KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

Impact of Subcontractors Risk Management on Construction Project Cost Performance

By

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MASTER OF SCIENCE

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DECLARATION

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

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ABSTRACT

This study was conducted to determine the impact of subcontractor risk management on cost performance in construction project management using structured questionnaire and 150 participants. Specifically, the study sought to achieve the following: determine the significant factors of subcontractor risk in construction project management; determine the significant factors of cost performance in construction project management; determine the correlation between factors of subcontractor risk and cost performance in construction project management and assess the extent of impact of risk factors on cost performance in construction project management. Quantitative research design was used in this study along with descriptive and explanatory designs. The study found that there was a significant positive ($R=0.491$, p-value $= 0.000<0.05$) association between cost performance and risk of subcontracting management. The study found that subcontractor risk management explains about 24.1% variance in cost performance. The study concludes that risk of subcontractor management significantly predicts cost performance. This implies that with all things being equal, a change in risk of subcontractor management leads to 27.6% change in cost performance. Moreover, the study concludes that factors such as short-term relationships with the main contractor, low management competency of the subcontractor, financial problems, amendments, poor site safety, shortage of construction materials, site coordination risk, lack of safety, inexperienced workmanship of the contractor and site coordination challenges were ranked very high and significant risks in subcontractor management. The study recommends that management of construction project must conduct proper assessments on sub-contractors before awarding contracts to them.

Keywords: Subcontractors, Risk Management, Construction, Project Cost, Performance

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Above all, God is to be praised

DEDICATION

I dedicate this project report to Almighty God for his guidance and protection throughout this study. I also dedicate it to my lovely husband Mr. Restson Kwakye Ameyaw and daughter Deborah Kyakye-Ameyaw and family for their support and encouragement.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Risk is defined as uncertainties surrounding any human endeavour that is being valued or demands investment (Aven and Renn, 2009). The International Standards Organization (ISO) considered risk to be the effect of uncertainties on objects. According to the Law on Safety and Health at Work (2005), risk is the injuries, diseases and damages that affect the health of employees due to hazards. Putting risk in another context, it has been defined as the expression of influence and possible accidents that are likely to occur during an event (Mil-STD-882D, 2000).

1.1.1 Subcontracting

Subcontracting is a common practice in the construction industry. McCord and Gunderson (2013) have indicated that on any particular project, general contractors may rely on a number of subcontractors to execute specific works such as construction works, electrical works, mechanical works, drywall, roofing, steel erection and so on. Main contractors in large construction projects have mostly resorted to decomposition of their work by collaborating with various subcontractors.

Williams (2005) pointed out that although this working paragon offers many advantages, it also poses new challenges for main contractors in managing their projects successfully. Arguably, the most important of these challenges has become the main contractor dependency upon their subcontractors (Williams, 2005). When a construction firm wins a contract, it is common to subdivide the project and sub-let some portions (Wang and Yung, 2001).

As stated by the Associated General Contractors of America (AGCA), subcontractors are the independent contractors who perform the works, normally for a portion of the works described in the contract document. Subcontractor is defined as one who enters into a subcontract; individual or company that is hired to perform part of the work of general contractor.

Hinze and Tracy (1994) have also defined subcontractors as specialist contractors whose duties on a construction projects, are to embark on specific tasks (cited in Enshassi *et al*., 2008). Fah (2006) defined subcontractor as one who enters into a subcontract; individual or company that is hired to perform part of the work under main contractor and have no relationship with client directly. In addition, he stated that the main contractors transfer risks to subcontractors when they sublet the works to them.

1.1.2 Project Performance

Huang and Lu (2011) stated that the services of professional subcontractors are required for every construction project. They have further noted that the quality and performance of the construction projects depended on the performance of the subcontractor workers, and they found in their paper that there several demographic variables affected the level of job performance such as age, education, number of children, payment, marital status, work experience, and work type. Tam et al. (2011) noted that the use of subcontracting system is widely known to provide many advantages to the construction industry in many areas such as better efficiency of subcontractors 'work because of their exclusive expertise.

According to Ng and Tang (2010) subcontractors are vital component of the success of every construction project. The factors affecting the performance of subcontractors are classified, as those related to the project or an organization and on another hand, there are important factors affecting the performance of the subcontractors. These factors include

management level leadership, timely completion of project, profit, staff qualification/skill, reputation, payment method, company history, and project procurement method, safety, bidding method, insurance, bond and relationship with main contractors.

Ng *et al*. (2009) noted that subcontractors are considered more capable of maintaining a high-quality performance or improving inadequate performance and gain a greater chance of success when they have a good reputation and sound company history. There is no doubt that the Ghanaian Construction industry (GCI) as in many other holds the key to the development of the country by providing significant employment opportunities to the nation. Construction contributes to the national socio-economic and skilled levels (Ahadzie et al., 2012).

Beyond that, the industry provides the infrastructure and facilities required for other sectors of the economy to flourish such as; schools for education and training, factories and shops for commercial and business activities, housing for basic human needs, hospitals for health care, buildings for the national communications network and so on. It is the generation of these physical assets that many modern economies both developed and developing have successfully exploited towards achieving and sustaining the requisite socio-economic progress.

The construction industry plays a significant role in the economy of developing countries. However, the sector is also one of the most hazardous and dangerous to work in, with high injury and fatality rates around the world with frequent accidents and health-related problems (Kheni, et al., 2008).

In 2000, the British Government indicated that the number of deaths and injuries must be reduced in the construction industry (DETR, 2000). The British Government DETR (2000) and Carpenter *et al.* (2004, p. 36), both suggested that all construction professionals such

as engineers, architects, and surveyors should have an adequate education in health and safety risk management, in addition to their academic studies, for an improvement in the health and safety risk management of the construction industry (Ismail, 2014).

Osipova (2008) indicated that there are four approaches to the identification of risk, namely: (1) ad-hoc approach provides an assessment of the risk when the first symptoms appear on the project. (2) Informal approach involves the discussions with people involved with the project either directly or indirectly on some of the issues emerging risks or risks that might appear. (3) Periodic approach involves the use of repetitive procedures for the identification and specification of risk. (4) Formal approach identifies the risks and performs an evaluation of each risk. Risk management in construction projects is still very ineffective and that the main cause of this situation is the lack of knowledge (Serpella *et al.*, 2014).

1.2 PROBLEM STATEMENT

Generally, projects fail due to inadequate risk management and the best practices for the recovery. In addition, the author's goal is to define pre-signals for the failure of a project, because of risk management. Projects, by their nature, are unique and many of the more interesting ones are complex. They frequently take place over an extended period of time and demand the engagement of a wide range of resources, including people, finance, facilities, materials and intellectual property. In most circumstances, projects have defined objectives or an end-state that provides those involved in them with a clear vision and specification of their goals.

The lack of a risk analysis or management has results to most construction companies failing to plan for troubled projects and make real the three variables of a project; time, cost and scope.

However Risk management is essentially influencing the success of project performance such that risks in construction projects have impacts on the project performance (Siang & Ali, 2012). The gaps in previous studies include the elimination of subcontractors risk management in estimating the construction project cost performance. For instance Gunderson (2013) have indicated that on any particular project, general contractors may rely on a number of subcontractors to execute specific works such as construction works, electrical works, mechanical works, drywall, roofing, steel erection and so on. Main contractors in large construction projects have mostly resorted to decomposition of their work by collaborating with various subcontractors. Williams (2005) pointed out that although this working paragon offers many advantages, it also poses new challenges for main contractors in managing their projects successfully. Arguably, the most important of these challenges has become the main contractor‘s dependency upon their subcontractors (Williams, 2005). When a construction firm wins a contract, it is common to subdivide the project and sub-let some portions (Wang and Yung, 2001). In the light of the above the present study will determine the impact of subcontractors risk management on construction project cost performance.

1.3 AIM OF THE STUDY

The aim of this study is to assess the impact of subcontractor risk management on construction project cost performance.

1.3.1 Objectives of the Study

The specific objectives of the study include the following;

1. To identify the significant factors of subcontractor risk in construction project management.
2. To identify the significant factors of cost performance in construction project management.
3. To determine the correlation between factors of subcontractor risk and cost performance in construction project management.
4. To determine the of impact of risk factors on cost performance in construction project management

1.4 RESEARCH QUESTION

The specific objectives were used as the basis to formulate the research questions and the research questions are;

1. What are the significant factors of subcontractor risk in construction project management?
2. What are the significant factors of cost performance in construction project management?
3. What is the correlation between factors of subcontractor risk and cost performance in construction project management?
4. What is the extents of impact of risk factors on cost performance in construction project management?

1.5 SIGNIFICANCE OF THE STUDY

The significance of this study is judged on it theoretical and practical implications. In addition, the study has the efficacy to broaden the knowledge horizons of the researcher on

a wide variety of issues with regard to subcontractor's risk management on project cost performance in the construction sector of Ghana. This will first fill the knowledge gap identified regarding construction project management through its findings and proposed recommendations.

1.6 SCOPE AND LIMITATION OF THE STUDY

The contextual scope of the study is to determine the impact of subcontractor's risk management on construction project cost performance. The study was restricted to some selected construction projects in the Greater Accra and Ashanti Region. Geographically, the study was limited to selected construction projects in the Greater Accra and Ashanti Region in Ghana. The study area was informed by information accessibility and proximity to large population and the fact that the researcher is fluent in the indigenous language of the target population. The time scope is limited to cross sectional survey. Every study has at least one or two limitation and this study is no different. The study is limited by time, which has led to the researcher using a cross-sectional design other than longitudinal study. The study was also affected by the willingness of respondents to respond to the study based on the assumption that they want to protect the image of the company. Financial commitment is another limitation of this study, as the study has to be financed by the researcher without any sponsorship.

1.7 RESEARCH METHODOLOGY

This study employed cross sectional descriptive survey design. The population of the study comprised of all project contractors and subcontractors from selected construction projects in the Kumasi and Accra metropolises. Specifically, The survey covered D1K1, D2K2 and D3K3 construction firms in the Greater Accra and Ashanti regions, who are registered members of the Association of Building and Civil Engineering Contractors in Ghana and

Subcontractors who worked under them. A total of 150-sample size was adopted for the study. The study would rely on primary data. Primary data was gathered through administration of structured questionnaires. The field data was analyzed with the aid of Statistical Package Social Science version 21. Data analyses comprised of descriptive statistics like frequencies, percentages and means and standard deviations and inferential statistics like correlation and regression.

1.8 ORGANIZATION OF THE STUDY

The study's organization is into five sections (chapters). Chapter 1 provides the general introduction to the study. Chapter 2 involves the review of relevant literature in tandem with the study objective. Chapter 2 entails the methodology of the study. Chapter 4 involves the presentation of results and discussions. The final study chapter will present summary of findings, conclusions and also recommendations to influence policy actions.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents relevant literature review on the impact of subcontractor risk management on quality performance in construction project management. The review starts with conceptual definitions of key variables including; nature of subcontracting in the construction industry, defining subcontracting and subcontractors and their categories. Moreover, this chapter presents the challenges in subcontractor management and factors affecting the performance of subcontractors. It also highlights the management of cost and time constraints in subcontracts. The chapter culminates with theoretical review to support the variables under consideration.

2.2 CONCEPTUALIZING SUBCONTRACTING IN THE CONSTRUCTION INDUSTRY

Subcontracting is a common practice in the construction industry. McCord and Gunderson (2014) have indicated that on any particular project, general contractors may rely on a number of subcontractors to execute specific works such as construction works, electrical works, mechanical works, drywall, roofing, steel erection and so on. Main contractors in large construction projects have mostly resorted to decomposition of their work by collaborating with various subcontractors.

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Hinze and Tracy (1994) have also defined subcontractors as specialist contractors whose duties on a construction projects, are to embark on specific tasks (cited in Enshassi *et al*., 2008). Fah (2006) defined subcontractor as one who enters into a subcontract; individual or company that is hired to perform part of the work under main contractor and have no relationship with client directly. In addition, he stated that the main contractors transfer risks to subcontractors when they sublet the works to them.

Construction projects are normally awarded to general contractors or prime contractors, who intend sublet their works out to specialize outside firm to perform specific project activities. Main contractors usually undertaken to manage aspects of the project such as contract administration, cash flow management, material and equipment procuring, and monitoring the project progress (Benjaoran, 2009). As stated earlier, studies have established that the general contractor‘s performance with respect to time, quality and cost is strongly influenced by the performance of subcontractors (Mbachu, 2008; Albino and Garavelli, 1998). Studies have shown that well-performed sub-contractor can achieve jobs within planed duration with anticipated budget and prescribed quality. In the contrary, a poor-performed sub-contractor results a defective work and therefore consumes additional costs and completion time (Kale and Arditi, 2001; Schaufelberger, 2003; Shaikh, 1999).

2.3 DEFINITION OF SUBCONTRACTOR AND SUBCONTRACTING

Elazouni and Metwally (2000) have described Subcontracting as the act of general contractors hiring specialty contractors (subcontractors) to help them overcome problems on the jobsite such as the need for special expertise, shortage in resources of the general contractor, and limitation in finances. According to Samuel (2009), subcontractors enter into an agreement with principal contractor to undertake some specific parts of the main contractors work.

To reiterate earlier observation, Hinze and Tracy (1994), have also stated that the subcontractors are specialty contractors appointed to carry out specific tasks on a project (as cited in Enshassi and Shoman, 2008). Furthermore, Fah (2006) defined subcontractor as one who enters into a subcontract; individual or company that is hired to perform part of the work under main contractor but who have no direct contractual relationship with client.

In another vain, Chiang (2009) have described subcontracting is usually a contractual arrangement in which a main contractor sublets parts of the job to another contractor who may intend sublet it to third party firm. Mbachua (2008) has indicated that Subcontracting is a normal practice on housing and building construction projects than it is the case on engineering and industrial projects.

2.3.1 Categories of Subcontractors

Subcontractors have been grouped into three different categorizations (Mbachu, 2008). The first category comprises trade subcontractors. They are specialized on specific trades such as paintwork, brickwork, etc. The second category includes specialist subcontractors, which provide specialist services such as electrical, plumbing, insulation etc. The third category is known as labor-only-subcontractors that perform labor-only services (example,

skilled artisans). Ng *et al*., (2008) have categorized subcontractors into equipment-based subcontractors (who are specialized plant and equipment dealers) and labor-based subcontractors (those who are engaged because of result of their specialized labor resources).

Costantino *et al*., (2001) indicated that the benefit to the main contractor for employing only labour-intensive subcontractor lies in the fact that it reduces the cost of mobilization and material purchase. Besides, by avoiding the markup of full subcontracting, the general contractor obtains an economic advantage. However, because of the possibility of quality problems and claims in obtaining the supply of material when labour-only subcontractor is used, some general contractors are in favor of full subcontracting to shift risk and liability.

According to Enshassi and Medoukh (2007), there are two types of subcontracting as specialist subcontracting and volume subcontracting. They have explained that specialist subcontractor is used when the main contractor is not able to execute the work himself. This may be because he/she is not a specialist in the work at hand and so he obtains goods or services, and makes a contract with subcontractor. Volume subcontracting is used when an enterprise appoints a subcontractor because, while technically able to carry out the work, it is overloaded and has to obtain additional capacity from another source or contractors.

According to the contractual perspective, Yik *et al*., (2006) have classified subcontractors as domestic subcontractors and nominated subcontractors. Similarly, Masrom and Asrul (2007) opined that Subcontractors might be nominated, named and domestic subcontractor depending on the contractual arrangement made in a construction project. Whatever the circumstance, the client and his advisors appoint a nominated subcontractor whereas the main contractor does the appointment of a domestic subcontractor. The client appoints

Named Subcontractor but the main contractor has oversight responsibility over the named contractor's work and payments.

Nominated subcontractors are described as named subcontractors who go into a contractual arrangement with the principal contractor to execute part of the main contractor‘s work, supply or fix any materials or goods (Yik *et al*., 2006; Samuel, 2009). Associated General Contractors of America (AGCA) have described domestic subcontractor as the independent contractors who execute the works, normally for a portion of the works described in the contract document.

2.4 MOTIVATION FOR SUBCONTRACTING IN CONSTRUCTION PROJECTS

Ng et al. (2008a) has noted that the construction organisations rarely execute the work in its entirety without the use of subcontractors at a point in a project. Subcontracting is 15 used in construction projects primarily for performing specific, pre-determined types of construction works. Traditionally such firms act as trade sub-contractors to a general contractor (Bennett and Ferry, 1990 cited in Enshassi *et al*., 2008). The advantage of subcontracting is that the company performing a task is specialised in that particular type of construction task.

There is a further advantage of the subcontractor‘s competence and legal readiness to perform the relevant work section and to take responsibility for the related warranties. In subcontracting, the main contractor usually does supervision and management of the subcontractor and the main contractor is essentially the party ordering the performance of tasks from that subcontractor (Costantino and Pietroforte, 2001; 2002). Hughes *et al*., 2001 have indicated that multiple layers of subcontracting add enormously to the overall construction budget but the use of subcontractors varies appreciably. Subcontractors can

also save time and money by subletting some aspects of their work, and they often have a series of sub-subcontractors (Arditi and Chotibhongs, 2005).

2.5 CHALLENGES INHERENT IN SUBCONTRACTOR MANAGEMENT

According to Maturana (2007), a very momentous way in which the subcontractor management procedure has influenced the construction industry is that it has encouraged specialization and helped in transferring risk from the general contractor to the subcontractor. Maturana (2007) further stated that, subcontractor management has achieved remarkable results when it performed correctly but may also hinder project progress if performed inaccurately.

Poorly implemented subcontractor management responsibility can be attributable to lack of effective planning and coordination. Lack of requisite direction from construction management to subcontractors denies them the prospect to work to the best of their utmost capability. A project requires that subcontractors and subcontractors work together in an interactive manner; however because of the rather short-term nature of interaction period between them, there is little prospect to develop long-term relationships and trust (Vilasini, 2012).

One of the major challenges that exist when managing subcontractors is that, in most cases, the drive for each party has been to obtain profitability regardless of the adverse effects on other parties, instead of focusing on the overall project goals (Thomas 2005). Management must therefore make a consented effort, throughout a project‘s life to achieve unification of purpose of all parties involved in the construction process to head for a single undivided goal.

Usdiken (1988) argues that increased sub-contracting may reduce the main contractor's control over the construction process and could lead to cost and time overruns. Non-completion of construction projects have also been attributed to subcontractor delays (Alarcón *et al.*, 2005). Ohnuma, et al., (2000) suggests that the subcontractors 'main focus is on work completion with the least attention to material wastages and work quality. This could be because sub-contracted services are paid on the basis of physical production at a fixed price.

In Malaysia, factors contributing to time delays of construction projects have been traced to problems of subcontractor management (Abdul-Rahman *et al*., 2006; Sambasivan and Soon, 2007). According to Sambasivan and Soon (2007), in most mega projects in Malaysia, it is common to find many subcontractors working under the general contractors. Nevertheless, top five causal reasons for project delay have been attributed to subcontractors.

Lack of subcontractor skills have been established by Alaghbari *et al*. (2007) in another study, as one of the factors hindering the completion of projects within the stipulated time in construction projects in Malaysia. Apart from delays, coordinating the activities of subcontractors has been cited as one of the major challenges affect the construction labour productivity (Kadir *et al*., 2005). Notwithstanding disruption to work progress, subcontractors have been recognized as partner of general contractor and material suppliers in construction project are also publicized.

2.6 MAIN CONTRACTOR-SUBCONTRACTOR INTERFACE CHALLENGES

Several studies have been carried out on the interface problems. For example, Al-Hammad and Assaf (1992) and Al-Mansouri, (1988), have studied interface problem between designers and contractors. Again, Al-Hammad and Assaf (1992) and Hinze and Tracey,

(1994) focused on interface between contractors and sub-contractors; while Al-Hammad and Al-Hammad, (1996) also studied the interface problem between clients and designers.

The uniqueness of each construction project and the large number of project participants such as clients, consultants, main contractors, and subcontractors presents some interface problems. These problems can arise because of different specialties and multiple interrelated workflows as asserted by Irlayici and Tas, (2012). To emphasize this point, Moore *et al*., (1992) noted that because of the involvement of multiple parties in a particular construction project, some interface challenges is inevitable, e.g. lack of cooperation, antagonistic relationship among project stakeholders resulting from lack of efficient communication.

Ku (2000) identified five dimensions in analyzing interface management i.e. contract interface; technology interface; monitor interface; execution integration interface and the interacting behaviour in the interface. Huang *et al*., (2008) has indicated that the most practical and comprehensive to understand interface management in construction projects is the execution integration interface. The main interface problems have been identified and listed as:

a) Site coordination challenges

Subcontractors have blamed their inability to perform site works efficiently and effectively on poor site organization by main contractor. To counter the earlier assertion subcontractors have also accused main contractors of poor site coordination leading to under-utilization of subcontractors (Andy and Andrew, 2010). Studies have shown that such problems can be traced to issues such as project information, working programme, preparation for work place, interface between trades, access to site and plant and material support (Othman, 2007).

b) Contractor's financial challenges

It has been observed that inefficient management, lack of accurate estimates and delayed payments by the client can plunge the main contractor into serious financial problems. Consequently, this may lead to delayed payment from the main contractor to his subcontractor (Al Hammad, 1993). Othman (2007) has noted that one of the most crucial ingredients in fostering closer relationship between a contractor and his subcontractor in the long-term is timely payment to the latter. Each party is always overly suspicious in all business dealings with the other party due to lack of trust. The relationship between the two could be seriously mired if the main contractor is perceived a poor paymaster (Othman, 2007).

c) Non-adherence to the construction schedule

As part of the contractual agreement signed between the client and the main contractor, the project duration is spelt out and inserted in the contract. The main contractor will schedule his construction activities and that of his subcontractor(s) to meet the identified project duration. If any party delays the execution of his scheduled construction activities, it will have rippling effect on the way forward for the succeeding activities of the subsequent trades (Al-Hammad, A., S. Assaf 1992). According to Sambasivan and Soon (2007), high degree of subcontracting leads to high risk of delays and consequently, inefficiency in the construction industry.

During the construction process, it is common for the main contractor to blame his inability to fulfill the agreed project deadlines on subcontractors or contrariwise. Accordingly, misunderstanding may ensue between the general contractor and subcontractor(s) (Al-Hammad, A., S. Assaf, 1992). Joseph and Proctor (1996) opined that time overruns occur partly due the failure of the contractors to thoroughly appreciate a subcontractor's work

sequence. Hence, failure on the part of the main contractor to factor the subcontractor‘s work sequences in determining the project schedule. In another vain, where there are multiple subcontractors involved, conflicts may arise when a subcontractor fail to appreciate the requirements of variant subcontractors whose work may interfere with his or her operations (Joseph and Proctor, 1996).

d) Lack of proper communication

It has been established that the success of construction project in relation to timely completion is significantly affected be the effectiveness of communication between the contractor and his subcontractors. Inappropriate means of sharing and disseminating information among project the parties may seriously impede the headway for work Al-Hammad & Assaf, (1992). Some of the information communicated in construction projects covers issues such as project timelines, objectives and constraints. Lack of explicit and timely communication of relevant information on instructions and requirements from the clients to subcontractors affects their ability to performance to schedule.

Making change orders very late in the project and lack of sufficient time for planning prior to project take-off accumulations undue burden on the subcontractor and subsequently culminates into sub-standard outcome, or even unacceptable specifications. According to Huang *et al*. (2008), problems in communication might bring about serious inefficiencies such as improper planning and scheduling and absence of an appropriate information update system. When contractors poorly communicate information to their subcontractors, it is a recipe for wrongful pricing. Othman (2007), raised concern that main contractors usually mount pressure on the subcontractor to reduce prices and yet essential information that would have aided in the subcontractor‘s decision-making is held back; making it difficult for proper pricing and working.

e) Lack of Safety

According to Enshassi *et al*. (2008), the rate of accident occurrence involving subcontractors 'employees on multiplex construction projects is very high, principally when multiple subcontractors are engaged in one project. On the word of Al-Hammad & Assaf, (1992), non-adherence to health and safety regulations and standards by the contractor or his subcontractor have resulted in injury and even death to workers on construction sites.

f) Insufficient work-drawings or scanty specifications

According to Al-Hammad & Assaf, (1992), the ability to execute the construction works effectively, is contingent on the clarity of working drawings and specifications provided. Working with half-finished or vague drawings will create interpretation difficulties, which could result in wrong judgment that influences negatively on the quality of the project and results in disputes between contractors and subcontractors. On their part, Alinaitwe *et al*. (2007) established that interface challenges between main contractor and subcontractor due to incomplete drawing leads to low productivity.

g) Amendments

It is common for the client to request for an amendment when it becomes necessary to alter the original designs and the specifications. The component cost for executing a specific work section when amendment are made, may be the cause contractor-subcontractor disagreements Al-Hammad & Assaf, (1992) . To endorse earlier observations, Enshassi *et al*., (2007) pointed out that design modifications and specifications in the course of construction leads to low productivity. The main contractor-subcontractor interface challenges arise out of low productivity.

h) Delay in shop drawings and sample material approval

In construction contracts, the subcontractor is usually required to turn in shop drawings or sample materials for the contractor‘s endorsement. Delays in the approval of the submitted materials or drawings are because of inefficiency of the contractor. Disagreement may ensue between the contractor and the subcontractor as to who is the cause those delays in the execution of the work (Al-Hammad, 1993). To affirm this, Huang *et al*., (2008) noted contractor-subcontractor interface problems may arise due to delays in approval because of vague drawing.

i) Materials shortage

Continuous supply of materials to the production process is key sustaining the continuity of the construction work. Any shortage of material is detrimental to progress of the work by either the contractor or his subcontractor, thus conflict may arise between the two parties (Al-Hammad, 1993). Along with the observation by Enshassi *et al.* (2007) and Alinaitwe *et al*., (2007), shortage of material gives rise to main contractor-subcontractor problem interface owing to low productivity.

j) Legal disputes

According to Jannadia *et al*., (2000), disputes are a reality in every construction project and occur due to so many reasons. These legal disputes may arise between project participants, example; between clients and contractors, between the main contractors and subcontractors and even among the subcontractors. These types of disagreements may affect the relationships and negatively impact on performance of the contractor or his subcontractor and thus the overall outcome of the project (Al-Hammad, 1993).

2.7 CONSTRUCTION PROJECT PERFORMANCE

This section of the study presents project performance reported by previous researchers. Demirkesen and Ozorhon (2017) developed construction-specific determinants and indicators of project management performance. Interrelations among the knowledge areas and influence of these factors on performance were investigated. Data collected from construction projects were analyzed using structural equation modeling. The findings revealed that project integration, communications, safety, risk, human resources, financial, and cost management had a direct impact, whereas scope and time management have an indirect effect on performance.

Apanaviciene and Juodis (2006) examined the effectiveness of construction project management. The article presented construction project management effectiveness modeling from the construction management organization perspective. The paper reported on construction project performance data collected from management companies. Construction project management effectiveness model was established by applying artificial neural network methodology. The results showed that factors that influence project management effectiveness in terms of construction cost variation were identified covering areas related to the project manager, project team, project planning, organization and control.

Meng (2012) examined the effect of relationship management on project performance. Construction projects often suffered from poor performance in terms of time delayed cost overruns and quality defects. The causes of poor performance had often been analyzed. Few studies had addressed the influence of supply chain relationships on project performance in construction. The findings revealed that the deterioration of the relationship between project parties increase the likelihood of poor performance. And poor performance

is effectively reduced by improving some aspects of the relationship. Furthermore, the adoption of supply chain collaboration and partnering helps to solve the performance problems, in which a long-term collaboration is more favorable for performance improvement than a short-term collaboration.

Cho et al (2009) examined the effect of project characteristics on project performance in construction. Due to the limitations of the research methodologies used in these studies, important characteristics were often not considered in developing the relationship between project performance and project characteristics. In addition, the study established a SEM based on quantitative data from actual case studies as opposed to previous SEM studies that mainly use qualitative data. The findings revealed that the SEM developed identified the project characteristics that affect the level of project performance required by the owner.

Kim et al (2008) investigated the structure of the prediction model of performance for international construction. The study developed structural equation model (SEM) to predict the project success of uncertain international construction projects. Through a comparative analysis of SEM with a multiple regression analysis and artificial neural network, SEM showed more accurate prediction of performance because of its intrinsic ability to consider various risk variables in a systematic and realistic way. The findings revealed that international construction projects were affected by more complex and dynamic factors than domestic projects; frequently being exposed to serious external uncertainties such as political, economic, social, and cultural risks, as well as internal risks from within the project itself.

Memon et al (2011) accessed the time and cost performances in construction projects. And the time and cost performance of construction projects using structured questionnaire survey. The major contributors of this poor performance included design and

documentation issues, financial resource management and project management and contract administration issues. Further, qualitative study was carried out using semi-structured interviews with the experience personnel involving in managing construction project which resulted in developing mitigation measure to improve time performance mitigation measure to improve cost performance in construction project.

Jha and Iyer (2006) investigated the factors affecting quality performances in construction projects. The reasons for the underperformance of the quality of the construction projects were studied to suggest possible remedial measures. A preliminary survey identified attributes responsible to impact quality performance of the projects. Statistical analysis of questionnaire responses on the attributes resulted into two distinct sets of success and failure attributes. The results found that extent of contribution of various success factors varies with the current performance ratings of the project. And also found that Project manager's competence; top management support and their competence; inter- action between project participants; owners' competence; and monitoring and feedback by project participants are the factors having positive contributions to achieving the desired quality level, while factors such as conflict among project participants; hostile socio-economic and climatic condition; ignorance and lack of knowledge; some project specific factors; and aggressive competition at the tender stage are found to adversely affect the quality performances of projects.

Kang et al (2013) investigated the indirect impact of IT on construction project performance. Benchmarking and Metrics database, the overall impact of 3d cad use, including the direct impact of the use to project cost growth and its indirect impact via CII designated Best Practice(s), was tested by path analysis. The analysis results showed that the direct impact of 3d cad use on project cost growth is not statistically significant. On the

other hand, the indirect impact of 3D CAD use via Best Practice(s) was statistically significant. Furthermore interpreting the path values revealed that the use of cads contributed to more use of Best Practice(s), which in turn leads to cost performance improvement.

Ismail et al (2014) accessed the Time and Cost Performance of Construction project unfortunately construction industry has been regarded as industry facing poor performance leading to failure in achieving effective time and cost performance. As a consequence most of the projects faced huge amount of time and cost overrun. The study assessed the time and cost performance of construction projects using structured questionnaire survey. The findings showed that construction industries were significantly facing with the poor performance of construction time and cost. Hence, interviews were conducted to develop mitigation measure for controlling time and construction cost.

Enshassi et al (2007) identified factors affecting the performances of construction project. A comprehensive literature review was deployed to generate a set of factors believed to affect project performance. A total of questionnaires were distributed to a key group of project participants; namely owners, consultants and contractors .The survey findings indicated that all the groups agreed that the most important factors affecting project performance were: delayed because of borders, roads closure leading to materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials.

Badu and Sudhakar (2016) accessed the factors influencing performance of construction projects. The study of project success and the critical success factors (CSFs) was considered to be a mean for improving the effectiveness of project. Performance could be assured by

identifying and eliminating the factors that caused poor project outcome. And the purpose of the study was to systematically investigate the causes of project failure and how it could be prevented, managed, or controlled. Constructions projects were frequently influenced by success factors which helped project arties reach their intended goals with greater efficiency.

Pereira and flood (2017) investigated the Impact of linear correlation on construction project performance. In the construction industry, the productivity of all trades was directly impacted by uncertainty and variability. For repetitive projects, smooth workflow of productive resources was necessary to minimize or eliminate interruptions and idle time with the objective of reducing costs. An ideal or near optimal solution was required careful planning of the sequence, timing and resource allocations for each activity. The findings revealed that uncertainty in the duration of repeated activities would have a significant impact on what was determined to be the optimum project plan.

Zhang and Fan (2013) identified the improvement of performance of construction project. As a crucial soft skill, emotional intelligence (EI) is reported to have many benefits, yet it remains largely unexplored in construction project management. A questionnaire-based survey covering project managers in construction was used to determine project managers and related to the performance of their most recent projects, as well as examined the moderating effects of international involvement and contract types. The results indicated that international involvement and contract type are found to moderate the relationships between certain EI factors and project performance.

Powl and skitmore (2005) investigated the Factors hindering the performance of construction project. This study reported on the results of a worldwide survey of PMs concerning these issues and showed that they had the potential to be more effective and

more productive in their working. Associated with this was a need to be more aware of progress and developments in the CI generally, more aware of progress and developments in their own organization, more delegation of contract administration tasks and more general administrative support. The study revealed that the effective performance of the Project Manager (PM) is the single most critical factor affecting successful project outcomes.

2.8 FACTORS AFFECTING THE COST PERFORMANCE OF SUBCONTRACTORS

Huang and Lu (2011) stated that the services of professional subcontractors are required for every construction project. They have further noted that the quality and performance of the construction projects depended on the performance of the subcontractor workers, and they found in their paper that there several demographic variables affected the level of job performance such as age, education, number of children, payment, marital status, work experience, and work type. Tam et al. (2011) noted that the use of subcontracting system is widely known to provide many advantages to the construction industry in many areas such as better efficiency of subcontractors' work because of their exclusive expertise.

According to Ng and Tang (2010) subcontractors are a vital component of the success of every construction project. The factors affecting the performance of subcontractors are classified, as those related to the project or an organization and on another hand, there are important factors affecting the performance of the subcontractors. These factors include management level leadership, timely completion of project, profit, staff qualification/skill, reputation, payment method, company history, and project procurement method, safety, bidding method, insurance, bond and relationship with main contractors.

Ng *et al*. (2009) noted that subcontractors are considered more capable of maintaining a high-quality performance or improving inadequate performance and gain a greater chance of success when they have a good reputation and sound company history. According to Eom *et al*., (2008) subcontractor evaluation and management processes must include factors that will enhance cooperative relationships, especially, developing cooperative relationships, sharing mutual objectives, improving communication and participating in collaborative work.

Ng *et al*., (2008), have also discussed other factors effecting the management of the subcontractors in construction projects. Such factors include performance of relevant previous projects, quality of workmanship, compliance with regulations, prompt payment to labourers, adherence to programme, regularity and effectiveness of communication with main contractor, adherence to subcontract requirements. Other factors comprise adherence to statutory environmental regulations, number of experienced site supervisory staff, inspection and maintenance of good work environment, number of artisans and laborers, quality of as-built and shop-drawings and capacity to carry out the size of work and so on. The following factors that have been seen as affecting the management, operation and performance of subcontractors in the construction projects will further be discussed.

2.8.1 Technical and Managerial Skills

Failure of construction project have been attributed to improper managerial principles at all project members, such as improper focus of the management system, by rewarding the wrong actions and the lack of communication of goals (Hughes (1986), *c.f* Pheng and Chuan, 2006). According to Ng and Tang (2010), one of the most significant success factors that enable the subcontractors to perform their tasks successfully and to achieve the

project and organizational goals is managerial and technical skills and the most valued resources of the organization or the construction company is the subcontractor‘s skills.

Another study by Ng *et al*., (2003) postulated that planning resource efficiently could improve the project delivery time by as much as 45% and lead to about 7% project cost savings. Poor managerial skills can defeat the organization‘s objective to achieve a successful project and in many cases can lead to the tarnished image of an organization. Subcontractors must therefore possess the requisite skills to efficiently manage and plan for projects in the most economical manner.

According to Mahamid (2013), poor site management could result from a number of factors including poor management of labour, poor communications between labourers and managers, poor communications between construction parties, poor material management, lack of site manager experience and lack of labour experience.

2.8.2 Financial Capabilities of the Main Contractor and Subcontractors

According to Sears *et al*. (2008), general contractors are found of delaying payment to their subcontractors for completed work. General contractor may have the contractual right to withhold payments for many reasons but this could be a major source of disputes between the subcontractor and general contractor. Ng *et al*. (2008) have noted that to ensure the survival of subcontractors, they must have a good financial background to demonstrate that they have are in the position to complete the work. Ng and Tang (2010) have also noted that in order to expand their businesses and achieve a growth in revenue, subcontractors must maintain appositive cash flow and a good record of accomplishment of settling liabilities. As mentioned earlier, Arditi and Chotibhongs (2005) explained that the major cause of disagreements and disputes between main contractor and subcontractors is delayed payments from the main contractors to subcontractors.

To emphasize the earlier point, Ng *et al*., (2008), postulated that the prompt payment to labourers is among the most critical factors affecting construction project success. On the other hand, delayed and irregular payment of wages adversely affects the morale of the workers. Consequently, this will lead to slow progress of work, poor quality and undesirable delays to the project. Main contractors and subcontractors must therefore take payment issues seriously, and main contractors should enhance relationship with subcontractors and labourers to ensure the success of the project and to achieve good performance.

2.8.3 Subcontractors Qualification and Experience

Ameh and Osegbo (2011) have recommended that project managers should ensure that both nominated and domestic sub-contractors on any project have the necessary experience and plan of work to meet the requirements of the project. Ameh and Osegbo explain further that pre-qualification of the subcontractors would ensure that they have sufficient experience, proficiency and capacity to deliver not only quality work but on time. According to Kang (2011), the performance and excellence of the subcontractor‘s project team affect the project outcome with respect to quality and timely delivery, thus a key determinant of a project‘s economic performance.

Ng *et al*. (2003) noted that when incapable or inexperienced subcontractors are employed, the quality of final construction product could be sacrificed. In another study, Zhengquan (2005) revealed that some contractors have have exposed projects to hidden dangers of irregular contract performance by subletting certain works to undeserving subcontractors in order to preserve special relationships and lower project cost. Due to the awareness of the problems caused by incapable subcontractors in construction projects, the selection of

the capable subcontractors to execute the subcontracted tasks successfully and satisfactorily, has become increasing difficult (Ng *et al*., 2008).

Therefore, main contractors would collaborate with the consultant to invite the subcontractors who have previous relationship or subcontractors who have satisfactorily completed works of similar nature, size and complexity. So the previous experience and performance of relevant projects by subcontractor‘s is of paramount importance by the contractors and consultant in determining whom to invite to submit a quotation for a subcontract. Arslan *et al*. (2008) advised that the criteria for selecting subcontractors should look beyond bid price. In order to reduce risks and contribute significantly to the overall success of the project, main contractors should consider other factors such as previous experience, financial stability and quality of products. This can eliminate the problem of insufficient finance; inexperienced and incompetent subcontractors

Ng and Tang (2010) have concluded that the skill level of the workers of the subcontractor's construction team has a direct relationship with the quality of completed works achieved in a construction project. According to Mahamid (2013), normally, experience improves both the intellectual and physical capabilities of a laborer and hence improves productivity of the work.

2.9 MANAGEMENT OF COST CONSTRAINTS IN SUBCONTRACTS

A constraint is defined as a limitation. In every construction project, cost as well as time is regarded among the limitations that are critically challenging in the production process. In relation to Sambasivan and Soon (2007), time and cost overruns are clearly inter-related, causing disputes, litigation and even complete abandonment of projects. To emphasize this, Al-kharachi and Skitmore (2009) stated that cost issues are significant during production processes in delivery of project at specified time and at quality expected by the client.

The project manager is responsible for disseminating the constraint information to project participants, thereby ensuring that everyone involved in production process is in the known as regarding the significance of the project constraints and potential consequences of adjustment to time and cost. According to Roger (2012), in every construction project, completion within the time frame and at budgeted cost specified is one of the most significant factors of which everyone involved must be cognizant. Thus, slow progress of work causes anxiety among project participants.

Azhar *et al.* (2008) have argued that a project is successful when it is completed at an estimated budgeted cost within the period. Desai and Desale (2013) asserted that a project is successful when it is completed at budgeted cost within a reasonable frame time. Memon *et al.* (2010) emphasize that cost is a driving force for success in building development processes as well as being very important throughout the construction management life cycle. However, budget increase could result in unexpected time schedule delay (Azhar *et al.*, 2008).

In Nigeria for instance, Ganiyu and Zubairu (2010) noted that cost has been the major problem confronting the construction industry in delivery of projects at budgeted cost specified. Ganiyu and Zubairu (2010), further recommended the development of analytical cost models that capture the factors affecting cost during building production processes. According to Fugar and Agyakwah-Baah, (2010), in a construction project in Ghana, financial group factors ranked highest in among all the factors that caused delay. Desai and Desale (2013), who have argued that delay is a constant problem in private residential projects, support this assertion.

Ganiyu and Zubairu (2010) noted that most building clients are quite aware of economic constraints which have made it obligatory that any available budget should be spent wisely

to achieve best economic advantage. Consequently, specified budgeted cost is a constraint to construction, which clearly hinder the production process. Many researchers have liked the causes of delay in building production processes globally to cost issues. For example, Fugar and Agyakwah-Baah, (2010) argued that cost problems render it difficult for contractors to procure materials for building construction processes in Ghana, explaining that the material delay factor was ranked the second most important factor that causes construction delay.

According to Nega (2008), one of the major problems, causing a nightmare for construction stakeholders is the inability of a construction firm to complete project at budgeted cost within time frame at quality expected. Building production process completed does not necessarily mean that the client is satisfied with the project delivered. Client's satisfaction depends not just on completion, but also on completion *within* the budgeted cost specified and meeting up with the requirements specified (Nega, 2008). According to Fatoye (2012), the target of any construction firm is to complete project within the anticipated budgeted cost and quality. However, when the construction cost does not match up with the budgeted cost during production process, disputes and further delays arise. Consequently, Sunday (2010) argues that client and consultant should ensure that all the necessary needs and funding techniques are readily available during the production process.

2.10 THEORETICAL FOUNDATIONS

According to Stoner *et al*., (2003) theories are stance with which people make meaning of their world experiences. In the opinion of Yasin (2004), a theory consists of inter-reliant ideas and doctrines, which are methodically gathered for developing a background to a substantial area of knowledge. Theoretical framework has been defined as a configuration that can underpin or support a theory of a research. It outlines the theory that elucidates

why the problem under study occurs and serves as a basis for conducting research (Acharyya, 2004).

In order to better understand and establish an appropriate theory (ies) underpinning the concept of subcontractor management, various theories were reviewed. In the management of any construction project, there exist constraints relating to its scope, cost, and schedule; and the coordination of these constraints is the major challenge faced by construction managers Warburtan (2011). Koskela and Vrijhoef (2000) have argued that without improved theory, improvement in practice cannot be realized. Therefore, two theories had been employed in this study. Namely: Theory of Constraints and contingency theory

2.10.1 The Theory of Constraints

Goldratt developed the Theory of Constraints (TOC) at the early stages of the eighties in his book titled. The Goal: It is an organizations-based management idea for continuously promoting improvement in a system ‘s performance by targeting principal challenges hindering the system from accomplishing its objective (Inman *et al*., 2009; Gupta and Kline, 2008; Kim *et al*., 2008; Fredendall *et al*., 2002; Mabin and Baldestone, 2003; Simatupang *et al*., 2004).

The TOC methodology is Systems Thinking centered and therefore, it considers the totality of the system ‘s performance rather than concentrating on achieving improvement in the performance of tasks individually (Taylor and Churchwell, 2004; Mabin and Balderstone, 2003; Gupta *et al*., 2002; Scoggin *et al*., 2003). The TOC establishes that in any system there exist features called ―constraints‖ which inhibit its performance (Gupta and Kline, 2008; Schaefers *et al*., 2004; Simatupang *et al*., 2004). TOC realizes that absence will result in an improbable productivity: increase without bounds or eventually go to zero (Goldratt, 1990 cited in Leach, 1999).

The underlying belief of TOC is that every system has at least one constraint (Mabin and Baldestone, 2003; Schaefers *et al*., 2004; Simatupang *et al*., 2004) and it is only by enhancing the results of that constraint that the results of the entire system can be improved. The constraints in a system may be physical (example, equipment, skilled workforce or raw materials), policy (if the organisational policies fall short of the revolutions occurring in the operational setting) or behavioural (prevailing organizational culture). According to Rahman (1998), policy constraints abound in most organisations compared to physical constraints. The TOC empowers managers in detecting the system constraints and device methods to do away with them (Simatupang *et al*., 2004). As stated in Goldratt and Cox, there are five basic steps in the TOC continuous improvement process. These steps are Identify, Exploit, and Subordinate and elevate (Lechler *et al*., 2005, Leach, 1999).

a) *Identify the system constraint:* The constraint in a system is the part of the system that hampers the achievement of its objective. To manage a project successfully to achieve the expected results, it is important to recognize the system's weakest link. The constraint, otherwise referred to as bottleneck in a production environment, must be identified in this step. The term "link" can denote the systems "resource or workstation that is the bottleneck‖.

b) *Exploit the system constraint:* In order to prevent costly delays in the system, exploitation is done by maximizing the use of existing resources to improve the system. If for instance the constraint is equipment, make the most use of it at all time.

c) Second everything else to the system constraint: As soon as the constraint has been identified and exploited, the planning decisions have to be subordinated to the constraint to allow for workflow without difficulty. Re-assigning surplus capacity in non-constrained resources to constrained resources will help reduce the uncertainty in meeting deadlines.

d) Elevate the system constraint: If the overall performance of the system is not improved, or does meet the desired expectations after applying the above-mentioned steps, then the next step is to intensify the overall system capacity starting with the bottleneck. The main difference between this step and the step ―b‖ is that step ―d‖ requires additional investment in terms of time, money or effort. Techniques for elevating systems constraints include management-training, investment in additional resources, Information Technology (IT) etc.

e) If a new constraint surfaces, go through the previous steps; not allowing inertia to become the constraint. Increase in the capacity in the step ―d‖ might lead to change in the system‘s constraint. Accordingly, the process needs to be repeated to identify any possible new constraint. There is a wide unanimity among researchers (*e.g*. Inman *et al*., 2009; Lin *et al*., 2009; Watson *et al*., 2007; Inman *et al*., 2009; Gupta *et al*., 2002; Gardner *et al*., 1993) that, the application of the TOC leads to momentous improvement in organizational performance. It has also been established that the use of the TOC improves due date delivery performance (Watson and Patti, 2008; Wahlers and Cox, 1994; Darlington, 1995; Mabin and Balderstone, 2003).

Theory of Constraints has, however, been criticized on a number of issues. Koljonen and Reid (1999) point to the failure of the TOC to appreciate the revolving nature of contemporary organizational atmosphere as the main weakness. They have bemoaned the linearity and the static nature of the relationships among a system ‘s components as portrayed in the Theory of Constraints ‘logic trees for failing to fully represent the dynamic complication in today ‘s organizations. The authors have therefore suggested the pairing of the Theory of Constraints logic trees with System Dynamics Modelling techniques towards

reinforcing the TOC procedure. In another observation, Watson *et al.* (2007) noted that lack of top-level management backing and pledge to ensure the sustainability of the TOC.

In their opinion, substantial length of time required for training to master the usage has triggered the delegation of implementation of the TOC by many top-level managers to mid-level managers. Moreover, Goldratt (1990) postulated that the success of the TOC process depends to a large extent on the collective enthusiasm of all members in the organization for the Theory of Constraints. Goldratt foresees that to generate appreciable level of enthusiasm among members in an organization can only be realized if the members consciously ―own the organization‖.

2.10.2 Contingency Theory

The contingency theory (Luthans, 1973) was an alternative response to the classical school that advocated for universal principles of ―one single way‖ to organize and manage (Donaldson and Hilmer, 1998; Weill and Olson, 1989; Hanisch and Wald, 2012). The theory stresses the need for flexibility and advocates the absence of any one best way to organize or manage organizations but rather, management decisions should be built on situational and contextual factors.

Daft (2000) argues that management ‘s should be able to study and ascertain the precise features of the situation and then come up with answers to deal with these eventualities. To support this argument, Sauser *et al.*, (2009) stated that the contingency theory affords the opportunity for industry stakeholders to frequently re-examine project characteristics and tailor project management exercise to fit different construction project. In support of the contingency theory, many researchers have refuted the rigid claim of one size fits all ‘that was assumed to apply for all types of project in previous project management practice (Shenhar and Dvir, 2004; Sauser *et al.*, 2009; Shenhar, 2001).

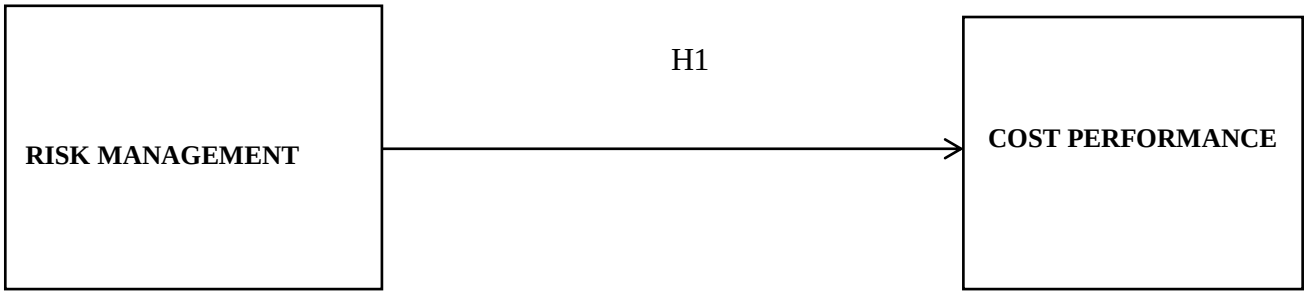
The contingency theory postulates that, diverse external conditions exist in organizations and hence, in all cases, project management practice need dissimilar operational features (Sauser *et al.,* 2009; Shenhar, 2001). Consequently, goodness of fit between structural and environmental variables on the project influences the achievement of organizational effectiveness (Sauser *et al.,* 2009; Shenhar, 2001). According to Shenhar (2001 cited by Kwofie, 2015) organic organization thrives well mostly in turbulent energetic project setting whiles rigid organizations succeed within a steady and more stable project atmosphere. On his part, Youker (2002) puts forward that projects share highly comparable features when they are grouped based on their product and similar methodologies based on the features is more appropriate than general methodologies.

To support earlier assertions, Crawford *et al.* (2005) using the classical theory of contingency in project management admitted that advancing project management concept based on categorization of project is more beneficial to organizations. Certainly, the classical theory of contingency school strongly upholds the believe that there exist different project environments as is the case with subcontracts and so the management methods should be different (Sauser *et al.,* 2009).

However, the contingency theory has been criticized on a number of issues including a clear definition of the environment for the organization. Besides, the peculiarity between organization and its environment is not necessarily as distinct in practice as contingency theory suggest as big businesses can create their own environments (Mullins, 2007). Notwithstanding these criticisms and limitations, Mullins (2007) maintains that the contingency theory draws attention to the possibilities of different structures for different activities of the organization and varying structures based on nature of projects, the economy and the cyclical nature of specific industry such as construction.

2.11 PROPOSED CONCEPTUAL FRAMEWORK

Conceptualizing the impact of subcontractor's risk management on construction project cost performance



Independent (IV) **Dependent (DV)**

Fig.2.1; Concept of Subcontractor Risk Impact on Cost Performance

Source: Author's Construct (2018)

The conceptual framework above indicated the relationship between independent variable (risk management), the dependent variable (cost performance). The diagram hypothesized that risk management (IV) has direct effect on cost performance among subcontractors. This relationship had been empirically supported. For instance Gunderson (2013) have indicated that on any particular project, general contractors may rely on a number of subcontractors to execute specific works such as construction works, electrical works, mechanical works, drywall, roofing, steel erection and so on. Main contractors in large construction projects have mostly resorted to decomposition of their work by collaborating with various subcontractors. Williams (2005) pointed out that although this working paragon offers many advantages, it also poses new challenges for main contractors in managing their projects successfully. Arguably, the most important of these challenges has become the main contractor‘s dependency upon their subcontractors (Williams, 2005). When a construction firm wins a contract, it is common to subdivide the project and sub-let some portions (Wang and Yung, 2001).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The chapter discusses and presents the research methods adopted for the study at hand. Subsequently, the research design, research strategy, population, sample size and sampling techniques of the study are comprehensively discussed. The sources of data, which incorporate both primary and secondary data, are presented. Also, data collection instruments and techniques are presented with the ethical considerations governing the conduct of the research also put forward.

3.2 RESEARCH DESIGN

Research design is defined as a plan of action or guided procedure for scientific studies. This study employed quantitative research design. Quantitative research is based on the principles of the natural sciences and therefore relies on the assumptions of an objectivist view of the social world. Objective methods of measurements are therefore used in the measurement of constructs in quantitative research. In Creswell's (2009) view quantitative research generally involves the collection and analysis of data using statistical procedures and analysis with an aim to determine the truth or otherwise of hypotheses or theory. The research hypotheses and or questions may often be grounded in a theoretical framework based on past studies on the topic. In this study quantitative instruments were used to determine the impact of subcontractor risk management on construction project cost performance. This research purpose fell into descriptive and explanatory research designs. The descriptive design allowed the researcher to ascertain detail information about the variables, defined and described them. The descriptive further was used to describe the characteristics of the study variables in more detail to reflect the larger population in which

the samples were drawn from. The explanatory design was used to measure the cause and effect relationships among the man constructs in the study.

3.3 POPULATION

Population encompasses a group of individuals, objects or elements, which form the object of study. They are simply elements or individuals with similar characteristics that are being studied (Saunders *et al.,* 2009). Population represents the entire number of people available for a particular study. Hence, Saunders et al., (2009) stated that population consists of members who are likely to be selected for to answer study questionnaires. This survey covered D1K1, D2K2, D3K3 construction firms in the Greater Accra and Ashanti regions, who are registered members of the Association of Building and Civil Engineering Contractors in Ghana and Subcontractors who worked under them.

3.4 SAMPLE SIZE AND SAMPLE TECHNIQUE

Saunders *et al*. (2009) has noted that when it is impossible to collect data from the whole population for a study within the stipulated time, a researcher must select a sample. The authors further stated that sampling saves time, and should be considered as the best option when the researcher is constrained with time (Dawson, 2002). According to Fellows and Liu (2008), the objective of sampling is to allow practical means by which the data collection process is undertaken to achieve a good representation of the sampled population. According to Sakaran, (2000) sampling means taking a part of a population as representative of that population. Convenient sample was used to select 200 respondents for the study. Convenient sampling was used because the researcher gave the questionnaires to respondents who were available and willing to participate in the study. Besides, convenient technique was used due to time, finance and other constrains.

3.5 DATA COLLECTION INSTRUMENTS

Data collection is the process of eliciting information from a given population. The main data collection tool used in this study is structured questionnaire. This technique was used due to the nature of the topic. Moreover, questionnaire was used because it has been identified as a way to gather data from a potentially large number of respondents at the relatively cheaper cost. Serious thoughts were given to the wording of individual questions. This was done to ensure that respondents answered objectively to the questions in the questionnaire. Questionnaires were developed using the specific objectives as a guide in order for the analysis to reflect or address the objectives.

3.5.1 Questionnaire Piloting

According to Dawson (2009) a pilot study is a test of the questionnaires in order to identify any probable amendments prior to the start of the main study, and is usually carried-out on people who will be taking part in the main study. Ngulube (2005a) further advised that questionnaire should only be ready for administration when it has undergone pre-testing. After the questions were prepared and arranged, a pilot trial of the questionnaire was done on researcher ‘s fellow graduate students to check the precision, consistency and relevance of the questions asked. Subsequently, the necessary alterations were made to streamline final version in accordance with the objectives of the study prior to formal administration of the questionnaire.

3.5.2 Questionnaire Distribution and Administration

The questionnaires were hand delivered to respondents and retrieved personally by the researcher. This ensured that the questionnaires got to the intended recipients and aided in improving the response rate. According to Frazer and Lawley (2000), there are four

approaches to administering questionnaire: by mail; personally administered questionnaire; telephone questionnaire; and internet questionnaire. The questionnaires were self-administered by respondents such as Project Managers, Quantity Surveyors, Structural Engineers, and Architects of the sampled construction firms; comprising of the Main contractor and the Subcontractor organization. The respondents usually complete self-administered questionnaires by themselves (Saunders et al, 2009). Some of the respondents completed and returned the questionnaires instantly whiles the rest of the questionnaires were retrieved subsequently.

3.6 DATA ANALYSIS

Data preparation was the initial step to convert raw date into structured format that are more appropriate for the analysis. Tasks in this stage will include data editing, data coding and data entry. The questionnaires returned were first cleaned and checked for completeness. They were then coded and fed into Statistical Package for Social Science (SPSS) version 20 and then transported into the Microsoft Excel 2010 for analysis using descriptive statistical tools and measures namely mean and standard deviation, tables and Relative Importance Index (RII). Apart from the demographic data respondents, relative importance index employed to rank each section to determine the significant factors. In keeping with the observation by Enshassi *et al.,* (2007) who noted that analysis of data on Likert scale 1-5, the request of Importance Index is also appropriate. Unlike the mean that could be impacted by extreme values (outliers), variables with high significant effect could be observed using relative index, which evaluate each variable in relative to other variables. Also, average ranking of each variable was done using mean scores with their standard deviation. The analysis also included inferential statistics (correlation and regression).

3.7 ETHICAL CONSIDERATIONS

Respondents who formed the focus of the study were asked to indicate their willingness to participate in the study. The freedom of respondents was taken into consideration by the author who indicated that their rights were respected. However, the primary data collected was handled with care to ensure rights to privacy of respondents. Anonymity was ensured. Thus, the identity of the respondents was secured as names were not associated with the data.

3.8 SUMMARY OF CHAPTER

In this chapter, the researcher discussed the methodology used in the research. The chapter discussed issues relating to the study area. The study was guided by the mixed philosophy of research, hence, used both quantitative and qualitative method of data collection and analysis. Moreover, the chapter also stated the sources of data and information, target population, sample size used and sampling procedures. The instruments for data collection as well as how the data was to be analyzed and presented were considered in the chapter.

CHAPTER FOUR

DATA PRESENTATIONS, ANALYSES AND DISCUSSIONS

4.1 INTRODUCTION

This chapter presents the analyses and discussions on the impact of subcontractor risk management on cost performance in construction project management. One hundered and fifty useable questionnaires were received out of 200 distributed representing 75% response rate. The analysis had been organized into three mean categories. Notably; frequencies and percentages, means and standard deviations finally correlation and regression.

4.2 DEMOGRAPHIC INFORMATION

This section presents the demographic information of the respondents typically their classes in the construction industry, level of education, professional background, experience and dealing with subcontractors.

Table 4.1: Socio-demographic Characteristics of Respondents

Variables	Frequency	Percent
Class in the construction industry		
D1K1	46	30.7
D2K2	70	46.7
D3K3	34	22.7
Highest Level of Education		
HND	24	16.0
BSc	64	42.7
Post Graduate	51	34.0
Other	11	7.3
Professional background		
Construction Project Manager	29	19.3
Architect	30	20.0
Quantity Surveyor	48	32.0
Civil and/or Structural Engineer	43	28.7
Years of working in the category of organization		
1-5 years	2	1.3
6-10 years	47	31.3
11-15 years	41	27.3
16 years and above	60	40.0
Working on a project with subcontractors		
1-5 years	30	20.0
6-10 years	78	52.0
11-15 years	15	10.0
16 years and above	27	18.0

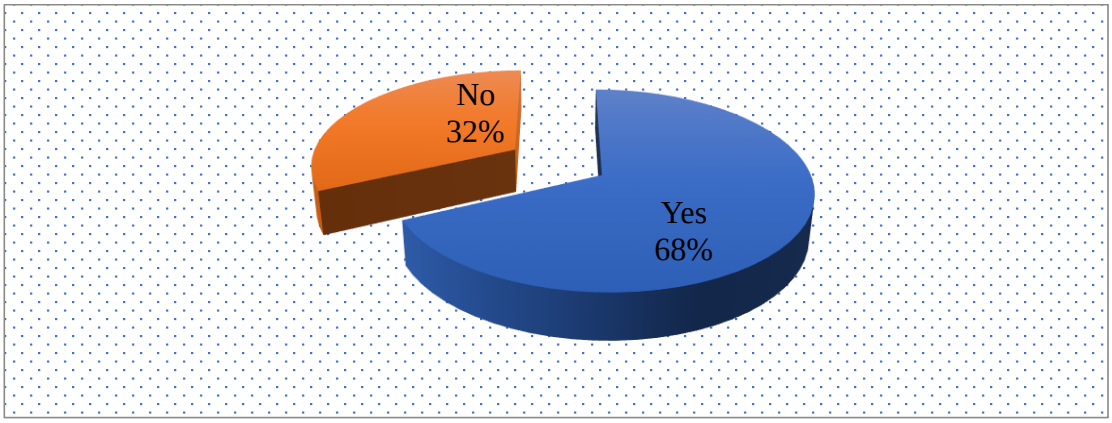
Source: Field Survey, 2018

Table 4.1 presents the socio-demographic characteristics of respondents. The survey revealed that 46.7% of the respondents are in the D2K2 category in the construction industry, 30.7% of the respondents are grouped under the D1K1 category in the construction industry and 22.7% are captured under the D3K3 category in the construction industry. Moreover, 42.7% of the respondents are BSc certificate holders, 34% are post-graduate personnel, 16% are HND certificate holders and 7.3% have other certificates. More so, 32% of the respondents are quantity surveyors, 28.7% of the respondents are Civil and/ or Structural Engineers, 20% of the respondents are Architects and 19.3% of the respondents are construction project managers. Also, 40% of the respondents have worked

in their current construction company for 16 years and above, 31.3% of the respondents have worked for 6-10 years, 27.3% have worked for 11-15 years and 1.3% of the respondents have worked for 1-5 years. With the number of years company have worked with subcontractors, majority (52%) of the respondents indicated that they have worked with subcontractors for 6-10 years followed by 20% of the companies that have worked with subcontractors for 1-5 years, 18% of the companies have worked with subcontractors for 16 years and above and 10% of the companies have worked with subcontractors for 11-15 years.

4.1.1 Do Subcontractors further subcontract out assigned work assign to them?

This question is intended to find out whether subcontractors further give out works there are on to another subcontracting firm to execute



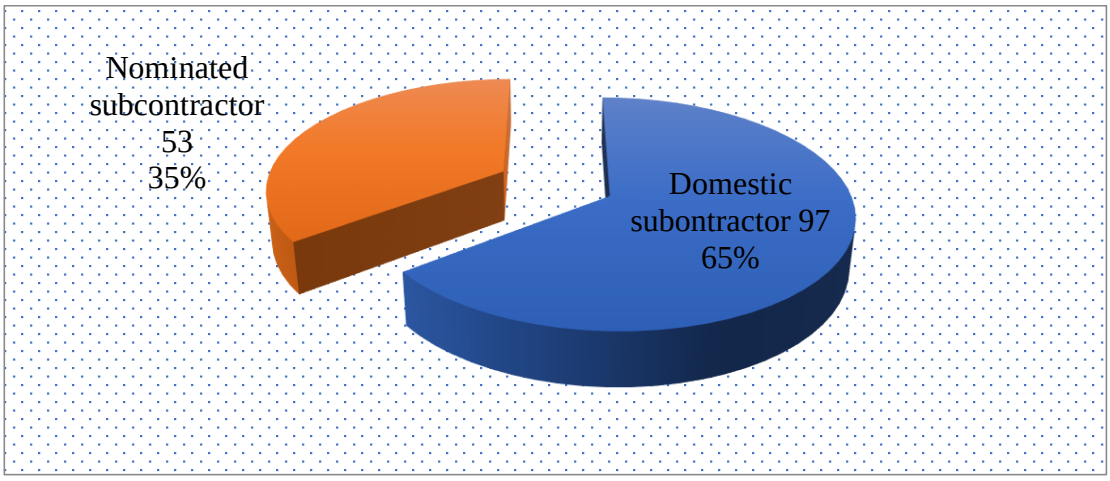
Source: Field Survey, 2018

Figure 4.1: Subcontracting furthering subcontract

Figure 4.1 presents subcontractors furthering subcontracting of its work. The survey shows that majority (68%) of the subcontractors further subcontract its works to other small contractors and 32% of the subcontractors do not further subcontract its works.

4.1.2 Preferred Types of Subcontractors by Main Contactors.

This aspect of the question is geared towards finding out the preferred subcontractor



Source: Field Survey, 2018

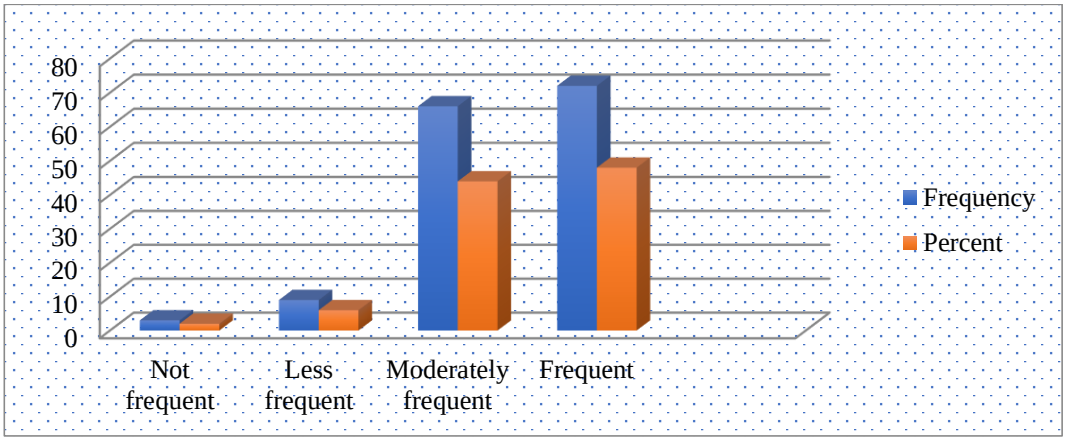
Figure 4.2: Preferred Types of Subcontractors

Figure 4.2 presents preferred subcontractors and from the figure, 65% of the construction companies prefer to subcontract their projects to domestic subcontractors and 35% of the companies prefer to subcontract its activities to nominated subcontractors.

4.2 EXTENT SUBCONTRACTING IS USED IN THE CONSTRUCTION INDUSTRY

4.2.1 Frequency of Subcontracting Practiced

The extent at which subcontractors are used on a project is key to knowing how relevant their works are.



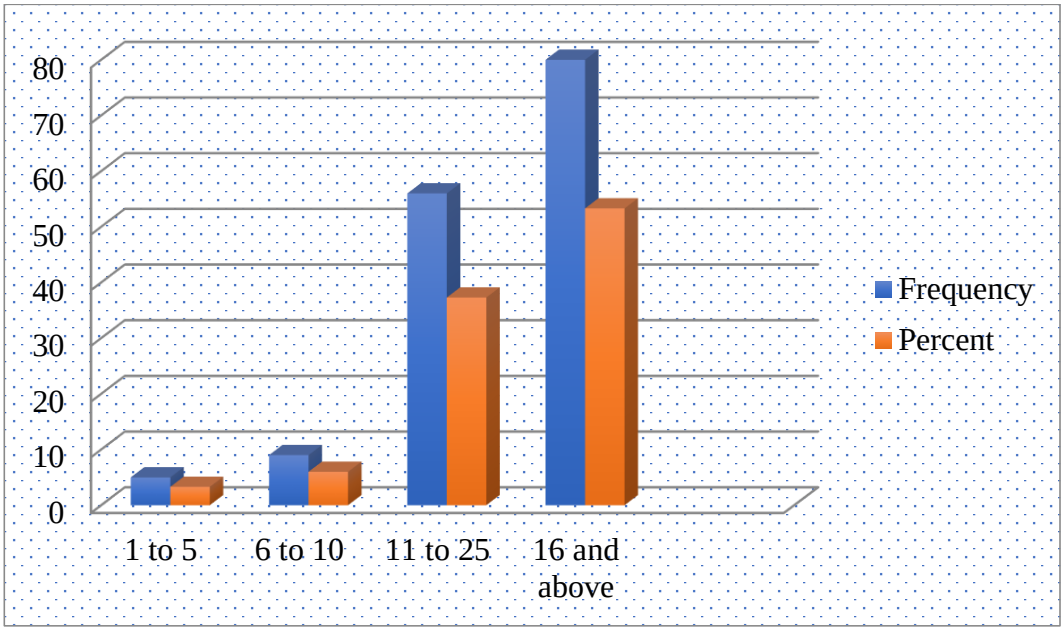
Source: Field Survey, 2018

Figure 4.3: Frequency of Subcontracting Practices

Figure 4.3 presents frequency of subcontracting practices. Results show that 48% of the construction companies frequently practice subcontracting, 44% of the companies moderately practice subcontracting, 6% of the companies less frequently practice subcontracting and 2% do not frequently practice subcontracting.

4.2.2 Subcontracted Project within the last five years

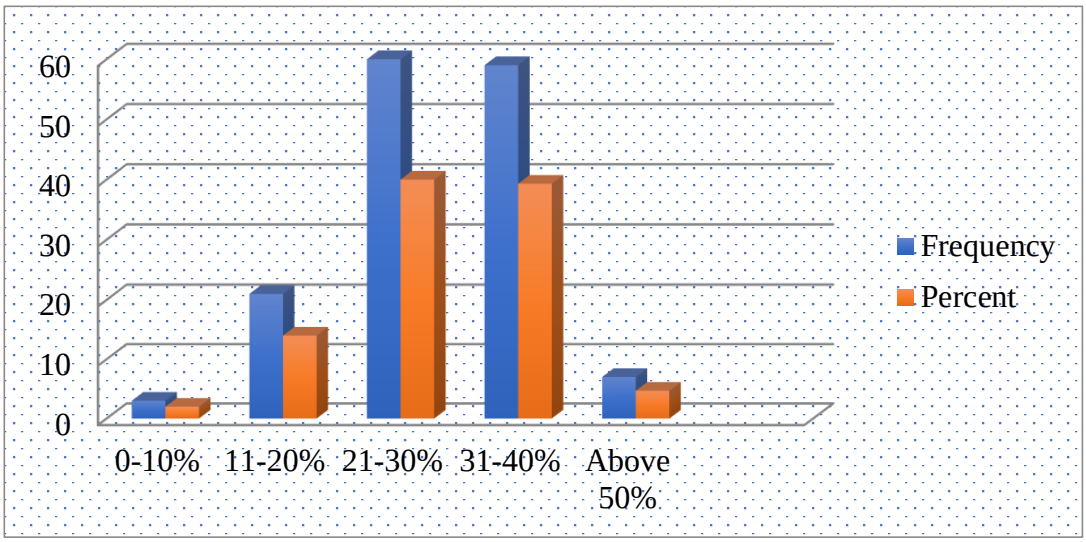
The significance of subcontracting is clearly demonstrated in the frequency of their engagement over a period. Hence the need to find out how often their used on a project.



Source: Field Survey, 2018

Figure 4.4: Subcontracted Project in the last five years

Figure 4.4 presents subcontracted project construction companies have been involved in the past five years. More than half (53.3%) of the construction companies have undertaken subcontracting for 16 years and above, 37.3% of the respondents have undertaken subcontracting for 11-25 years, 6% have practiced subcontracting for 6-10 years and 3.3% of the construction companies have practiced subcontracting for 1-5 years.



Source: Field Survey, 2018

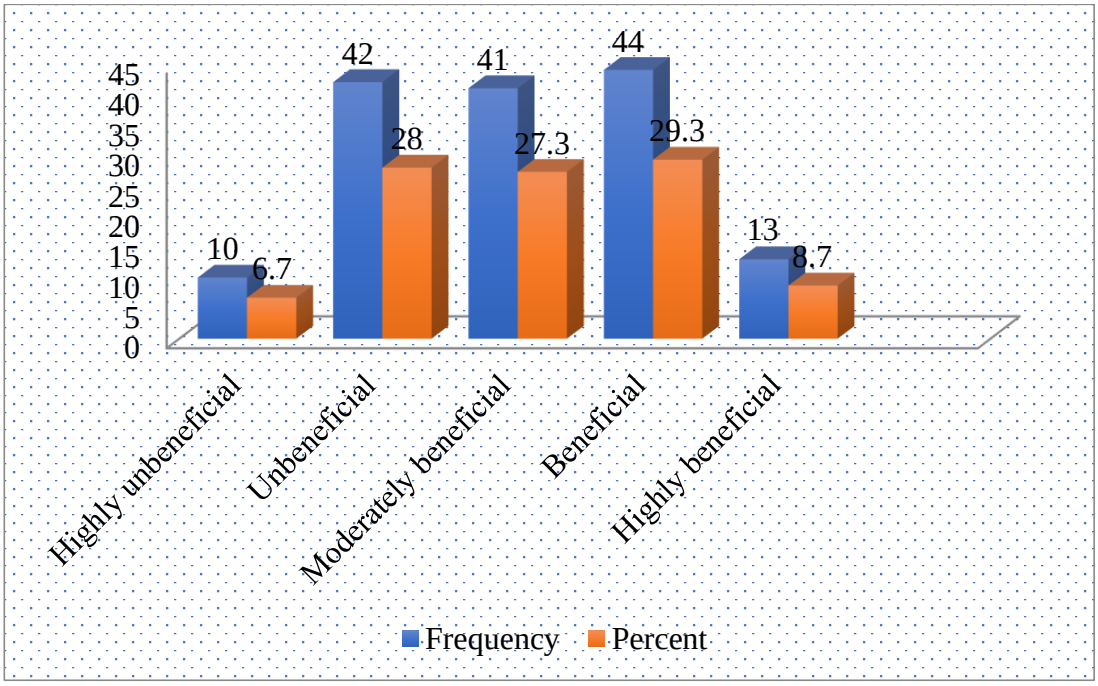
Figure 4.5: Percentage of work usually Subcontracted

4.2.3 Percentage of work usually Subcontracted

Figure 4.5 presents the percentage of work usually subcontracted. From the figure, 40% of the construction companies have undertaken subcontracting between 21-30%, 39.3% of the companies have undertaken subcontracting between 31-40%, 14% have practiced subcontracting between 11-20%, 4.7% practice more than 50% of subcontracting and 2% practice 0-10% subcontracting.

4.2.4 Benefits of Subcontracting in Construction Industry

The response seeks to find out the benefits associated with subcontracting in the construction industry



Source: Field Survey, 2018

Figure 4.6: Benefits of Subcontracting in Construction Industry

Figure 4.6 presents beneficial fundamental principles of subcontractor management to building industry. The study found that 29.3% of the respondents belief subcontracting management is beneficial, 29.3% of the respondents believe managing subcontractors are moderately beneficial, 28% belief it is unbeneficial, 8.7% belief managing subcontractors is highly beneficial and 6.7% belief it is highly unbeneficial.

4.3 Risks in Subcontractor Management

This section presents analysis on subcontractor management in construction projects. The study used 5-point Likert scale Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant

Table 4.2: Risks in Subcontractor Management

Statements	VS	S	A	NS	SNS
Legal disputes	74/49.3%	22/14.7%	27/18.0%	23/15.3%	4/2.7%
Shortage of construction materials	108/72.0%	17/11.3%	13/8.7%	2/1.3%	10/6.7%
Delay in shop drawings and sample material approval	46/30.7%	34/22.7%	13/8.7%	1/0.7%	56/37.3%
Amendments	102/68.0%	32/21.3%	6/4.0%	6/4.0%	4/2.7%
Incomplete work-drawings or specifications	40/26.7%	49/32.7%	9/6.0%	-	52/34.7%
Lack of safety	90/60.0%	41/27.3%	13/8.7%	-	6/4.0%
Site coordination challenges	92/61.3%	35/23.3%	11/7.3%	-	12/8.0%
Lack of proper communication	52/34.7%	28/18.7%	13/8.7%	-	57/38.0%
Low management competency of the subcontractor	107/71.3%	26/17.3%	11/7.3%	4/2.7%	2/1.3%
Improper planning by the contractor	52/34.7%	37/24.7%	24/16.0%	-	37/24.7%
Financial problems	96/64.0%	36/24.0%	15/10.0%	1/0.7	2/1.3%
Short-term relationships with the main contractor	111/74.0%	27/18.0%	8/5.3%	1/0.7%	3/2.0%
Unrealistic price estimation	27/18.0%	32/21.3%	15/10.0%	3/2.0%	73/48.7%
Inexperienced workmanship of the contractor	108/72.0%	17/11.3%	8/5.3%	7/4.7%	10/6.7%
Poor site safety	113/75.3%	10/6.7%	9/6.0%	13/8.7%	5/3.3%
Improper communication	53/35.3%	14/9.3%	9/6.0%	9/6.0%	65/43.3%
Contactor's financial challenges	97/64.7%	11/7.3%	11/7.3%	14/9.3%	17/11.3%

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.2 presents risks in subcontractor management. The survey discovered that 49.3% of the respondents indicated that legal disputes is a very significant risk in subcontractor management, 18% averagely belief that legal dispute is a risk in subcontractor management, 15.3% stated that legal disputes are not significant risk in subcontractor management, 14.7% belief legal dispute is a significant risk in subcontractor management and 2.7% belief legal disputes is strongly not significant a risk in subcontractor management. Also, 72% of the respondents agreed that shortage of construction materials is a very significant risk in subcontractor management followed by 11.3% who agree that shortage of construction materials is a significant risk in subcontractor management 8.7% averagely belief that shortage of construction materials is a risk in subcontractor management, 6.7% belief shortage of construction materials is strongly not significant risk in subcontractor management and 1.3% indicated that shortage of construction materials is not a significant risk in subcontractor management. Moreover, 37.3% stated that delays in shop drawings and sample material approval is strongly not a significant risk subcontractor management, 30.7% of the respondents belief that delays in shop drawings and sample material approval is a very significant risk in subcontractor management, 22.7% of the respondents agree that delays in shop drawings and sample material approval is a significant risk in subcontractor management, 8.7% averagely agree to that and 0.7% indicated that delays in shop drawings and sample material approval is not a significant risk subcontractor management.

Moving on, 68% of the respondent belief amendments are very significant in managing risks, 21.3% also agree to that, 4% belief amendment is not significant in risk management and 2.7% belief is strongly not significant in risk management. Again, 34.7% stated that incomplete work drawings is strongly not significant as risk in subcontractor management, 32.7% belief incomplete work drawings is a significant risk in subcontractor management,

26.7% belief incomplete work drawings is a very significant risk in subcontractor management and 6% averagely agree that belief incomplete work drawings is a risk in subcontractor management. With lack of safety, it was found 60% said it is very significant risk in subcontractor management, 27.3% said it is significant risk in subcontractor management, 8.7% averagely belief that and 4% said it is strongly not significant risk in subcontractor management. Regarding site coordination challenges, 61.3% is very significant, 23.3% belief it is significant, 8% indicated that site coordination challenge is strongly not significant and 7.3% averagely agree that site coordination challenge is a risk. Moreover, 38% of the respondents believe lack of proper communication is not strongly significant in risk subcontractor management, 34.7% belief lack of proper communication is very significant, 18.7% significantly belief lack of proper communication is a risk subcontractor management and 8.7% averagely agree to that. More so, 71.3% of the respondents believe that low management competency of the subcontractor is a very significant risk subcontractor management, 17.3% significantly belief that low management competency of the subcontractor is a risk in subcontractor management, 17.3% also agree to that, 7.3% averagely agree, 2.7% do not significantly serve as a risk in subcontractor management and 1.3% of the respondents said low management competency strongly not significant to subcontractor management.

More so, 34.7% of the respondents indicated that improper planning by the contractor is a very significant risk in subcontractor management, 24.7% belief improper planning by the contractor is a significant risk in subcontractor management, 24.7% also strongly said it is insignificant and 16% averagely belief improper planning by the contractor is a risk in subcontractor management. With financial problem being a risk in subcontractor management, 64% said it is very significant, 24% said it is significant, 10% said it is averagely true, 1.3% said it is strongly insignificant and 0.7% said it is insignificant.

Regarding short-term relationships with the main contractor being a risk in subcontractors, 74% very significantly agreed, 18% significantly agreed, 5.3% averagely agreed, 2% strongly belief it is insignificant and 0.7% said it is insignificant. Also, 48.7% indicated that unrealistic price estimation is strongly insignificant, 21.3% belief unrealistic price estimation is significant, 18% belief unrealistic price estimation is very significant, 10% averagely belief unrealistic price estimation is significant and 2% belief it is insignificant. Moreover, majority (72%) of the respondents believe that inexperienced workmanship of contractors is very significant, 11.3% belief it is significant, 6.7% belief otherwise, 5.3% agreed that it is averagely significant and 4.7% also belief it is insignificant.

In addition, majority (75%) of the respondents believe poor site safety is very significant to risks in subcontractor management, 8.7% said it is insignificant, 6.7% agreed that it is significant, 6% belief it is averagely significant and 3.3% belief poor site safety is strongly significant to risks in subcontractor management. relatedly, 43.3% of the respondents indicated that improper communication is strongly insignificant to risks in subcontractor management, 35.3% belief otherwise, 9.3% agreed that improper communication is a significant risk in subcontractor risk management, 6% averagely belief that and another 6% said it is insignificant. Lastly, in relation to contactor's financial challenges, 64.7% stated that it is very significant to risks of subcontractor management, 11.3%% belief it is strongly insignificant, 9.3% said it is insignificant, 7.3% averagely belief that contactor's financial challenges is a risk of contractor management and 7.3% said it is significant.

Table 4.3: Mean Rank on Risks in Subcontractor Management

Statements	Mini	Maxi	Mean	Std. D	Rank
Short-term relationships with the main contractor	1.00	5.00	4.61	0.79	1st
Low management competency of the subcontractor	1.00	5.00	4.55	0.82	2nd
Financial problems	1.00	5.00	4.49	0.81	3rd
Amendments	1.00	5.00	4.48	0.95	4th
Poor site safety	1.00	5.00	4.42	1.14	5th
Shortage of construction materials	1.00	5.00	4.41	1.14	6th
Site coordination risk	1.00	5.00	4.40	1.15	7th
Lack of safety	1.00	5.00	4.39	0.95	8th
Inexperienced workmanship of the contractor	1.00	5.00	4.37	1.20	9th
Site coordination challenges	1.00	5.00	4.30	1.15	10th
Contactor's financial challenges	1.00	5.00	4.05	1.46	11th
Legal disputes	1.00	5.00	3.93	1.24	12th
Improper planning by the contractor	1.00	5.00	3.45	1.56	13th
Incomplete work-drawings or specifications	1.00	5.00	3.17	1.66	14th
Lack of proper communication	1.00	5.00	3.12	1.76	15th
Delay in shop drawings and sample material approval	1.00	5.00	3.09	1.72	16th
Improper communication	1.00	5.00	2.87	1.82	17th
Unrealistic price estimation	1.00	5.00	2.58	1.66	18th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.3 presents the Friedman mean rank on risks in subcontractor management. The table shows that factors like short-term relationships with the main contractor, low management competency of the subcontractor, financial problems, amendments, poor site safety, shortage of construction materials, site coordination risk, lack of safety, inexperienced workmanship of the contractor and site coordination challenges were ranked very high and significant to risks in subcontractor management. These factors recorded means of 4.00 and above. Nonetheless, factors like improper communication, unrealistic price estimation, delay in shop drawings and sample material approval, lack of proper communication, incomplete work-drawings or specifications, improper planning by the contractor, legal disputes and contactor's financial challenges were ranked low as factors that contributes to risks in subcontracting management. The factors that were categorized under this the less significant recorded means of 3.99 and below.

4.4 Factors Affecting Cost Performance of Subcontractors

Table 4.4: Project related Factors

Statements	VS	S	A	NS	SNS
The presence of the project in a densely populated area	94/62.7%	16/10.7%	24/16.0%	6/4.0%	8/5.3%
Large or complex project	108/72.0%	17/11.3%	17/11.3%	-	6/4.0%
Increase or additional work for the project from the limit set in the contract	48/32.0%	18/12.0%	14/9.3%	6/4.0%	62/41.3%
Remote location (difficult accessibility to the site)	102/68.0%	19/12.7%	12/8.0%	8/5.3%	7/4.7%
There is no contingency budget to proceed works	33/22.0%	38/25.3%	11/7.3%	6/4.0%	60/40.0%
Increasing the fundamental changes in the nature of works	87/58.0	30/20.0%	24/16.0%	1/0.7	6/4.0%
Many execution obstacles	88/58.7%	18/12.0%	26/17.3%	4/2.7%	12/8.0%
Governments policy, market condition & political situation	59/39.3%	21/14.0%	13/8.7%	3/2.0%	52/34.7%

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.4 presents the project related factors. The study revealed that 62.7% of the respondents believe that the presence of project in a densely populated area is very significant to project related factors, 16% of the respondents averagely believes that, 10% belief the presence of project in a densely populated area is significant to project related factors, 5.3% said belief it is strongly insignificant and 4% belie is not significant. Moreover, a whopping % 72%of the respondents believe large or complex projects is significantly related to projects factors, 11.3% significantly belief that, another11.3% averagely believes that and 4% strongly disagree to that. More so, 41.3% of the respondent

believe additional work for the project from the limit set is strongly insignificant, 32% belief it is very significant, 12% belief it is significant and 9.3% averagely trust that additional work for the project from the limit set is significant and 4% said it is insignificant. Again, 68% of the respondent belief remote location is very significantly related to project factor, 12.7% belief remote location is significantly related to project factor, 8% averagely belief remote location is related to project factor, 5.3% belief it is insignificant and 4.7% belief remote location is insignificant project factor. Moving on, 40% of the respondents strongly belief no contingency budget to continue works is insignificantly related to project factor, 25.3% said it is significant, 22% belief no contingency budget to continue works is very significantly related to project factor, 7.3% averagely agree with that and 4% belief it is insignificant. Also, majority (58%) of the respondents believe increasing the fundamental changes in the nature of work is very significantly related to project factor, 20% agreed to that, 16% also agree to that but 4% of the respondents opposed the fact that increasing the fundamental changes in the nature of work is very significantly related to project factor and 0.7% disagreed. similarly, 58.7% of the respondents stated that many execution obstacles are very significantly related to project factor, 17.3% averagely agree to that, 12% agree to that while 8% strongly believe that many execution obstacles are an insignificant project factor and 2.7% believe it is insignificant. Lastly, 39.3% of the respondents indicated that government policy, market condition and political situation is a very significant project factor, 34.7% belief otherwise, 14% belief government policy, market condition and political situation is a significant project factor, 8.7% averagely agree to that and 2% belief it is insignificant.

Table 4.5: Mean Rank on Project related Factors

Statements	Mini	Maxi	Mean	Std. D	Rank
Large or complex project	1.00	5.00	4.49	0.99	1st
Remote location (difficult accessibility to the site)	1.00	5.00	4.36	1.14	2nd
Increasing the fundamental changes in the nature of works	1.00	5.00	4.29	1.03	3rd
The presence of the project in a densely populated area	1.00	5.00	4.23	1.18	4th
Many execution obstacles	1.00	5.00	4.12	1.27	5th
Governments policy, market condition & political situation	1.00	5.00	3.22	1.77	6th
Increase or additional work for the project from the limit set in the contract	1.00	5.00	2.89	1.77	7th
There is no contingency budget to proceed works	1.00	5.00	2.85	1.68	8th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.5 presents Friedman mean rank on project related factors. The study found that large or complex project, remote location (difficult accessibility to the site), increasing the fundamental changes in the nature of works, the presence of the project in a densely populated area and many execution obstacles were highly considered as significant as a project factor with means of 4.00 and above whereas governments policy, market condition and political situation, increase or additional work for the project from the limit set in the contract and there is no contingency budget to proceed works were ranked as low significant as a project factor with means of 3.99 and below.

Table 4.6: Contract Documents & Management related Factors

Statements	VS	S	A	NS	SNS
Implementing the lowest bid price system	103/68.7%	15/10.0%	23/15.3%	5/3.3%	2/1.3%
Selection of subcontractors through competitive strategy & taking the lowest price as the only criteria for selection	60/40.0%	25/16.7%	18/12.0%	1/0.7%	44/29.3%
Assisting the main contractors in pricing the tender by the subcontractors	96/64.0%	24/16.0%	25/16.7%	1/0.7%	2/1.3%
The subcontractors are preferred to be company registered in contractor's union	109/72.7%	21/14.0%	13/8.7%	3/2.0%	4/2.7%
Clear understanding of the contract conditions and requirements, project objectives and implementation methods by the contractors and subcontractors	28/18.7%	15/10.0%	16/10.7%	2/1.3%	89/59.3%
The clarity of the contract between contractor between contractors and subcontractors	105/70.0%	22/14.7%	14/9.3%	-	9/6.0%
Delays in the adoption of change orders	113/75.3%	21/14.0%	9/6.0%	1/0.7%	6/4.0%
Compliance with regulations by the contractors & subcontractors	59/39.3%	11/7.3%	17/11.3%	2/1.3%	61/40.7%
Adherence to subcontract requirements	20/13.3%	25/16.7%	10/6.7%	1/0.7%	94/62.7%
Quality and clarity of design drawing and shop drawings	27/18.0%	15/10.0%	18/12.0%	1/0.7%	89/59.3%
Payment method to the main contractor by the client	109/72.7%	8/5.3%	23/15.3%	2/1.3%	8/5.3%
Insurance terms, interest rate and bond/loan terms	19/12.7%	26/17.3%	23/15.3%	3/2.0%	79/52.7%

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.6 presents contract documents and management related factors. The study discovered that 68.7% of the respondents stated that implementing the lowest bid price system is very significant, 15.3% averagely agree to that, 10% belief implementing the lowest bid price system is significant, 3.3% belief implementing the lowest bid price system is insignificant and 1.3% belief implementing the lowest bid price system is strongly significant. Also, 40% of the respondents indicated that selection of subcontracting of subcontractors through competitive strategy and taking the lowest price is very significant, 29.3% belief it is strongly insignificant, 16.7% belief it is significant, 12% belief it is averagely significant and 0.7% belief selection of subcontracting of subcontractors through competitive strategy and taking the lowest price is strongly significant. More so, 64% of the respondents believe assessing main contractor's in pricing is very significant, 16.7% belief assessing main contractor's in pricing is averagely significant, 16% belief it is significant, 1.3% belief it is insignificant and 0.7% belief assessing main contractor's in pricing is insignificant. Moreover, 72.7% of the respondents indicated that subcontractors are preferred to be company registered is very significant, 14% belief it is significant, 8.7% averagely agree, 2.7% stated that it is insignificant and 2% belief subcontractors are preferred to be company registered is strongly insignificant. In furtherance, 59.3% of the respondent belief clear understanding of the contract conditions and requirements are considered strongly insignificant, 18.7% belief otherwise, 10.7% averagely agreed that clear understanding of the contract conditions and requirements are considered significant and lastly, 10% belief it is significant. Regarding clarity of the contract between contractor and subcontractor, 70% belief it is very significant, 14.7% belief it is significant, 9.3% averagely belief it is significant and 6% stated that clarity of the contract between contractor and subcontractor is not significant.

In addition, 75.3% of the respondents believe delays in the adoption of change orders is very significant, 14% belief it is significant, 6% averagely belief delays in the adoption of change orders is significant, 4% belief it is strongly insignificant and 0.7% belief delays in the adoption of change orders is insignificant. 40.7% of the respondent belief compliance with regulations by contractor and subcontractors is strongly insignificant, 39.3% believed the opposite, 11.3% averagely belief it is significant, 7.3% belief compliance with regulations by contractor and subcontractors is averagely significant and 1.3% stated that compliance with regulations by contractor and subcontractors is insignificant. Majority (62.7%) of the respondents belief adherence to subcontract requirement is strongly insignificant, 16.7% belief adherence to subcontract requirement is significant, 13.3% agreed to that, 6.7% averagely agreed and 0.7% belief adherence to subcontract requirement is insignificant. Most of the respondents (59.3%) belief quality and clarity of design drawings is strongly insignificant, 18% believed otherwise, 12% belief quality and clarity of design drawings is averagely significant, 10% belief it is significant and 0.7% belief quality and clarity of design drawings is insignificant. Majority (72.7%) of the respondents believe that payments methods are very significant, 15.3% belief payments methods are averagely significant, 5.3% belief it is significant, another 5.3% belief payments methods are strongly insignificant and 1.3% stated that payments methods are insignificant. Lastly, most of the respondents (52.7%) belief insurance terms, interest rate and bonds are strongly insignificant, 17.3% belief it is significant, 15.3% belief insurance terms, interest rate and bonds are averagely significant, 12.7% belief insurance terms, interest rate and bonds are very significant and 2% belief insurance terms, interest rate and bonds are insignificant.

Table 4.7: Mean Rank on Contract Documents & Management related Factors

Statements	Mini	Maxi	Mean	Std. D	Rank
Delays in the adoption of change orders	1.00	5.00	4.56	0.94	1st
The subcontractors are preferred to be company registered in contractor's union	1.00	5.00	4.52	0.93	2nd
Assisting the main contractors in pricing the tender by the subcontractors	1.00	5.00	4.43	0.89	3rd
Payment method to the main contractor by the client	1.00	5.00	4.39	1.13	4th
Selection of subcontractors through competitive strategy & taking the lowest price as the only criteria for selection	1.00	5.00	3.38	1.69	5th
Compliance with regulations by the contractors & subcontractors	1.00	5.00	3.03	1.82	6th
Insurance terms, interest rate and bond/loan terms	1.00	5.00	2.35	1.55	7th
Quality and clarity of design drawing and shop drawings	1.00	5.00	2.27	1.64	8th
Clear understanding of the contract conditions and requirements, project objectives and implementation methods by the contractors and subcontractors	1.00	5.00	2.27	1.60	9th
Adherence to subcontract requirements	1.00	5.00	2.17	1.60	10th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.7 presents the Friedman mean rank on contract documents & management related factors and from the table, delays in the adoption of change orders, the subcontractors are

preferred to be company registered in contractor's union, assisting the main contractors in pricing the tender by the subcontractors, the clarity of the contract between contractor between contractors and subcontractors, implementing the lowest bid price system and payment method to the main contractor by the client are ranked as very significant to contracting documents and management with means of 4.00 and above whereas selection of subcontractors through competitive strategy & taking the lowest price as the only criteria for selection, compliance with regulations by the contractors & subcontractors, insurance terms, interest rate and bond/loan terms, quality and clarity of design drawing and shop drawings and adherence to subcontract requirements are moderately ranked with means between 3.99 to 3.00.

Table 4.8: Factors pertaining to Project Staff in general

Statements	VS	S	A	NS	SNS
The lack of the efficiency, qualification and skills of the project team	97/64.7%	18/12.0%	16/10.7%	4/2.7%	15/10.0%
Morally support the project staff	34/22.7%	71/47.3%	38/25.3%	6/4.0%	1/0.7%
Conduct of training courses to qualify the project staff to work on-site	34/22.7%	34/22.7%	70/46.7%	12/8.0%	-
Number of craftsmen and laborers in the project	36/24.0%	58/38.7%	50/33.3%	6/4.0%	-
Qualified supervisory staff	39/26.0%	26/17.3%	79/52.7%	6/4.0%	-

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.8 presents factors pertaining to project staff in general. From the table, 64.7% of the respondents indicated that the lack of efficiency, qualification and skills of project team is a factor pertaining to project staff in general, 12% of the respondents believe the lack of

efficiency, qualification and skills of project team is a factor pertaining to project staff in general, 10.7% averagely agreed, 10% strongly belief it is insignificant and 2.7% belief it is insignificant. Most of the respondents (47.3%) belief morally support the project staff is significantly related to the project staff in general, 25.3% averagely agree, 22.7% very significantly agree to that effect while 4% of the respondents morally support the project staff is insignificantly related to the project staff in general and 0.7% strongly belief morally support the project staff is insignificantly related to the project staff in general. Also, 46.7% of the respondent belief conducting training course to qualify project staffs is averagely significant, 22.7% belief conducting training course to qualify project staffs is very significant, another 22.7% belief it is significant and 8% belief conducting training course to qualify project staffs is insignificant. Moreover, 38.7% of the respondent belief the number of craftsmen and laborers in the project is significant, 33.3% belief this is averagely significant, 24% belief this is very significant and 4% belief the number of craftsmen and laborers in the project is insignificant. Lastly, 52.7% of the respondents indicated that qualified supervisory staff are averagely significant, 26% belief that qualified supervisory staff are very significant and 17.3% indicated that that qualified supervisory staff are significant while 4% belief that qualified supervisory staff are insignificant.

Table 4.9 Mean Rank on Factors pertaining to Project Staff in General

Statements	Mini	Maxi	Mean	Std. D	Rank
The lack of the efficiency, qualification and skills of the project team	1.00	5.00	4.19	1.32	1st
Morally support the project staff	1.00	5.00	3.87	0.83	2nd
Number of craftsmen and labourers in the project	2.00	5.00	3.83	0.84	3rd
Qualified supervisory staff	2.00	5.00	3.65	0.91	4th
Conduct of training courses to qualify the project staff to work on-site	2.00	5.00	3.60	0.93	5th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.9 presents the Friedman mean rank on factors pertaining to project staff in general and from the table, lack of the efficiency, qualification and skills of the project team was ranked as highly significant with mean=4.19 while morally support the project staff, number of craftsmen and laborers in the project, qualified supervisory staff and conduct of training courses to qualify the project staff to work on-site are ranked as less significant with means of 3.99 and below.

Table 4.10: Factors pertaining to Project Manager

Statements	VS	S	A	NS	SNS
Manager personality & his experience	38/25.3%	23/15.3%	77/51.3%	12/8.0%	-
Salary of the managers	33/22.0%	52/34.7%	59/39.3%	6/4.0%	-
Management level leadership	36/24.0%	42/28.0%	59/39.3%	12/8.0%	1/0.7%
Regular and effective communication & coordination of main contractors and subcontractors' tasks to ensure the continuity of the work of subcontractors	15/10.0%	55/36.7%	57/38.0%	7/4.7%	16/10.7%
Managers' recognition of the other construction activities related to subcontractors tasks to ensure the continuity of the work of subcontractors	34/22.7%	83/55.3%	32/21.3%	1/0.7%	-

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.10 presents the factors pertaining to project manager. The survey revealed that majority (51.3%) of the respondent belief that manager personality & his experience is averagely significant to project managers, 25.3% belief manager personality & his experience is very significant to project managers, 15.3% belief manager personality & his experience is significant to project managers and 8% belief manager personality & his experience is insignificant to project managers. Moreover, 39.3% stated that the salary of the manager averagely influence the project manager, 34.7% belief it significantly influence the project manager, 22% belief the salaries of the manager is very significant to the project manager and 4% stated that the salary of the manager does not influence the project manager. Similarly, 39.3% of the respondents indicated that management level

leadership averagely influence project manager, 28% belief management level leadership significantly influence project manager, 24% stated that management level leadership very significantly influence project manager, 8% belief management level leadership does not significantly influence project manager and 0.7% strongly belief it does not significantly influence project managers.

More so, with regular and effective communication and coordination of main contractors and subcontractors influencing project manager, 38% averagely affirmed it, 36.7% belief it significantly influences project manager, 10.7% belief this is strongly insignificant, 10% belief regular and effective communication and coordination of main contractors and subcontractors influencing project manager and 4.7% belief otherwise.

Table 4.11: Mean Rank on Factors pertaining to Project Manager

Statements	Mini	Maxi	Mean	Std. D	Rank
Managers' recognition of the other construction activities related to subcontractors tasks to ensure the continuity of the work of subcontractors	2.00	5.00	4.00	0.69	1st
Salary of the managers	2.00	5.00	3.75	0.84	2nd
Management level leadership	1.00	5.00	3.67	0.95	3rd
Manager personality & his experience	2.00	5.00	3.58	0.96	4th
Regular and effective communication & coordination of main contractors and subcontractors tasks to ensure the continuity of the work of subcontractors	1.00	5.00	3.31	1.07	5th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.11 presents Friedman mean rank on factors pertaining to project manager. The study shows that managers' recognition of the other construction activities related to subcontractors tasks to ensure the continuity of the work of subcontractors was ranked as highly significant with mean=4.00 and manager personality and his experience, salary of the managers, management level leadership and regular and effective communication and coordination of main contractors and subcontractors tasks to ensure the continuity of the work of subcontractors were ranked as low significant with means of 3.99 and below.

Table 4.12: Factors related to main contractors

Statements	VS	S	A	NS	SNS
Previous experience, history and reputation of the main contractors	9/6.0%	79/52.7%	42/28.0%	6/4.0%	14/9.3%
Practical and technical ability of the main contractors	32/21.3%	71/47.3%	46/30.7%	-	1/0.7%
Contractors performance of relevant previous projects	27/18.0%	88/58.7%	30/20.0%	-	5/3.3%
Financial ability & strength of the main contractors	18/12.0%	69/46.0%	42/28.0%	6/4.0%	15/10.0%
Ability in dealing with uncertainty in the construction projects	39/26.0%	64/42.7%	40/26.7%	6/4.0%	1/0.7%
Controlling and follow up of subcontractors activities by main contractor's engineers	16/10.7%	60/40.0%	59/39.3%	-	15/10.0%
Financial facilitation to subcontractors to be able to purchase the materials and equipment	25/16.7%	77/51.3%	43/28.7%	4/2.7%	1/0.7%
Main contractor should give a subcontractors	30/20.0%	60/40.0%	53/35.3%	7/4.7%	-

management work plan before start the work					
Providing subcontractors location services and work requirements	4/2.7%	59/39.3%	67/44.7%	1/0.7%	19/12.7%
Make sure that the subcontractors' price fit to quality and specifications	36/24.0%	53/35.3%	58/38.7%	2/1.3%	1/0.7%
Commitment of the main contractors with project schedule	32/21.3%	61/40.7%	50/33.3%	6/4.0%	1/0.7%
Ability in bearing the risk in case of payment delay from the client	15/10.0%	63/42.0%	51/34.0%	6/4.0%	15/10.0%
Bearing responsibility in case of accidents	6/4.0%	64/42.7%	45/30.0%	18/12.0%	17/11.3%
Relationship with subcontractor/client/ consultant	16/10.7%	62/41.3%	27/18.0%	30/20.0%	15/10.0%
Lack of trust between main contractors and subcontractors	47/31.3%	49/32.7%	41/27.3%	13/8.7%	-

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.12 presents the factors related to main contractors. The results show that 52.7% of the respondents believe previous experience, history and reputation of the main contractors is significant, 28% belief it is averagely significant, 9.3% strongly belief it is insignificant, 6% indicated that previous experience, history and reputation of the main contractors is very significant and 4% belief previous experience, history and reputation of the main contractors it is insignificant. Moreover, 47.3% of the respondent belief practical and technical ability of the main contractors is significant to main contractors, 30.7% averagely agree to that, 21.3% belief practical and technical ability of the main contractors is very

significant to main contractors and 0.7% stated strongly that practical and technical ability of the main contractors is insignificant to main contractors. Again, 58.7% of the respondents established that contractors performance of relevant previous projects is significant to main contractors, 20% averagely agree to that, 18% belief contractor performance of relevant previous projects is very significant to main contractors and 3.3% belief contractor performance of relevant previous projects is not significant to main contractors.

More so, with financial ability and strength of the main contractors, 46% said it is significant, 28% belief it averagely influences main contractors, 12% belief financial ability and strength of the main contractors is very significant to contractors, 10% strongly belief financial ability and strength is insignificant and 4% belief financial ability and strength is insignificant. Moving on, 42.7% of the respondents indicated that the ability in dealing with uncertainty in the construction project is significant, 26.7% averagely belief the ability in dealing with uncertainty in the construction project is significant, 26% belief the ability in dealing with uncertainty in the construction project is very significant, 4% belief it is insignificant and 0.7% strongly belief that the ability in dealing with uncertainty in the construction project is insignificant.

Regarding controlling and follow up of subcontractors activities by main contractor's engineers, 40% belief it is significant, 39.3% belief this averagely influence main contractors, 10.7% belief this is very significant and 10% belief this is strongly insignificant. With financial facilitation to subcontractors to be able to purchase the materials and equipment influencing main contractors, 51.3% said it is significant, 28.7% belief it is averagely significant, 16.7% belied it is very significant, 2.7% belief that is insignificant and 0.7% belief it is strongly insignificant. With respect to main contractor

should give a subcontractor's management work plan before start the work, majority (40%) said is significant, 35.3% said it is averagely significant, 20% belief this is very significant and 4.7% belief contractors should give subcontractor's management work plan before start the work. Again, 44.7% of the respondents stated that providing subcontractor location services and work requirements are averagely significant, 39.3% belief providing subcontractor location services and work requirements are significant, 12.7% said it is strongly insignificant, 2.7% said is very significant and 0.7% belief this is insignificant.

Similarly, 38.7% of the respondents indicated that making sure that the subcontractors' price fit to quality and specifications is averagely significant, 35.3% belief subcontractors' price fit to quality and specifications is significant, 24% belief it is very significant, 1.3% said it is insignificant and 0.7% belief it is very insignificant. Again, 40.7% of the respondents stated that commitment of the main contractor with project schedule is significant to main contractors, 33.3% belief commitment of the main contractor with project schedule is averagely significant to main contractors, 21.3% belief commitment of the main contractor with project schedule is very significant to main contractors while 4% belief it is insignificant and 0.7% belief it is very insignificant. With ability in bearing the risk of payment delay from the client, 42% said it is significant, 34% belief it is averagely significant, 10% belief it is very significant, 10% belief it is strongly insignificant and 4% belief it is insignificant. Relatedly, 41.3% of the respondents belief relationship with subcontractors is significant, 20% indicated that relationship with subcontractors is insignificant, 18% belief it is averagely significant, 10.7% belief it is very significant and 10% of the respondents belief relationship with subcontractors is strongly insignificant and lastly, 32.7% of the respondents belief lack of trust between main contractors and subcontractors is significant, 31.3% belief it is very significant, 27.3% belief lack of trust

between main contractors and subcontractors is averagely significant and 8.7% belief lack of trust between main contractors and subcontractors is insignificant

Table 4.13: Mean Rank on Factors related to main contractors

Statements	Mini	Maxi	Mean	Std. D	Rank
Practical and technical ability of the main contractors	1.00	5.00	3.89	0.76	1st
Ability in dealing with uncertainty in the construction projects	1.00	5.00	3.89	0.86	2nd
Contractors performance of relevant previous projects	1.00	5.00	3.88	0.82	3 rd
Lack of trust between main contractors and subcontractors	2.00	5.00	3.87	0.96	4th
Financial facilitation to subcontractors to be able to purchase the materials and equipment	1.00	5.00	3.81	0.77	5th
Make sure that the subcontractors' price fit to quality and specifications	1.00	5.00	3.81	0.84	6th
Commitment of the main contractors with project schedule	1.00	5.00	3.78	0.85	7th
Main contractor should give a subcontractors management work plan before start the work	2.00	5.00	3.75	0.83	8th
Financial ability & strength of the main contractors	1.00	5.00	3.46	1.08	9th
Previous experience, history and reputation of the main contractors	1.00	5.00	3.42	1.01	10th
Controlling and follow up of subcontractors activities by main contractor's engineers	1.00	5.00	3.41	1.03	11th

Ability in bearing the risk in case of payment delay from the client	1.00	5.00	3.38	1.06	12th
Relationship with subcontractor/client/consultant	1.00	5.00	3.23	1.18	13th
Providing subcontractors location services and work requirements	1.00	5.00	3.19	0.99	14th
Bearing responsibility in case of accidents	1.00	5.00	3.16	1.07	15th

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Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.13 presents the Friedman mean rank on factors related to main contractors and from the table, practical and technical ability of the main contractors, ability in dealing with uncertainty in the construction projects, contractors performance of relevant previous projects, lack of trust between main contractors and subcontractors etc. were moderately ranked with mean between 3.99 to 3.50 while bearing responsibility in case of accidents, relationship with subcontractor/client/consultant, providing subcontractors location services and work requirements etc. were ranked as low significant to contactors with means of 3.60 to 3.99.

Table 4.14: Factors related to subcontractors

Statements	VS	S	A	NS	SNS
Size of contractors' staff	4/2.7%	87/58.0%	46/30.7%	6/4.0%	7/4.7%
Previous experience, history and reputation of the subcontractors	45/30.0%	60/40.0%	24/16.0%	19/12.7%	2/1.3%
Practical and technical ability of the subcontractors	39/26.0%	80/53.3%	28/18.7%	-	3/2.0%
Financial ability & strength of the subcontractors	48/32.0%	59/39.3%	42/28.0%	1/0.7%	-
Performance of relevant previous projects	47/31.3%	67/44.7%	29/19.3%	6/4.0%	1/0.7%
Subcontractor familiarity with the nature of the required tests for its own work and materials supplied by him	54/36.0%	57/38.0%	32/21.3%	7/4.7%	-
The extent of the subcontractor's commitment to the specifications and quality of the project	42/28.0%	53/35.3%	37/24.7%	18/12.0%	-
The extent of the subcontractor's commitment to the project's schedule	37/24.7%	61/40.7%	48/32.0%	3/2.0%	1/0.7%
Close control over the cost by the subcontractors	34/22.7%	51/34.0%	55/36.7%	9/6.0%	1/0.7%
Prompt payment to labourers	16/10.7%	76/50.7%	38/25.3%	11/7.3%	9/6.0%
Providing adequate information or conditions to main contractor	39/26.0%	44/29.3%	54/36.0%	11/7.3%	2/1.3%

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.14 presents the factors related to subcontractors. The study found that, 58% of the respondents stated that the size of contractors' staff is significant to subcontractors, 30.7% averagely belief that, 4.7% stated that the size of contractors' staff is very insignificant to subcontractors, 4% agreed to that and 2.7% belief the size of contractors' staff is very significant to subcontractors. Also, 40% of the respondents believe that previous experience, history and reputation of subcontractors is significant to subcontractors, 30% belief it is very significant to subcontractors, 16% averagely agree to that and 12.7% belief previous experience, history and reputation of subcontractors is insignificant to subcontractors and 1.3% also support the same idea.

With practical and technical abilities of subcontractors being significant, 53.3% agree to that, 26% said it is very significant, 18.75 averagely belief practical and technical abilities are averagely significant 2% belief practical and technical abilities is insignificant. Moreover, 39.3% of the respondents believe financial abilities and strength of subcontractors are significant, 32% agreed to that and 28% belief it is averagely significant and 0.7% belief financial abilities and strength of subcontractors are insignificant. Moving on, 44.7% of the respondents indicated that performance on previous project is significant, 31.3% also agree in that respect, 19.3% averagely belief that with 4% stating that performance on previous project is insignificant and 0.7% belief it is strongly insignificant. More so, 38% of the respondents believe that subcontractors' familiarity is significant, 36% belief it is very significant and 21.3% averagely belief subcontractors' familiarity is significant and 4.7% belief subcontractors' familiarity is insignificant. Relatedly, 35.3% of the respondents believe contractors' commitment to specification and quality is significant, 28% of the respondents agreed to that, 24.7% averagely agreed and 12% of the respondents stated that contractors' commitment to specification and quality is insignificant.

Almost half of the respondents (40.7%) belief extent of contractors' commitment is significant, 32% belief contractors' commitment is averagely significant, 24.7% belief contractors' commitment is very significant, 2% of the respondent belief contractors' commitment is insignificant and 0.7% agreed to that effect. Again, 36.7% belief close control over cost is averagely significant, 34% belief close control over cost is significant, 22.7% belief control over cost is very significant, 6% belief close control over cost is insignificant and 0.7% stated that close control over cost is strongly significant. Slightly above half (50.7%) of the respondent belief prompt payment to laborers is significant, 25.3% belief prompt payment to laborers is averagely significant, 10.7% belief prompt payment to laborers is very significant, 7.3% belief prompt payment to laborers is insignificant and 6% agreed to that. Lastly, 36% of the respondent belief that providing adequate information is averagely significant, 29.3% belief providing adequate information is significant, 26% belief providing adequate information is very significant, 7.3% belief providing adequate information is insignificant and 1.3% belief providing adequate information is strongly insignificant.

Table 4.15: Mean Rank on Factors related to Subcontractors

Statements	Mini	Maxi	Mean	Std. D	Rank
Subcontractor familiarity with the nature of the required tests for its own work and materials supplied by him	2.00	5.00	4.05	0.87	1st
Financial ability & strength of the subcontractors	2.00	5.00	4.03	0.79	2nd
Performance of relevant previous projects	1.00	5.00	4.02	0.86	3rd
Practical and technical ability of the subcontractors	1.00	5.00	4.01	0.79	4th
The extent of the subcontractor's commitment to the project's schedule	1.00	5.00	3.87	0.83	5th
Previous experience, history and reputation of the subcontractors	1.00	5.00	3.85	1.03	6th
The extent of the subcontractor's commitment to the specifications and quality of the project	2.00	5.00	3.79	0.99	7th
Close control over the cost by the subcontractors	1.00	5.00	3.72	0.91	8th
Providing adequate information or conditions to main contractor	1.00	5.00	3.71	0.98	9th
Prompt payment to labourers	1.00	5.00	3.53	0.99	10th
Size of contractors' staff	1.00	5.00	3.50	0.82	11th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.15 presents Friedman mean rank on factors related to subcontractors. The study revealed that, subcontractor familiarity with the nature of the required tests for its own work

and materials supplied by him, financial ability & strength of the subcontractors, performance of relevant previous projects and practical and technical ability of the subcontractors are highly ranked as significant recording means of 4.00 and above while the extent of the subcontractor's commitment to the project's schedule, previous experience, history and reputation of the subcontractors, the extent of the subcontractor's commitment to the specifications and quality of the project, close control over the cost by the subcontractors, providing adequate information or conditions to main contractor, prompt payment to labourers and size of contractors' staff were ranked as low significant with means of 3.99 and below.

4.6 Cost related factors most affected by Subcontractor Management

Table 4.16: Cost Performance

Statements	VS	S	A	NS	SNS
Profit rate of project	10/6.7%	54/36.0%	36/24.0%	32/21.3%	18/12.0%
Material and equipment cost	26/17.3%	24/16.0%	37/24.7%	60/40.0%	3/2.0%
Project labour cost	28/18.7%	45/30.0%	49/32.7%	24/16.0%	4/2.7%
Waste rate of materials	6/4.0%	71/47.3%	31/20.7%	16/10.7%	26/17.3%
Cost of variation orders	33/22.0%	40/26.7%	62/41.3%	12/8.0%	3/2.0%
Planned time for project construction	6/4.0	51/34.0%	47/31.3%	35/23.3%	11/7.3%
Time needed to implement variation orders	38/25.3%	35/23.3%	45/30.0%	31/20.7%	1/0.7%
Overhead percentage of project	38/25.3%	34/22.7%	42/28.0%	30/20.0%	6/4.0%

Source: Field Survey, 2018. *Where VS=Very Significant; S=Significant; A=Average; NS=Not Significant; SNS=Strongly Not Significant*

Table 4.16 presents cost performance and from the table, 36% of the respondents indicated that profit rates of projects are significant to cost performance, 24% belief profit rates of

projects are averagely significant to cost performance, 21.3% belief profit rates of projects are insignificant to cost performance, 12% belief profit rates of projects are is strongly significant to cost performance and 6.7% belief profit rates of projects are very significant to cost performance. With material and equipment cost influencing cost performance, 40% said it is insignificant, 24.7% belief it averagely significant, 17.3% belief it is significant, 16% belief material and equipment cost influencing cost performance and 2% belief material and equipment cost is insignificant to the cost performance. With project labour cost being significant to cost performance, 32.7% averagely agreed, 30% belief it is significant, 18.7% belief it is very significant, 16% belief it is insignificant and 2.7% belief project labour cost being is strongly insignificant to cost performance.

Again, 47.3% of the respondents believe waste rate of materials is significant to cost performance, 20.7% averagely belief waste rate of materials is significant to cost performance, 17.3% belief waste rate of materials is insignificant to cost performance, 10.7% agreed to that and 4% belief it is very significant. More so, 41.3% of the respondents stated that cost of variation orders is averagely significant, 26.7% belief it is significant, 22% belief it is very significant, 8% belief it is insignificant and 2% also agree to that. Moving on, 34% of the respondents believe planning time for project is significant, 31.3% belief planning time for project is averagely significant, 23.3% belief it is insignificant, 7.3% belief it is strongly insignificant and 4% belief planning time for project is very significant. Similarly, 30% of the respondents believe time needed to implement variation order is averagely significant, 25.3% belief it is very significant, 23.3% belief it is significant, 20.7% belief time needed to implement variation order is insignificant and 0.7% agree with that.

Lastly, majority (28%) of the respondents believe that overhead percentage of project is averagely significant, 25.3% belief it is significant, 22.7% agreed to that, 20% belief overhead percentage of project is insignificant and 4% belief overhead percentage of project is strongly insignificant.

Table 4.17: Mean Rank on Cost Performance

Statements	Mini	Maxi	Mean	Std. D	Rank
Cost of variation orders	1.00	5.00	3.59	0.98	1st
Time needed to implement variation orders	1.00	5.00	3.52	1.10	2nd
Project labour cost	1.00	5.00	3.46	1.05	3rd
Overhead percentage of project	1.00	5.00	3.45	1.18	4th
Waste rate of materials	1.00	5.00	3.10	1.20	5th
Material and equipment cost	1.00	5.00	3.07	1.16	6th
Profit rate of project	1.00	5.00	3.04	1.15	7th

Source: Field Survey, 2018. *Where Mini=Minimum; Maxi=Maximum; Std. D=Standard Deviation*

Table 4.17 presents the Friedman mean rank on cost performance and from the table, profit rate of project, material and equipment cost, project labour cost, waste rate of materials, cost of variation orders, planned time for project construction, time needed to implement variation orders and overhead percentage of project were all moderately ranked with means between 3.99 and 3.00.

Table 4.18: Correlations

	Cost Performance	Challenges Subcontractor Management
Cost Performance		
Challenges of Subcontracting Management	0.491 (0.000)	

Table 4.18 presents the correlation results for the study. From the table, the result shows that there is a significant positive (R=0.491, p-value = 0.000<0.05) association between cost performance and challenges of subcontracting management.

Table 4.19: Analysis of Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.805	3.155		1.523	.130
	Challenges Subcontractor Management	.276	.040	.491	6.852	.000
	Model Fit					
	R		0.491			
	R Square		0.241			
	Adjusted R Square		0.236			
	DF		1			
	F-Statistics		46.951			
	P-Value		0.000			

a. Dependent Variable: COST_PERFORMANCE

Table 4.19 presents the regression analysis of the study. The study found that the regression model for the study is fit (*R-Square* = 0.241, *F-Statistics* = 46.951, *DF* = 1, *P-Value* = 0.000). The model suggests that the variances found in the analysis (subcontractor management risk and cost performance) can be explained by 24.1% (R-Square = 0.241). The study found that subcontractor management risk significantly (B = 0.276, p-value = 0.000<0.05) predicts cost performance. This implies that with all things being equal, a change in subcontractor management risk leads to 27.6% change in cost performance. This result further suggests that as management put mechanisms in place to reduce risk

associated with sub-contracting they directly or indirectly reduce the cost of performance. Therefore management must endeavor to reduce more risks in order to save performance cost.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the summary of findings, conclusions and recommendations. In this view the chapter is divided into three. The first section presents the findings, the second presents the conclusions and the last presents the recommendations.

5.2 SUMMARY OF FINDINGS

5.2.1 Risks in Subcontractor Management

There are several risk factors confronted by major construction companies in managing subcontractor. The study found that factors like short-term relationships with the main contractor, low management competency of the subcontractor, financial problems, amendments, poor site safety, shortage of construction materials, site coordination risk, lack of safety, inexperienced workmanship of the contractor and site coordination challenges were ranked very high and significant to risks in subcontractor management. Nonetheless, factors like improper communication, unrealistic price estimation, delay in shop drawings and sample material approval, lack of proper communication, incomplete work-drawings or specifications, improper planning by the contractor, legal disputes and contactor's financial challenges were ranked low as factors that contributes to risks in subcontracting management.

5.2.2 Factors affecting Cost Performance of Subcontractors

The study again found that large or complex project, remote location (difficult accessibility to the site), increasing the fundamental changes in the nature of works, the presence of the project in a densely populated area and many execution obstacles were highly considered as significant to the cost performance of subcontractors whereas governments policy,

market condition and political situation, increase or additional work for the project from the limit set in the contract and there is no contingency budget to proceed works were ranked as low significant as a project factor.

5.2.3 Contract Documents and Management related Factors

The study discovered that delays in the adoption of change orders, the subcontractors are preferred to be company registered in contractor's union, assisting the main contractors in pricing the tender by the subcontractors, the clarity of the contract between contractor between contractors and subcontractors, implementing the lowest bid price system and payment method to the main contractor by the client are ranked as very significant to contract documents and management whereas selection of subcontractors through competitive strategy and taking the lowest price as the only criteria for selection, compliance with regulations by the contractors & subcontractors, insurance terms, interest rate and bond/loan terms, quality and clarity of design drawing and shop drawings and adherence to subcontract requirements are moderately ranked.

5.2.4 Factors pertaining to project staff in general

The lack of the efficiency, qualification and skills of the project team was ranked as highly significant in relation to interactions that exist among staffs relates with the basic activities that employees undertake while morally supporting the project staff, number of craftsmen and laborers in the project, qualified supervisory staff and conduct of training courses to qualify the project staff to work on-site are ranked as less significant.

5.2.5 Factors pertaining to Project Manager

The study revealed that managers' recognition of other construction activities related to subcontractors' tasks to ensure the continuity of the work of subcontractors is highly significant to project managers to make decisions and manager's personality and his

experience, salary of the managers, management level leadership and regular and effective communication and coordination of main contractors and subcontractors tasks to ensure the continuity of the work of subcontractors are less significant when project managers intends to make decision.

5.2.6 Factors related to main contractors

The study found that practical and technical ability of the main contractors, ability in dealing with uncertainty in the construction projects, contractors performance of relevant previous projects, lack of trust between main contractors and subcontractors among others have moderate effect on main contractors while bearing responsibility in case of accidents, relationship with subcontractor/client/consultant, providing subcontractors location services and work requirements are of low significance on main contractors.

5.2.7 Factors related to subcontractors

The study revealed that, subcontractor familiarity with the nature of the required tests for its own work and materials supplied by him, financial ability and strength of the subcontractors, performance of relevant previous projects and practical and technical ability of the subcontractors are very important for subcontractors to take note of while the extent of the subcontractor's commitment to the project's schedule, specifications and quality of the project, previous experience, history and reputation of the subcontractors, close control over the cost by the subcontractors, providing adequate information or conditions to main contractor, prompt payment to laborers and size of contractors' staff are mildly significant as far as subcontractors are concerned.

5.2.8 Cost Performance

Profit rate of project, material and equipment cost, project labour cost, waste rate of materials, cost of variation orders, planned time for project construction, time needed to

implement variation orders and overhead percentage of project have some level of influence on cost performance.

5.3 CONCLUSION

This study was conducted to determine the impact of subcontractor risk management on cost performance in construction project management using structured questionnaire and 150 participants. The study found that that there was a significant positive (R=0.491, p-value = 0.000<0.05) association between cost performance and risk of subcontracting management. The study found that subcontractor risk management explains by 24.1% variance in cost performance. The study concludes that risk of subcontractor management significantly predicts cost performance. This implies that with all things being equal, a change in risk of subcontractor management leads to 27.6% change in cost performance. Moreover, the study concludes that factors such as short-term relationships with the main contractor, low management competency of the subcontractor, financial problems, amendments, poor site safety, shortage of construction materials, site coordination risk, lack of safety, inexperienced workmanship of the contractor and site coordination challenges were ranked very high and significant risks in subcontractor management.

5.4 RECOMMENDATION

The study recommends that in order to minimize and control the risks associated with managing subcontractors;

- there is the need for major construction companies to pay critical attention to the processes involved in the selection of subcontractors. That is, the study found potential risks and challenges like low management competency of subcontractors, site coordination risk, lack of safety, poor site safety, shortage of construction materials and others as a challenge in handling subcontractors. Specifically,

screening process for selecting subcontractors, constructions companies should ensure that the management skills of subcontractors in the area of site management should be well assessed alongside their skills in handling site risks and safety, which is core part of every construction company to minimize losses and to comply with both domestic and international labour laws.

- In this respect, constructions companies through its subcontractors should promote employee safety and welfare, which reduces the cost or funds channeled into casualties and accidents. This has the tendency to attract more employees, lead to employee loyalty, employee commitment and increase productivity when employee develop the sense of being protected and care for by the company with its site measures. The study found

  that large or complex project, remote location, increasing the fundamental changes in the nature of works, the presence of the project in a densely populated area and many execution obstacles affects the cost of construction works. Also, governments policy, market condition and political situation, increase or additional work for the project from the limit set in the contract and there is no contingency budget to proceed works significantly affects the cost performance of subcontractors which influence the overall cost of constructions.

- The study on this basis recommends that prior to construction works, subcontractors and main construction companies should conduct an extensive feasibility and grounds work to ensure that the location of projects are situated in conducive environment both political and the natural environment where the location of less dense. Also, in conducting these feasibility assessments, government policies

regarding land acquisition and regulations bordering construction must be considered.

- The study also recommends that subcontractors in conjunction of main construction companies should develop contingency budgets which will serve as a backup for the main budgets to deal with shocks that may arise from the financial and materials market
- The study further recommends that further emphasis should be placed on the past experience of subcontractors to determine their level of accomplishment and records pertaining to the contract they are being offered. Critical evaluation of past contracts of subcontractors would provide vital information on subcontractor's communication abilities, the experience workmanship of the contractor, communication channels of the subcontractor and financial problems. The combination of these four variables promotes the smooth running of projects since communication plays a very significant role in construction to liaise with main contractors and the community and indirect stakeholders. Establishing the financial base of the subcontractor facilitate activities to know that project can run and finish on time in cases of financial stress or financial shocks.

5.5 LIMITATIONS

The research was not without challenges, as in case of almost every research.

The limitation of this research is in relation to the sample selection, which was limited to Accra and Kumasi Metropolis due fact that majority of the research target operated in this capital city. Although respondents' background represented a wide spectrum of construction works, it still did not cover all types of subcontract works in construction projects. Thus, views presented here represent those categories of contractors sampled.

5.6 FURTHER STUDIES

The study was conducted in a two geographic region, and it would therefore be necessary to extent the scope of future research on the subject to cover a wider area.

Again, one could also consider the measuring the impact of sub-contractor risk management on other construction success criterions such as cost and quality.

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APPENDIX

Dear Sir / Madam,

SURVEY QUESTIONNAIRE- THE IMPACT OF SUBCONTRACTOR RISK MANAGEMENT ON CONSTRUCTION PROJECT COST PERFORMANCE

I am an MSc master candidate of the department of construction technology and management Technology, Kwame Nkrumah University of Science and Technology, Kumasi. This questionnaire is designed for a research study on the Impact of subcontractor Risk management on construction project cost performance. The aim of this study is to assess the impact of subcontractor risk management on cost performance in construction project management. Kindly respond to the questions by ticking and writing the appropriate answers in the options and spaces provided for each item respectively. Individual's responses would be treated with the highest confidentiality

Thank you very much for your time.

Dorothy Abrafi Kwofie

E-mail: doroabe@yahoo.com

SECTION A

BACKGROUND OF RESPONDENTS

1. Please indicate your category in the Construction industry?

- D1K1
- D2K2
- D3K3

2. What is your highest level of education?

- HND
- BSc
- Post Graduate
- Other; Please specify…….

4. What is your professional background?

- Construction Project Manager
- Architect
- Quantity Surveyor
- Civil and/or Structural Engineer
- Other (please specify)…….

5. How long have you been working in the category of organization chosen in question 1 above?

- 1-5 years
- 6-10 years

- 11-15 years
- 16 years and above

6. When was the last time you worked on a project with subcontractors?

- 1-5 years
- 6-10 years
- 11-15 years
- 16 years and above

7. What is your Specialty

- Building
- Mechanical
- Plumbing and Drainage Tilling
- Electrical
- Glazing
- Others (please specify)…….

8. Type of contractor

- Domestic contractor
- Nominated subcontractor

9. Type of Project contract

- Commercial/Office Building
- Hotel Retail/Shopping Centre
- Hospital
- Market
- Sports Centre
- Government Office Building

- Residential Development
- School
- Library
- Others

FOR THE MAIN CONTRACTOR

10. Do you allow subcontractor to further subcontract out the work you assign them?
    - Yes
    - No
11. Do you prefer to have nominated subcontractors or your own domestic subcontractors to undertake specialist works in construction projects?
    - Domestic subcontractor
    - Nominated subcontractor

SECTION 2: EXTENT TO WHICH THE CONCEPT OF SUBCONTRACTING IS USED IN THE CONSTRUCTION INDUSTRY

12. How frequent is subcontracting practiced in construction projects?

- Not frequent
- Less frequent
- Moderately frequent
- Frequent
- Very frequent

13. How many subcontracted projects have you been involved in within the last five years?

- 1-5
- 6-10
- 11-15
- 16 and above

14. On average what percentage of work is usually subcontracted?

- 0-10%
- 11-20%
- 21-30%
- 31-40%
- Above 50%

15. How beneficial is the Fundamental principles of subcontractor management to the Ghanaian building industry?

- Highly unbeneficial

- Unbeneficial
- Moderately beneficial
- Beneficial
- Highly beneficial

SECTION 3: RISKS (CHALLENGES) IN SUBCONTRACTOR MANAGEMENT

16. Below are a number of potential challenges inherent in the management of Subcontracts. From your experience, please tick the appropriate cell by indicating how significant each challenge is. Ranking; 1=Strongly Not Significant; 2=Not Significant; 3=Average; 4=Significant; 5=Very Significant

Potential challenges in the management

Statements	**1**	**2**	**3**	**4**	**5**
Legal disputes					
Shortage of construction materials					
Delay in shop drawings and sample material approval					
Amendments					
Incomplete work-drawings or specifications					
Lack of Safety					
Site coordination challenges					
Lack of proper communication					
Low management competency of the subcontractor					
Improper planning by the contractor					
Financial problems					
Short-term relationships with the main contractor					
Unrealistic price estimation					
Inexperienced workmanship of the contractor					
Poor site safety					
Improper communication					
Financial problems					
Poor site safety					
Site coordination risk					
Poor site safety					
Contractor's financial challenges					
Contractor's financial challenges					

SECTION 4: FACTORS AFFECTING COST PERFORMANCE OF SUBCONTRACTORS

17. The following are some of the factors affecting the cost and performance of subcontractors as identified from literature. Using the scale below, what is the relative importance of each of the factors. Ranking; 1=Strongly Not Significant; 2=Not Significant; 3=Average; 4=Significant; 5=Very Significant

Statements	**1**	**2**	**3**	**4**	**5**
Project related factors					
The presence of the project in a densely populated area					
Large or complex project					
Increase or additional work for the project from the limit set in the contract					
Remote location (difficult accessibility to the site)					
There is no contingency budget to proceed works					
Increasing the fundamental changes in the nature of works					
Many execution obstacles					
Government policy, market condition & political situation					
Contract documents & management related factors					
Implementing the lowest bid price system					
Selection of subcontractors through competitive strategy & taking the lowest price as the only criteria for selection					
Assisting the main contractors in pricing the tender by the subcontractors					
The subcontractors are preferred to be company registered in contractor's union					
Clear understanding of the contract conditions and requirements, project objectives and implementation methods by the contractors and subcontractors					
The clarity of the contract between contractors and subcontractors					
Delays in the adoption of change orders					
Compliance with regulations by the contractors & subcontractors					
Adherence to subcontract requirements					
Quality and clarity of design drawing and shop drawings					
Payment method to the main contractor by the client					
Insurance terms, interest rate and bond/loan terms					
Factors pertaining to project staff in general					
The lack of the efficiency, qualification and skills of the project team					
Morally support the project staff					
Conduct of training courses to qualify the project staff to work on-site					

Number of craftsmen and labourers in the project					
Qualified supervisory staff					
Factors pertaining to project manager					
Manager personality & his experience					
Salary of the managers					
Management level leadership					
Regular and effective communication & coordination of main contractor and subcontractors by the project manager					
Managers' recognition of the other construction activities related to subcontractors tasks to ensure the continuity of the work of subcontractors					
Factors related to main contractors					
Previous experience, history and reputation of the main contractors					
Practical and technical ability of the main contractors					
Contractors performance of relevant previous projects					
Financial ability & strength of the main contractors					
Ability in dealing with uncertainty in the construction projects					
Controlling and follow up of subcontractors activities by main contractor's engineers					
Financial facilitation to subcontractors to be able to purchase the materials and equipment					
Main contractor should give a subcontractors management work plan before start the work					
Providing subcontractors location services and work requirements					
Make sure that the subcontractors' price fit to quality and specifications					
Commitment of the main contractors with project schedule					
Ability in bearing the risk in case of payment delay from the client					
Bearing responsibility in case of accidents					
Relationship with subcontractor/client/consultant					
Lack of trust between main contractors and subcontractors					
Factors related to subcontractors					
Size of subcontractors' staff					
Previous experience, history and reputation of the subcontractors					
Practical and technical ability of the subcontractors					
Financial ability & strength of the subcontractors					
Performance of relevant previous projects					
Subcontractor familiarity with the nature of the required tests for its own work and materials supplied by him.					
The extent of the subcontractor's commitment to the specifications and quality of the project					
The extent of the subcontractor's commitment to the project's schedule					
Close control over the cost by the subcontractors					
Prompt payment to labourers					
Providing adequate information or conditions to main contractor					

SECTION 5: COST RELATED FACTORS MOST AFFECTED BY SUBCONTRACTOR MANAGEMENT

18. In your opinion, what is the most affected cost and time related factors by subcontractor management? Ranking; 1=Strongly Not Significant; 2=Not Significant;

3=Average; 4=Significant; 5=Very Significant

Effects of subcontract management in saving project cost

Statements	**1**	**2**	**3**	**4**	**5**
Profit rate of project					
Material and equipment cost					
Project labour cost					
Waste rate of materials					
Cost of variation orders					
Planned time for project construction					
Time needed to implement variation orders					
Overhead percentage of project					

19. What recommendation(s) would you propose in the subcontractor management process to improve the performance of subcontractors within the cost and time constraints?

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THANK YOU