safety include: protection of employment relationship; general conditions of employment; protection of remuneration; unions; employers' organisations and collective bargaining agreements; National Tripartite Committee; and, labour inspection.

Many international regulations from the International Labour Organisation (ILO) have shaped the legal framework of health and safety of employees. For instance, the Underground Work (Women) Convention 1935 (No. 45); Radiation Protection Convention 1960 (No. 115); Guarding of Machinery Convention 1963 (No. 119); Hygiene (Commerce and Offices) Convention 1964; Working Environment (Air Pollution, Noise and Vibration) Convention, 1977; and, Labour Inspection Convention 1947 are all international regulations that have been ratified in Ghana and form part of the Ghanaian legal regime.

Currently, the laws of Ghana in relation to occupational health and safety is fragmented and limited in coverage. Some key economic sectors are not covered by the country's occupational health and safety laws. A notable example is the agricultural sector, although it employs over 60 per cent of the country's workforce there is no any form of occupational health and safety laws regulating the activities of the sector. This unfortunate situation can be traced back to colonial rule in Gold Coast (Ghana), where the colonial government placed more emphasis on labour relations in formal sectors of economy where formal employment relations existed. The mining and manufacturing sectors of the economy are examples of such economic sectors. Commenting on the shortcomings of occupational health and safety legislation of Ghana, Tetteh (2003), noted that health and safety statutes evolve without due regard to existing ones, resulting in fragmentation, overlapping areas of jurisdiction and inconsistencies in occupational health and safety laws of the country.

According to Tetteh (2003) the apparent lack of comprehensive laws on health and safety in the construction sector has led to exploitation by contractors, who usually engage temporary workforce. The construction sub-sector is yet to be formalized, hence contractors are free to employ temporary labour, invariably, such labourers are without formal education and unaware of their rights, do not form part of any labour union and are not insured. Their situation is very precarious as accidents in the construction sites is a common phenomenon.

## **2.5 HEALTH AND SAFETY PRACTICES IN THE CONSTRUCTION INDUSTRY**

High incidents of accidents and injuries in the construction industry have raised serious health and safety concerns amongst health and safety professionals, researchers and governments over the past few decades (Marhani et al., 2012; Sousa et al., 2014; Zin & Ismail, 2012). As a result of the high rate of accidents, industry players have adopted health and safety practices for the management of construction businesses. Health and safety practices in the construction industry



have been developed to promote construction businesses. According to Laryea (2010), health and safety management practices have evolved from being focused on accident prevention to a more systematic and proactive approaches in minimizing the risk of hazards associated with construction projects.

In the year 1977, Simonds and Shafai-sahrai investigated the factors that distinguished firms with lower injury frequency rates from those with higher rates. The study identified five distinct health and safety practices that distinguished firms with lower injuries from firms with higher rates of injuries. Among these practices included top management involvement; higher average age of workers; longer average length of employment; adequate working space and neat environment; and, higher percentage of married workers (Simonds and Shafai-sahrai, 1977).

Additionally, Liska et al. (2013) examined the health and safety practices that lead to zero accident at the construction sites. Liska et al (ibid) identified ten (10) safety practices, which ensured no accident occurred at the construction sites. They mentioned (i) safety training and orientations; (ii) provision of safety incentives; (iii) safety pre-task planning included in safety goals; (iv) safety person or personnel; (v) safety policies and procedures; (vi) fire protection programme; (vii) accountability/ responsibility and safety budget; (viii) alcohol and substance abuse programme in place; (ix) accident and near-miss investigation; and, (x) record keeping and follow-ups.

A study by Jaselskis et al. (2016) also stated that companies with lower incidence rates of accidents were characterized by more detailed safety programmes; expended large percentage of revenue on safety programmes; greater safety training time; more formal safety inspections per month; and, more safety meetings. Another study by Gallagher (2017) identified the factors associated with improved health and safety performance. The most prevailing factors identified by Gallagher (2017) included (i) high level of top management commitment; (ii) health and safety



responsibilities known; (iii) supervisor involvement encouraged; (iv) active involvement of health and safety representatives who have a broad role; (v) effective health and safety committees; (vi) planned identification of risk and hazard elimination or control emphasis; and, (vii) comprehensive approach in inspections and investigations.

Tam and Fung (2017) conducted a study on the effectiveness of management strategies on safety performance. Their study concluded that, the use of more directly employed labour; continuous safety training; institution of safety awards; and post-accident investigations were important practices to reduce accidents at the construction sites. According to Wright (2008) certain factors create positive pressure on project managers to promote health and safety practices at the construction sites. The factors identified by Wright (2008) include the fear of prosecution by maintaining image of responsibility thereby avoiding adverse regulatory, customer or public reaction; belief that it is necessary and morally right to comply with health and safety regulations; compliance with customer or regulator certification schemes; minimisation of cost of ill-health and injury; conformity with principles of total quality management, empowerment among others; and, the desire to improve staff morale and productivity. In addition, Gad (2012) examined health and safety practices in an organization. Gad (ibid) placed the project manager at the centre of strategies to promote health and safety in the construction industry. He explained that the project manager is paramount in promoting organisational safety culture in the construction industry. Gad (2012) opines that financial incentives to improve productivity or to compensate for working in hazardous conditions can lead to safety being compromised.

A study by Baldock et al. (2005) identified the factors associated with a propensity to make health and safety related improvements. Baldock et al. (2005) recognised the enforcement of health and safety activity by the project manager; the use of external assistance with respect to health and

safety issues; management training and experience. Nonetheless, Aksorn and Hadikusumo (2008) investigated the effectiveness of safety programmes in the construction industry. Aksorn and Hadikusumo (2008) found that safety performance was influenced by the nature of the implemented safety practices. Their study identified eight (8) health and safety practices that positively affected safety performance of construction sector. These practices included (i) accident investigations; (ii) jobsite inspections; (iii) job hazard analysis; (iv) safety inductions; (v) safety record keeping; (vi) safety committees; (vii) safety incentives; and, (viii) control of subcontractors. The health and safety practices identified by Simonds and Shafai-sahrai (1977); Liska et al. (2013); Jaselskis et al. (2016); Gallagher (2017) and other scholars places the responsibility of the promotion of health and safety at the construction site in the hands of the project manager. Thus, the project manager places an important role in the management of health and safety at the construction site. What the literature review has revealed is the inextricable responsibilities Management of construction companies play in upholding health safety practises.

## **2.6 FREQUENCY AT WHICH PROJECT MANAGERS CONSIDER HEALTH AND SAFETY DURING THE DESIGN AND CONSTRUCTION PHASES OF PROJECTS**

A review of literature on accidents at the construction sites reveals that many of the accidents in the construction sector could have been avoided if adequate steps were put in place at the design and construction phases of the project (Baxendale & Jones, 2000; OSHA, 2016; Smallwood, 2011). The project manager therefore has a role to play in improving the health and safety performance of construction projects at various stages of the project life cycle. According to OSHA (2016) there is the need to integrate health and safety management practices into the entire construction process, from design to completion phases of projects. This school of thought on health and safety management is, at least to some extent, largely driven by developments in health and safety

legislation in Europe and USA. This view of integration of health and safety management into construction processes requires responsibility for health and safety to be equitably shared between the key participants in a construction project (Pillay, et al., 2007; Sousa et al., 2014). There is this belief by Hinze et al. (2013) that the project manager ought to think health and safety throughout the phases of the project. Hinze et al. (2013) explains that addressing the safety of construction workers in the design phase involves recognising the potential impact designers' decisions can have on the health and safety of construction site workers. Similarly, owners' involvement in construction safety could reduce cost of safety to minimum. The OSHA (2016) advocates for health and safety to be considered during the early stages of a project. However, optimum benefits can be derived from considering health and safety at the early stages of project if procurement routes are adopted which facilitate coordination and team spirit (Kheni et al., 2010).

In the view of BIM Industry Working Group (2011), there is a strong linkage between project design decisions and safe construction. In fact, a report by the HMSO Cabinet Office (2011) revealed that more than one-third of accidents at the construction sites are caused by falls, which could have been reduced through designs decisions. This view is shared by the U.K Health and Safety Executive (HSE) (2001), which explained that the construction of new buildings is by its nature an ergonomics problem, since the construction project requires work at floor and ceiling level, resulting in, among others things, kneeling, bending, reaching out, twisting and in general, the adoption of uncomfortable work postures.

According to Kheni et al. (2010) the frequency with which project managers integrate health and safety into project design and construction is a determinant of project success. Baxendale & Jones (2000) examined practical ways of managing health and safety as integral aspect of project planning during one or more of the phases of project execution. Additionally, Hare et al. (2006)



investigated the integration of health and safety with the pre-construction phase of projects. These authors underlined the importance of considering health and safety during the design and construction phases of a project.

Existing literature on health and safety in the construction sector suggest that the earlier phases of the construction process are critical to the successful implementation of the performance approach. The pre-design and design phases are important, as it is during these early stages that the end user and performance requirements are established (Behm, 2005; Bjögvinnson et al., 2012; Weinstein et al., 2005). Research has shown that the early involvement of all participants, particularly designers, in the construction worker safety effort has great potential for reducing exposure to hazards and potential hazards (Behm, 2005). The consequence of this early involvement potentially results in the reduction of accidents, injuries and fatalities (Smallwood & Haupt, 2009). By including construction workers as users, designers have the potential to consider their particular requirements and the performance required to meet them during the predesign and design phases of construction (Hinze, Hallowell, et al., 2013).

During the construction phase, workers engage in construction tasks during which they are exposed to hazards due to the nature of the activities being carried out, the properties of the materials being worked with, and the complexity of the construction methods being used. Other impacting factors include the location in which the activity is being performed, the environment, climatic conditions, and personal attitudes (Haupt, 2001). These have to be considered during risk assessments, qualitative and quantitative identification of their requirements as users, and implementation of solutions that will satisfy these user and performance requirements (Weinstein et al., 2005).

However, according to Coble and Haupt (1999) there is a shift in focus of health and safety management from actual site processes to overall management of projects in developing nations.



Coble and Haupt (1999) opined that the construction industry reflects the level of economic development within the country. Thus, project managers in less developed countries pay less attention to health and safety concerns at the construction sites. This is one of the major challenges identified by researchers like (Alhajeri, 2014; Cooney, 2016; Haupt, 2001; Kheni et al., 2010; Laryea, 2010) as hindering the adoption and implementation of health and safety policies. There is therefore the need for governments' commitment and direct intervention. A direct intervention by government will create an enabling environment for the participation of project managers, clients, designers and health and safety stakeholders in health and safety management (Haupt, 2001).

It is important to stress on the fact that economic structures, occupational structures, working conditions, work environment, and the health status of workers vary from country to country and from sector to sector (Eadie, et al., 2013; Kheni et al., 2010). Practitioners in the construction sector have therefore rejected the prescription of one-size fits all scenario for the adoption of health and safety measures. Health and safety management is a challenge to governments as well as owners of businesses in developing countries. Therefore, the mechanisation of the construction industry is not uniform throughout the world. However, as stated earlier, the construction industry plays a vital role in boosting the economy of any country, especially a developing country. It provides the infrastructure required for other sectors of the economy to flourish (Hwang & Low, 2012; Rahman et al., 2014). The construction sector everywhere faces problems and challenges. However, in developing countries, these difficulties and challenges are present alongside a general level of socio-economic stress and a lower productivity rate when compared to developed countries (Djokoto et al., 2014; Frimpong et al., 2003). Nevertheless, it is generally believed that the

construction industry is a good source of employment at various levels of skills, from a general labour to semi-skilled, skilled and specialist workforce.

According to Baxendale & Jones (2000) and Weinstein et al. (2005), project designers influence health and safety directly through design specific, supervisory and administrative interventions. In the design phase of the project, the project manager ought to focus on concept design; general design; selection of type of structural frame; site location; site coverage; details; method of fixing; specification of materials and finishes. During the course of the project, the project manager has to constantly make reference to health and safety as an agenda item during site meetings and obtain health and safety report from contractors. After the completion, the project manager has to make reference to the health and safety document upon site handover (Smallwood & Venter, 2002).

Smallwood (2011) explains that project designers can influence health and safety through the type of procurement strategies used. The designer can influence the procurement process through prequalification, project time, partnering and the facilitating of pre-planning (Smallwood, 2011). The project manager also has to engage with the designers and clients. The design phase of every project is critical for healthy and safe execution of any project. Any variations from the original design of the project can be a catalyst that can trigger multiple events, which could lead to catastrophic consequences. For this reason, the project manager must continuously consider the project design to know what exactly are required at each stage of the project and develop a comprehensive brief for the design team.

The project manager also has a role to play in the pre-planning of health and safety of the project. The pre-planning of health and safety highlights a structured approach to health and safety related issues by both the project designers and contractors. Pre-planning identifies all the ingredients of and resources required for the health and safety programme to be effective and efficient. However,

the design of a project is a great influence on determining the method of construction and the requisite health and safety interventions. The project manager therefore needs to abreast himself with relevant information regarding project designs at the early stages of the project in order to facilitate budgeting for optimum use of resources (Cooney, 2016). In fact, project managers must frequently consult project drawings, legislation and site inspections records for relevant information on health and safety planning.

## **2.7 FREQUENCY AT WHICH VARIOUS PROCUREMENT RELATED SITUATIONS AFFECT HEALTH AND SAFETY ARE ENCOUNTERED BY PROJECT MANAGERS**

Unlike many other industries that are involved in mass production, the construction industry tends to focus on one-prototype projects (Sabol, 2007). However, according to Lenzen and Lundie (2012) there are certain comparisons to be made between construction and mass products: cases where a prototype from construction emerges as a model, and this model in turn is then replicated. Also, unlike the case of mass production, in construction the client is normally the one that takes the initiative in having the constructions designed and build (Cooney, 2016). In such as a case, the client pays for the construction and remains the actor (Cooney, 2016). The client is the one that places the order for the construction hence he may sell or even let the construction for a later period (Cooney, 2016). And in all construction projects, there are different types of clients: those involved in one-off requirements (Badri, et al., 2012), organisations involved in a regular process of development, as well those with huge development programmes that tend to employ technically skilled staff (Demirkesen & Arditi, 2015).

### **2.7.1 Vetting Bidders for Contracts**

The vetting of bidders, or otherwise contractors in the construction industry is a very complex one (Gadd & Collins, 2002). The client has to be aware of the many areas in which prospective builders,



or whatever service is needed by the contractor, may indulge to be awarded such a contract, by breaching health and safety legislation, and cutting corners to increase a financial gain (Walters, et al., 2005). However, the issue of overseeing contractual worker execution is an increasing concern among associations of all commercial enterprises, regularly in light of the fact that temporary workers might be performing non-routine work at destinations that are not specifically regulated by a supervisor, or any director by any means. Much research as at now have been conducted to decide why security can be adversely affected through temporary workers and how much (or little) consideration is paid to overseeing contractual worker wellbeing, how and why the management and administration must oversee temporary workers on location from prequalification to post-work assessment, general investigating cross-industry best practices for contractual worker administration. The US Department of Labour suggests a 25% unemployment rate in the construction and development business (Zou & Sunindijo, 2013). Reuters refers to non-residential development spending has dropped more than 20% in 2011. Office development is down 29%, lodgings, 43% and the recuperation is relied upon to be moderate and small. Construction, being a mainly adult industry in the U.S., has dependably been focused yet there is another crucial movement in all temporary workers' business sector viewpoints. Specialists concur; this is “another typical” with littler volumes, with tighter margins and much warier proprietors.

### **2.7.2 Financial and Legal Implications with Construction Accidents**

There are several pieces of legislation relevant to workplace injuries and accidents in the UK.

The first concerns reporting and is called the Reporting of Injuries, Diseases and Dangerous Occurrences Regulation (RIDDOR) and was enacted in 2013. The regulations state that employers and people in control of the workplace are responsible to report the included accidents, diseases and any dangerous occurrences. In the UK, the health and safety executive monitors and enforces



health and safety laws and regulations. The construction sector plays a major role in the economic development of almost every country in the world. That being said, the work involved in construction is regarded as the most hazardous as compared to other industrial activities. Injuries incurred while performing construction work is about 50% higher as compared to all other work (OSHA, 2016). The risk of musculo-skeletal injury is especially higher among construction workers. Accidents and mishaps at the construction sites results in injury and/or death of many workers every year. That is why it is of fundamental importance for the construction company to assess the risk at the work site, and take effective measures to minimize the risk. Through continuous monitoring and surveillance, the work related injury risk can be minimized (Islam & Razwanul, 2017). According to Gadd & Collins (2002), work related accidents are unexpected and unplanned occurrences that results in loss of productivity due to disturbance in the planned work sequence, injury, and damage to the plant and equipment that interrupts normal flow of production. O.S.H.A (2016) reports that about 60,000 deaths occur every year around the world due to mishaps at the construction sites, and the rate of fatalities in the sector is much higher as compared to others. A study conducted by Jaselskis, et al. (2016) showed that most of these accidents occur due to lack of commitment to workplace safety.

### **2.7.3 Cost Effectiveness in Construction Projects**

According to Baccarini (1999), the success of a project is synonym to effectiveness. In other words, the degree of achievement of project goals determines its effectiveness. Project team is formed to achieve and accomplish goals and the success of the project is determining how well those goals have been achieved. The top project priorities include completing the project on time, within the budget, and meeting technical specifications and mission. This corroborates with findings of de Wit (1988), who found that the success of a project depends on the achievement of

project objectives relating to quality, cost, time, and mission. According to a number of researchers the success factor in the construction industry relates to effectiveness and efficiency measures (Belout & Gauvreau, 2004; Crawford & Bryce, 2003; Dyer, 2017).

#### **2.7.4 Contractor and Stakeholder Strategic Decisions in Construction**

Contractors undertake the construction project using a team comprising of different department. Most of the contributors make decisions that affect health and safety at the worksite. In some cases, the project team consists of external members such as advocacy groups or regulatory agencies. It is important that the construction company identify health and safety issues related to the sector during the decision making process (Belout et al., 2014; Dasgupta et al., 2007; Leahy, et al., 2016).

#### **2.7.5 Vetting Bidders for Contracts**

Under the current Health and Safety laws in the UK, both the client and the contractor have responsibilities to reduce the risk of work-related injuries and illness. Clients need to develop and deliver a clear policy in regards to the HS standards they expect from contractors. This policy needs to be well publicised so that agents on the client side like procuring officers and contractor side like the tendering officers understand the priorities of the client (Wells & Hawkins, 2010). The clients should also have realistic expectations in terms of health and safety and this can be achieved with a survey of the market and making sure that the criteria they are setting can be met by the available market. This analysis of the market should include the OHS regulatory framework already set in the market and a study of the common OHS strategies used by contractors in the market.

In the past few years, there has been an increase in the risk models that contractors can use during the bidding process to allocate risk contingencies. Some of the risk models that have been

introduced for assessing risks include influence diagramming based technique (Wells & Hawkins, 2010), fuzzy set model (Project Management Institute, 2002; Project Management Institute Inc, 2013; Ward & Chapman, 2003), and logic based ANN model (Lang, 1990). However, most of the recent research studies have shed light to the fact that the risk assessment tools are not commonly used by the contractors. Only seven contractors in UK were found by Dikmen, et al. (2007) to have used risk assessment tools to assess the risks during the bidding process.

Moreover, Akintoye, (2000) found only 30 and 84 contractors in the UK used the risk assessing models. Winter, et al. (2006) had found 12 contractors in the US utilized the risk models, while only 60 contractors in Hong Kong were found to have used risk assessment model to assess the risks (Chan & Au, 2008). That said, Laryea & Hughes (2008), state that the use of risk and price during the bidding process is not articulated well in any of the recently published literature. In the construction industry, pricing of the work is quoted during the bidding phase. A basic knowledge of the tender process is required to determine how contractors determine the bidding price.

Additionally, there is a need to determine how the price is influenced by risk factors, and also under what circumstances this takes place. At the moment, there seems to be very little empirical research works have been conducted that examined the entire process of bidding used by the construction workers. Without a basic knowledge on how the bidding process takes place while taking account the process, it is difficult to know the right analytical models for assessing risk in the real world situations. Assessment of risks has a significant impact on the pricing strategy of the contractor. Nonetheless, other factors also influence the pricing decisions. Price that the customers will be willing to pay depends on the resources allocated for the work as well as the price that the competitors are willing to pay for the same project (Ballard, 2007). This suggests that the bidding



price is dependent on the competitive and the market and its environment at a particular moment in time.

According to Fulford & Standing (2014), the bidding process consists of two stages. The first stage is the estimating stage where the costs of the project is considered. Pricing at this level depends on the estimating department's skill in determining the cost. Second stage of bidding pricing is the adjudication that refers to the stage where the directors estimate the cost taking into account commercial factors in the context of risks, market conditions, and specific circumstances. In the end the management will try to set the final bidding price between the value and cost in order to win the bidding (Hughes & Murdoch, 2001). The problem is that the existing literature do not clearly shed light on the approach taken by the contractors to accommodate for risks inherent in the process of estimating the bidding price while taking account of the market factors.

A number of analytical methods have been proposed by scholars to deal with risks during the bidding process. In order to conceptualize the analytical models that align with the contractor's actual performance, it is important to understand the actual process of the bidding process taking into account the market risks. However, Ruparathna & Hewage (2015) have stated it is difficult to get contractors to take part in studies to understand the bidding process as it involves commercially confidential data. Risk is an inherent part of any business endeavour (Eriksson & Westerberg, 2011; Porwal & Hewage, 2013). Capital market and portfolio theories state that there are two types of risks present in the market (Loosemore, 2016).

The first is the systematic risk that is outside the control of the organizations such as interest rate and market risk, purchasing power risk, and natural calamities. The second type of risk is the unsystematic risk that is inherent to organization and can be controlled. It includes financial and business risk. Both these risks are also relevant to the construction sector according to



Ruparathna & Hewage (2015) and Varnäs, et al. (2009). Varnäs, et al. (2009) state that one way of estimating the price that meets the profit target is through quantifying the risk and setting a required rate of return. The rate of return takes into account a risk free rate and also compensation of the individual risk factors. Loosemore (2016) said that the risk element contains costs that in some cases can be catastrophic. However, estimating the price risk is not that easy as has been revealed in a survey of 400 top contractors in the US (Eriksson & Westerberg, 2011). Oyegoke, et al. (2009) conducted a conceptual study in which an analytical approach was taken to assess the risk in the construction projects. It was found that projects that are undertaken in dynamic and multifaceted environment results in high risks and uncertainty that is compounded by the time constraints.

Naoum & Egbu (2015) say that every construction project has some unique features and risks.

On the other hand, Szymański (2017) are of the view that risks are not unique in the sector. Iqbal, et al. (2015), state the construction industry is unique due to multiple reasons. They are of the view that, factors, which are contractual, economic, environment, and political in nature all affect how construction work is awarded, reported, and described. Some of the factors outlined by the authors that affect construction sector include competitive tendering, production, preliminary expenses, low fixed capital requirements, tendency to operate with low working capital, delays to cash inflow, government interventions, seasonal fluctuations and effects, and uncertain weather conditions, unpredictable ground conditions, and no long term guarantees or performance liability.

The same factors have been explained by Frimpong et al. (2003) and Amoatey, et al. (2015) who say that the construction work is mostly complex consisting of multiple market participants and long production cycle. A number of scholars such as Kangari & Riggs (1989), Lam, et al. (2007); Costantino, et al. (2015) and Porwal & Hewage (2013) have introduced models that the contractors can use to determine risks inherent in the bidding process. Kangari and Riggs (1989) introduced a

fuzzy set model to assess the risks that can help contractors a more rational and logical basis to make bid pricing decisions. The authors demonstrated how to calculate risk value taking into account of fuzzy set principles that include a risk premium. That said, no reference has been made to any research on how contractors actually calculate the risks.

A conceptual model was developed by Lam, et al. (2007) that help contractors to assess the risks during the preparation of the bid process that took into account contingencies using the fuzzy set model logic. In addition, Costantino, et al. (2015), proposed a based ANN (artificial neural network) model, as mentioned earlier, that can assist contractors in estimating the price mark up in an uncertain and constantly changing market environment. Any model development method that a contractor uses to assess the risks and set prices should be based on ground realities. The process of negotiating prices with the clients is a complex process that is not well elucidated in the current literature. A number of research studies have identified the process of estimating and bidding the prices (Dikmen et al., 2007; Iqbal et al., 2015; Porwal & Hewage, 2013; Szymański, 2017). It is important to explain that, most of the literature conceptualised what ought to be and not how contractors actually estimate and bid the prices. Up till now, no detailed research work has been conducted that fully explains the actual bidding process, and especially how various procurement related situations, which affect construction health and safety are handled by project managers. Without having in depth knowledge about the actual bidding process, it is hard to make effective recommendations for improvements.

## **CHAPTER THREE**

### **METHODOLOGY**

### **3.1 INTRODUCTION**

This chapter of the study presents detail information about the process of data collection and analysis. The chapter vividly describes the research design, type and sources of data, target population, sampling technique and sample size. The chapter goes further to describe the process of data collection, data collection instruments and tools for data analysis.

### **3.2 RESEARCH METHODOLOGY**

Research methodology describes how the entire study will start and finish. The research methodology connects the researcher to specific research approach and methods for data collection and analysis. Walliman (2010) generally, categorises research methodology into two broad categories, qualitative and quantitative. This study uses quantitative methods of research enquiry to investigate the nature and scope of construction accident in Ghana and the role of project managers in construction health and safety. The use of quantitative method is because the variables for this study are in the form of quantitative data, which can be measured. According to Kothari, (2004) quantitative approach involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion. Quantitative research involves the use of mathematical procedures to analyse the numerical data. Data for this study are quantitative in nature and therefore the use of quantitative research methods can sufficiently answer the research questions.

### **3.3 RESEARCH DESIGN**

According to Bhattacharjee (2012) research design is a blueprint for conducting an entire study. It set out the guidelines that linkup the elements of methodology adopted for the study namely, relating the paradigm to the research strategy and then the strategy to methods for collecting empirical data (Walliman, 2010). Having access to construction companies requires a research



design that would enable the researcher to get conversant with the study setting and also, win the trust and cooperation of key persons in organisations, which could enhance the researcher's access to the Management of such companies. It is important to note that construction health and safety is mainly the responsibility of project managers and the health and safety officer. Many clients engage third party consultants to serve project managers on their projects. For this reason, it is important to design the research to gather the views of both the project manager and the health and safety officer/contractor. Additionally, empirical literature on construction health and safety have shown that the adoption of health and safety practices relates to organisational characteristics such as business size, management style, pertaining legislations and the external environment within which construction firms are situated. It is therefore important to examine some of the organisational factors influencing the adoption of certain health and safety practices.

It is for this reason that this study adopted descriptive research design to examine relationships between certain quantitative variables and examine the views of research participants on the role of project managers in construction health and safety. Descriptive research includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research is description of the state of affairs as it exists at present (Kothari, 2004). Additionally, the study used photographs of construction sites to augment the findings from the survey.

### **3.4 TYPES AND SOURCES OF DATA**

Two main types of data were used for this study. Both primary and secondary data were used for the study. Primary data are set of raw data that is collected afresh and for the first time and this emanates from an ongoing study. On the other hand, secondary data are those which have already been collected by someone else and which have already been processed. Primary data for this study were obtained from project managers on various construction projects in Accra and health and



safety officers (if any) on these same projects. Primary information obtained included health and safety practices at construction sites, health and safety budget, number of accidents at construction sites, number of employees, activities performed by the project managers, challenges of health and safety management, among others. Secondary data on the other hand, included relevant legislations, health and safety policies. Secondary data for the study were obtained from Management of construction companies and government departments and agencies with the functions relating to health and safety in construction. These organisations and government departments included the Labour Department; Ministry of Health; the Architectural and Engineering Services Limited and Ministry of Works and Housing.

### **3.5 TARGET POPULATION**

It is important to note that construction health and safety is mainly the responsibility of project managers. Thus, to investigate properly the role, played by the project manager in construction health and safety, this study targeted registered project managers who were members of the Project Management Institute of Ghana. This group of professionals were believed to possess adequate knowledge about the subject matter. Since the scope of the study was in the construction sub-sector, sample frame was limited to registered project managers who were construction workers. According to the Project Management Institute of Ghana, the number of registered PMI professionals were 402.

### **3.6 SAMPLING TECHNIQUES AND SAMPLE SIZE**

Having identified the target population, it is important to determine the sample size for the study. The study employed purposive sampling technique to identify study participants. Since the study was about the role of project managers in construction health and safety, the researcher selected only registered members of Project Management Institute of Ghana (PMIG) who were involved in

construction work. In determining the sample size, the researcher was guided by principles of representativeness, efficiency, reliability and flexibility. The sample frame for the study was made up of licensed project managers in Ghana who were involved in construction activities. In this regard, the researcher consulted the PMIG to collect data on the registered members who fell within this category. According to the PMIG, there are 402 registered members. Since, the relevant members for this study were scattered across Ghana it was impractical for the researcher to locate all of them. It was therefore agreed that, the PMIG would send the questionnaires to the PMI members on behalf of the researcher. Out of the total 402 Project Managers, only fortyeight (48) responded to the questionnaires. It is instructive to note that, these respondents were all involved in construction activities as indicated on the questionnaires.

### **3.7 METHODS AND INSTRUMENTS FOR DATA COLLECTION**

The main instrument for primary data collection was structured questionnaires. These questionnaires were sent to the director of the project management institute of Ghana. The researcher added an introductory letter to the questionnaire explaining the purpose of the instrument. The researcher then requested that the questionnaire should be forwarded to the registered members of the institute for them to respond. It is important to state that due to the short duration of the study, the researcher gave the respondents only two weeks to respond to the questionnaire. Out of the total population of 402 registered project managers, only forty-eight (48) responded to the questionnaire.

The information sought by the questionnaires included a description of health and safety management of construction firms; the role of the project managers in promoting health and safety; the frequency at which project managers considered health and safety during project design and construction; and the frequency at which project managers considered various related procurement

issues. The questionnaire developed and used in the study comprised questions with fixed response categories (dichotomous, and multiple choice). The research questionnaires were divided into four sections. The first section sought information about the profiles of the construction firms. This information included position of respondent, characteristics of construction firm, type of construction and business turnover. The second section sought information about health and safety management practices adopted by construction firms. The third section of the study examined the frequency at which project managers considered health and safety during the design and construction phases of projects. Finally, the fourth section of the study looks at the frequency at which various procurement related situations affected health and safety are encountered by project managers.

### **3.8 DATA ANALYSIS**

Data analysis involved the compilation of the survey data and entering into SPSS. Descriptive statistic like Relative Importance Index (RII), means and standard deviations were used to report some of the data. Chi-square test was used to compare the relationships between certain dependent and independent variables. Findings from the survey were presented in the form of frequency distribution tables and relative importance indices.

## **CHAPTER FOUR**

### **PRESENTATION OF DATA, ANALYSIS AND DISCUSSION**

#### **4.0 INTRODUCTION**

This chapter is a presentation of the analysis of the field data from the project managers who served as research participants. The survey took place in August 2018 and involved forty-eight (48) study participants drawn from the Project Management Institute of Ghana. The data analysis is divided into four section according to the research objectives. Data from the analysis is presented in the



form of frequency tables and descriptive statistics. The discussion aspect of this chapter was supported by the reviewed literature.

#### 4.1 HEALTH AND SAFETY PRACTICES IN THE CONSTRUCTION INDUSTRY

The literature review reveal some of the requirement to ensure the effective implementation of health and safety standards by project managers. These requirements included the health and safety budget and policy compliance. The first aspect of the analysis examines some of the health and safety practices adopted by project managers in Ghana in the construction industry. The analysis revealed a number of interesting information about the health and safety practices adopted by construction firms in Ghana. Table 4.1 provides background information about construction health and safety in Ghana.

**Table 4. 1 Background information about Construction Health and Safety**

<b>Category</b>	<b>Responses</b>	<b>Freq.</b>	<b>Percent</b>
Existence of specific health and safety budget	Yes	43	89.6%
	No	5	10.4%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>
Health and safety budget as a percentage of project cost	Less than 1%	19	39.6%
	1-5%	29	60.4%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>
Policy adopted by firms	Health, safety and welfare provisions in Labour Act, 2003	29	60.4%
	Health, safety and welfare provisions in conditions of contract	15	31.3%
	Health, safety and welfare provisions in Factories, Offices and Shops Act, 1970	4	8.3%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>



Institutions accidents are reported to	Handled internally	29	60.4%
	Factories Inspectorate Unit	4	8.3%
	Department of Labour	9	18.8%
	Regulating ministry	6	12.5%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>
Registration of project sites	All project sites are registered	21	43.8%
	Most of our project sites are registered	4	8.3%
	Some project sites are registered	13	27.1%
	None of our project sites are registered	10	20.8%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>

**Source: Authors Field Survey, (2018)**

Table 4.1 shows that 89.6% of the study participant indicated they had specific budget for health and safety in their firms. Only 10.4% had no health and safety budget. What this means is that, most of the construction firms in Ghana have prioritise health and safety by dedicating portion of the project cost for health and safety. According to Cooney (2016) organisations with positive health and safety outlook allocated dedicated fund within the project cost at the corporate level and asses accident cost at the project level. In this case, the project manager, who has direct impact on safety performance, has a responsibility for safety performance within the project management.

Table 4.1 further showed that 60.4 percent of the respondents indicated health and safety budget formed between 1% and 5% of project cost, whereas 39.6 percent of the respondents stated health and safety budget constituted less than 1 percent of the total project cost. The practice of dedicating part of the project cost to health and safety ensures that health and safety management does not come at extra cost to the project. Additionally, the project manager is able to work within approved project cost. Depending on the size of the project, a budgetary allocation of about between 1 and 5 percent for health and safety is enough to ensure project are completed on time and within specifications.

The study revealed that the Health, safety and welfare provisions in Labour Act, 2003, and Health, safety and welfare provisions in conditions of contract mostly guided project managers in the discharge of health and safety responsibilities. In fact, 60.4% of the study participants indicated the Health, safety and welfare provisions in Labour Act, 2003, guided them, whereas 31.3 percent of the participants indicated the health and safety provisions in conditions of contract guided them. Only 8.3 percent of the respondents still worked with the Health, safety and welfare provisions in Factories, Offices and Shops Act, 1970. From the responses, it is clear that project managers are well abreast with the current Health and Safety regulations enacted by the parliament of Ghana to ensure employees work under satisfactory, healthy and safe conditions.

Regardless of the being guided by the Health, safety and welfare provisions in Labour Act, 2003, Table 4.1 shows that about 60.4% of the study participants indicated that accidents at the construction sites are handled internally. Additionally, 18.8% of the participants stated that, they reported accidents to the Department of Labour, 12.5% reported to the specific regulating ministry, where 8.3% reported accidents to the factories inspectorate unit. From the responses, it is clear that many accidents at the construction sites are not reported to appropriate authorities. This is contrary to the Section 6-8 of the Labour Act, 2003, which requires construction businesses to register their sites and report workplace accidents and dangerous occurrences to the Factory Inspectorate Department.

Table 4.1 further provides information about project managers who registered their project sites with the Factory Inspectorate Department. The responses indicated that 43.8% registered all their project sites, 27.1% registered some of their project sites, and 8.3% registered most of their project sites, whereas 20.8% did not register any of their project sites.

#### **4.1.1 Occurrence of Accidents at Construction Sites**

Table 4.2 shows the number of accidents recorded at various construction sites. The table also shows the extent of severity of these accidents.

**Table 4. 2: Accident Cases at Construction Sites over the past one Year**

<b>Severity of Accidents</b>	<b>Number of Cases</b>
Minor injuries requiring one day off work	32
Injuries requiring one to three days off work	17
Four or more days off work including strains, sprains, lacerations.	5
Death	0
<b>Total</b>	<b>54</b>

**Source: Authors Field Survey, (2018)**

Table 4.2 shows that a number of accident cases have been recorded over the past one at various construction sites. It is important to note that none of these accidents was fatal. Thirty-two (32) of the recorded accident cases were minor injuries, which required just one day off work, 17 of the cases were injuries, which required one to three off work. Additionally, five (5) of the accident cases were major injuries, which required four or more days off work. The findings is in line with the findings of Laryea (2010) injuries and accidents are common on construction sites.

#### **4.2 THE IMPORTANCE OF HEALTH AND SAFETY AND OTHER PROJECT PARAMETERS TO PROJECT MANAGERS**

This section of the analysis presents evidence of how project managers perceived health and safety in relation to other project parameters. In this regard, the study participants were presented with a number of project parameters. They were required to indicate, which of the project parameter was most important to them. In this regard, the study used a Relative Importance Index (RII) of the



various parameters of project management to rank which of the parameters was most critical to project managers. The study gave each parameter a scale ranging from one (1) to five (5), with 1 representing not important at all, 2 not really important, 3 sometimes important, 4 important and 5 very important. In developing the relative importance index, individual frequencies were multiplied by their corresponding values of factors under each rank of 1-5 and the sum was divided by the product of total number of respondents and 5, which is the highest figure on the five-point Likert scale. Table 4.3 shows the RII and their ranks.

**Table 4. 3 The Importance of Various Project Parameters to Project Managers**

Project Parameters	Frequency of Responses					Total	Weighting	RI	Ranking
	1	2	3	4	5				
Client satisfaction	0	0	3	0	45	48	234	0.98	1
Project time	0	0	3	3	42	48	231	0.96	2
Project cost	0	0	3	9	36	48	225	0.94	3
Project quality	0	0	5	6	37	48	224	0.93	4
Labour productivity	0	0	3	15	30	48	219	0.91	5
Project health and safety	0	3	3	7	35	48	218	0.91	6
Designer satisfaction	0	2	6	7	33	48	215	0.90	7
Public health and safety	0	2	3	15	28	48	213	0.89	8
Worker satisfaction	0	3	5	16	24	48	205	0.85	9
Environment (natural)	0	3	3	20	22	48	205	0.85	10
Contractor satisfaction	0	5	7	14	22	48	197	0.82	11

**Source: Authors Field Survey, (2018)**



The result in Table 4.3 above shows project managers considered all the project parameters to be important. All the eleven parameters presented to study participants recorded relative importance index above 0.80 with client satisfaction ranking highest with an RII of 0.98. Client satisfaction was followed by project time (RII=0.96), project cost (RII=0.94), project quality (0.93). The first four parameters project managers considered important had to do with the traditional project management. Table 4.3 further shows that labour productivity and project health and safety both obtained RII of 0.91 showing strong perceived importance to these two parameters. Designer satisfaction obtained an RII of 0.90, followed closely by public health and safety (RII-0.89). Additionally, worker satisfaction and natural environment obtained RII of 0.85 each whereas contractor satisfaction obtained RII score of 0.82. The result above shows that project managers still regarded the traditional project parameters of time, cost and quality, very important. However the most important factor considered by project managers was client satisfaction. The findings from this study is similar to the findings of the Chartered Building Professional (2016), which stated that all projects must seek to provide solutions that not only satisfy customers' requirements, but which exceed them.

#### **4.3 FREQUENCY AT WHICH PROJECT MANAGERS CONSIDER HEALTH AND SAFETY RELATIVE TO VARIOUS DESIGN ACTIVITIES**

This section of the study examines the third objective of the study. The purpose of this analysis is to examine the frequency with which project managers considered health and safety relative to design activities. In this regard, the study participants were presented with fifteen (15) situations that would require that they refer to the health and safety requirements of the contract before continuing with the project. The answers obtained are summarised in Table 4.4.

**Table 4. 4: Frequency at which project managers consider health and safety during Design and Construction Phases of Project**

Situation	Frequency of Responses								
	1	2	3	4	5	Total	Weighting	RI	Ranking
Type of structural frame	0	0	5	21	22	48	209	0.871	1
Method of fixing	0	0	2	28	18	48	208	0.867	2
Edge of materials	0	0	9	19	20	48	203	0.846	3
Details	0	4	5	19	20	48	199	0.829	4
Content of material	0	0	9	27	12	48	195	0.813	5
Finishes	0	0	8	29	11	48	195	0.813	6
Specification	0	4	9	16	19	48	194	0.808	7
Site location	0	4	5	26	13	48	192	0.800	8
Mass of materials	0		11	28	9	48	190	0.792	9
Plan layout	0	5	10	16	17	48	189	0.788	10
Position of components	0	5	13	17	13	48	182	0.758	11
Texture of materials	0	3	14	22	9	48	181	0.754	12
Design (general)	0	4	25	0	19	48	178	0.742	13
Surface area of materials	0	3	14	26	5	48	177	0.738	14
Schedule	0	5	17	21	5	48	170	0.708	15

**Source: Authors Field Survey, (2018)**

Table 4.4 presents various scenarios, which may require the project manager to consider the health and safety of a project. The study participants were presented with a range of responses to indicate the frequency at which project managers consider construction health and safety relative to various design related aspect. The range for the responses started from 1 to 5, with 1 representing not at all, 2 representing rarely, 3 represented sometimes, 4 represented frequent and 5 represented very frequent. The responses obtained were ranked using RII. The study revealed that the project managers always made reference to health and safety at various phases of the project. The first

aspect, which required constant reference to construction health and safety was the type of structural frame with an RII of 0.871. This was followed by the Method of fixing (RII=0.867) and Edge of materials (RII=0.846). Additionally, the fourth aspect that required constant reference was Details (RII=0.829) followed by Content of material (RII=0.813) and Finishes (RII=0.813). Given the important role of project specification in the overall project performance, it was not surprising that specification obtained an RII of 0.808. Health and safety was also considered frequently when considering site location for project (RII=0.8) ranking 8th. Table 4.4 shows that mass of materials (0.792), plan layout (0.788), position of components (0.758), texture of materials (0.754), Design [general] (0.742), Surface area of materials (0.738), and Schedule (0.708) ranked 9<sup>th</sup> to 15<sup>th</sup> respectively. The study shows that there is not particular pattern as to the design related activities, which attracted the attention of project managers to health and safety. All the design related activities obtained an RII above the midpoint of 0.5. It can therefore be concluded that health and safety was considered and referred to by project manager during all the design related activities.

#### **4.4 FREQUENCY AT VARIOUS PROCUREMENT RELATED SITUATIONS, WHICH AFFECT HEALTH AND SAFETY, ARE ENCOUNTERED BY PROJECT MANAGERS**

This aspect of the analysis examined how frequent project managers considered health and safety, when confronted by procurement related issues. The study used a five-point Likert scale to enquire from the study participants how frequent they referred to construction health and safety when confronted with procurement related situations. The range for the scale was from 1 to 5. 1 represented not at all, 2 represented rarely, 3 represented sometimes, 4 represented frequent and 5 represented very frequent. The answer obtained were ranked using the means and standard deviations. A mean of 2.5 and below meant that the respondents considered health and safety less frequently, whereas a mean of about 2.5 meant the respondents considered health and safety more frequently. Table 4.5 summarises the responses obtained.



**Table 4. 5 Frequency at which Project Manager encounter various procurement related situations**

	N	Min	Max	Mean	Std. Deviation
Drawings are revised	48	2.00	5.00	3.8125	.93754
Clients revise their requirements	48	2.00	5.00	3.6667	.93019
Optimum project period	48	1.00	5.00	3.6458	1.24609
Variation orders	48	2.00	5.00	3.5625	1.00861
Design is separated from construction	48	2.00	5.00	3.5625	.87291
Prequalification of contractors	48	2.00	5.00	3.5417	1.00970
Competitive tendering	48	2.00	5.00	3.3542	.83767
Design is complete when construction commences	48	1.00	5.00	2.9375	1.06003

Table 4.5 shows that all the procurement related situations obtained a mean score above 2.50. This meant that PMs referred to health and safety when confronted by all the procurement related scenarios presented to them. For instance, when drawings are revised, PMs frequently referred to construction health and safety, with a mean mark of 3.8125. Additionally, PMs referred to construction health and safety when clients revise their requirements (mean=3.667) and optimum project period (mean=3.6458). The study further established that PMs considered health and safety anytime client made variations to their orders (mean=3.5625) and design is separated from construction (mean=3.5625). Additionally, PMs referred to health and safety during the period of prequalification of contractors (mean=3.5417) and the period of competitive tendering (mean=3.3542). However, the study participant were less frequent is referring to health and safety when design is completed and construction commences (mean=2.937). It is important to note that vast majority of construction is done under contractual arrangements. The procurement methods used and the attitude of the clients towards health and safety affect project health and safety performance. It is therefore important to state that clients play important role in ensuring health



and safety of a project. After the award of a contract, contractors are expected start work within a very short time. Meanwhile, the commitment level of clients varies regarding safety standards. Very few clients place emphasis on health and safety at the beginning of the project, as they do not see project safety as an issue to concern them. However, in the course of the project, some project variations may cause the project manager to consider health and safety of the project.

#### **4.5 DISCUSSION OF RESULTS**

Given that project management in the construction industry in Ghana begins at the construction stage, the project managers' input are not regarded during the design stages of the project. The PMs only get involved when construction begins. The findings for this study was therefore not surprising as the project managers are mostly third party consultants who are brought in by client to safeguard their interest. In addition, the study participants indicated that for each project, a specific percentage of the total project cost is dedicated to health and safety. This practice is positive in promoting health and safety in the construction industry of Ghana. However, it would be preferable if the project managers will be consulted at the early stages of the project during the design and prequalification stages. The involvement of the PMs at these stages will ensure that their input on health and safety is considered during project costing and budgeting. This findings does not deviate from the findings of Kheni, Gibb, & Dainty (2008) who posited that Project Managers are often isolated from the project design stage and are only brought in during the construction phase ostensibly to help complete the project within budget, or at the required quality and on time. However, serious accidents at the construction site can derail the attainment of any of these traditional project parameters.

Additionally, Section 122 of the Labour Act 2003 enjoins the Labour Department of the Republic of Ghana to carry out regular inspection at registered construction sites. The study findings

however revealed that there are instances where some construction sites are not registered with the Ministry of Employment and Labour Relations. This situation means that, the state agency would not be able to carry out its mandate efficiently. In this regard, the project managers have to insist that construction sites are registered before or during the project. The non-registration of project sites prevents the Factory Inspectorate Department from carrying out its core mandate.

In terms of the frequency with which project managers referred to health and safety during the design activities, the findings of the study is a reflection on the reality on the ground. The design activities relative to the commencement of projects (like plan layout, design, and schedule) ranked very low because the project managers are mostly not consulted at this stage. It is when the construction work begins that project managers are contracted. For this reason, design activities at the assembly stage (like type of structural frame, method of fixing, finishes) obtained higher RII.

In general, health and safety is very important for the construction industry, but its implementation has been haphazard with no concerted effort to ensure its implementation in the industry. Even though laws (Labour Act, 2003) have been enacted to promote health and safety in Ghana, enforcement is still a problem. The health and safety component of the Labour Law for instance does little to protect the interest of the client, worker and the people who are within the vicinity of the project sites. Project managers are still pre-occupied with the desire to satisfy the client and complete project on schedule, within budget and at the desired quality. They place little emphasis on health and safety. The enactment of specific Health and Safety Act of Ghana could help bring health and safety issue onto the front burner of the Ghana construction industry.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION**

#### **5.0 INTRODUCTION**

This chapter of the study presents a summary of the entire study. It summarises the major findings of the study and draws conclusions based on the findings made. The chapter goes further to make recommendations for policy makers and researchers.

## **5.1 SUMMARY OF MAJOR FINDINGS**

Project performance measurement has moved from the traditional key performance indicators of time, cost and scope (quality) to include safe delivery of projects. Hence, the study investigated why project managers in Ghana elevates other parameters of project at the expense of health and safety. The general aim of the study was to examine the role of project managers in construction health and safety in Ghana. The study therefore sought to:

5. Health and safety practices in the construction industry in Ghana
6. Identify the importance of health and safety and other project parameters to project managers.
7. To determine the frequency at which project managers consider health and safety relative to various design activities.
8. Determine the frequency at various procurement related project managers encounter situations, which affect health and safety.

Purposive sampling technique was used to select 48 study participants from the project management institute of Ghana. Data was collected with the help of structured questionnaires.

### **5.1.1 Summary on the Health and safety practices in the construction industry in Ghana**

The study found out that most construction firms in Ghana had specific budget for health and safety for most construction projects. The study revealed that project managers have responsibility to ensure that health and safety budget is appropriated at the beginning of the project. The project manager also has direct impact on safety performance by ensuring that safety standards are adhered



to. The study revealed that depending on the nature of the contract, project managers allocated between 1% to 5% of the total project cost to health and safety. This was seen as good practice, as the promotion of health and safety standards goes a long way to reduce unbudgeted expenditure on projects. The study further established that the provisions of the Ghana Labour Act 2003 guide most project managers in Ghana. However, a section of project managers relied on the health and safety component of each contract to discharge of health and safety responsibilities. The study found out that project managers were well abreast with the current Health and Safety regulations enacted by the parliament of Ghana to ensure employees work under satisfactory, healthy and safe conditions.

However, the study revealed that a number of accident cases at the construction sites go unreported to the appropriate agencies of state. In fact, the study established that most accident cases at the construction sites are handled internally. The project managers indicated they did not report to any outside agency. This was seen as a worrying trend as employee may not be guaranteed a fair compensation in such incidents are not reported. The study revealed that, construction accident occurs frequently, as the participants indicated about 54 accidents have occurred at their construction sites over the past one year. Even though none of these cases was fatal, 32 of the recorded accident cases required victims to stay home for one day, 17 of the cases required the victims to stay home between one to three days, while 5 of the accident cases required the victims to stay home for four or more days.

#### **5.1.2 Summary on the Importance of Health and Safety and Other Project Parameters to Project Managers**

The study revealed that project managers still believe that the best way of measuring project performance is by the traditional project parameters of cost, time and quality. What stood out in



this regard was the importance attached to client satisfaction. All the project managers agreed that client satisfaction was the most important parameter to consider in project management. It is important state that client satisfaction can be achieved once these three parameters of cost, time and quality have been achieved. Nonetheless, significant number of project managers agreed that project health and safety was also an important parameter that must be considered by project managers.

### **5.1.3 Summary on the frequency at which project managers consider health and safety relative to design activities**

The findings of the study established that, project managers made reference to health and safety at various stages of the project relative to design activities. The study revealed that project managers the most important time when project managers made reference to health and safety was during the development of the structural frame. Additionally, the study revealed that PMs made reference to health and safety during method of fixing and when considering the edge of materials. The study established PMs constantly made reference to health and safety when considering project design details, content of material and finishes ( $R_{II}=0.813$ ). The study shows that there is not particular pattern as to the design related activities, which attracted the attention of project managers to health and safety. All the design related activities obtained an RII above the midpoint of 0.5.

### **5.1.4 Summary on the Frequency at Various Procurement Related Situations, Which Affect Health and Safety, Are Encountered By Project Managers**

The study showed that PMs referred to health and safety when confronted by all the procurement related situations. The reason being that, procurement activities go a very long way to determine whether a project adheres to health and safety standards or not. Contractors who purchase low quality materials may jeopardize the structural integrity of projects and compromise on the health and safety of the project. It is therefore important that health and safety standard becomes priority

during procurement of inputs for each project. The study established that PMs frequently referred to construction health and safety when drawings were revised and when clients revise their requirements. The study further revealed that PMs considered health and safety anytime client made variations to their orders.

## **5.2 CONCLUSION**

This research has made a number of interesting findings regarding each of the study objectives. In fact, PMs have the ultimate responsibility to ensure that their clients are not short-changed by the contractor. They also have the responsibility of promoting high health and safety standard at the construction sites to safeguard the workers from any accident and insulate the client from court cases and insurance claims that may arise from construction sites accidents. In terms of the first objective, the study concluded that PMs have prioritise health and safety by integrating safety standards in every project. For instance, PMs have now added health and safety expenditure unto the project cost by allocation up to about 5% of the total project cost to health and safety.

Regardless of the seeming prioritisation of health and safety, project managers believe that the ultimate goal for every project is client satisfaction. The study therefore concluded that the traditional project parameters of cost, time, and quality still guides the actions of project managers. Health and safety is considered important all right. but trails these three traditional parameters. With time PMs may realise it is not just good enough to finish project on time, at the stated quality and efficient cost but without any loss of life or limb.

Nonetheless, the study concluded that during design activities and procurement related situations, project managers first ensure that that they will not compromise on the project health and safety by ensuring that safety standards are duly considered.

### 5.3 RECOMMENDATIONS

Based on the findings made the study made the following recommendations:

1. **Enactment of the Health and Safety Act of Ghana:** The study recommends the need for separate health and safety Act for the republic of Ghana. The current situation where health and safety is just a component of the labour law makes it too general and workers are not adequately protected. It is in the interest of client, contractors and workers to have a law that comprehensively addresses this all important aspect of construction project.
2. **Enforcement of Section 122 of the Labour Act 2003:** The Labour Act 2003 enjoins contractors to register all their project sites with the factory inspectorate department of the Ministry of Labour. However, construction firms did not adhere to this important provision. What is even more worrying is that, nothing has been done over the years to ensure enforcement of this important provision. The Factory inspectorate department must be well resourced with vehicles and personnel to carry out this important mandate.
3. **Reporting of Construction Sites Accidents:** The findings of the study regarding how workplace accident are handled was also worrying. The current situation of handling accidents internally within the organisation cannot guarantee adequate compensation will be paid to the victims. The government and the appropriate state agencies must surcharge any construction firm that refuses to report accident at the sites. This will ensure strict compliance to the law.



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## QUESTIONNAIRES

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

PROJECT MANAGEMENT

TOPIC: THE ROLE OF PROJECT MANAGERS IN CONSTRUCTION HEALTH AND  
SAFETY

### SECTION A: PROFILE OF CONSTRUCTION FIRMS

BACKGROUND INFORMATION	RESPONSE
1. Duration of business	a) Less than 1 year [ ] b) 1-5 years [ ] c) 6-10 years [ ] d) 11-15 years [ ] e) 16-20 years [ ]
2. What is your position in the company?	a) Project Manager [ ] b) Health and Safety Officer [ ] c) Other (specify).....
3. What is the number of full time workers in your firm?	a) 1-50 workers [ ] b) 51-100 workers [ ] c) 101-150 workers [ ] d) 151-200 workers [ ] e) > 200 workers [ ]
4. What is your annual turn over?	a) Less than \$100,000 [ ] b) \$100,000-\$500,000 [ ] c) \$500,001-\$1,000,000 [ ] d) More than \$1,000,000 [ ]
5. Which association do you belong?	a) No Association [ ] b) Association of Road Contractors of Ghana (ASROC) [ ] c) Association of Building and Civil Engineering Contractors of Ghana (ABCECG). [ ] d) Other (specify).....
6. Type of construction work	a) Civil engineering works [ ] b) Building construction [ ] c) Other (specify).....

## SECTION B: HEALTH AND SAFETY PRACTICES BY CONSTRUCTION FIRMS

QUESTION	RESPONSE										
7. Does your firm have a specific health and safety budget?	a) Yes [ ] b) No [ ]										
8. Please state the budget amount in the year 2017	.....										
9. Which of the following H&S standards does your firm comply with?	a) Health, safety and welfare provisions in Labour Act, 2003 [ ] b) Health, safety and welfare provisions in Factories, Offices and Shops Act, 1970 [ ] c) Health, safety and welfare provisions in Workmen's Compensation Law, 1987 [ ] d) Health, safety and welfare provisions in conditions of contract [ ] e) Other (specify)..... .....										
10. If a serious accident happens on your site which institutions will you report to?	a) We do not report to any one [ ] b) Factories Inspectorate Unit [ ] c) Department of Labour [ ] d) Regulating ministry [ ] e) Other (specify).....										
11. How many accidents cases have been recorded in the past one year?	<table border="1"> <thead> <tr> <th>Severity of injury</th><th>Frequency</th></tr> </thead> <tbody> <tr> <td>Minor injuries requiring one day off work</td><td></td></tr> <tr> <td>Injuries requiring one to three days off work</td><td></td></tr> <tr> <td>Four or more days off work including strains, sprains, lacerations etc resulting in four or more days off work</td><td></td></tr> <tr> <td>Death</td><td></td></tr> </tbody> </table>	Severity of injury	Frequency	Minor injuries requiring one day off work		Injuries requiring one to three days off work		Four or more days off work including strains, sprains, lacerations etc resulting in four or more days off work		Death	
Severity of injury	Frequency										
Minor injuries requiring one day off work											
Injuries requiring one to three days off work											
Four or more days off work including strains, sprains, lacerations etc resulting in four or more days off work											
Death											
12. Please indicate the extent to which your company registers its construction sites with the Factories Inspectorate Department?	a) All project sites are registered [ ] b) Most of our project sites are registered [ ] c) Some project sites are registered [ ] d) None of our project sites are registered [ ]										

**13. Please indicate the extent to which you agree with each of the following statements regarding the processes your firm uses to manage health and safety at construction sites by using the table below.**

1	2	3	4	5
<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Not sure</b>	<b>Agree</b>	<b>Strongly Agree</b>

<b>Company Environment</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Formal health and safety policy					
Using outside health and safety consultants					
Procedures for investigating accidents					
Procedures for reporting accidents					
Provision of drinking water on site					
Provision of canteen service on site					
Provision of first aid box					
Designated safety person					
Provision of cloak and toilet facilities on site					
Provision of personal protective equipment					
<b>Worker Consultation And Participation</b>					
Our workers participate in hazard identification on sites					
We reward workers who demonstrate exemplary safe behaviour on site					
We consult trade union representatives on health and safety matters					
We ask workers for their ideas on health and safety matters					
<b>Communication</b>					
Using health and safety posters					
Discussing health and safety during site meetings					
Verbal communication with operatives during site tours					
Networking with other companies/institutions					
Communicating health and safety performance to employees					
<b>Health and safety planning</b>					



Disciplinary measures to correct wrong behaviours relating to health and safety					
Document method statements					
Document risk assessments					
Ensuring adequate welfare provisions on site					
Identification of hazards on sites before work commences					
Insurance cover for sites					
Pricing health and safety in preliminaries					
We obtain a labour certificate for every contract					
<b>Education and training</b>					
Site inductions for operatives					
Planned health and safety training for supervisors and/or senior management					
Toolbox talks					
Planned health and safety training of operatives - first aid, manual lifting etc					
Site inductions for operatives					
<b>Monitoring and review</b>					
Setting health and safety performance targets					
Carrying out site inspections					

### SECTION C: FREQUENCY AT WHICH PROJECT MANAGERS CONSIDER HEALTH AND SAFETY DURING THE DESIGN AND CONSTRUCTION PHASES OF PROJECTS

Please indicate the frequency at which the project manager consider health and safety during the design and construction phases of projects using the key below.

1	2	3	4	5
Not at all	Rarely	Sometimes	Frequent	Very frequent

Situation	1	2	3	4	5
14. Content of material					
15. Design (general)					
16. Details					
17. Edge of materials					
18. Finishes					

19. Mass of materials					
20. Method of fixing					
21. Plan layout					
22. Position of components					
23. Schedule					
24. Site location					
25. Specification					
26. Surface area of materials					
27. Texture of materials					
28. Type of structural frame					

#### **SECTION D: FREQUENCY AT WHICH VARIOUS PROCUREMENT RELATED**

#### **SITUATIONS AFFECT HEALTH AND SAFETY ARE ENCOUNTERED BY PROJECT MANAGERS**

Please indicate the frequency at which the project manager encounter procurement related challenges.

1	2	3	4	5
Not at all	Rarely	Sometimes	Frequent	Very frequent

<b>Situation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Clients revise their requirements					
Competitive tendering					
Design is complete when construction commences					
Design is separated form construction					
Drawings are revised					
Optimum project period					
Prequalification of contractors					
Variation orders					