EVALUATION OF HEALTH AND SAFETY PERFORMANCE OF SUBCONTRACTORS IN CONSTRUCTION PROJECTS

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By

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A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Construction Economics and Management of the Ardhi University

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CERTIFICATION

The undersigned certifies that she has read and hereby recommences for acceptance by the Ardhi University the dissertation entitled: "**Evaluation of Health and Safety Performance of Subcontractors in Construction Projects"**, in partial fulfilment of the requirements of the degree of Master of Science (Construction Economics and Management) of the Ardhi University

.....

Dr. Sarah Phoya

(Supervisor)

Date…….……..

DECLARATION AND COPYRIGHT

I, Herman D.K. Rugaravu, declare that the contents of this report are the results of my own study and findings, and to the best of my knowledge; they have not been presented elsewhere for a Diploma, Degree or any professional award in any Institution of Higher Learning.

HERMAN D.K. Rugaravu

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DEDICATION

To my loving late father, Deogratias Katatwire for their remembrance; to my mother Elice Rutebuka and to my wife whose constantly dedication and love enlightened me. To my beloved three daughters and the only son who kept praying for my success.

ABSTRACT

Health and safety in construction industry is still a challenge. Generally, efforts to improve health and safety performance in the construction industry focused more on the main contractor, with little attention to subcontractors. While subcontractors dominate the construction industry, little is known regarding on how they influence health and safety performance in construction sites. This study therefore aims to evaluate health and safety performance of subcontractors in construction projects. In achieving this objective, the study adopted mixed method whereby both qualitative and quantitative information were obtained. The study used questionnaire survey whereby 33 subcontractors were selected purposively in the category of electrical, plumbing and air condition. In addition, three subcontractors were selected for the interview, based on their experience, and level of education.

Findings from this study reveal that, proper budget allocated into each work package, stakeholders health and safety responsibilities, safety communication, and enforcement of safety law and regulations are the factors that influence safety performance of subcontractors. The study further revealed that, lack of safety committee, failure to employ safety officer, lack of safety communication between subcontractors and main contractor, and inadequate personal protective equipment are the challenges facing subcontractors to implement safety. Furthermore, employing safety officer, close supervision and top management commitment on safety related issues, enforcement of safety law and regulation are the strategies to improve safety performance. The study concluded that, effective selection and monitoring of subcontractors' activities and effective safety training is the best way to improve safety performance. The study recommends that the Government ought to enforce health and safety law, and regulation at construction sites in order to improve safety performance.

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LIST OF ABBREVIATIONS

AQRB	-	ty Surveyor Registration Board
BLS	-	Bureau of Labour Statistics
CII	-	Construction Industry Institute
CRB	-	Contractors Registration Board
EALRA	-	Employment and Labour Relations Act
EASHW	-	European Agency for Safety and Health at Work
ERB	-	Engineers Registration Board
GDP	-	Gross Domestic Product
HSE	-	The Health and Safety Executive
ILO	-	International Labour Organization
MS	-	Mean Scores
OSH	-	Occupational Safety and Health
OSHA	-	Occupational Safety and Health Agency
PPE	-	Personal Protective Equipment
PPRA	-	Public Procurement Regulatory Authority
RII	-	Relative Importance Indices

SMEs	-	Small Medium Enterprises
SPSS	-	Statistical Package for Social Science
TNBS	-	Tanzania National Bureau of Statistics
UK	-	United Kingdom
USDL	-	United States Department of Labor

CHAPTE ONE

INTRODUCTION

1.1 Background Information

Construction industry is an important sector of the economy whose input is required for economic advancement in many countries and is often seen as a driver of economic growth especially in developed countries (Takim, 2005). As stated by Olawale (2010) on his research on cost and time control practice of construction projects in the UK, construction industries contribute to the gross domestic product (GDP), provide employments, and considered as an investment that benefit the country in future.

In Tanzania, construction industry is one of the main economic driving sectors, supporting the Tanzanian economy. It contributed 12.5 per cent to its GDP during 2014 with USD 6bn, while in 2008 the sector accounted for 8.8 per cent of the country's GDP or 1.9bn. Construction activities including construction of residential and non-residential buildings; roads and bridges; and other civil works grew by 8.8 per cent in the first quarter of 2015 compared to 21.4 percentages in the corresponding quarter of 2014. The growth rate of Tanzania construction sector was 17.6 per cent in third quarter of 2015. According to the Tanzania National Bureau of Statistics (TNBS, 2015), the growth was attributed to the ongoing construction of roads, residential and non-residential buildings.

However, the construction industry is recognized to be the most hazardous industry with health and safety risks of working at height, working underground, working in confined spaces, handling load manually, handling hazardous substances, noises, dusts, using plant and equipment, fire, exposure to live cables, poor housekeeping and ergonomics (Muiruri and Mulinge, 2014).

In an urban context, health and safety accidents are relatively higher because high-rise buildings remain predominant with the fast growing complexities of domain wide construction projects to cope with modernizing cities arena and high demand for housing, offices, services and other infrastructures due to the high urbanization (Phoya, 2012).

Generally, the efforts to improve health and safety performance on construction sites have been focused on the main contractor (Ozmec et al., 2014); this is because health and safety programs are prepared by the main contractor. However, the construction industry is dominated by the subcontractors (Sunindijo, 2015), and that, the ability of the main contractors and consultants to deliver the project within time, quality, and cost target depends largely on the performance of subcontractors (Mbachu, 2007).

Shaw (1998) on his studies commented that, subcontractors are faced with specific health and safety challenge, many firms lack adequate resources and were often struggling to survive. Similarly, Poon (1998) noted that, the major cause of

accident on construction sites was that, subcontractors are rewarded according to the work done. They were working under tremendous time constraint, which cause high probability of construction accidents, and that, they have no informal safety arrangements on health and safety. As a result, hazards are not considered seriously, they are a consequence of construction. Furthermore, Wong and So (2000) on his studies found that, subcontractors would rarely employ safety professional and they had no interest in safety matter because most of them believe that safety should be the responsibility of the main contractors, who would usually be responsible for workers compensation and penalized for safety offenses. Thus, it is clear that selection of subcontractors based on overall ability to perform on health and safety related issues is crucial to the success of a project delivery.

In Tanzania, especially in Dar es Salaam City where construction activities are almost in every corner, the construction activities need to be regulated, and evaluate health and safety performance of subcontractors in order to improve the performance of construction specialist (subcontractors) as a way of reducing accidents on construction projects.

The study conducted by Contractors Registration Board (CRB) and Occupational Safety and Health Administration (OSHA) in 2001 found that many accidents remain unreported, and noted 3 fatal accidents and 147 injuries in 63 construction sites.

Practically, a safe working environment reduces high accident rate, raises firms' image, increases the morale of the supervisors and employees, increases efficiency, improves marketability, and improves productivity in the construction industry (Levitt and Samelson, 1995);. as a result, business performance is accelerated. Thus, one can hope that improving construction workers safety should continue to be a major goal in the construction industry and that, further improvements will continue to reduce the numbers of fatalities and serious injuries in the industry.

1.2 Statement of the Problem

The construction industry is one of the industries that are typically dominated by subcontractors. Despite their substantial contribution to the construction industry on executing significant portion of construction works, there are significant numbers of accidents happening to their works as compared to main contractors (Phoya, 2012). While the main contractor prepares and maintains safety program for subcontractors, there is little evidence showing how subcontractors are fitting into the main contractor's safety performance.

This study therefore looks at health and safety issues of subcontractors in construction projects, and how their performance could be improved.

1.3 Objectives of the Study

The main objective of this study is to evaluate health and safety performance of subcontractors in construction projects.

1.3.1 Specific Objectives

The specific objectives of this study are:

i) To analyse factors influencing health and safety performance of subcontractors in construction site.

ii) To examine the challenges facing subcontractors on health and safety performance in construction site.

iii) To propose strategies to improve health and safety performance of subcontractors in construction site

1.3.2 Research Questions

In order to meet the objectives of this study, the following research questions guided the study:

i) What are the factors that influence safety performance of subcontractors in construction site?

ii) What are the challenges facing subcontractors on health and safety performance in construction site?

iii) How health and safety performance of subcontractors in construction site can be improved?

1.4 Significance of the Study

The findings from this research would help to add knowledge on health and safety performance of subcontractors in construction sites in the following aspects:

- Effective health and safety performance reduces subcontractor's accident rates, compensation costs, enhance productivity and efficiency in project execution, increase subcontractor's competitive advantage in the market by providing better value to the client, and accelerate business performance.
- In addition, the study will assist to know that subcontractors can significantly use a well performed health and safety record to aid tendering, and win more contract, hence keeping the company in operation at all times.
- Furthermore, this study will be a basis of policy formulation on implementation of health and safety of subcontractors on construction sites in Tanzania.

1.5 Scope and Limitation of the Study

This study focuses only on health and safety performance of subcontractors in construction sites. Additional factors to measure performance of a project to recognize if a project is successful or not, such as stakeholder's satisfaction, transfer of technology, environmental performance, and other requirement challenging construction performance was not included. Due to time and financial limit, the study focuses on building projects based in Dar es Salaam region, which is the commercial capital of Tanzania with the highest level of construction activities.

1.6 Structure of Research

The study is organized into five chapters. Chapter one is introductory part of the research. It includes background of the study, statement of the problem, objective of the study, research questions, and significance of the study, scope and limitation of the study, and dissertation structure.

Chapter two discusses literature review on the subject of health and safety performance of subcontractors in construction sites. Chapter three is on research methodology that were used to collect required information to achieve the objective of researchwhile Chapter four is data interpretation, discussion and presentation of the findings from the respondents. Lastly, Chapter five consists of conclusion and recommendations.

1.7 Chapter Summary

The chapter has discussed the background of the study, problem statement and justification of the research. It also discussed the objectives together with their research questions, significance, scope and limitation of the study as well as the structure of research and a summary of the chapter. Next chapter will contain relevant literatures reviewed.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature reviewed in this study. It covers construction industry's health and safety history, basic concept of subcontracting, types of subcontractors, importance of subcontractors on construction sites and safety performance of subcontractors. In addition, it includes factors influencing safety performance of subcontractors, safety performance indicators, health and safety responsibility of the main contractor and subcontractors, challenges facing subcontractors to improve health and safety, strategies for improving health and safety in construction sites, and conceptual framework.

2.2 The Construction Industry's Health and Safety History

In the middle ages, more awareness of the link between the work that people did and the types of injuries and illnesses, which they suffered were recognized. During this period, the first unions began to organize to try to protect workers from the hazards of the workplace. The only improvement in the 1800s was fire protection because of pressure from insurance companies (Reese, 2003).

According to Reese (2003), during the first part of the 1900s, worker's compensation laws started appearing and finally the constitution was enacted by the Supreme Court in 1916. Prior to this, most employers passed the blame and

responsibility to their workers for workplace incidents using what called "the common laws" which stated that:

- The employer was not responsible when a fellow worker caused your injury due to negligence.
- The employer was not responsible if the worker was injured, due to his/her own negligence.
- If an employee took a job and knew that it was risky, or knew of the inherent hazards of the work prior to taking the job and was injured, the employer was not responsible.

It was during this time that mining catastrophes continued to occur and more laws passed to protect miners. When 2,000 workers or 50 percent of the work force died from silica exposure at Gauley Bridge, West Virginia, the Walsh-Healey, act that required safety and health measures for any employer receiving a government contract passed, and some companies began to understand their moral responsibility, (Reese, 2003).

When management found itself in the problem, by legislation, of having to pay for injuries on the job, it decided that it would be financially better to stop the injuries from happening (Petersen, 1971). This decision by the industry all over the world gave birth to the organized industrial safety movement. Management concentrated heavily on correcting the hazardous physical conditions that exist in the work place in the early years of the safety movement. This showed a significant decline in the death rate (Petersen, 1971).

Recently, safety standards and regulations have been published by international and national organizations and accepted by the construction industry. Among these are the Occupational Safety and Health Administration (OSHA) standards for the construction industry, the US Department of Energy safety regulations, and US Army Corps of Engineers safety and health requirement manual, (Kartam, et al, 2000).

In Tanzania, health and safety framework came into effect in 2003. The Government, in its efforts to promote health and safety in construction sites, has established regulatory bodies. This includes Engineers Registration Board (ERB), Contractors Registration Board (CRB), and the Architects and Quantity Surveyors Registration Board (AQRB) under the Act of Parliament in 1997 to ensure Engineers, Contractors, Architects and Quantity Surveyors comply with health and safety when performing their duties (Mwombeki, 2006).

2.3 Importance of Health and Safety on Construction Sites

Accidents on construction sites are considered as major problems throughout the world. The number of injuries and death is still high (EASHW, 2004). According to the US Bureau of Labour of Statistic (BLS, 2010), average of US industries is five death per 100,000 employees. Construction averages 15.3 deaths per 100,000 employees. This is over three times the amount of fatalities than all industries. In addition, ILO (2005) estimates show that each year there are at least 60,000 fatal accidents on construction sites around the world. Accordingly, one in every six

fatal accidents at work occurs on construction sites, and in industrialized countries, as many as 25% to 40% of work related deaths occurs in construction sites, even though the sector employs only 6% to 10% of the workforce.

In developed countries, they have demonstrated commitment in reduction of injuries and fatalities. This is because, they have incorporated health and safety as integral in the regulation framework (Kheni et al., 2008), and a contractor health and safety performance record is considered as one of the items that qualify the contractor for bid.

In developing countries like Tanzania, the culture of construction industry does not promote health and safety, safety is not a priority, and employment of safety measures during construction is considered a burden (Kadir et al., 2005). Furthermore, the practices of competitive tendering and award of most public contracts to the lowest evaluated bidder is not based on safety compliance in many developing countries(Muiruri and Mulinge 2014). This compels contractors to drive their prices low while cutting costs in which in turn affects health and safety.

However, safety is humanitarian concern, economic considerations, legal considerations, and company image (Bu-Khamsini 1999). Actually, good health and safety on construction sites satisfy the client through the production of good quality works, works completed within allowable cost and time limitation, and create good working environment for the workers. Levitt and Samelson, (1995) on

his study establish other benefits, which include less compensation insurance, improved supervisor morale, increased efficiency, and improved marketability. In the same way, Promfret, (1997) noted that, good health and safety lead to fewer injuries, less property damage, enhance industrial relations, increased productivity, and enhanced quality.

2.4 The Basic Concept of Subcontracting in the Construction Industry

A main contractor may engage another person, in this case, the subcontractor to undertake a specific part of the main contractor's works. Subcontracting therefore, is the practice of assigning part of the obligations and tasks under a contract to another party known as subcontractor. In this practice, the main contractor continues to have overall responsibility for project completion and execution within its stipulated parameters and deadlines (Turner, 1994).

A subcontractor undertakes a specific part of the work due to the complexity and specialized nature of construction project (Arditi and Ranon, 2005). This is either because, the main contractor lack expertise in a specific area and hence requires additional specialist advice or expertise or because the subcontractor holds certain patent and required by the law to appoint them (Chamara et al., 2015).

According to Partner (2010) the first edition of the Standard Method of Measurement (SMM) issued in 1922 by the Royal Institute of Charted Surveyors

(RICS), superseding a Scottish Standard Method of Measurement (SSMM), which was, published in 1915, contained 16 different subcontract works. In the seventh edition (SMM 7), which was first published in 1988, and revised in 1998, it referred to in excess of 300 separate specialist works. There is therefore a wide variety of specialist subcontractors operating within the construction industry.

The other reason for the use of subcontractors is the increased flexibility afforded to main contractors who may expand or reduce their construction capabilities depending upon their workload (Hinze and Tracy, 1994). The main contractor need to manage, control, responsible for time, quality (Ofori and Debrah, 1998), select appropriate subcontractors, and pay the subcontractor in accordance with the contract between the main contractor and subcontractor (Chamara et al., 2015).

2.5 Types of Subcontractors

Villacreses (1994) classifies types of subcontractors depending on the types of services they provide which include:

- Subcontractors of basic activities: that offer general trade services such concreting, masonry painting and others,
- Subcontractors of technical specialties: that undertake specialist activities such as electric, plumbing, air conditioning, among others
- Labour only subcontracting specialists: those hired because of their specialized labour resources only. They provide skilled labour for painting,

floors, windows, glasses, foundations, and cleaning among the most important

According to the contractual point of view, subcontractors are categorized as domestic and nominated subcontractors. In United Kingdom building industry contract law, particularly when using Joint Contract Tribunal (JCT) standard form of contracts, three subcontractor or types are identified as follows:

2.5.1 Domestic Subcontractor.

According to Fong (2004), the main contractors possess over a part of the work and subletting to another contractor while remaining directly related to the employer and responsible for contract between the main contractor and the client. This is called domestic subcontracting. A domestic subcontractor is one whose selection and appointment, the employer normally plays no part, other than simply giving consent where this is required under the main contract (John and Hughes, 2000). Accordingly, a major practical problem in relation to subcontracts is the way in which the main and subcontract fit together.

With domestic subcontractor, the main contractor has the freedom of choice over which subcontractors to employ and the term on which they are employed (Cheesema, 2004). Moreover, as noted by Mordoch and Hughes (1996), employer use nomination to have a better control over cost, because of the opportunity to get the lower competitive prices in the market is higher. Accordingly, they found that,

the employer may have plenty of time to achieve value for money by searching for offer that satisfy his balancing requirement between prices and quality, and negotiate the shortest duration of executing the work with the potential subcontractor.

Furthermore, domestic subcontractor is that a main contractor selects and appoints the subcontractor to perform work for which he, the contractor has tendered as part of the main contract (Turner, 1990). Thus, domestic subcontractors are the result either of individual negotiation or commonly, of imposition by one side or the other (John and Hughes, 2000).

2.5.2 Nominated Subcontractor

According to Rawling (2001), the system of nominating subcontracting in the construction industry is common and widespread and it seems to have a number of advantages for the employer. For that reason, it enables the employer to select a subcontractor to the contractor to carry out certain work, particularly specialist works such as mechanical and electrical installation works. Besides, the employer may obtain the most competitive price for the execution of the work.

In subcontracting, the contractor has no option about whether to subcontract and little option about whom to subcontract, as the architect's nomination will usually have to be accepted (Fong, 2004). Accordingly, the nomination indicated by a prime cost sum that has been inserted in the tender document, as ordered by the

Architect to be employed by the contractor to execute work or supply materials or services under provisional sum. This situation is named as nominated subcontracting (Fong, 2004).

In this approach, it allows the employer or his professional team full involvement in the early selection of the individual company, using the subcontractor's expertise (Robinson et al., 2004). Thus, nomination is the practice by which an employer, through the contract administrator, selects a person who then enters into sub-contracts with the main contractor (John and Hughes, 2000).

Furthermore, according to Loots and Charrett (2009), the main contractor is permitted to make profit from the use of nominated subcontractor on site, but must provide "attendance" usually the provision of water, power for the work, restroom and other service to enable the nominated subcontractor to do his job.

2.5.3 Named Subcontractor.

According to the study conducted by Rawling (2001), named subcontracting introduced by Swire Properties Limited into its contract in the late 1980s to replace traditional nominated subcontracting (Rawling, 2001).

Accordingly, they state that, named subcontracting requires tender documents to include names of would be potential subcontractors to be furnished at the main contract tender stage by the consultants, for the main contractor to issue tender

enquiries and for him to select the proposed named subcontractor. Furthermore, they found that, after the award of subcontract, the named subcontractor is treated like any other domestic subcontractor and the employer or architect has no obligation to re-nominate.

2.6 The Importance of Subcontractors on Construction Sites

In the construction industry, subcontractors execute significant portion of the construction work and their effect on industry are apparent in different activities of construction (Enshassi et al., 2008). For example, in building construction projects, it is common that subcontractors put theirinput ranging from 60% to 95% of the project value in different country and in different circumstance (Lehton, 1998; Maturana et al., 2007; Ohnuma et al., 2000).

However, Chiang, (2009) said that technology requirements in civil engineering construction are less demanding than building construction. Consequently, a civil engineering or infrastructure contractor could not subcontract out as much as a building contractor, given the usual technologically complex nature of civil engineering works. On highways or other infrastructure projects, the portion subcontracted is generally less but a significant amount of the work performed under subcontract agreements (Hinze, 1997). According to Scotney (2000), in civil engineering works, around 20% to 30% of the project value subcontracted out. Bennette and Douglas (1990) concluded that, the right to choose specialist

contractor provide a great certain that the specialist work carried out by a competent contractor.

2.7 Safety Performance of Subcontractors

Sohail (1994) conducted the study and found that, the main contractors has a legal responsibility to plan, manage, and control construction phase and coordinate health and safety related issues. The main contractor is responsible for their employees, subcontractors and their employees, and others who may visit the site (Hallowell and Gambatese, 2009). In addition, according to Tam and Fung (1998) the main contractor must ensure all practicable steps is taken so that no known hazards harms people in vicinity or those lawful at work.

Subcontractors must take all necessary precautions for the health and safety of its employees (Hallowell and Gambatese, 2009), and comply with applicable law and any other requirements established by the main contractor and its client, especially when client has a specific safety plan or requirement for specific training (Tam and Fung, 1998).

It is important that, all contractors (main/subcontractors) on the construction site uniformly and consistently emphasize safety, and ensure policies and procedures enforced across the site (Enshassi et al., 2008)

The subcontractors should implement a site safety plan, provide an appropriate personnel protective equipment, this will minimize risk related to subcontractor's works (Hallowell and Gambatese, 2009).

2.7.1 Factors Influencing Safety Performance of Subcontractors

The study conducted by Hinze and Gambatese (2003) noted that, specialist contractor's safety performance is influenced by number of factors which include: minimizing workers turnover, implementing employee drug test with various factors initiating the tasting, conducting training of subcontractor, and safety incentives to be employed with cautions.

According to Hinze and Talley (1988), on large projects, subcontractor's safety performance are influenced by the scheduling and coordinating effect of the main contractors and the degree of emphasis placed on safety by the main contractor. Accordingly, they state that, better safety performance of subcontractors were noted when the main contractors provide a full time project safety personnel, discussed safety at meeting and pre job meeting, monitor project safety performance, insist on compliance with safety regulation, and top management involvement in project safety. Accordingly, they found that, on medium sized projects, safety performance of the subcontractor was influenced by keeping projects pressure under control and providing effective project coordination.

2.7.2 Safety Performance Indicators

Construction safety is always a significant concern for both practitioners and researchers (Cigularov et al, 2010). It aims to provide feedback for proactive safety management and form the basis for continuous improvement (Mark, 2014). In order to manage health and safety performance on construction site, a composite performance evaluation system consisting of measurable and achievable indicators in many facets of safety management is required (Chang JI, and Liang C-L (2009).

According to Jones et al., (1999), safety performance indicators are divided into two types, namely passive indicators and active indicators.

2.7.3 Passive Indicators

Construction Industry Institute (CII) (2012) in their study they revealed passive indictors refer to both before the accident and after the accident indicators.

Before the accident, indictors include those strategies that implemented before the construction begins to set the project success. Example of such indicators are safety manual, safety readership, training programs for foremen, subcontractors participation in the main contractors' safety orientation and training, written safety plan, safety behaviour, reward and recognition, safety goal development and communication, and job hazards analysis.

After the accident indicators refer to historical parameters such as near miss rate, accident rate, and number of lost days (Toellner, 2001).

2.7.4 Active Indicators

These are strategies made during construction phase to indicate health and safety of the project. The active indicator prompts you to take corrective action when one is actually executing the project. Active indicator can alert management about the need of positive response before an injury occurs. Examples of such indicators are site safety inspection, safety site audits, and implementation of effective action plan, and toolbox meeting (CII, 2012).

2.8 Health and Safety Responsibilities of Employer, Contractors, Subcontractors, and Regulatory Agencies

2.8.1 Health and Safety Responsibilities of Employer

Clients have a big influence over how work executed on construction sites. The employers must assess the working environment his employees will operate in when determining the appropriate PPE to worn. Ringen et al, (1995) found that, the employer is responsible for ensuring any hazards related to work are controlled, coordinating health and safety activities on a construction site, team communicate and cooperate, suitable management arrangement are in place. Lingard and Rowlinson (2005) shows that, the employer is to ensure that adequate welfare facilities are on site, health and safety plan is in place, maintain the health and safety file, and protecting the public.

Furthermore, Huang (2003) noted that, the owner could achieve a better project health and safety performance by setting objectives, selecting safety contractor's

records, and participating in safety management during construction. Therefore, the owner can take measures to achieve better safety performance by providing health and safety guidelines that contractors must follow.

2.8.2 Health and Safety Responsibilities of Main Contractor

The main contractor is responsible for preparation of workplace safety programming, must establish and provide for a workplace free of recognized hazards that have the potential to cause serious injury to workers or other individuals at the construction site.

According to Nelson & Associates (2010), the main contractor's role and primary responsibility on health and safety is to establish, coordinate, monitor, and generally manage the overall health and safety program for all persons at construction sites.

Main contractor must tell the subcontractors about hazards caused by the work they are doing, site specific hazards, any changes, including the number of workers, new equipment, safety procedures for the people who may be affected by the work, including the public, plant to be used, and necessary safety equipment (Teo et al., 2006).

Levitt and Samelson (1993) stated that, main contractor must ensure that construction workers are following established policies and safety regulations,

helping to create safer construction sites, and check that all subcontractors or their employees are not harmed while undertaking any work they are required to complete, and are conforming by providing PPE for all their employees free of charge.

Sousa and Teixeira (2004) conducted studies and noted that, the main contractor must plan the work, manage and monitor construction phase and coordinate all matters relating to health safety during construction to ensure that, so far as reasonable construction work is carried out without risks to health or safety.

Similarly, Lingard and Rowlinson (2005) found that, the main contractor must ensure subcontractors are trained to do the work and provided with competent supervisor; ensure subcontractor's requirements are fulfilled by monitoring and evaluation of health and safety performance.

In addition, according to Smallwood (1998), the main contractor should train workers, promote safety culture, educate them on how to avoid risks, prepare regular safe meeting, ensure coordination of health and safety activities on construction site, inform the employer and workers of hazard related activities, and punish workers who make safety violation.

2.8.3 Health and Safety Responsibilities of Subcontractor

Subcontractor should recognize and agree that, safety is of paramount importance in performing any work regardless of whether the work is low risk work, medium risk work or high-risk work.

Specialty sub-contractors should actively participate in the development of the overall project safety program established during pre-job safety planning sessions conducted by the main contractor, so that hazards specific to their trade are addressed.

According to Nelson & Associates (2010), subcontractors have the responsibility to adhere to safety program prepared by the main contractors, establish and implement their own safety program, communicate with main contractors on safety issues as they arise, and coordinate their activities with the main contractor and other subcontractors for the safety of all workers.

Kumaraswamy and Matthews (2000) found that, subcontractor is responsible to perform all work safely, compliance with any additional safety standard, procedure, rules or requirement set forth in the contract with main contractor, be trained to undertake the work require and be adequately supervised, be aware with hazards, and control implementation.

In addition, El-nagar et al (2015) commented that, subcontractor is responsible for reporting accidents/incidents and near misses in the required time, use correct personnel protective equipment (PPE) safely and in the approved manner. Furthermore, Hinze and Gambatese (1996) conclude that, subcontractor must be familiar with the emergency plan and if in doubt or unsure to stop the work and ask.

2.8.4 Health and Safety Responsibilities Regulatory Agencies

In Tanzania, from the ministries and department, there are several regulation governing health and safety in the construction sector. These regulations includes the Occupational Health and Safety (OHS) Act, 2003, the Contractors Registration Board (CRB) Act, 2010, the Employer and Labour Relation Act, (ELRA) 2004, and the Workers Compensation Act, 2008, these regulation requires all the employers to assess health and safety risks of workers and any other person who may be affected by their undertaking (Phoya, 2012).

Thus, the Government and Regulatory agencies often enact regulations to ensure that a construction project is safe to build, safe to use, and safe to maintain and delivers you good value. Good health and safety planning also helps to ensure that, a project managed well, and that unexpected costs and problems is minimized.

2.8.5 Health and Safety Responsibilities of Employees

Employees is responsible to wear the PPE appropriately, take care of equipment and report any defects, and that if they do not wear or misuse any PPE that has been issued, this could lead to disciplinary action (Chan and Tan, 2004).

According to Sousa and Texeire (2004), the employees must undergo orientation plan and familiarize themselves with, and comply with all applicable requirement of safety and health program, and report unsafe conditions and practice to their immediate supervisors and take corrective action to eliminate such hazard. Furthermore, Hinze (2006) noted that, the employees must not operate equipment unless they are authorized and trained to do so, all safety gear are in place and functional, no person will be endangered, actively participate in tool box safety meeting, maintain housekeeping and enter or leave their work area using safe route.

2.9 Challenges Facing Subcontractors to Improve Health and Safety on Construction Sites

Many researchers have studied the challenges facing subcontractors in improving safety performance and found the number of barriers among the subcontractors to improve safety performance, and further classified into external and internal barriers.

The external barriers are forces outside the organization that influence its performance, whereas internal barriers are shared value, principles, and traditions that influence the ways the organization members act (Robin et al., 2012). These barriers are further into the following factors.

2.9.1 Client Demands and Focus on Project

Due to the competitive nature in the construction industry, economic survival and gaining of contracts, client are not often prioritized over safety considerations

(Mayhew and Quinlan, 1997), thus the intense competition also causes the clients to 'dictate' the construction industry. This is because, client have high bargaining powers of more players, i.e., small contractors compete in the same market as big contractors (Torbica and Stroh, 1997). Therefore, clients consider competitive tendering as a feasible strategy to assure that a job carried out at the lowest possible cost. This strategy, however, may worsen safety risks because economic pressures and intense competition penalize those contractors that try to do the right thing due to their higher tender prices (Mayhew and Quinlan, 1997, Wadick, 2010). The clients pay more attention on getting the job done rather than worker's health and safety. This is because they perceive subcontractors Construction Company as disposable and replaceable items (Wadick, 2010). As a result, subcontractors Construction Company prioritize on maintaining good relations with their clients over health and safety performance (Ozmec at el., 2014).

2.9.2 Negative Perceptions Towards Safety

Subcontractors Construction Company's owners perceive that safety regulations are too excessive and complex, preventing them from implementing those regulations effectively (Zhao at el., 2013). They consider safety regulations and demands to improve safety as a financial burden, which is too heavy, and unrealistic (Hasle and Limborg, 2006). Although they understand that poor safety performance has negative impacts on the financial performance of their organizations, they still perceive that the cost of compliance with certain aspects of regulations was too high in relation to the perceived benefits (Okoye and Okolie,

2014); also the perception that safety issues are the responsibility of main contractors and not their responsibilities.

2.9.3 Lack of Safety Knowledge and Safety Training.

Subcontractors Construction Company's owners do not have sufficient safety knowledge to implement safety measures and to appreciate the importance of safety (Jorgensen at el., 2011). They perceive that their work is repetitive and simple, thus they tend to underestimate safety risks and believe that those risks are part of the job (Champoux and Brun, 2003). This condition made worse by the lack of safety training because it seems to be expensive and unnecessary. At the same time, compulsory safety training considered as inadequate or ineffective to gain the required safety knowledge and to develop positive safety attitudes (Wadick, 2010, Hasle at el., 2010).

2.9.4 Poor Safety Culture.

Subcontractors do not pay more attention on safety due to poor safety culture hence they do not consider safety as a priority, they consider economic pressures and intense competition in order to meet the client's requirements. They consider compliance to regulations as their primary approach to safety implementation and perceive that, implementing higher safety standards is unnecessary due to implementation costs and additional resources required (Cagno at el., 2010). They often require their workers to control safety risks themselves and then blaming them when accidents happen (Floyde at el., 2013). This lack of management

commitment worsens the already poor safety attitudes of the workforce in Subcontractors Construction Company (Ozmec at el., 2014).

2.10 The Relationship between the Main Contractor and Subcontractors

The oxford dictionary defines a relationship as the way which two or more concepts, objects, or people are connected, or the state of being connected. In a construction project, the important relationships are between parties involved in the construction project. Therefore, the relationship between parties in the construction project is essential to the project success (Beach et al, 2005).

2.9.1 Relationship between the Main Contractor and Subcontractors on Health and Safety

The construction industry on average has a high rate of occupational injury and fatality than most industries. In this regard, safety is a crucial aspect that requires profound consideration in a construction project. It has been noted that the rate of injury increases among contractors and their workers on large and complex projects, particularly those, which require a large number of subcontractors (Enshassi et al, 2008). In this regard, the main contractors have a requirement to ensure their subcontractors work is in a safe manner and conduct their on-site operations in compliance with relevant safety codes and laws.

On a project, a contractor may employ hundreds of workers; in addition, the main contractor may use the services of several subcontractors who in turn have dozens

of workers. There exists a possibility that there will be an injury or a loss of life for anyone of the labourers. However, the responsibility on health and safety will not be clear. Chiang (2008) supported this by indicating that it is apparent that there is confusion about which party is responsible for jobsite safety.

Subcontractors have been known to rarely employ safety professionals and have no interest in safety work. Tayeh, (2009) believed that subcontractors have no interest in safety matters because most of them believe that safety should be the responsibilities of the main contractors. According to Arditi and Chotibhongs (2005), the reason for subcontractors' disinterest in health and safety issues is due to the expense incurred in implementing such a program. On the other hand, the general contractors usually leave the responsibility of safety to subcontractors and may never take an active part in ensuring that the subcontractor is actually necessary safety measures.

Lack of proper safety regulations and standards on the work site, can lead to injury or even loss of life (Tayeh, 2009). This can lead to interface problems, as there will be issues of responsibility between the main contractor and the subcontractor. In addition, interface problems may arise when the main contractor enforces safety measures that are too burdensome for some subcontractors to comply with health and safety related issues.

2.10 Strategies to Improve Health and Safety Performance of Subcontractors

Safety performance among subcontractors is still behind. Therefore, it is important to focus on the strategies to improve to improved safety performance at the construction sites as follows:

2.10.1 Client Safety Roles.

(Lingard and Blismas, (2013) conducted studies and found that, clients are in the best position to drive the changes needed to bring about safety improvements, as is the one who make key decisions that can accommodate or constrain safety implementation. A Client is responsible to acknowledge that safety complements quality and schedule, which, ultimately, will lead to a reduction in construction costs. Although other clients may not have enough resources and expertise to undertake comprehensive safety interventions, nothing precludes them from enquiring about a subcontractor's safety performance and referring to safety during the construction phase of a project (Smallwood, 1998).

2.10.2 Safety Training for Workers

Training plays an important role in worker's safety. Worker training begin with worker orientation and continue, as worker need to become more informed about a certain aspects of the works they are doing (Jorgensen at el., 2011). Many researchers (Hudges and Ferrett; 2008; Akson and Hadikusumo 2008 Jones et al., 1999; Tam et al., 2004; and Zeng et al., 2008) have addressed the importance of

safety training to improve safety performance in the construction industry. Together, they concur that effective training of construction workers can be one of the best ways in which to improve site safety performance and that some accidents such as falling from height, and being hit by falling materials in construction, could easily be prevented by implementing training for employees. Furthermore, subcontractors need to allow their workers to participate in training, toolbox meeting program of the main contractors.

2.10.3 Enforcement of Health and Safety Law and Regulations.

Safety regulation establishes guideline to follow and uniform requirements to ensure that contractor's safety orientation at construction sites is coordinated, and safety practice communicated and understood by all subcontractors' employees (Wong et al., 1999).

The government should find a way to effectively monitor and enforce safety regulations (Hasle and Limborg, 2006). Without proper enforcement, subcontractors that try to implement safety would be at a disadvantage over those that cut corners (Mayhew and Quinlan, 1997). The government should also come up with incentive programs that encourage subcontractors to focus on safety (Sunindijo, 2015)

2.11 Conceptual Framework

Several factors such as historical, economical or budgeting, psychological, technical, procedural or document and contract administration, organization, environmental issues, and risk management affect construction safety performance.

However, the following factors have a direct influence on safety, namely safety regulations factors, nature of subcontractor's factors, contract factors and safety program factors. These components are inter related as illustrated in Figure 2.1.

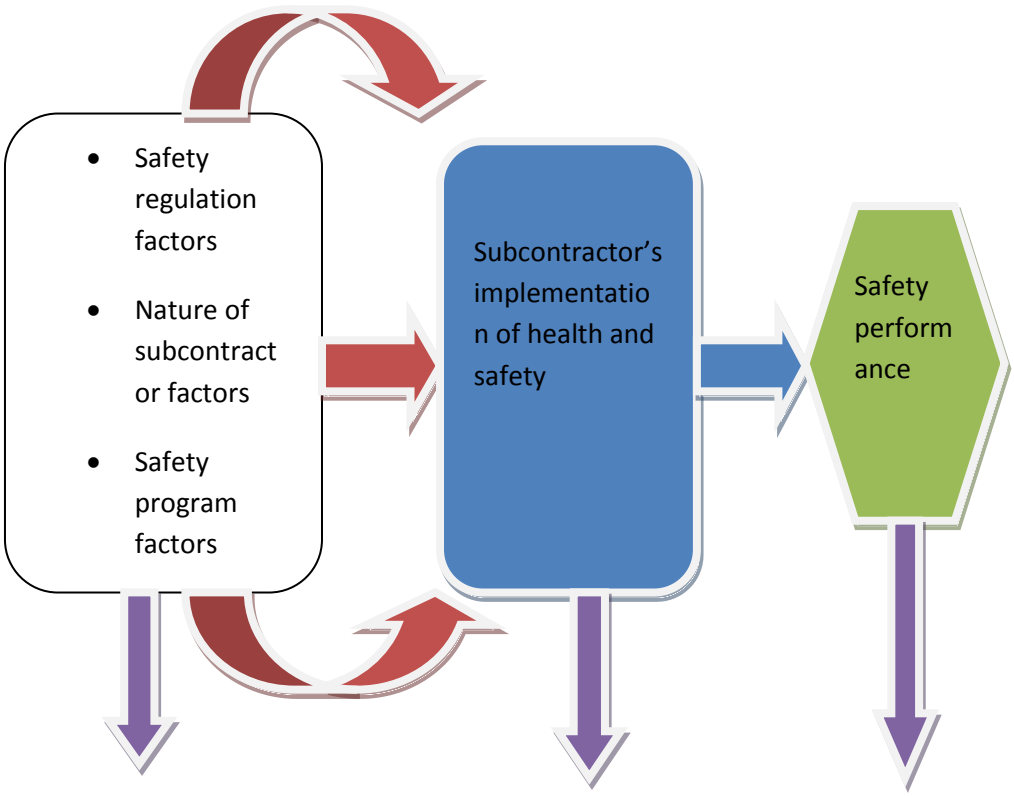

Figure 2. 1: Conceptual framework of the study research problem (Author's Construct)

Figure 2.1 have independent and dependent variables, the idea is organized in such a way that, basing on imposed safety regulations, nature of subcontractors, contract factors safety program. The effectiveness of health and safety implementation can be determined, which will then result into effective safety performance.

2.11.1 Safety Regulation Factors

The Government, in its efforts to promote health and safety in construction sites has established regulatory bodies. This include ERB, CRB, and AQRB to ensure Architects, Quantity Surveyors, Engineers, and Contractors comply with health and safety when performing their duties. Also, the Government has established OSHA, Employer and Labour Relation Act, and Workers Compensation Funds. This requires all the Employers to assess health and safety risks of workers and any other person who may be affected by the undertaking. Thus, the effective implementation of health and safety regulation by the Government will ensure a construction project is safe to build, safe to use, and safety to maintain and deliver good value. Enforcing including regular inspection, fines and penalty will influence the subcontractors to adhere to regulations.

2.11.2 Contract Factors

This refers to the ability to use effective documentation system and procedural for performing daily activities and tracking various changes that may happen in the project in order to implement the majority of safety management related risks. In construction, site subcontractors sign the contract with the main contractors. The

issue of health and safety clauses if include into contract documents will influence the performance.

2.11.3 Safety Program Factors

Safety program such as training, provision of PPE, and toolbox meeting influences performance. Safety procedure and instruction requires documentation that complies with legislation, and must be available in a written standard throughout the project schedule. Therefore, the contract is required to enforce the preparation of a written safety program and distribute such program to everyone involved in construction project for the developing safety attitude towards safety performance.

2.11.4 Nature of Subcontractor Factors

A subcontractor is the core of the safety management implementation. Subcontractors have to identify, assess and determine appropriate safety risk before the construction begins; communicate safety risks during construction to relevant stakeholders, and make sure that each activity in the construction project performed according to safety plan and procedure developed earlier, to ensure safety implementation.

2.12 Chapter summary

From the above literature, it is clear that safety and health implementation on construction sites depends on imposed safety regulations, main contractor, and nature of subcontractor and safety programs. In addition to that, the concept of safety performance, roles of subcontractors at site on issues of safety implementation, factors influencing safety performance, strategies to improve and challenges facing subcontractors to improve safety performance have been identified under this section.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the details of research methodology used to conduct the research in order to achieve objectives. It includes research design, population and sample, sample size and sampling techniques, data collection instruments, procedure of the study, data analysis and presentation methods.

3.2 Research design

Research design refer to the plan of how a research will take place from start to completion in a coherent logical way thereby ensuring the research problem is effectively addressed.

According to Burn and Grove (2005), research design help the researcher to plan and implement the study in the way that help the researcher to obtain information associated with the real situation. On the other hand, Kothari (2004) define research design as the conceptual structure within which research conducted, constituting the blueprint for the collection, measuring and analysis of data.

Both qualitative and quantitative approach was used to conduct this research through collecting views from subcontractors in evaluation of health and safety performance in the construction site.

3.3 Study area

According to Kothari (2003), a research needs to select a specific area for the study. The construction projects studied were in Dar es Salaam Region. This is because they are easily accessible with a lot of information. Both completed and ongoing projects were studied.

3.4 Population and sample size

According to Cochran and William (1997), a population is the total collection of elements, objects or items, which at least have one thing in common from which the sample taken to make same inference. The population for this study comprised of subcontractors in the construction projects, with ongoing construction activities for the projects registered with CRB in the categories of Electrical, Air Conditioning, and Plumbing Installations.

As with CRB, at the time of data collection, the population size was 35 registered projects with subcontracting activities. The desired sample size computed by using Slovin's (1960) formula was 33 companies, which is as follows:

$$N = \frac{N}{(1+Ne^2)} = \frac{35}{(1+35x0.05x0.05)} = 33 \text{ respondents}$$

Where: n= the sample size

N= Population size

e= Margin error of 5%

1= Constant value

3.4 Sampling techniques

According to Kothari (2003), it is difficult to collect data from all sources; hence, a technique has been adopted by the researcher in selecting items for the sample size.

The methods for selecting representative samples from population fall under two broad categories namely: probability (random) sampling, non-probability (non-random) sampling.

Non-probability sampling (non-random) was used in this study. This is because of purposive sampling of subcontractors with on-going construction activities.

Thirty three (33) companies selected for the study were twelve (12) electrical subcontractors, ten (10) air conditioning subcontractors, and eleven (11) plumbing installations subcontractors.

3.5 Data Collection Instruments

In order to collect relevant information, the entire work was divided into three aspects, namely: questionnaire survey (survey study), conducting personal interviews (case study) with subcontractors, and literature review related to research area of study.

3.5.1 Questionnaire Survey

The questionnaire survey was a stage one of the research design. The questionnaire was designed to achieve the objective of the research. It consisted of an introduction and four parts. The introduction gives a description of the survey, its purpose and objectives. The first part of the questionnaire is related to general information pertaining to the profile of the respondent, in terms of company name and address, designation, company size, working experience, and type of the company specialized trade.

The second part of the questionnaire included the list of the factors influencing health and safety performance of subcontractors in the construction site. Respondents were asked to give views of the factors influencing health and safety performance based on a five-point Likert scale, from not at all to very frequently apply. Respondents were asked to state any other factors influencing safety performance and to rate those factors.

The third and fourth part of the questionnaire included the list of the challenges facing subcontractors to improve health and safety performance, and the strategies to improve health and safety performance in construction sites.

Respondents were asked to give views based on a five-point Likert scale, from strongly disagree (lowest score) to strongly (highest score). They were also asked to state any other challenges and strategies to improve safety performance and to rate them.

3.5.2 Interviews

According to McNamara, (1999) interviews are particularly useful for getting the story behind a particular experience, which involves asking question, and getting answer from participants in the study. Yin, (2003) argues that interviews are a very effective method of gathering a large volume of data. Thus, interviews were used because of its ability to gain information of respondents' views, opinion, and experience on health and safety performance of subcontractors in the construction sites.

The face-to-face interviews were guided by open-ended questions as in accordance with Creswell (2012) that, open-ended questions ought to be used during interviews, as they are primarily qualitative.

To sample the surveyed subcontractors and carry out interviews, probability sampling (random) technique was used to select sample in which each element has an equal and independent chance of being selected.

Fish Bowl Draw Method was used to select three (3) subcontractors' construction companies one

(1) each in the categories of Electrical, Air Conditioning, and Plumbing Installations by using the following steps:

- Listing of members of the population

- Names of all members (subcontractor's construction companies) were written on pieces of paper and placed in three containers, one container for electrical, other for air conditioning and the last for plumbing installations.
- The researcher drew the desired number (one sample) from each container

3.6 The Study Procedure

The procedures of the study were divided into five phases. The first phase involved identification of the aim of the study, the problems and research objectives.

The second phase involved carrying out extensive literature review on the topic, followed by questionnaire survey distributed and collected from respondents to ascertain their views. The next stage was to sample the surveyed subcontractors and carry out a case study on three selected subcontractors' construction companies in the categories of electrical, air conditioning, and plumbing installations. This was followed by the evaluation of the health and safety performance.

The final stage was to analyse and discuss results; thereafter, a conclusion and recommendations were provided.

3.7 Data Required for the Study

Two major sources of data were required:

- Secondary
- Primary

Secondary data were obtained from review of literature, which include published books, articles, journal reports, online articles, and other materials related to health and safety of specialist contractors (subcontractors) at construction sites.

Primary data were obtained from the sampled subcontractors in different construction companies using questionnaire survey and interviews on respective case studies.

3.8 Data Analysis and Presentation Method

According to Kothari (2004), data analysis is the process of computing certain indices or measures along with search for patterns of relationship that exist among the data groups.

Responded questionnaires and conducted interviews were processed before analysis of data as follows:

- Checked for completeness, accuracy, and uniformity as well as rectifying the errors
- Classified data according to categories of subcontractors such as electrical, air conditioning, and plumbers.
- Weigh factors, challenges and strategies to improve health and safety performance of subcontractors at construction sites by use of formulae and software calculation, and
- Rank results from the highest to the lowest of factors, challenges and strategies to improve health and safety performance of subcontractors

The data collected were analysed using the Statistical Package for Social Science (SPSS) computer software, and results are presented in tables. Finally, study findings and recommendations were provided.

3.9 Data processing and analysis

To determine the ranking, Relative Important indices (RII) was adopted because it suits this type of study.

The ranking made it possible to compare the relative importance of the items as perceived by the respective subcontractor's respondents. The weighted average for each item for the respondents was determined and rank (R) were assigned to each item representing the opinion of the respondent. The relative important indices was calculated for each item by using the following formula (Lim and Alum, 1995)

$$RII = \frac{\Sigma W}{AN}$$

where: W = Weight given to each statement by the respondents.

This range from 1 to 5, where very high score 5 point and very low score 1 point
A= Highest score (5)
N= Total number of respondents

Thus, W = 1n1 + 2n2 +3n3 + 4n4 +5n5

were n1 = number of respondent for "not at all" or "strongly disagree"

n2 = number of respondent for "rare apply" or "disagree"

n3 = number of respondent for "moderate"
n4 = number of respondent for "frequently apply" or "agree"
n5 = number of respondent for "very frequently apply "and "strongly agree

To establish relative importance of the risk factors basing on their significance to the safety performance, mean score were calculated for each factor to determine ranking among all factors. Analysed data were later presented in tables.

The mean index formula (MS) was used because mean score takes into account all scores for each potential factor influencing safety performance, challenges and strategies to improve safety performance. These were computed using the following formula.

$$MS = \frac{\Sigma (f \times S)}{N}$$

where:

MS = Mean score

F = Frequency of response

S = Score assigned (1 to 5)

N = Total number of response

The Relative Important Index (RII) for all factors was calculated. RII comparison table was used to rank the results by taking into account the average score and RII as follows.

Average Mean Score	RII	Ranking
4.0 – 5.0	0.7 – 1.0	High
3.0 – 4.0	0.5 – 0.7	Moderate
1.0 – 3.0	0.2 – 0.5	Low

3.10 Chapter summary

This chapter has presented the research design, sampling techniques, data collection and tools used for conducting the study. The management of data and analysis were described showing the substantial reasons for the approach adopted. In addition, this chapter shows how the data was presented and analysed to answer the research questions. Justification has been made to give reasons for the adopted research methods and why they seemed suitable for this research.

CHAPTER FOUR

DATA ANALYSIS, DISCUSSION, AND PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents and discusses the results of data collected, and describes results on the factors influencing health and safety performance, challenges and strategies to improve health and safety performance of subcontractors. A summary of findings is presented at the end.

4.2 Response

4.2.1 Response Rate and Type

In order to obtain information, questionnaires were distributed to 33 subcontractor companies. All respondents replied, which represents 100 percent of the total questionnaires. The numbers of companies were 12 for electrical, 10 for air conditioning and 11 plumbers. This high response rate was achieved due to personal administration of the questionnaires as expressed in Table 4.1

Table 4.1: Questionnaires Response Rate

	Questionnaires Distribution			
No	**Type of Respondents**	**Distribution**	**Received**	**Percentage**
1	Electrical Subcontractors	12	12	36.4
2	Air Conditioning Subcontractors	10	10	30.3
3	Plumbing Installations Subcontractors	11	11	33.3
	Total respondents	33	33	100

Source: Field data 2017

4.2.2 Designation of the Respondents

Respondents were from various fields, which play part in health and safety performance of subcontractors in construction sites. The total number of respondents were 33 of which 10 were electrical, 6 plumber, 6 air conditioning engineers, 8 and 3 civil technician as shown in Table 4.2

Table 4.2: Designation of the Respondents

No	Types of Subcontractors	Frequency
1	Electrical Subcontractors	12
2	Air Conditioning Subcontractors	10
3	Plumbing Installations Subcontractors	11
	Total respondents	33

Source: Field data 2017

4.2.3 Company Size

The researcher wanted to know the number of workers employed at the construction site in order to measure the size of the company. Response shows that 25 companies employ less than (20) twenty workers representing 75.8 per cent of valid response. Five (5) companies employ between 21 and 50 workers representing 15.1 percent while three

(3) companies (9.1 percent) did not answer that question . This implies that most of the construction companies are small size due to the number of specialist (subcontractors) employed in these companies as shown in Table 4.3

Table 4.3 Company Size

No	Number of employee		Frequency	Percentage
1	0 – 20		25	75.8
2	21	– 50	5	15.1
3	51	– 100	3	9.1
	Total		33	100

Source: Field data 2017

4.2.4 Working Experience of the Company

It was the interest of the researcher to know the experience of these companies. It was revealed that nineteen (19) companies have been operating for more than 10 years, representing 57.6 per cent. Furthermore, six (6) companies had the experience of 6 and 10 years, representing 16.2 per cent, while eight (8) companies operated for about 5 years, representing 24.2 percent of respondents as expressed in Table 4.4

Table 4.4: Working Experience of the Company

No	Experience of the Company		Frequency	Percentage
1	0	– 5	8	24.2
2	6	– 10	6	16.2
3	10 years above		19	57.6
	Total		33	100
Source: Field data 2017				

4.3 Factors Influencing Health and Safety Performance of Subcontractor

Table 4.5 indicates the list of factors influencing health and safety performance of subcontractors at construction sites.

To obtain the degree of importance of the factors influencing health and safety performance of subcontractors for the second section, a five point Likert scale was used whereby 1 denoted "not at all", 2 for "rare ", 3 indicated "moderate", 4 represented "frequently apply, and 5 stood for "very frequently apply".

Table 4.5: Factors influencing Safety Performance of subcontractors as ranked by respondents

Factors influencing Safety	**1**	**2**	**3**	**4**	**5**	**W**	**MS**	**RII**	**Rank**
Performance of Subcontractors									
Ensure health and safety item in the subcontractor's bills of Quantities	1	10	12	10	0	97	2.93	0.588	8
Ensure health and safety items provision for subcontractor work is priced	0	8	10	8	7	85	2.57	0.515	10
Specific safety responsibility	6	8	7	6	6	97	2.93	0.588	8
assigned to subcontractors									
Ensure subcontractors'	0	9	0	15	9	123	3.72	0.745	1

worker wear personal protective equipment (PPE)									
Sharing safety information between main contractor and subcontractors.	0	10	13	0	10	109	3.30	0.661	4
Encourage workers from subcontractors to attend safety committee meeting.	0	7	9	10	7	116	3.51	0.703	3
Enforce provision of safety sign and poster at the construction site in subcontractors works	0	10	11	12	0	101	3.06	0.612	5
Enforce availability of safety protection measures at job site such as guardrail, hand rails, warning barriers, protective partitions and others for subcontractors works	0	7	7	12	7	118	3.57	0.715	2
Subcontractors enforce more job site visit and conducting safety inspection	0	8	16	0	9	109	3.30	0.661	4
Reward workers for their	0	8	17	8	0	99	3	0.60	7

safety behaviour, and penalize workers for unsafe behaviour									
Ensure safety law and regulations are adhered at construction site	0	8	14	11	0	96	2.90	0.582	9
Workers from subcontractors participate in safety planning	0	10	12	11	0	100	3.03	0.606	6
Agreement between main contractor and subcontractors stipulate a specific amount for safety during bidding	0	7	9	17	0	109	3.30	0.661	4

Source: Field data 2017

Table 4.5 indicated that, "availability of PPE on site" were important factors influencing safety performance as it had the highest score and ranked one (1), with Relative Important Indices (RII) of 0.745. The second factor was "enforcement of availability of safety protection measures at job site such as guardrail, handrails, warning barriers, protective partitions and others for subcontractors' works", with Relative Important Indices (RII) of 0.715. The finding indicates that,

"encouragement of workers from subcontractors to attend safety committee meeting" was ranked three (3) with Relative Important Indices (RII) of 0.703.

"Enforcement of more job site visit and conducting safety inspection" and "agreement between main contractor and subcontractors stipulate a specific amount for safety during bidding", had the same rank of four (4) with Relative Important Indices (RII) of 0.661.

Furthermore, the moderate factor influencing safety performance of subcontractors at construction site was: "provision safety sign and poster at the construction site for subcontractors' works" which ranked five (5) with Relative Important Indices (RII) of 0.612; while "participate in safety planning by the subcontractors" ranked six (6) with Relative Important Indices (RII) of 0.606, and "reward workers for their safety behaviour, and penalize workers for unsafe behaviour ranked seven (7) with Relative Important Indices (RII) of 0.60.

Moreover, the least ranked factors with minimum influence were "assigning of specific safety responsibility to subcontractors" and "ensure health and safety item is included in the subcontractor's bills of quantities that had the same rank of eight (8) with Relative Important Indices (RII) of 0.588. "ensure safety law and regulations are adhered at construction site" ranked nine (9) with Relative Important Indices (RII) of 0.582, and "ensure health and safety items provision for subcontractor work is priced" ranked last, with Relative Important Indices (RII) of 0.515.

4.4 Challenges to Improve Health and Safety Performance of Subcontractors

The challenges to improve health and safety performance of subcontractors at construction sites was listed (Table 4.6), the respondent were required to give their views on the challenges they face to improve health and safety performance.

The respondents were requested to respond on a five - point Likert scale, 1 being "strongly disagree", 2 for "disagree", 3 indicated "neutral", 4 represented "agree", and 5 stood for "strongly agree" .

Table 4.6: Challenges to Improve Safety Performance of Subcontractors

Challenges to improve safety	**1**	**2**	**3**	**4**	**5**	**W**	**MS**	**RII**	**Rank**
Performance									
Safety items in the Bills of Quantities not priced by main Contractors	0	10	0	13	11	123	3.72	0.745	5
Client focus on other objectives such as time and cost, rather than health and safety on construction site	0	8	8	10	7	115	3.48	0.697	8
Absence of safety and health committees in construction site which incorporate	0	0	0	19	14	146	4.42	0.885	1

subcontractors' workers									
Fail by the main contractor to nominate safety officer that comply with safety requirement	0	0	10	11	12	134	4.06	0.812	2
Lack of safety communication between the main contractor and Subcontractors' workers on safety Issues	0	0	9	13	11	134	4.06	0.812	2
Inadequate personal protective equipment (PPE) at work	0	0	11	12	10	131	3.96	0.794	3
Lack of regular supervision at least once a week	0	10	0	12	11	103	3.12	0.624	11
Risk assessment for subcontractors workplace	0	10	0	11	12	123	3.72	0.745	5
Irresponsible attitude of the workers during working or handling machines	0	10	10	13	0	102	3.09	0.618	12
Fatigue caused by working with tight schedule and overtime	0	0	12	10	11	131	3.96	0.794	3

Lack of accident records and official safety data	0	7	11	8	7	98	2.96	0.594	14
The perception that safety is expensive to implement	0	11	12	10	0	100	3.03	0.606	13
Lack of safety briefing/toolbox meeting	0	11	10	12	0	105	3.18	0.636	10
Safety law and regulations are not adequately enforced, thus disadvantaging those trying to implement them	0	12	10	11	0	98	2.96	0.594	14
Safety law and regulations are impracticable for subcontractor construction companies	0	11	10	12	0	100	3.03	0.606	13
Lack of mandatory safety training to give basic safety knowledge for subcontractors	0	11	7	7	8	111	3.36	0.673	9
Lack of safety knowledge in order to implement proper safety measures as required	0	0	16	17	0	116	3.51	0.703	7
Using unsafe equipment among subcontractors	0	0	13	10	10	129	3.90	0.782	4

increase the injury rate									
Economic hardship among subcontractors lead to poor safety performance	0	11	0	11	11	121	3.66	0.733	6
Unfamiliar with the work site and dangerous position of subcontractors work to avoid Injuries	0	13	0	10	10	116	3.51	0.703	7

Source: Field data 2017

Table 4.6 indicates that, "absence of safety and health committees in construction site which incorporates subcontractors' workers" was a strong challenge to improve safety performance as it as it had the highest score and ranked one (1), with Relative Important Indices (RII) of 0.885. The second challenge was "failure by the main contractor to nominate safety officer that comply with safety requirement" and "lack of safety communication between the main contractor and subcontractors workers on safety issues". These had the same rank of two (2) with Relative Important Indices (RII) of 0.812.

"Inadequate personal protective equipment (PPE) at work" and "fatigue caused by working with tight schedule and overtime" both had the same rank of three (3) with Relative Important Indices. (RII) of 0.794. The last but one challenge which ranked number four (4) was "using unsafe equipment among subcontractors increase the injury rate" with Relative Important Indices (RII) of 0.782. "Safety items in the Bills

of Quantities not priced by main contractors" and "risk assessment for subcontractors work is not practicable at workplace" were the last strong challenges to improve safety, with the same rank of five (5) with Relative Important Indices (RII) of 0.812.

Furthermore, the moderate challenges facing subcontractors to improve safety performance at construction site were "economic hardship among subcontractors, which lead to poor safety performance" ranked six (6) with Relative Important Indices (RII) of 0.812. "Lack of safety knowledge in order to implement proper safety measures as required" and "l being unfamiliar with the work site and dangerous position for subcontractors work to avoid injuries," both had the same rank of seven (7) with Relative Important Indices (RII) of 0.703. Other barriers include; "absence of safety and health committees in construction site, which incorporate subcontractors' workers" that ranked eight (8) with Relative Important Indices (RII) of 0.697, and "lack of mandatory safety training to give basic safety knowledge for subcontractors which ranked nine (9) with Relative Important Indices (RII) of 0.673.

The least ranked challenges were "lack of safety briefing/toolbox meeting" ranked ten (10) with Relative Important Indices (RII) of 0.636, "lack of regular supervision" ranked eleven (11) with Relative Important Indices (RII) of 0.624, and "irresponsible attitude of the workers during working or handling machines" ranked twelve (12) with Relative Important Indices (RII) of 0.618.

Furthermore, “the perception that safety is expensive to implement” and “safety law and regulations are impracticable for subcontractor construction companies”, both had the same rank thirteen (13) with Relative Important Indices (RII) of 0.606. “Lack of accident records and official safety data” and “lack of enforcement of safety law and regulations” both ranked last, with Relative Important Indices (RII) of 0.594.

4.5 Strategies to Improve Health and Safety Performance of Subcontractors

The strategies to improve health and safety performance of subcontractors at construction sites were listed (Table 4.6), respondents were required to give their views on the strategies to improve health and safety performance.

They were requested to respond on a five - point Likert scale; 1 being “strongly disagree”, 2 for “disagree”, 3 indicated “neutral”, 4 represented “agree”, and 5 stood for “strongly agree”.

Table 4.7: Strategies to improve safety performance

Strategies to improve safety performance	**1**	**2**	**3**	**4**	**5**	**W**	**MS**	**RII**	**Rank**
Training for construction workers	0	0	0	3	30	162	4.90	0.982	1
Include safety provision on	0	0	0	16	17	151	4.57	0.915	2

subcontractors Bills of Quantities									
Subcontractors to price Bills of Quantities on issues related to Safety	0	0	0	14	19	151	4.57	0.915	2
Establish the specific role of subcontractors on safety	0	0	0	17	16	148	4.48	0.897	4
Close supervision by safety officer and top management	0	0	0	14	19	151	4.57	0.915	2
Subcontractors should carry out risk assessment	0	0	0	33	0	132	4.00	0.800	5
Commitments from highest level of company on safety related issues	0	0	0	14	19	151	4.57	0.915	2
Safety performance record of subcontractors to be one of the critical criteria in tendering	0	0	0	16	17	149	4.51	0.903	3
Government should enforce safety law and regulation effectively	0	0	0	19	14	148	4.48	0.897	2
Punishments or consequences to	0	0	0	16	17	149	4.51	0.903	3

subcontractors construction companies that violate safety Regulations									

Source: Field data 2017

Table 4.7 indicates that “safety trainings for construction workers” were strong strategies to improve safety performance as it had the highest score and ranked one (1), with Relative Important Indices (RII) of 0.982. It was followed by “subcontractors to price Bills of Quantities on issues related to safety”, “close supervision by safety officer and top management”; “government to enforce safety law and regulation effectively” and “ management commitments” had the same rank of two (2) with Relative Important Indices (RII) of 0.915.

Other strategies to improve safety performance at construction site were “safety performance record of subcontractors to be one of the critical criteria in tendering” and “punishments or consequences to subcontractors’ construction companies that violate safety regulations” having the same rank of three (3) with Relative Important Indices (RII) of 0.903.

The least ranked strategies were “establish the specific role of subcontractors on safety” and “include safety provision on subcontractors Bills of Quantities”, that ranked number four (4) with Relative Important Indices (RII) of 0.915. The last ranked strategies to improve safety performance was “subcontractors should carry out risk assessment” which ranked five (5) with Relative Important Indices (RII) of 0.800.

4.6 Interview Results

Respondents from all categories of electrical and plumbing installations and air conditioning were interviewed. The interviews were on the Factors Influencing Health and Safety Performance, Challenges to Improve Health and Safety Performance, and the Strategies to Improve Health and Safety Performance of Subcontractors at Construction Site. The results of interviews were as follows:

4.6.1 Factors Influencing Health and Safety Performance

4.6.1.1 Health and safety budget

Respondents were asked if they could influence the budget of safety management in their bills of quantities. They revealed that they have no control since the bills of quantities are prepared by consultants; health and safety items may or not be included in their bills of quantities. Furthermore, even if it is provided in the bills of quantities it is not necessary to be priced, and there is no means to ensure that.

4.6.1.2 Health and safety responsibility of subcontractor

The researcher wanted to know if respondents were aware of their health and safety responsibilities. They commented that they have not been assigned any health and safety responsibility". Furthermore, the researcher asked the uses and availability of PPE. Respondents revealed that workers were insisted to wear.

4.6.1.3 Safety communication

It was the interest of this research to explore whether respondents share health and safety information with the main contractors. It was hinted that they share health and safety information; they are as well encouraged to attend safety meeting. It was also

added that they enforce more job site visit and safety inspection in order to identify hazard and eliminate them".

On the other hand, it was revealed that safety protection measures for workers at job site such as guardrail, handrails, and protective partitions are not provided by the main contractor, they have to take precaution themselves through their own initiative". However, safety warning barriers are always provided by the main contractor.

4.6.1.5 Enforcement of health and safety law and regulations

With respect to safety law and regulations, respondents were required to comment if this is adhered. Their response showed that it was observed but the contract is silent on what should be done for safe and unsafe behaviour in construction sites. They have the opinion that there should be a system to reward construction workers for their safety behaviour or penalize them for unsafe behaviour".

Further, respondents commented that the contract is silent on the responsibility of the subcontractor to participate in the preparation of safety plan, but they think they have to participate. They said, they "do not participate on health and safety preparation of safety plan, they have to follow plan prepared by the main contractor, hence they have no control of main contractors' safety program".

Further explanations were that, there are no any agreements within the contract which stipulate a specific amount for safety implementation by the main contractor. Which will reflect the special attention that the parties to the contract pay on health and safety issues, instead of depending on health and safety amount provided in the preliminaries of the bills of quantities"

4.7 Challenges to Improve Health and Safety Performance

4.7.1 Health and Safety Budget

The researcher wanted to know if lack of health and safety budget is the challenge on the implementation of health and safety at construction site. Respondents strongly agreed that, unpriced health and safety item for their works in the bills of quantities lead to lack of safety budget. This results into insufficient provision of PPE on construction site such as hard hats, foot wear, eye protectors and others as they are not budgeted, and that inadequate PPE is the challenge to improve safety performance because of economic hardship of the companies, hence lower health and safety performance. Furthermore, clients focus more on the completion of work as agreed in the contract neglecting health and safety issues of construction workers.

4.7.2 Health and Safety Responsibility

It was the interest of this research to understand if lack of health and safety responsibility is among the barriers to improve safety performance. Respondents had the view that safety responsibility to all stakeholders is a key for safety performance. They also indicated that safety committees have to assist in developing health and

safety policies and procedures, and recommend strategies to decrease accident rate. Therefore, absence of health and safety is a barrier to improve safety performance.

The other barrier mentioned by respondents was failure by main contractor to nominate safety officer on construction site. The safety officer maintains safe working environment for all employees and assess hazards and unsafe situation to assure safety. Hence, the absence of safety officer is a key barrier to improve health and safety performance in construction sites.

4.7.3 Safety Communication

With regard to safety communication, it was evident that this aspect is essential tool to improve safety performance, and that lack of communication is a setback to improve health and safety in construction site. This is because identified hazards and unsafe situation will not be communicated.

4.7.4 Poor Safety Culture

The researcher wanted to understand if poor safety cultures of construction workers affect safety performance. Respondents had the view that irresponsible attitude of the worker is the barrier to improve safety performance and that bad attitude such as poor handling of machine increase the probability of accidents to occur, which lowers overall morale and decrease safety performance.

Moreover, fatigue caused by working with tight schedule and overtime as well as physical and mental exhaustion is the challenges to improve safety. In addition to that, negligence on risk assessment lead to lack of identification of who may be at risks e.g. employees, visitors, contractors, etc. in order to prevent injuries. If proper risk assessment and accident records are maintained, then, unsafe equipment leading to injuries to the company's workers will not be used hence healthy and safety risks will be reduced.

4.7.5 Health and Safety Perception

The researcher wanted to explore if people had the perception that safety is expensive to implement. It was vivid that respondents held this perception and that lack of financial resources to cover safety costs such as insurance are the major barriers. It was also evident that lack of regular supervision hinders safety improvement while regular supervision help to instruct workers to follow safe work practices and ensure equipment are properly used.

Furthermore, it was mentioned that toolbox meeting were not in place at the construction sites. Respondents stressed the importance of having toolbox meeting to ensure they are ready to do their job safely, and keep everyone aware of current risks, hazards and safety trend.

It was also emphasized that safety training help to give safety awareness, therefore, construction workers need training in order to identify dangerous position of work

site, and that, safety knowledge obtained help workers to develop skills they need to stay safe at construction site.

4.7.6 Enforcement of Health and Safety Law and Regulation

The researcher asked if lack of enforcement of safety law and regulation are the barriers to safety performance. According to respondents, lack of safety law and regulation enforcement lead to violation of policies by the workers and breaking of rules and regulations established and that safety law need to be enforced by the government.

4.8 Strategies to Improve Health and Safety Performance

4.8.1 Safety Training

Safety training improves workplace safety, enables all employees to have similar skill and knowledge of safety, and prevent injuries. Therefore, safety training for the construction workers is crucial to improve safety performance as mentioned by respondents during the interview.

4.8.2 Health and Safety Budget

Respondents were asked if availability of safety budget is one of the strategies to improve safety performance. They agreed that provision of health and safety budget in bills of quantities for their works lead to availability of PPE, which improve safety performance.

4.8.3 Health and Safety Responsibility

Respondents were asked if health and safety role to all stakeholders could be the strategies to improve safety performance. They explained that health and safety roles should be the responsibility of all stakeholders in the construction industry in order to improve safety. In addition, establishing specific role of health and safety related issues to all stakeholders will improve safety performance.

They went on explaining that close supervision should be the responsibility of a safety officer; this will enable workers to follow safe work practice, ensure equipment is properly used, and promote safety awareness for construction workers it will also guarantee that only authorized people enter work place, and adequately trained workers operate equipment.

In the same way, risk assessment should be done to create awareness of the hazards and risk, identify who may be at risk, and minimize the chance of harm. On top of that, respondents had views that top management commitment on health and safety will set up health and safety culture of the organization, and encourage employee to actively take part in hazards and risk prevention, reporting near misses, and set up strategies to improve safety performance.

4.8.4 Enforcement of Health and Safety Law and Regulation

With regard to enforcement of health and safety law and regulation by the Government, respondents had the view that health and safety law and regulation

need effective enforcement by the government to facilitate safety awareness on construction workers, including preparation and implementation of health and safety programs.

They also had the view that punishment will prevent workers from wrongdoing against health and safety related issues and that the practice helps the construction companies to track health and safety issues, identify the cause of risk, which allows the organization to prevent incidents before they happen, and hence, help to improve compliance of safety procedures.

4.9 Findings and Discussion

4.9.1 Factors Influencing Safety Performance

Factors influencing safety performance of subcontractors at construction sites are discussed below

4.9.1.1 Health and Safety Budget

Availability of PPE is crucial for main safety performance but it depicts budget allocation. This finding is in the same line with El-nagar et al., (2005) who found that there is a relationship between budget and PPE. The implication is, in order to ensure safety performance of subcontractors, budget issues need to be addressed as subcontractors are responsible to ensure their employee use correct PPE safely and in approved manner.

4.9.1.2 Health and Safety Responsibility

Health and safety is the responsibility of the main contractors. It has been perceived that a subcontractor has no responsibility regarding to it. This was also observed in the contract between main and subcontractors, where issues of health and safety are not stipulated. The findings are contrary to Kumaraswamy and Matthews (2000) who found that subcontractors are responsible to perform work safety, and comply with safety standard set forth with the main contractor. Thus, in order to ensure safety performance of subcontractors, safety responsibilities need to be assigned to subcontractors. This will enable them to participate on safety planning with the main contractor.

4.9.1.3 Health and Safety Communication

It was evident that regular communication was the key to construction safety within the subcontractors and between them and the main contractor. Workers and supervisors in some cases were constantly acting and reacting to changing work environment, and ensured their activities and safety risks are communicated. This is consistent with Floyde et al., (2013) who found that in the construction industry, job site safety is historically communicated on site and in person in order to be aware of hazardous situation. This implies that, to ensure safety performance, sharing of safety information is essential and need to be maintained at construction site.

4.9.1.4 Enforcement of Health and Safety Law and Regulation

This study revealed that the contract is silent on what should be done to a construction worker who observes and for those who violate safety behaviour. Furthermore, the contract does not stipulate if subcontractors are required to participate on the preparation of safety plan as they are as well responsible for safety of their construction workers. In addition, there is no agreement in the contract between subcontractors and main contractor stipulating the specific amount of pay for safety implementation to depict the special attention the party ought to pay to the contract for safety.

This is contrary to Government aims for establishment of Regulatory Agencies such as OSHA, CRB, AQRB, ERB, Employers Labour Relation, and WCF, which require that a construction project is safe to build, safe to use, and safe to maintain. That is, health and safety law and regulation need to be enforced to ensure that all employers adhere to it and that assessment of health and safety risks of workers and other persons who may be affected by their undertaking should be done (Phoya, 2012).

4.9.2 Challenges to Improve Safety Performance

4.9.2.1 Health and Safety Budgets

Results show that subcontractors experience poor safety performance. This is because; they cannot influence the budget of health and safety as they have no control over the preparation of bills of quantities for subcontractors' works. They are as well not assigned any health and safety responsibilities. Furthermore, they lack

safety communication with the main contactor which is an essential tool for safety performance.

These findings contradict those of Nelson & Associates (2010) who found that subcontractors have responsibilities to adhere to safety programs prepared by the main contractor, and establish and implement their own safety program as well. Therefore, lack of safety budget, safety responsibility and commitment, and safety communication are the challenges to improve safety performance.

4.9.2.2 Poor Safety Culture

Irresponsible attitudes such as poor handling of machine increase the probability of occurrence of accidents. Negligence on risk assessment to identify who may be at risks in order to prevent injuries is also a problem. This was revealed by respondents from all categories and these findings concur with those of Cagno et al., (2010) who observed that subcontractors do not pay more attention on safety due to poor safety culture; they do not consider safety as a priority, but they consider economic pressures and intense completion of the project in order to meet client requirements. Therefore, poor safety culture is the barrier to improve safety performance.

4.9.2.3 Health and Safety Perception

It was learnt people had the perception that safety is expensive to implement. This is similar to Zhao et al., (2013) study on Process Safety Challenges for SMEs who

noted that subcontractor's construction owner perceive safety implementation is expensive; this prevents them from implementing safety effectively.

Furthermore, it was learnt that because of this perception subcontractors lack regular safety supervision; they do not attend toolbox meeting and safety training, and do not employ safety officers. This was also observed by Okoye and Okolie (2014) that although subcontractors understand poor safety performance has negative impacts on the financial performing, they still perceive the cost of compliance to be high in relation to perceived benefits.

4.9.2.4 Lack of Safety Knowledge and Safety Training

Field data indicated that subcontractors do not have sufficient safety knowledge. They perceive their work is repetitive and simple, underestimate safety risks and believe those risks are part of their job. This finding is consistent with Champoux and Brun, (2003) who noted that lack of safety training to gain required knowledge and to develop positive attitude on safety is the main challenge to safety performance.

4.9.3 Strategies to Improve Safety Performance

4.9.3.1 Safety Training

Safety training improves knowledge and develops positive attitude on safety. This view is also held by Hudge and Ferrett (2008) who insist on effective training of construction workers to be one of the best ways to improve safety performance. In a

similar vein, Zeng et al., (2008) insist that some accidents could be easily prevented if employees are trained. This implies that in order to ensure safety performance, safety training is important to construction workers.

4.9.3.2 Health and Safety Budget

Safety budget is crucial for safety performance. This is because safety budget achieves availability of PPE, employment of safety officer for close supervision, top management commitment on safety, and conducting risk assessment before doing the actual work. As commented by Lingard and Blismas (2013), clients are in the best way to drive the changes needed as they are the one to make key decision on safety budget to accommodate or constrain safety implementation. Therefore, in order to ensure safety performance, availability of health and safety budget is crucial and it is a good strategy to improve safety performance.

4.9.3.3 Enforcement of Health and Safety Law and Regulation

Health and safety law and regulations need effective enforcement by the Government in order to facilitate safety awareness. This includes preparation and implementation of health and safety programs. Finding effective ways to enforce these regulations is paramount Hasle and Limborg (2006). Without proper enforcement, subcontractors that try to implement safety would be at a disadvantage over those cut corners (Mayhew and Quinlan 1997). Indeed, as insisted by Sunindijo 2005, there is a need for governments need to come up with incentive programs that encourage subcontractors to focus on safety.

4.9.3.4 Chapter Summary

This chapter presented the analysis and discussion of the data collected from the field. The analysis included factors influencing safety performance, challenges and strategies to improve it.

The next chapter, which is the final of this study will comprise summary, conclusion, recommendations for this study, and for further studies.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusion and recommendations for improving health and safety performance of subcontractors in construction projects.

5.2 Conclusion

This study has assessed the factors influencing health and safety performance of subcontractors in construction sites. It revealed that availability of safety gears, provision of protective measures at job site such as guardrail, and attending safety committee meeting are among factors influencing safety performance.

The study further revealed that subcontractors face challenges in influencing safety performance. These challenges include lack of health and safety committee in construction sites, failure by the main contractor to nominate safety officer, lack of communication between main contractor and subcontractors, and inadequate personal protective equipment (PPE).

Furthermore, it was learnt that implementation of some strategies will improve safety performance. These are safety training for construction workers, safety budget, close supervision by safety officer, effective enforcement of safety law and regulation by the government, and punishments or consequences to subcontractors' construction companies that violate safety regulations.

5.3 Recommendations

For effective implementation of health and safety performance of subcontractors in construction site, the study recommends that:

- The contract between the main contractor and the employer should stipulate specific amount of pay for safety implementation. Specifying this in the contract will reflect the special attention that the parties to the contract pay instead of depending on health and safety amount provided in the preliminaries part of bills of quantities.
- In order to secure construction health and safety, it is recommended that, the subcontractors should ensure their workers have information, instructions, trained and supervised to carry out their job in a way that secure health and safety. This also should be included in the contract between main and subcontractors
- A safety plan should be continuously revised and updated according to the changing site conditions and activities, and should involve subcontractors
- The main contractor needs to have a project emergency plan and ensure that all members of the project are able to respond to major emergency quickly and systematically
- Government regulatory agencies should enforce safety law and regulations to help ensure that a construction project is safe to build, use, maintain and deliver good value. Clients or employers should ensure that

they provide safe working environment for their employees. Employees should also be made aware of their health and safety responsibilities

5.3.1 Suggestions for Further Research

This study was carried out in Dar es Salaam; it did not cover other construction projects in different regions and districts. Therefore, studies similar to this may be carried out in other parts of the country in order to come out with different suggestions on effective health and safety performance of subcontractors.

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APPENDIX 1

QUESTIONNAIRE

TOPIC: EVALUATION OF HEALTH AND SAFETY PERFORMANCE OF SUBCONTRACTORS IN TANZANIA CONSTRUCTION PROJECTS

Dear sir/madam

I am a Masters student in the University of Ardhi, Dar es Salaam, Tanzania. The aim of this research is the factors that influence health and safety performance of subcontractors, the challenges facing subcontractors to improve health and safety, and strategies to improve health and safety performance of subcontractors on construction projects.

In order to address the research goals. I have developed the attached questionnaire, which I will appreciate if you complete. I believe the topic of my Masters research bring an important contribution to enhance the quality of safety on construction sites

Dear respondent, you are kindly requested to answer the following question in this questionnaire. Your responses form an essential part of my research, hence will contribute to advances in health and safety performance of subcontractors on construction sites. The information under which this questionnaire has been prepared is solely for academic purposes only as a requirement to qualify for the award of Master of Science Construction Economics and Management Degree offered by the University of Ardhi, Dar es Salaam, Tanzania.

All information will be strictly confidential, remain anonymous and used only for the purpose mentioned above.

Thank for you time and valid contribution in advance.

Herman D.K. Rugaravu

MSc Candidate

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SECTION A - PERSONAL AND COMPANY INFORMATION

Please provide the contact information:

1. Company name and address:

Occupation of Respondents:

Approximate number of employee at this site (Please tick (√) the appropriate answers)

0 – 20

21 – 50

51 - 100

How long you have been working/involving in the construction industry.

----------Years

Principal business activity/type of specialized trade (Please tick (√) the appropriate answers)

Electrical

Plumbing

Air conditioning

Scaffold

Roofing

Others (Specify)

SECTION B - FACTORS THAT INFLUENCING SAFETY PERFORMANCE OF SUBCONTRACTORS

The following below are factors, which influence safety performance of subcontractors. For each of these factors, rate to what extent you have applied the factors by providing a tick (√) in the correspondence box provided. Rate in the order of: - 1 - not at all, 2 - rare apply, 3 – moderate, 4 - frequently apply, 5 - very frequently apply

		Not at all (1)	Rare apply (2)	Mode rate (3)	Frequ Ently Apply (4)	Very freque ntly apply (5)
	Factors that influencing Safety Performance of Subcontractors					
1.	Ensure health and safety item in the subcontractor's bills of Quantities					
2.	Ensure health and safety items provision					

	for subcontractor work is priced					
3.	Specific safety responsibility assigned to subcontractors					
4.	Ensure subcontractors' worker wear personal protective equipment (PPE)					
5.	Sharing safety information between main contractor and subcontractors.					
6.	Encourage workers from subcontractors to attend safety committee meeting.					
7.	Enforce provision safety sign and poster at the construction site in subcontractors					

	works					
8.	Enforce availability of safety protection measures at job site such as guardrail, hand rails, warning barriers, protective partitions and others for subcontractors works					
9.	Reward workers for their safety behaviour, and penalize workers for unsafe behaviour					
10.	Ensure safety law and regulations are adhered at construction site					
11.	Workers from subcontractors participate in safety planning					

12.	Agreement between main contractor and subcontractors stipulate a specific amount for safety during bidding					

SECTION C - CHALLENGES FACING SUBCONTRACTORS TO IMPROVE HEALTH AND SAFETY

The following below are barriers facing subcontractors on health and safety performance on construction site. For each of these barriers, rank to what extent affect safety performance of subcontractors by providing a tick (√) in the correspondence box provided. Please indicate your true filling or opinion by ranking the challenges to improve health and safety performance of subcontractors in the order of '1' being strongly agree'2' agree, '3'neutral '4' disagree, and '5' strongly disagree

	Challenges to improve health and safety performance	Strongly agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly Disagree (5)
1.	Safety items in the Bills of Quantities not priced by main contractors					
2.	Client focus on other objectives such as time and cost, rather than health and safety on construction site					
3.	Absence of safety and health committees in construction site					

	which incorporate subcontractors' workers					
4.	Fail by the main contractor to nominate safety officer that comply with safety requirement					
5.	Lack of safety communication between the main contractor and subcontractors workers on safety issues					
6	Inadequate personal protective equipment (PPE) at Work					
7	Lack of regular supervision at least once a week					
8	Risk assessment for subcontractors work is not practicable at workplace					
9	Irresponsible attitude of the workers during working or handling machines					
10	Fatigue caused by working with tight schedule and					

	overtime Lack of accident records and official safety data					
11	The perception that safety is expensive to implement					
12	Lack of safety briefing/toolbox meeting					
13	Safety law and regulations are not adequately enforced, thus disadvantaging those trying to implement them					
14	Safety law and regulations are impracticable for subcontractor construction companies					
15	Lack of mandatory safety training to give basic safety knowledge for subcontractors					
16	Lack of safety knowledge in order to implement proper safety measures as required					
17	Using unsafe equipment among subcontractors increase the					

	injury rate					
18	Economic hardship among subcontractors lead to poor safety performance					
19	Lack of familiar with the work site and dangerous position of subcontractors work to avoid injuries					
20	Lack of accidents records and official safety data					

SECTION D – STRATEGIES TO IMPROVE HEALTH AND SAFETY PERFORMANCE OF SUBCONTRACTORS ON CONSTRUCTION SITE

The following statement below are strategies to improve health and safety performance of subcontractors on health and safety performance in construction site. For each of these barriers, rank to what extent affect safety performance of subcontractors by providing a tick

(√) in the correspondence box provided. Please indicate your true filling or opinion by ranking in the order of '1' being strongly agree'2' agree, '3'neutral '4' disagree, and '5' strongly disagree

	Strategies to improve safety performance	Strongly agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly disagree (5)
1.	Trainings for construction workers					
2.	Include safety provision on subcontractors Bills of Quantities					
3.	Subcontractors to price Bills of safety Quantities on issues related to					

4.	Establish the specific role of subcontractors on safety					
5.	Close supervision by safety officer and top management					
6.	Subcontractors should carried out risk assessment					
7.	Commitments from highest level of company on safety related issues					
8.	Safety performance record of subcontractors to be one of the critical criteria in tendering					
9.	Government should enforce safety law and regulation effectively					
10	Punishments or consequences to subcontractors construction companies that violate safety regulations					