THE EFFECT OF STRATEGIC RISK MANAGEMENT ON PROJECT DELIVERY; A CASE STUDY OF THE CONSTRUCTION INDUSTRY IN GHANA

By

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DECLARATION

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

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DEDICATION

To:

My wife: Mrs Angela Da Pilma Odonkor

My Church: Word Miracle International

My Pastor: Rev. Chris Parsram

My Mother: Mary Asamoah

My Siblings: Solomon, Sheriff, Muniratu and Miram

My Employer: Mr Albert Awuah, Jnr

My Friends: Francis Obeng, Maxmillian Acquah, Miriam Akita, Eric Quao, Wilberforce Aidoo, Nadia Adjei, Doris Nyante, Christian Yorke, Nana Yaa Mensah and Pushpa Khemchand.

My Nephew: Kweku Asenso Kumah (KAK)

And the blessed memory of my grandmother, Victoria Quaye Lamptey.

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- Ralphique Daudi(Mr)
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- Patience Adjoa Austin (Mrs)
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- Mohama Mahamoud (Mr)

who contributed in diverse ways to the successful completion of this research. I pray the good Lord blesses and replaces for them, all they might have lost in supporting this work and me.

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ABSTRACT

Managing risks in construction projects is recognized as a very important management process which enables the achievement of project objectives in terms of time, cost and quality. However, until now most of the previous studies have focused attention on some aspects of construction risk management rather than using a systematic and holistic approach to identify, analyze their impacts and adopt management options to mitigate the effect of these risks. This study sought to identify and analyze the effect of risks associated with the delivery of construction projects from the perspectives of identified stakeholders in the Construction Industry in Ghana (CIG). Additionally, the study sought to identify if risk issues are been managed strategically in the CIG. The researcher utilized a convenient sampling method to collect data but where necessary face to face interviews were conducted. The study identified that there is lack of in-depth understanding and knowledge of the inherent risks issues and the impact among the stakeholders in the CIG. There were also no strategic risk models or process which have been developed for the CIG. The lack of knowledge was attributed to lack of curriculum in the tertiary institution on risk, even though the subject is gradually been introduced at the Master of Business Administration Level. Further, the research found that the main risk impacting on the CIG is financial which stems from overdue payments to Contractors, Consultants, Suppliers, Subcontractors etc. This research also found that the construction stage is the phase which risk impact is most exacerbated. The research did not identify any risk management processes or procedures laid down for CIG. The researcher identifies that policy makers should formulate suitable SRM options for the CIG to enable the judicious use of government funds on construction projects and avoid or reduce the infantile demise of a chunk of the projects or the few completed projects not outlasting their designed life. In concluding, setting realistic Time, Cost and Quality targets is critical and all stakeholders on a project must work collaboratively from the feasibility phase to execution phase to ensure the successful delivery of construction the project..

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LIST OF ABBREVIATIONS

CIG – Construction Industry in Ghana

FDI - Foreign Direct Investment

GDP – Gross Domestic Product

GHIA – Ghana Institution of Architects

GHIS – Ghana Institution of Surveyors

GHIE – Ghana Institution of Egineers

PMI – Project Management Institute

VfM – Value for Money

PMt – Project Management

PMg – Project Manager

MBA – Master of Business Administration

RMt – Risk Management

RMg – Risk Manager

SRM – Strategic Risk Management

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Ghana is a low-income economy and has recently attained a middle income status in Sub-Saharan Africa. In 1957, it was the first country in Sub-Saharan Africa to emerge from colonialism. Ghana once experienced the highest Gross Domestic Product (GDP) on the continent before an economic crisis in the late 1970s.

It cannot be repudiated that the construction industry in Ghana (CIG) plays an immeasurable role in the national developmental agenda and has been a major contributor to the road to recovery by providing infrastructure and generating employment. The CIG contributed to 8.9% of GPD in the 2009 fiscal year (Ghana Statistical Service, 2009). The government of Ghana, as in many countries, is the major developer and therefore dominates the construction industry. Billions of cedis of the taxpayer's money is committed to construction projects annually through budgetary allocation, donor funded projects and Foreign Direct Investment (FDI).

On the private front, it can argued that much of the remittances from Ghanaians abroad and resources of the private sector go into investment in the building and construction industry. In recent times private established partnerships which include National and Multinational companies have been investing heavily in the real estate sector by the provision of well planned communities and high rise buildings in and out of the major cities. An example is the multimillion dollar Villaggio and Trasacco Valley Real Estates which are located in plush residential areas of Dzorwolu and East Legon in the Greater Accra Region.

However, the CIG is indeed inherently beset with a myriad of problems than that of other industries. Amongst all the stakeholders in the construction industry, Contractors, mostly bear the brunt of public criticisms for shoddy work, undue delay of projects and perceived diversion or misapplication of contract payments because they constitute the frontliners in the award and execution of contracts (Ghana Business News, 2009).

The advancement or otherwise of the construction industry has also largely been attributed to the performance and/or competence of Contractors even though other professionals, notably Consultants, Architects, Civil Engineers, Building Technologists and Quantity Surveyors play complementary roles in the planning and execution of projects or contracts.

In Ghana, professional institutions directly associated with construction activities such as the Ghana Institution of Architects (GHIA), Ghana Institution of Surveyors (GHIS) and Ghana Institution of Engineers (GHIE) have all recognized the importance of taking measures to improve the performance of construction delivery which can affect directly the development of the nation by improving the aggregate percentage contribution to GDP.

Gyadu – Asiedu (2009) in an attempt to providing solution to the above mentioned problems argues that:

"it was necessary to work within a paradigm shift in the following regard:

(i) moving away from expecting "project autopsy reports" towards "project health reports"

(ii) moving away from considering the outcomes of a project in terms of success/failure dichotomy into project performance results within an identifiable criteria

(iii) acknowledging the uniqueness of every project and the contingency factors which calls for contingency measures of assessment".

This thesis investigated the subject of project performance in the CIG by finding possible solutions to the myriad of problems through the rather subdued risk related influences on project delivery. Despite the extensive research on risk management for the CIG, there is limited literature dealing specifically with the effect of SRM on project delivery or success.

However, SRM is a carefully devised plan of action to achieve a goal which involves processes that focus on identifying risk events and developing strategies to respond and control risks should they occur in a project.

This study therefore investigated the application of SRM and its resultant effects on projects delivered in the in Ghana. This study identified the effect of strategy risk management on project delivery results and their impact on the networked of stakeholders (Clients, Consultants, Contractors and Beneficiaries) on some selected projects in Ghana.

The most common risk management process or procedure which has been embraced and implemented in Ghana is the Contingency Reserves which are only provisions held in reserve by the project sponsor to mitigate cost and schedule risks which are anticipated due to additional cost resulting from changes in scope and quality.

PMI (2004) purports that risk identification is not a one-off initiative since projects are constantly evolving and new risks arose while other risks dissipated or reduced in importance. Hence risks should be identified, monitored and controlled on a regular basis to mitigate its effects. This statement confirmed that Construction Projects shall invariably or inadvertently fail even with adequate contingency plans because some of the risk impacting on the projects are unknown at the inception/planning phase and would not be planned for in the Contingency Plan.

Flanagan and Norman (1993) stated that the typical risks on a construction project included:

- Failure to achieve completion within the stipulated design and construction time.
- Failure to obtain the expected outline planning, detailed planning or building code/ regulation approvals within the time allowed in the design program.
- Unforeseen adverse ground condition.
- Exceptionally inclement weather.
- Strike by the labour force.
- Unexpected price rises for labour and materials.
- Failure to let to a tenant upon completion.
- An accident to an operative on site causing physical injury.
- Latent defects occurring in the structure through poor workmanship.
- Natural disasters (flood, earthquake, etc.).
- A claim from the contractor for loss and expense caused by the late production of design details by the design team.
- Failure to complete the project within the client's budget allowance.

For the purposes of this research, we limited the risk classification to: Schedule Risk, Quality Risks and Cost Risks. PMI (2004) stipulated that, all projects are affected by the "Triple Constraints'" that is TIME, QUALITY and COST and a project is deemed successful if all the objectives of the triple constraints are successfully achieved after the project delivery. Therefore the above classification was used by the researcher to determine the application of SRM in the execution of construction projects in Ghana and their variable impacts on Time, Quality and Cost.

This research further deepened the understanding of risk management issues, which included the identification, understanding and analyzes of the risks issues and its impact on construction projects in Ghana.

1.2 Problem Statement

Indeed, the CIG is plagued with countless inherent problems which impinge negatively on the execution of projects. The superficial understanding of these numerous problems amongst industry stakeholders resulted in profligate management of project funds been the main reason behind the infantile demise of a chunk of projects or the few completed projects not outlasting their designed life and provides no value for money (VfM).

As stipulated by Gyadu – Asiedu (2009):

"it was necessary to work within a paradigm shift in the following regard:

(i) moving away from expecting "project autopsy reports" towards "project health reports"

(ii) moving away from considering the outcomes of a project in terms of success/failure dichotomy into project performance results within an identifiable criteria.

The questions relating to the identified problem are:

are there any risk issues in the construction industry in Ghana?

Are these risk issues strategically managed?

Are there options or processes which provide solutions to these identified risk problems?

It is against these backgrounds that this research is being carried out.

1.3 Objectives

The objectives of the study are:

a) To investigate into the risk issues that confront the CIG.

b) To determine the main risk issues that impact on project delivery in Ghana.

c) To investigate the SRM processes or options deployed in Ghana.

1.4 Research Questions

The researcher was guided by the following questions.

1) Are there any risk issues confronting the CIG?

2) What are the main risk issues that impact on project delivery in Ghana?

3) What SRM options or processes employed for the CIG?

1.5 Research Methodology

This research was exploratory and experimental in nature. The exploratory aspect gave a background, familiarized and explored the general subject area. This was achieved by the use secondary data by relying on the data base of the internet and also related literature in the industry.

The experimental aspect also established the causes and effects relationship for the subject area and involved the use of qualitative and quantitative techniques which adopted the appropriate statistical method for the analysis of data collected.

Structured questionnaire was administered to the various hosts of the Industry to ascertain firsthand information for the study. Data collection was by convenient sampling via structured questionnaire. This instrument was used to solicit information from Consultants,

Contractors, Private Real Estate Providers and Clients/Beneficiaries to determine the impact of SRM in their delivery of construction projects.

This was backed with an unstructured interactive face-to-face interview with stakeholders when necessary. The researcher found the above methods appropriate because of the varying levels of literacy amongst the various stakeholders in the industry.

Data collected was presented and analyzed using tables, charts, graphs, mathematical models and non-tabular presentation - use of words.

1.6 Relevance of Study

The researcher envisaged that this study would go a long way to ensure parsimonious management of project funds and the provision of Value for Money projects which in the end would help in achievement of stated objectives of projects in Ghana.

Over the years, projects have failed to achieve their stated objectives and reasons assign for their failure have been vague and superficial with some stakeholders attributing it to issues such as; economic conditions, lack of expertise etc. These fuzzy and incoherent excuses do not provide solutions to these inherent and recurrent problems.

Therefore the study explored the reasons for failure of most projects in Ghana and further broadened the understanding of risk issues and its impact on project delivery in Ghana.

1.7 Scope of Study

The study was mainly on the CIG and included at least six (6) selected substantially completed building projects in Ghana with the following minimum criteria: Cost of

construction should be above US$ 100,000.00 and Completion duration of at least eight (8) calendar months and the works tendered for competitively within the last five (5) years.

The stakeholders (Consultant, Contractor and Client) for each of the projects was administered with structured questionnaires and face to face interview adopted where necessary to solicit for important information.

1.80 Limitations

The information gathered especially from private developers was inadequate because of their quest to keep trade secrets from competitors in the industry. The duration for the thesis and budgetary limitations did not allow the researcher to conduct a comprehensive test of the viability and suitability of the SRM interventions which was put forward for the CIG. Due to the varying levels of literacy amongst the stakeholders, the researcher had difficulty with language as a communication barrier during face-face interactions. As a limitation, the researcher identified poor record keeping amongst some Ghanaian Contractors and Private Developers thus the veracity of the information verbally provided was indeed very difficult to verify.

1.9 Organisation of Work

Introduction

This first chapter include the introduction of the research topic, the relevance and scope of the study and objectives. The problem statement is also captioned together with research questions guided the researcher on the type of research method adopted. The limitations to the study is also outlined.

The Literature Review segment is the second chapter which is theoretical and delved into related literature on the area of study. This included an overview of the CIG, pertinent industry-related issues, performance of the industry and challenges. Further, risk management techniques, classification of risks, risk analysis models and project network techniques were reviewed extensively.

The design of the research, the relevant data collected and methods of sampling, data collection techniques - questionnaires, interview and other data collection methods employed are discussed in this third chapter.

The chapter four highlighted in detail the findings and discussions from the data collected to ensure constructive discussions. The discussions attempted to answer the research questions and achieve the study objectives.

This is the final chapter which included the conclusions from the findings made in Chapter 4 and recommended for further research related areas which could not be researched into because of various limitations outlined.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to review the literature on subject areas relevant to the research topic and questions of the study. The review is directed towards identifying important themes, concepts, variables and significant findings and to facilitate the development of a theoretical framework for the study.

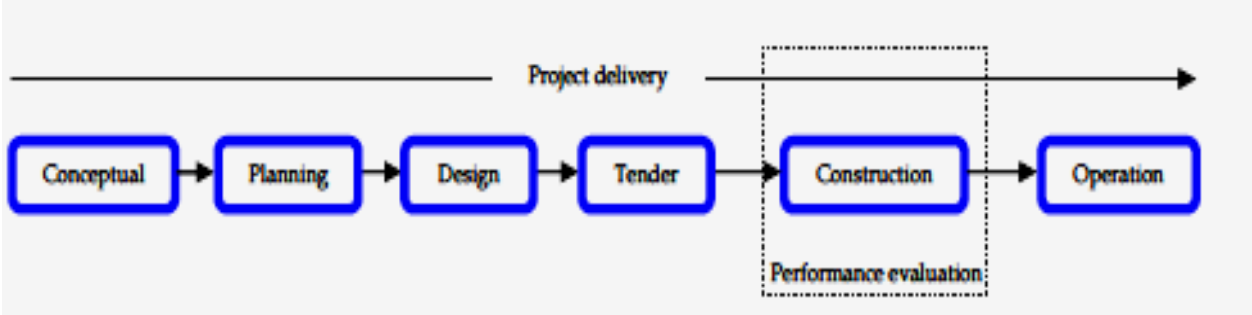
2.2 Overview of Construction Industry

2.2.1 Construction Delivery Process

Generally construction involves the organization and coordination of all the resources for the Project - labor, construction equipment, permanent and temporary materials, supplies and utilities, money, technology and methods and time to enable completion of a desired Project on schedule, within budget and according to the standards of quality specified by the Architectural and Engineering Drawings.

The delivery process itself occurs in a number of phases.. From a PMt perspective, a more suitable classification of phases may be as set out in the research studies of Lim and Mohamed (1999), Takim et al. (2003), and Ahadzie et al. (2006), with six phases of conception, planning, design, tender, construction, and operational phase clearly identified (Figure 2.1).

Figure 2.1**:** The process for delivering a construction project



Source: Lim and Mohamed (1999)

Although the successful execution of the project in each of these phases is critical to the overall success of the project (Ahadzie et al., 2006), very often in examining project success, the construction phase tends to be the focal point as indicated in Figure 2.1 above. This is because according to Lim and Mohamed (1999), the construction phase is the phase where all the project goals like time, cost, quality, safety and the like are put to the test. Whilst this may be true in many cases – certainly in the traditional approach – it is not always the case.

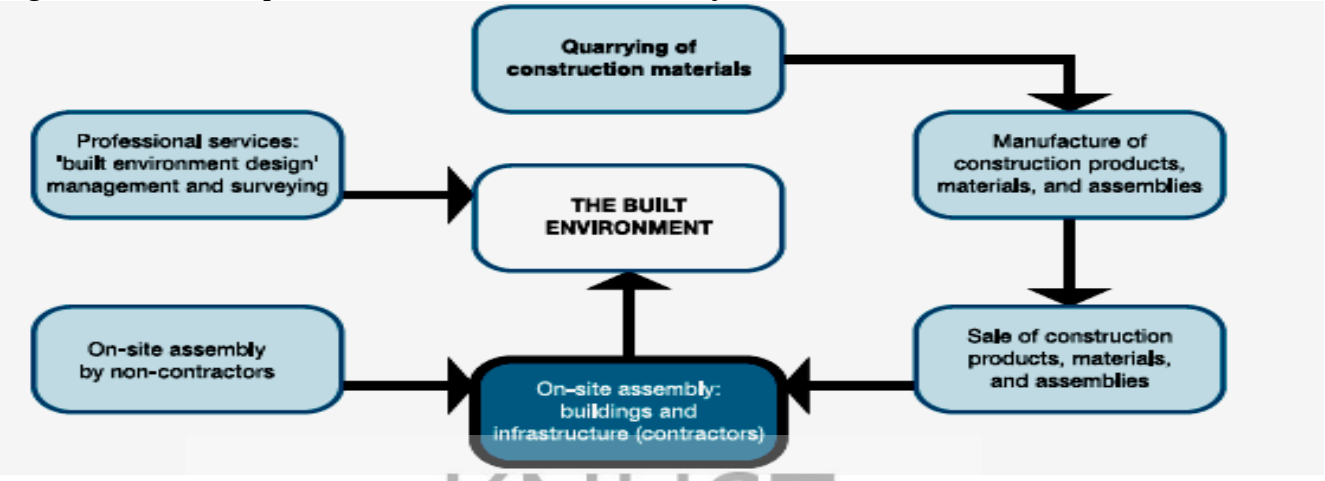
2.2.2 Global Perspective of the Construction Industry

Walewski and Gibson (2003) argue construction is a major worldwide industry accounting for approximately $3.4 trillion USD, or almost ten percent of global Gross Domestic Product (Engineering News Record 2000; Batchelor 2000; Bon 2001). Walewski and Gibson (2003) state that construction that is performed in an international context can be very complex and the risks involve a host of issues.

The significance of the Construction Industry cannot be overemphasized, for instance, although the United States is the largest construction market which is estimated at over $800 billion USD, most projects completed outside of the domestic market, have long been and have become an even greater part of the capital investment portfolio of U.S.

As shown in Figure 2.2 below, the narrow definition focuses attention on the actual on-site construction activities of contractors whilst the broad definition, which actually covers the true extent of the construction industry, draws in the quarrying of construction raw materials, manufacture of building materials, the sale of construction products, and the services provided by the various associated professionals (Pearce, 2003).

Figure 2.2**:** The composition of the construction industry



Source: Pearce, (2003).The social and Economic Value of Construction

Table 2.1 shows the advantages and demerits of globalisation to the construction industries of developing countries.

Table 2.1: Advantages and Disadvantages of Globalisation Considering Construction Industries in Developing Countries

Advantages	Disadvantages
Involvement of international finance makes possible the implementation of several projects, such as those of major infrastructure.	Local construction firms have no funds or expertise to participate in the sponsorship of privatised projects.
Direct foreign investment in projects leads to increase in construction demand, creating work opportunities for local firms.	Local construction companies lack the technical and managerial capability to undertake most of the foreign-funded projects.
Competition among foreign firms lowers the costs of projects to developing countries.	It is possible that local firms will be deprived of the opportunity to grow (Hillebrandt, 1999).
Presence of large numbers of international firms offers scope for technology transfer and the development of local firms and upgrading of the industry. The large number of such firms also means that technology transfer can be a tool for competition.	Foreign construction firms may pay lip service to technology transfer (Carillo, 1994) or take measures to avoid it. Moreover, local companies may not be in a position to benefit from technology transfer, or to subsequently utilise the acquired expertise.

Source: Ofori, (2000). Challenges of Construction Industries in Developing Countries: Lessons from Various Countries

Moavenzadeh and Hagopian (1984) see foreign contractors as the sole factor influencing the development of the construction industries of poorer countries. This model is criticized by Ofori (1996) who notes that the objectives of foreign construction enterprises and host developing country governments differ. Raftery et al. (1998) suggest that in the long term, the gap between

local construction firms and their foreign counterparts in technology, finance and management knowhow, could be filled through technology transfer, for example, via joint ventures among the two groups of firms.

2.3 The Construction Industry in Ghana (CIG)

2.3.1. The Evolution of the Ghanaian Construction Industry

The CIG was developed along lines similar to the pattern in Britain when the bricklayers acted as master builders in an organization. The Ghanaian industry, like the industry the world over (Langford et al., 1995), has attained a broad spectrum of employees making it 87% labour intensive industry. Companies within this industrial sector operate in a constantly changing environment in the face of volatile economic environment, shifting political climate and a highly competitive market (Dansoh,2004).

As Ahadzie (2010) narrates; the early beginning of the formal CIG was a reflection of Ghana's historical link with Britain. Hitherto, construction in this country was a non-commercial family vocation restricted largely to the provision of village shelters of mud and wood. The form of construction during this period was largely very simple rectangular and circular single-storey shelters designed by family heads and constructed by family members and friends as communal labour. The rectangular buildings were often found in Southern Ghana whilst the circular shelters were common in the Northern parts. In both forms of construction, the materials used were normally located within the settlement and were in their raw form including thatch for roofing.

Ahadzie (2010) continues by drawing from developments of global construction practices as evidenced in history of architecture and/or construction, it sounds reasonable to argue that the type of construction forms in Ghana in the colonial era and the immediate aftermath had its root in rudimentary crafts handed down by family heads. Typical of pre-historic times, the construction

practices could be described as “crude at it best” especially because of its very elementary and unscientific nature. Obviously, traces of such shelters can still be found in many of the typical rural villages across the breadth and length of the country. To this extent, the provision of sandcrete (i.e. cement and sand) block houses based on architectural working drawings became popular.

Really, during the pre-independence era, local construction capacity especially with respect to local construction companies) was totally non-existent in any recognizable form. It is therefore not surprising that, almost all construction contracts were awarded mostly to British Conglomerates during this period. Naturally, the trend began to change when the care-taker government of Nkrumah was sworn in the early 1950s. Subsequently the then Ghana National Construction Corporation (GNCC) was formed. On attaining independence, the GNCC was renamed the State Construction Corporation (SCC).

Osei-Asante (2005) states that Political independence in 1957 saw the establishment of the Ghana Highway Authority (GHA), the defunct State Construction Corporation (SCC) and the Architectural and Engineering Services Limited (AESL) to take over the formal construction sector. According to this author, the advent of sophistication has led to the establishment of other state departments as well as private organizations though the sector as established by Gilham and Ebohon (2004) works with systems that have been largely imposed or inherited from colonial rule

The CIG has over the years developed into two sectors: the formal sector: which adopts a variety of procurement routes (Anvuur et al., 2006); and the informal sector: which like in other African countries and indeed the world over, adopts an approach similar to the historical approach of master craftsman engaging labour in product delivery (Miles and Ward, 1991; Mlinga and Wells, 2002; Wells, 2001;Wells and Wall, 2003).

In general, demand for new construction products, and hence construction activities, tend to be highest at the early stages of economic development and level off after high level of economic development has been attained (Edmonds and Miles, 1984; Wells, 1987). It has also been shown that: "During periods of accelerated economic growth, construction output grows at a faster rate than the economy as a whole. From the foregoing, Kirmani (1988) argues that a developed construction industry is described as a powerful engine to growth of any economy. Therefore the current resurgence in construction activities spanning from residential buildings to hydro-power dam developments is a confirmation of the above arguments; Ghana is currently classified as a middle income economy moving from the earlier developing status

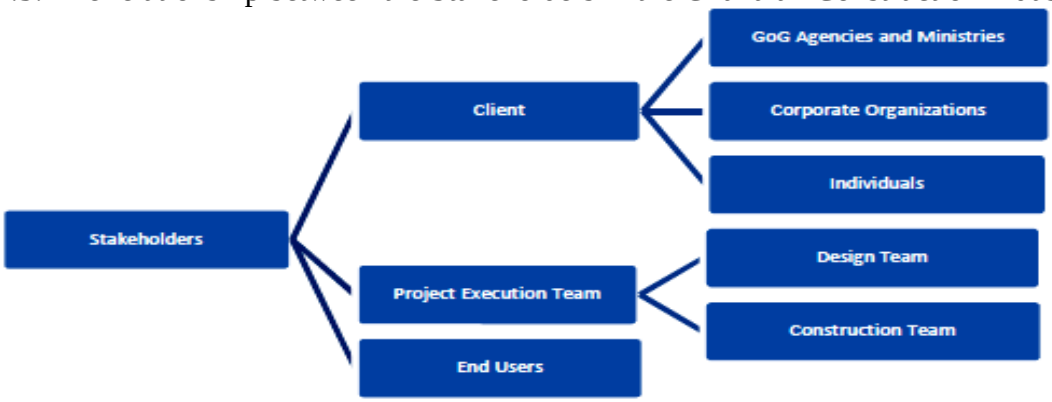
2.3.2. Overview of the Construction Industry in Ghana (CIG)

This section would review literature on the Stakeholders in the Industry, the Significance and Problems of the CIG.

2.3.2.1 Stakeholders in Ghanaian Construction Industry

Agbodjah (2008) argues by broadly classifying the Stakeholders into distinct groups and sub-groups as captured in fig 2.3.The relationship between stakeholders has be captured in the figure below as adapted from (Agbodjah 2008).The relationship show practically how the various stakeholders interact in executing their different but related roles to ensure successful project delivery in the Ghanaian Construction Industry.

Figure 2.3: The relationship between the Stakeholders in the Ghanaian Construction Industry



Source: Agbodjah (2008). A Human Resource Management Policy Development (HRMPD) Framework for Large Construction Companies Operating in Ghana

For the purposes of understanding the subject matter, the main stakeholders in the CIG to be reviewed are: - clients, professional consultants and contractors.

2.3.2.1.1 Clients

The Clients can be describing as project sponsor or proponent of the project. According to Gyadu-Asiedu (2009), four main clients are distinguishable in the Ghanaian Construction Industry: the Government (being the major client), Real Estate Developers, Investors and Owner occupiers. According to World Bank (2003) as provided by Anvuur and Kumaraswamy (2006), an approximate annual value of public procurement for goods, works and consultant services amount to US$600 million. This represent about 10% of the country's GDP. This amount forms part of the bulk of the expenditure of all government agencies, namely, the Ministries, the Assemblies, Departments, Institutions and other Agencies. Procurement of contracts must strictly follow the rules and regulation of the national procurement law as stipulated in the Procurement Act, 2003 (Act 663).

The government as a client is represented by the Ministry of Road and Transport (MRT) (for road works) and the Ministry of Water Resources, Works and Housing (WRWH) in giving out projects. In recent times the various Ministries such as Local Government and Rural

Development, Ministry of Health etc are quite autonomous and act as Clients when infrastructural development are within their domain. These projects are usually donor funded and sometimes may require a percentage to be counter funded from the Government of Ghana (GOG) to be able to implement.

To further ensure effectiveness and maintenance of completed projects, the Government has further established allied Agencies and Departments such as Highway Authority, Urban Roads and Feeder Roads to act as medium for implementation of the policies and programmes of the Ministry of Roads and Transport. The two main Ministries (MRT & MWRWH) established with the intention to take over formal construction, have in recent times essentially formulated policies, programmes with oversite supervision of implementing Agencies.

Another notable Client is the Real Estate developers who are also the other group of clients who undertake large investment in building. Usually, these take loans and undertake speculative buildings for sale. Their performance is usually influenced by the lending situations in the country. An interview with the head of the Ghana real estate developers association (GREDA) in 2007 revealed that they expect extra assistance from the government to support them in their quest to contribute to solving the housing problem in the country. In particular, they expected the government to have involved their association in its on-going affordable housing programme. Investors are usually financial companies who decide to invest excess capital in building construction. The social security and national insurance trust (SSNIT) is one of the leading investor in housing in Ghana.

Gyadu-Asiedu (2009) further argues that Owner occupiers are individuals who decide to build their houses to live in. It has been the tradition of Ghanaians to buy lands from the chiefs (the chiefs are the custodians and owners of land in Ghana, not the government) and hire skilled

workers to build their houses for them. This tradition has been entrenched mostly because successive governments failed to meet the housing expectations of individuals. Some of these owner occupiers also rent out

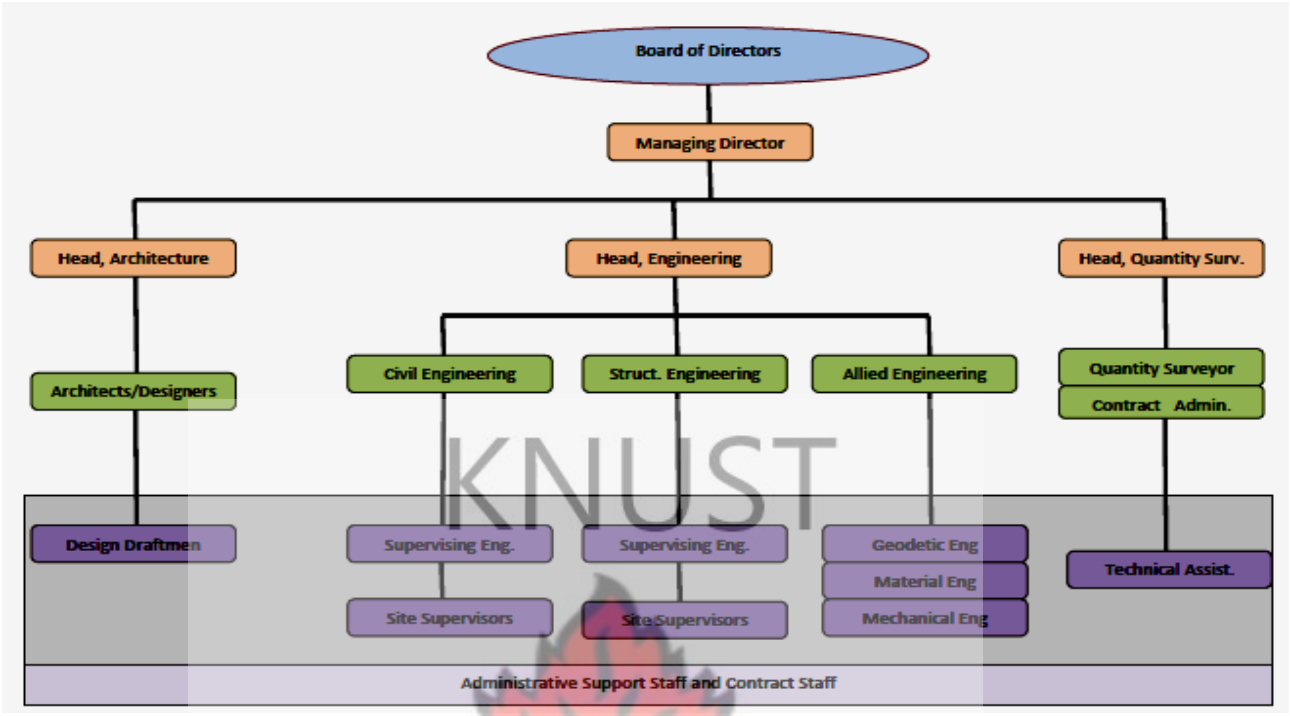
extra rooms in their houses for income. Therefore, some of these owner occupiers are able to progress to the level of being private investors. The owner occupiers, thus, constitute the largest number of clients in Ghana – almost every Ghanaian is a potential owner occupier. They, usually, do not engage professional consultants.

2.3.2.1.2 Professional Consultants

Gyadu-Asiedu (2009) states that Professional consultants who are regularly engaged by the government and other clients are Architects, the Quantity Surveyors (QS), Geodetic Engineers (GE), Structural Engineers (St.E), Electrical Engineers (EE) and Services Engineers (SE). Geodetic Engineers are often called when it is about roads construction. All these professional are regulated by their professional institution, namely, Ghana Institution of Architects (GhIE), Ghana Institution of Surveyors (GhIS) for the QS and GE and (GhIE) for the rest respectively.

With an upsurge in the Service related sector, the trend is currently changing from engaging professional individual consultant but rather a Consultancy Firm. In order to reinforce their position to executing larger contracts, professional consultants and firms are coming together to form Consortiums, in which the Client can be assured of all required professional services from one Consulting firm.

Figure 2.4: The Organizational Chart of a Typical Ghanaian Consultancy Firm



Source: Field Study June 2011

This paradigm shift has been encouraged by the Government and Donors when drafting Request for Proposal s (RFPs) by encouraging for firm to form joint venture ship or strategic alliances. The researcher has developed the organizational chart of typical Consortium in the CIG as captured in the figure above. Each of the main functional departments (Architecture, Engineering and Quantity Surveying) can be an isolated consulting firm with the Heads assuming the positions of Managing Directors. The support staff provides assistance for all the functional departments to enable the functional department concentrate on their core activities.

2.3.2.1.3 Contractors

In an attempt to underscore the CIG, Agbodjah (2008) highlighted that Contractors in Ghana are grouped into eight categories (A, B, C, S, D, K, E and G) according the type of works they undertake. These are:

(i) Roads, Airports, and Related Structures (A); (ii) Bridges, Culverts and other Structures (B);

(iii) Labour based road works (C);

(iv) Steel bridges and structures: rehabilitation and maintenance (S);

(v) General building works (D); (vi) General civil works (K);

(vii) Electrical works (E); and (viii) Plumbing works (G).

In each category, they are grouped into 4, 3, 2 and 1 financial classes in increasing order. In addition, Dansoh (2004) notes a combined category of AB for road contractors. According to Dansoh (2004) Class 4 contractors can tender for contracts up to $75,000; class 3 up to $200,000; class 2 up to $500,000 and Class 1 take contracts of all amounts.

Usually the category D contractors are main Contractors together with categories E and G being usually engaged as sub-contractors for general building works. Categories E and G contractors act as main contractors when the work is of a specialized nature. The industry is dominated by large number of small- and medium-sized firms, that is, classes 3 and 4, especially in the categories D groups, E and G.

Agbodjah (2008) states further that this is mainly because such firms are able to register with as little equipment as possible. Mostly, they are sole proprietors, (few cases of partnerships), and are characterised by high attrition rate. This is because they are highly influenced by the boom and slum nature of the industry in Ghana. They are the least organized and because they lack the resources to employ and retain very skilful labour, their performance is usually below expectation and they have often by accused of producing 'shoddy' works. Because there are often more jobs within their financial class than those above their limits, and because they form the largest group, their performance impacts greatly on the performance of the industry.

Because of this, the classification by the Ministry has been criticized as being too general and obsolete with the registration criteria, list of contractors and monetary thresholds not regularly updated (World Bank, 1996).

The two upper classes (D1 and D2) are more organized and hence more stable, taking on both bigger and smaller works. However, these firms (especially the D2 firms) do not always employ the very qualified workers. The Ghanaian-based foreign contractors are able to do this and hence performance better. Vulink (2004) notes that because of the poor performance of Ghanaian local contractors most of the nation's major projects are usually awarded to foreign contractors.

This is arguably attributable to the lethargic, unprofessional and the "non-businesslike culture" with which indigenous firms operate in Ghana and the high level of attrition which leads to loss of "organisation memory" which impact negatively on the project execution.

2.3.2.2 Significance of the CIG

Between 2000 and 2008 the government of Ghana identified construction as a priority sector for foreign and private investment as part of its vision to promote the private sector as the engine of growth. According World Bank (2003) as provided by Anvuur and Kumaraswamy (2006), an approximate annual value of public procurement for goods, works and consultant services amounted to US$600 million. This represent about 10% of the country's GDP. This amount forms part of the bulk of the expenditure of all government agencies, namely, the Ministries, the Assemblies, Departments, Institutions and other agencies. In 2006, the construction industry represented 8.6% of the national GDP which according to World Bank statistics stood at 10.6 billion USD as of 2005 (The World Bank, 2007). In that same year, the industry is recorded to have contributed 0.7% to GDP growth and recorded an 8.2% growth.

From Ghana Statistical Service (2011), by the end of the first quarter 2011, in real terms, GDP estimate (at constant 2006 prices) for 2010 is reported as GHc 24,187.30 million, an increase of 7.7% over the GDP estimates for 2009(GHc 22,454.5 million). The total contribution of industry to GDP is 18.6 %, the construction industry contribution to the industry sector is about 46% in the

2010 fiscal year. From the nominal GDP, one of the notable contributors to growth is the construction industry which added a value of GHc 3,706 million which is GHc 562 million more than the preceding year of 2009.

Table 2.2: Industry Share of Ghana's GDP

	2006	2007	2008	2009	2010*
INDUSTRY	**20.8**	**20.7**	**20.4**	**19.0**	**18.6**
Mining and Quarrying	2.8	2.8	2.4	2.1	1.8
Manufacturing	10.2	9.1	7.9	6.9	6.8
Electricity	0.8	0.6	0.5	0.5	0.6
Water and Sewerage	1.3	1.0	0.8	0.7	0.9
Construction	5.7	7.2	8.7	8.8	8.6

Source: Ghana Statistical Service. (May 2011).National Account Statistics: Revised Gross Domestic Product

The link between the construction industry and the wider economy has been theoretically and empirically acknowledged (e.g. Turin, 1969; Drewer, 1980; Wells, 1986; Ofori, 1988). A developed construction industry is described as a powerful engine to growth (Kirmani,1988). In general, demand for new construction products, and hence construction activities, tend to be highest at the early stages of economic development and level off after high level of economic development has been attained (Edmonds and Miles, 1984; Wells, 1986). It has also been shown that: "During periods of acceleration economic growth, construction output grows at a faster rate than the economy as a whole. Inadequate construction capacity could act as a constraint on capital investment programmes. Investment and the rate of growth will be slowed down – and may eventually grind to a halt" (Wells, 1986, p.33).

The importance of the industry is more felt in developing countries where infrastructure facilities required for improved living conditions is relatively undersupplied. Ghana's case typifies the current infrastructure position in many developing countries. The housing situation could be described as national crisis. A study conducted by the Ghana Real Estate Developers Association

(GRADA) in 1999 estimated the annual housing requirement to be about 120,000 units per annum, but production at that period was only about 30,000 units per annum.

The road network condition survey conducted in 1999/2000 under the Road Sub-sector Plan for 2000-2005 established that the overall network was 29.2 good, 27.1% fair, and 43.7% poor; the rate of rehabilitation and maintenance equaled the rate of deterioration. It was concluded "If the road sub-sector is to achieve its set objective...by the year 2005, it implies that over the next six years, a total of 2,822km of the trunk road network will have to be improved to good conditions through reconstruction, rehabilitation and upgrading" (MRT, 1999, p. 63). The need for urgent response to address the situation cannot be an underestimation.

In prioritizing the immediate and medium term goals to aid in the achievement of the goals of the Ghana Poverty Reduction Strategy (GPRS I), 2001-2005, the first priority of the Government of Ghana (GoG) was infrastructural development. This focus was due to a high population growth rate in the country (3% projection for 2003 and rising (Amankwaa, 2003), coupled with rural urban migration and the concomitant high population density in urban and peri-urban areas throughout the country (Gyan-Baffour, 2004).

GPRS I classified access to good drinking water, adequate sanitation and sanitary facilities as well as decent housing as parts of the social access dimensions of poverty which the scheme seeks to address in its bid to reduce if not alleviate poverty. In the Growth and Poverty Reduction Strategy (GPRS II), 2006-2009, the GoG identified the construction industry as the first of the five thematic areas of the document and as a priority sector for foreign and private investments. The central goal of the GPRS II is to accelerate the growth of the economy so that the country can achieve middle income status (with a per-capita income of at least US$ 1000.00 by 2015 within a decentralized and democratic environment) within a measurable planning period. This document

treats for instance housing provision as a strategic area for stimulating economic growth while at the same time improving the living conditions of citizens. It further adds that, the very activity of providing housing contributes to economic growth through multiplier effect on the economy. An interesting estimation was that, for every Ten Thousand US Dollars ($10,000) spent on housing, more than seven jobs are created in related industries and enterprises (NDPC, 2005).

Table 2.3: Economically Active Population by Industry Distribution of the Country

Activity	1984	2000
Agriculture	61.00	50.00
Commerce	15.00	14.50
Manufacturing	10.80	10.80
Services	8.70	13.30
Transport/Communication	2.30	3.40
Construction	1.20	2.30
Mining	0.50	2.00
Electricity/Water	0.30	0.40

Source: Amankwaa, O. P. J. (2003) Ghana: A Human Geography for Secondary Schools. Ghana: St Francis Press.

From the table above, the economically active population by industry distribution of the country, which stood at approximately 5.5million in 1984 and projected to be approximately 9 million in 2000. The industry does indeed employ a significant percentage of the economically active population of the country

It is with no shadow of doubt that this industry is a key to providing the necessary infrastructure to aid in the achievement of these goals. There is the need therefore for the industry to put in measures and enhance practices to ensure productivity enhancement and resource maximization in project delivery. This will aid in poverty alleviation, human resource development, enhanced sanitation and access to potable drinking water, increased per-capita income of the citizenry, modernization of agriculture amongst others through the provision of infrastructure for development and the creation of jobs.

2.3.2.3 Problems in the Ghanaian Construction Industry

Inferring from the works of Crown Agents (1998) and Westring (1997), Anvuur and Kumaraswamy (2006), the performance of the CIG is poor and saddled with several problems ranging from contract administration, through complex, lengthy and bureaucratic payment procedure, delayed payments to that of project execution. This is because sometimes this delays run into several months and thus, these employers find it difficult to continue paying their staff. The unskilled labours of the contractors form the largest group and the lack of guaranteed income, despite their commitment to work, shows an unpleasant side of the industry that is seen as one of the largest employer of labour.

Because of the representation of construction workers in the working population of the country, such situation reflects on the socio-economic life of ordinary Ghanaians. The reverse is also true. This could be likened to a period of freeze on government projects. To some extent, in Ghana, there are practical reasons to subscribe to the argument that construction industry is a regulator of the economy Ashworth (2004).

Agbodjah (2008) postulates that Construction companies within the industry, generally exist as companies with a head office which is central to the company's activities and coordinates projects and then individual project sites which are treated as subsidiaries of the companies. Loosemore et al (2003) added that, though construction activity is extremely diverse, ranging from simple housing developments to highly complex infrastructure projects, it has some characteristics:

unique one-off nature; tendency to be awarded at short notices; reliance on a transient workforce; increasingly demanding clients; and its male dominated culture, which are common to all projects irrespective of the size of the project as well as its location.

Following the introduction of the procurement law, construction activities in Ghana (government projects) are organised essentially as a tripartite arrangement between the client, professional consultants and the contractor. The clients, upon taken a decision to build, calls on the chief consultant, usually, the Architect and the other consultants. They provide professional advice to the government during the briefing stage. They then provide design, appoint the qualified contractor, supervise the execution and advice for payment and finally, conclude the project.

Table 2.4: Project Procurement in Ghana Using the Traditional System.

Stakeholder	First Action	Second Action	Third Action	Fourth Action	Fifth Action
Client	Conceptualise	Initialise	* * * * *	* * * * *	Use the product
Practitioners (consultants)	* * * * * *	Design client's concepts	Manage the project	Manage the project	* * * * *
Contractor	* * * * * *	* * * * * *	Execute the project	Complete the project	* * * * *

* Stakeholder has no active role here.

Source: Gyadu-Asiedu (2009). Assessing Construction Project Performance in Ghana: Modelling Practitioners' and Clients' Perspectives.

This has meant that after the initialisation stage the client's role is often limited to expecting the finished product. The consultants, led by their team leader (usually, the Architect, Quantity Surveyor or Civil Engineer depending on the project, or project manager where applicable) traditionally become not only the managers of the project ensuring that the right thing is done by the contractor but also the sole judge assessing and giving the verdict as to the state of performance and satisfaction of the project to the client.

According to Crown Agents (1998) and Westring (1997) as recorded in Anvuur et al (2006), contracts for both works and consultancy services take very lengthy periods to reach financial closure and are subject to unnecessary delays. Westring (1997) attributes the causes of the delays

to extensive post-award negotiations, delays in the preparation of technical specifications and drawings, delays in evaluation, an extensive system of controls, reviews and approvals, and land ownership disputes.

Project implementation has been characterised by extensive cost and time overruns and poor quality (Crown Agents, 1998; Westring, 1997; World Bank, 1996; World Bank, 2003). For instance, Anvuur et al (2006) recorded that, the process for payment to contractors and suppliers is very long, involving over thirty steps from invoice to receipt of the payment cheque for public clients, and often overcentralized, leading to delays in project execution. They added that, fiscal constraints and poor procurement practices led to insecurity of funding for construction projects and created a constant spectra of delayed payments and payment arrears to contractors and consultants (World Bank, 1996). Westring (1997) noted that, many private sector entities delivering works and services to government establishments try to limit their losses by cutting corners or abandoning the work altogether which has negative consequences on project delivery as well as increasing contractor-client conflicts.

Anvuur et al (2006) recorded that, long-term strategic planning by both public and private sectors was difficult and so was the monitoring and control of procurement (Dansoh, 2004; Westring, 1997). According to these authors, some procuring entities also resorted to making contractual payments before the due dates in order to prevent a budget allocation lapse and advance mobilisation funds provided to contractors exceed considerably the 15% allowable (Dansoh, 2004; Westring, 1997; World Bank, 1996).

Gareis (2007) defined PMt as the business process of an organization. He added that, the PMt process consists of subprocesses including: project start; continuous project coordination; project controlling; resolution of a project discontinuity; and project closedown. PMt as defined above as

well as in Turner (2007), can be described as what is referred to as the procurement system or route within the construction industry. Walker (2007) described the procurement systems as the system which describes the total process of meeting a clients' expectations for a project, starting at the point where this need is first expressed, inception to completion and even in some cases, after commissioning. According to this author, it can also be described as the management system used by the client to secure the design and construction services required for the execution of the proposed project to the required cost and quality within the required time.

The main procurement method used for public works in the country prior to and after the enactment of the PPA is the traditional method. The performance of construction in Ghana has been poor and many reports have decried the public sector's lack of commercial edge in the exercise of its procurement function (Anvuur et al., 2006). The objectives of the procurement reform proposals according to the MoFEP include to: promote national development; enhance harmony with other local and international laws; foster competition, efficiency, transparency and accountability; facilitate ease of procurement administration; and, ensure value for money. Annual savings of about US$150 million are envisaged through better management of government-financed procurement alone (World Bank, 2003). Anvuur et al (2006) recounted additional direct measures undertaken by the GoG which included: the issuance and monitoring of expenditure ceilings for each Municipal and District Assemblies (MDA) consistent with the annual budget and updated cash flow forecasts; and implementing new anti-corruption strategies including codes of conduct for state officials. After this era, all procuring entities have to seek clearance from the MoFEP, through certification as proof of the availability and adequacy of funding, before any works contract is awarded. The PPA applies to all procurement financed in whole or in part from public funds (PPA, Section 14), though procurement with international obligations arising from grants or concessionary loan to the government are in accordance with the terms of the grant or loan (PPA, Section 86). PPA (2003). It is believed that the PPA will ensure transparency, probity

and accountability in public construction procurement. The summarized chart for selection of appropriate procurement method is attached as Appendix 1.

Anvuur and Kumaraswamy (2006), however summarized the notable problems influencing the industry vis-à-vis authors who have conducted research into these problem in the table below.

Table 2.5: Project Procurement in Ghana Using the Traditional System

Authors	Problem	Causes
Westring (1997)	Delays and cost overruns	Extensive post-award negotiations, delays in the preparation of technical specifications and drawings, delays in evaluation, an extensive system of controls, reviews and approvals, and land ownership disputes,
Westring, 1997; World Bank, 1996;2003	poor quality	Service providers cutting corners to limit losses or abandoning the work altogether.
Eyiah and Cook, 2003; Westring, 1997	Delays	Long process of payment to contractors and suppliers – "over thirty steps from invoice to receipt of payment cheque", over-centralised.
World Bank, 1996; 2003	Insecurity of funding for projects	Fiscal constraints and poor procurement practices resulting in delayed payments and arrears to contractors and consultants; accumulated interest on late payments and the frequent price changes due to extensive renegotiation; difficulties by contractors and consultants in processing claims
Dansoh, 2005; Westring, 1997.	Contractual and procurement issues	Lack of respect for contract with neither party expects contracts to be fully binding; ad hoc approaches to economic-sizes project; difficulties in long-term strategic planning by contractors; poor monitoring and control of procurement.

Source: Anvuur, A., Kumaraswamy, M. (2006), "Taking Forward Public Procurement Reforms in Ghana".

2.4 Risk

2.4.1. Understanding Risk in Construction Context

The subject of risk management has been influential ever since colonies of people have evolved. In Covello and Mumpower (1985) article, and according to Grier (1981), the first signs of risk management go back as far as 3200 BC in the Tigris-Euphrates valley with a group of people called the Asipu. One of their functions was to act as risk consultants. Their procedure would be to identify the important dimensions of the problem, propose alternative actions, and collect data on the likely outcomes. Their data sources, though, were signs from the gods. Each alternative option would be interpreted from the gods, and either a plus or a minus sign would result, whether

the idea was a favorable one, or not. Then, the most favorable action would be selected from the pool of positive responses and reported to the client.

Dawson (1997) in his research on a “Hierarchical Approach to the Management of Construction Project Risk” noted that the subject of risk management has developed over the last few decades to bring together the many systems and techniques used in the management of risk. As a starting point, the British Standards Institute, in BS 4778 (1979), provides the following definition: "The combined effect of the probability of occurrence of an undesirable event, and the magnitude of the event. "British Standards Institute, 1979.This definition comprises several aspects of importance; that risk is an undesirable event and that its magnitude and probability of occurrence should be taken into account. This qualitative approach, of multiplying the effect by the magnitude is also suggested in definitions given by Green (1982), RISKMAN (1994) (termed risk exposure rather than risk), and CIRIA (1994). These definitions place risk in a technical environment, allowing risk to be quantified. A looser definition is that given by Bannister and Bawcutt (1981) who define risk as: "Potential variability in the future outcome (of a stated situation) due to uncertainty" Bannister and Bawcutt, 1981 One aspect of the above definition which is important is the potential for a desirable impact to be termed a risk. This concept that risk is the impact of uncertainty, whether beneficial or detrimental, is also supported by Drucker (1974), who effectively defines the net risk as the balance between the upside and the downside, and Al-Bahar and Crandall (1990) and Perry and Hayes (1985).

As noted by Dawson (1997) the upside of uncertainty, that is opportunity, unfortunately does not warrant discussion in many of the papers which offer a definition of risk. Perhaps if the subject had developed under the title "Uncertainty Management", the opportunity aspect would gain more attention. However, the more recent additions to the literature covering risk management acknowledge the importance of opportunity when assessing risk (Flanagan & Norman, 1993).

Dawson (1997) further states that there is a need to classify the extent to which uncertainties are risks and opportunities to allow comparisons and decisions to be made regarding their acceptability. A risk, therefore, has two meanings. It can be an undesirable outcome of an uncertainty, or an uncertainty with a balance between the risk and opportunity outcomes in favour of the risks. Obviously, an opportunity can be seen in a similar manner.

Laryea (2007) in a paper presented at Construction Management and Economics 25th Conference on the topic "An experimental approach to project risk identification and prioritization" argues that Risk measurement is difficult and highly subjective. Laryea (2007) noted that several definitions of risk exist in the literature, with a close link of them to formal probability theory. The commonest evaluation mechanism for one measure of project risk is to multiply its probability and its impact. The basis for evaluating the probability and the severity parameters of the concept often leads to varying risk definitions. Over the years, several questions have arisen from risk research. The key questions relate to what the natural unit of risk should be, and whether the uncertainty and severity components be multiplied directly in the sense that a small probability of a large loss is considered equivalent to a larger probability smaller loss.

Williams (1996) argues that proper consideration of project risk requires consideration of both impact and likelihood. Multiplying impact and uncertainty to "rank" risks is misleading, since the correct treatment of the risks requires both dimensions. In dealing with a single risk, there is little danger in considering the multiplied figure.

Laryea (2007) postulated quantitative description for project risk as the variability of return around an expected average, mathematically expressed as:

[Risk ≈ realized return - expected return].

To highlight further, the researcher identifies that there are three variables necessary to enable this expression to be meaningful, these are: a known variable (example project cost), 2) an inferred variable (example final project cost) and 3) an expected variable (example expected profit margins). Laryea (2007) noted since risk is the possibility that realized return will deviate from the expected return, the operationalise risk-level as follows:

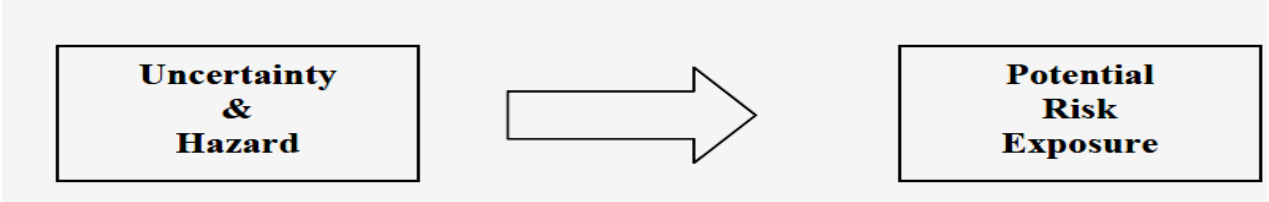
Risk-level ≈ [(expected return - realised return) / expected return] x 100%

Risk is not the same as risks, although the terms are often used interchangeably in the literature. Whiles risk is the deviation to an expected outcome, risks are the actual deviation-causing events. As explained in a financial analysis textbook by Fisher and Jordan (1996: 70), forces [risks] that contribute to variations in return constitute elements of risk. Al-Bahar and Crandall (1990) defined risk event as what might happen in favour or in detriment of a project.

According to Ahmed *et al.* (2001), "The construction industry has a poor reputation in coping with risks, many projects failing to meet deadlines and cost targets." Kangari (1989) said: "…the construction industry has a very poor reputation for coping with risk. Risk analysis is either ignored or done subjectively by simply adding a contingency. As a result many major projects fail to meet schedule deadlines and cost targets with attendant loss to both contractors and owners."

Also Powell (1996) concluded that risks generally arise due to lack of certainty about the project being undertaken or because of the existence of hazards within the project.

Figure 2.5: Risk Exposure Causes



Source: Powell,C. (1996)." Laxton's Guide to Risk Analysis & Management"

2.5 Risk Management and Risk Strategies

2.5.1. Risk Management Process

Risk management seeks to identify and control possible future occurrences and should be proactive rather than reactive. To be effective, risk management must rely on tools and techniques that help predict the likelihood of future events, the effects of these future events and methods to deal with these future events. Risk management is the responsibility of everyone involved in a project.

Dawson (1997), identified that there are many definitions of risk management, just as there are of risk, and, similarly to the definitions of risk, the definitions of risk management are also inconsistent. This inconsistency, and hence confusion, arises because of two aspects of the definitions. Firstly, as for risk, there are different definitions as to what risk management is, and secondly, different titles are sometimes given to a process which could be described as risk management

Risk management is an ongoing, iterative process. Although every project undertaken is different and unique, the approach to the management of risk is usually the same (Powell 1996). The main three basic steps in a risk management process are:

• Risk Identification and Initial Assessment

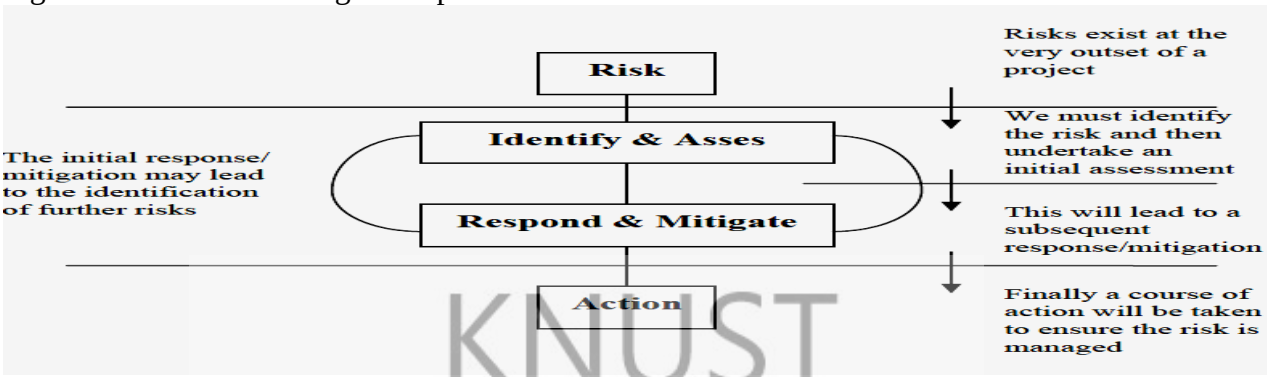
• Response and Mitigation

• Risk Analysis

The above findings on risk management is addressed as three stage process, is corroborated by other authors as entailing identification, analysis, and response (Perry and Hayes (1985), Clark et al (1990), Bannister and Bawcutt (1981), and Toakley and Lind (1991). Al-Bahar and Crandall, (1991), added a fourth stage, referred to as system administration. The inclusion of this stage highlights the iterative nature of risk management, as it contains the monitoring of the risk

management process confirms the assertion by (Powell1996). In responding to some risks, the effect of others can be changed or new risks produced or identified (Berny and Townsend, 1993).

Figure 2.6: The risk management process



Source: Powell,C. (1996).” Laxton's Guide to Risk Analysis & Management”

2.5.1.1. Risk Identification and Initial Assessment

This stage of risk management is viewed by many as the most important, as the subsequent stages can only operate on the identified risks (Al-Bahar and Crandall, 1991). Clark, Pledger and Needler, 1990, go as far as to say "an identified risk is not a risk, it is a management problem. " This suggests a difference between an identified risk and one which, although it exists, has not been identified. The process of risk identification is defined by (Al-Bahar and Crandall, 1991) as "the process of systematically and continuously identifying, categorising, and assessing the initial significance of risks associated with a construction project. " Although the initial assessment of significance of risks could be considered a part of the analysis stage, it is placed here because of the need to limit the number of identified risks (Perry and Hayes, 1985, Berny and Townsend, 1993).

Risks could be controllable or uncontrollable. Controllable risks are the risks that are within the control of the project or can be controlled by the project participants. Uncontrollable risks are the risks that are outside the control of the project participants. Sometimes they are called "Acts of God". In this way, pre-analysis can help to eliminate insignificant risks from the detailed analysis

stage. Analysis can then be seen as a process of increasing complexity and sophistication, initially viewing risk independently,

2.5.1.2 Techniques

The process of risk identification relies on the knowledge, judgement, and experience of the people involved in the project or business. In order to assist these people, and to add a scientific base to the process, techniques have been developed. These techniques also help to control the bias, discussed earlier, arising from the subjective nature of the exercise and personal objectives.

The techniques can be divided into two categories; those designed to assist in the identification of risks and opportunities, and those designed to assist in determining the initial significance of those sources. The following list, although not exhaustive, shows examples of the techniques available to assist in the identification stage.

1) Checklists 2) Brainstorming 3)Cause-event-effect 4)Prototype activities

The techniques applied to the pre-analysis stage include the following.

1) Qualification 2) Quantification 3) Risk Mapping 4) Classification

Checklists are a popular method of identifying risks and opportunities. They are an effective method of relating past experience to present situations. The checklist will usually contain a list of the risks which commonly occur on projects or ventures of a similar type. Although this technique will not identify the risks specific to the venture under consideration, they do ensure that risks identified on other ventures, usually through experience, are considered (Al-Bahar and Crandall, 1987).

Brainstorming; the objective of this technique is to elicit information specific to the venture under consideration. The process requires a group of people involved in the venture, preferably with different expertise and perspectives, in order that the list of risk and opportunities reflects all aspects of the venture. The inclusion of a number of people in the exercise helps to control

personal bias although this also introduces problems of an increased time requirement and a potentially riskier stance (Harrison, 1995).

Cause-Event-Effect technique approaches the problem from a different perspective by tracing the consequences back to discover the possible causes (Jardine Ins Brokers, 1987, Al-Bahar and Crandall, 1991, Flanagan and Norman,1993). This approach acknowledges that a single risk (the effect) can have many causes, each one contributing to the probability of occurrence. Table 2.7 below shows an example of risk categories and typical risk.

Table 2.6: Example of risk categories and typical risks

Risk Category	Typical Risks
Acts of God	Flood, earthquake, landslide, fire, wind, lightning
Physical	Damage to structure, damage to equipment, labour injuries, material and equipment fire or theft
Financial and economic	Inflation, availability of funds from client, exchange rate fluctuation, financial default of subcontractor, non-convertibility
Political and environmental	Changes in laws and regulations, war and civil disorder, requirements for permits and their approval, pollution and safety rules, expropriation, embargoes
Design	Incomplete design scope, defective design, errors and omissions, inadequate specifications, different site conditions
Construction related	Weather delays, labour disputes and strikes, labour productivity, different site conditions, defective work, design changes, equipment failures

Source: Al-Bahar, J. F., and Crandall, K. C.(1990). Systematic Risk Management Approach for Construction Projects

Prototype activities; this technique, by (Klein, Powell, and Chapman, 1994,) for use on construction projects requires a prototype activity to be defined. The risks are then identified as variations from that prototype. The technique was produced to reduce the reliance on using the network of activities and allow the risk aspects of the project to be targeted. The key feature of the prototype activity is that it does contain uncertainty, but at an acceptable level. In this way, rather than identifying every source of uncertainty, only those with above normal uncertainty are

considered. This again reinforces the idea that the objective is to gain an acceptable level rather than to minimise risk.

At the pre-analysis stage , the first is stage of any analysis is risk measurement, in which the possible effects of the identified risks and their likelihood of occurring are assigned. There are two methods of achieving this; qualification and quantification (Franke, 1987).

Qualification is used when the two parameters are described using words. For example, the impact might be described as low, moderate, or high, and the likelihood as probable, unlikely, etc. Words are used because of the difficulty in assigning actual values. Although such classifications are relatively easy to assign, their usefulness is limited.

In Risk Quantification, it is also possible to evaluate the impact of a risk in terms of cost or time, as these have commonly used units. Quantities such as quality cannot readily be quantified due to the lack of suitable units. In such cases, it is suggested that the effect is converted to an equivalent cost (Franke, 1987). However, in some cases this is not possible or advisable (Drucker, 1974).

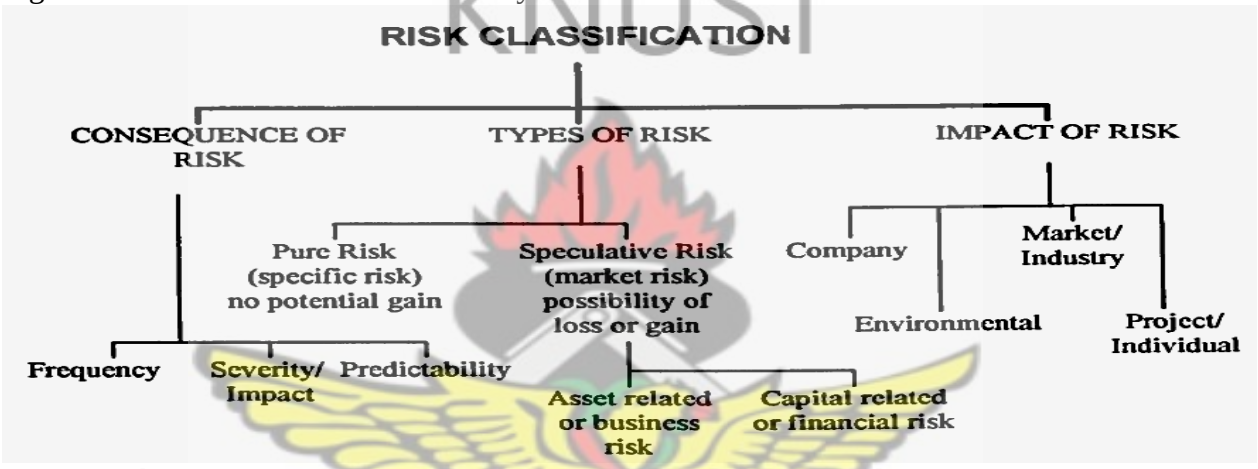
The quantification of the probability of the risk occurring is often a more subjective task than that of the impact or effect. Ideally, the probability would be derived statistically from historical data, Unfortunately, historical data is generally not available, or is too sparse to make a confident statistical prediction. Consequently, in many cases, a subjective assessment is made, based on the historical data available and the experience and judgement of the people involved. The following list contains examples of the techniques used for this task. Risk Mapping and Risk Classification

Risk Mapping, this is perhaps the most common and simplest of the techniques. A risk map is a two dimensional graph; one axis representing the potential impact of a risk, and the other denoting

the probability of occurrence. The graph is converted to a map by the placing of contours (or iso-risk curves); the contours further away from the origin denote high risk.

Risk classification has been developed to describe the nature of a risk, either in terms of its origin, consequence, or impact, etc. The risk classification can then be used in determining possible strategies to control each risk.

Figure 2.7 - Hierarchical classification system



Source: Flanagan, R and Norman, G.(1993). Risk Management and Construction.

This of risk identification and initial assessment should be taken early in a project's life, because decisions made during the early feasibility and design stages of a project have the greatest impact on the project (Hendrickson and Au, 1989). The uniqueness of construction projects makes the information at this stage most likely to be incomplete or inaccurate.

2.5.1.3 Risk Analysis

Before developing appropriate risk response and mitigation strategies it is necessary to conduct a detailed risk analysis for the identified risks which have been classified under the risk classification taxonomy. This process of risk analysis is necessary to determine the impact(severity or otherwise) and their likehood of occurrence at the project delivery stage.

This section will described several techniques developed to determine the combined risk, usually in a project, and the sensitivity of the project to the individual risks. The importance of risk analysis is stressed by Al-Bahar and Crandall, 1991, by describing it as "the vital link between systematic identification and rational management of significant [risks]. " Of all the stages of risk management, the risk analysis stage contains the vast majority of the available techniques. The techniques discussed here are:

- Expected Outcome Analysis
- PERT
- Monte Carlo Simulation "

2.5.1.3.1 Expected Outcome Analysis

This is the simplest technique used and builds on the standard quantification technique of defining the probability and effect. Multiplying these two parameters gives the expected outcome for each uncertainty, and the sum of these gives the expected outcome for the project. The figure represents the average outcome of the uncertainties which, if added to the price of the project, would reflect the average price of the project.

Although this technique is quantifying the risk, giving a sum of money which can be added to the price, it does not really define the balance between the risks and the opportunities. To illustrate this, consider a list of items whose expected outcome was zero. The result gives no indication of how the risk and opportunity is distributed around the balancing point (of zero), or the likelihood and potential impact of the individual risks and opportunities. This highlights another problem in that this technique treats a risk with a relatively high probability of occurrence and moderate impact the same as one of low probability but catastrophic implications.

2.5.1.3.2 Pert

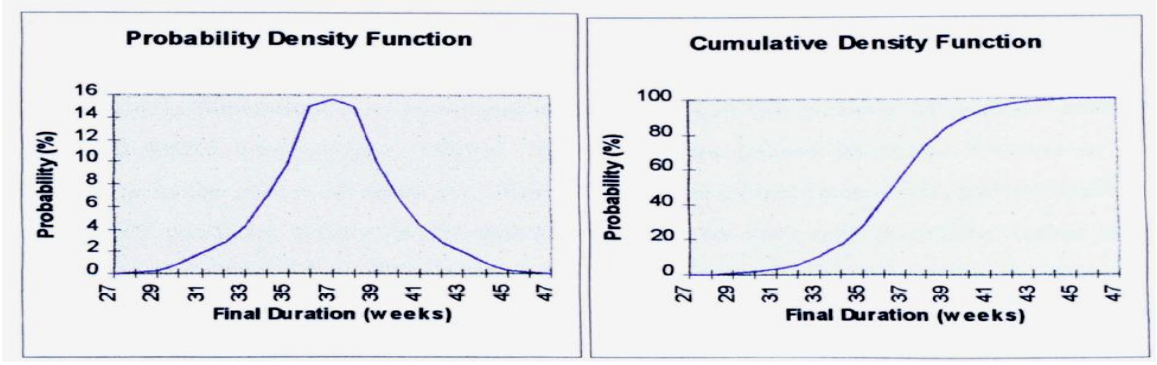
The Program Evaluation Review Technique, PERT, (Malcolm, Roseboon and Clark,1959) is perhaps the first risk analysis technique, dating back to the late 1950's. The technique is based on the network of activities for a project, in which the activity durations are considered variable, rather than fixed, as they are in critical path analysis.

The objective of the technique is to determine the probability of finishing the project by pre-defined dates. The range of possible durations for each activity is defined using a three point approximation based on the beta distribution. The three parameters are referred to as the optimistic, most likely, and pessimistic durations.

The mean and variance of each activity duration is evaluated using the properties of the beta distribution from the three parameters given. The analysis begins with the determination of the critical path using the most likely durations. The mean total duration is then the total of the mean duration of every activity in the critical path.

Using the Central Limit Theorem (Wilson, 1972), the variance of that duration is the sum of the variances of the activity durations on the critical path. The resultant distribution has the characteristics of the normal distribution, an example of which is shown in

Figure 2.8: Example output of PERT.



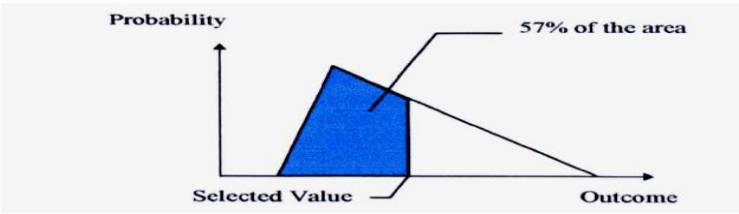
Source: Dawson, P. J. (1997). Hierarchical Approach to the Management of Construction Project Risk.

Frequency distributions, such as those shown in Figure 2.9, are a common output of quantitative risk analysis techniques. The distribution on the left is a probability density function (pdf) in which the height of the graph represents the relative likelihood of that outcome. The peak of the graph shows the most likely result and is easily identifiable. An alternative method of presenting the distribution is the cumulative density function, as shown on the right. The height of the graph represents the probability of finishing before that date rather than on that date. PERT is still being applied and an important technique, especially in determining the distribution of costs, as this contains only one path (Aquino, 1992).

2.5.1.3.3 Monte Carlo Simulation

Monte Carlo Simulation was developed as a solution to the problem of multiple critical paths in PERT (Van Slyke, 1963). The technique gained its name because of its similarity to the games of chance in Monte Carlo. The technique, explained in terms of the PERT problem, allows every activity duration to vary and estimates, rather than evaluates, the distribution of project duration. It achieves this by simulating the project a number of times, each time randomly assigning durations for each activity in the whole network from the distributions defined. A random number is converted to a duration by determining the duration for which the probability of that duration not being exceeded equals the random number. To illustrate this, consider the distribution in Figure 2.9 below, in which a value is selected from a triangular distribution using a random number of 57. The distribution of total duration is produced by compiling the results generated for each simulation.

Figure 2.9 - Conversion of a random number to a value



Source: Dawson, P. J. (1997). Hierarchical Approach to the Management of Construction Project Risk.

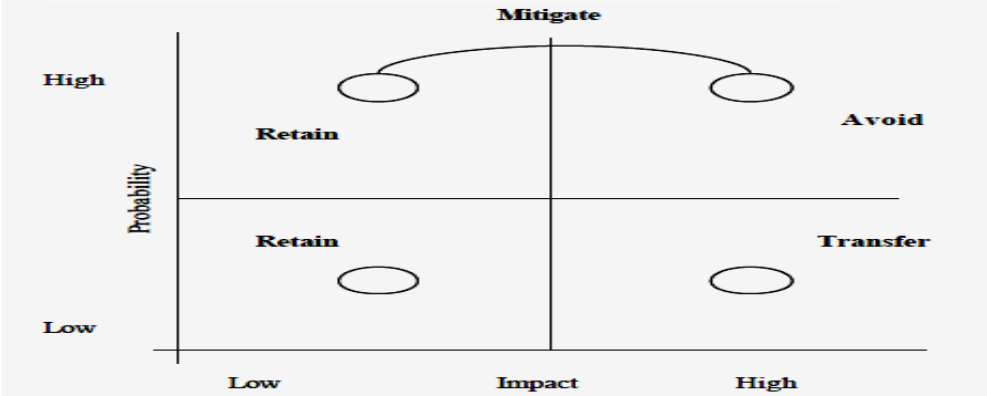
One aspect of Monte Carlo simulation which requires examination is the generation of the random numbers used in the analysis. Since Monte Carlo simulation is undertaken on computers, there are two methods by which the numbers can be produced; a table of random numbers can be stored on the computer or the computer can generate the numbers internally. The computer generates the numbers by evaluating a function which, strictly speaking, cannot produce truly random numbers. The numbers produced by this method have been termed pseudo random numbers (Tocher, 1963).

2.6 Risk Response and Mitigation Strategies

The main aim of any response and mitigation strategy is to take a course of action in order to eliminate risks from a project or, at least, reduce their potential negative implications. This can be achieved either through an immediate response to the project or through a retarded response (contingency plan). The immediate response usually results in the elimination of the risk. On the other hand, a contingency plan would only be implemented should an identified risk materialize.

In previous studies, numerous risk sources were identified based on the checklist from the literature and later classified under risk categories. These risk sources were also assessed in terms of probability of their occurrence and impact on the project cost if they occurred. Having identified and assessed the risk sources, the risk matrix can then guide the project personnel's choice of risk response strategy.

Figure 2.10: Risk Matrix diagram



Source: Alexander, C. and Marshall, M. I. (2006). The Risk Matrix: Illustrating the Importance of Risk Management Strategies

Depending on where the risk source lies on the matrix shown in Figure 2. 12., there are four broad risk response strategies (Alexander et al., 2006).

• Risk avoidance

• Risk reduction

• Risk transfer

• Risk retention

2.6.1 Risk Avoidance

When the chance of occurrence of risk sources and the impact associated with it are high, then avoidance is the risk response technique that should be followed. Simply speaking, this means not choosing to do the activity. However, if this means there is a big opportunity loss by avoiding the activity, the effort should be towards clarifying the requirements by obtaining more information (Hillson, 1999).

Changing the scope of work so that risky items in the scope of work are no longer undertaken is also a risk response technique. Sometimes it may not be easy to map the risk sources exactly in one of these quadrants. It may be that some of these risk sources lie on the border of these quadrants. In such cases, strategies that are most effective should be chosen. In most cases, the effectiveness is measured in terms of the cost associated with mitigating these risks.

2.6.2 Risk Transfer

When the impact is high even though the chance of occurrence of the risk source may be relatively low, risk transfer strategies are applied. The intention is to pass such risks to a third party which can handle them better. There are basically two ways of transferring project risks. Insuring the project against any high impact risk sources like hurricane is one way to transfer the

risk to the insurance companies by paying insurance premiums. Risk sources can be transferred through the contracts to either owner or other stakeholders of the project.

2.6.3 Risk Mitigation

Not all the risk sources can be solved by risk avoidance and transfer. In fact most of the risks cannot be addressed by the above two risk responses. Therefore, for majority of the risks, reduction or mitigation techniques need to be applied. Depending on where the risk source lies in the risk matrix, mitigation may be done either by reducing the probability of risks or by reducing their impact or both. If the impact of the risk is high, risk reduction may be done by lessening the extent of the damage. If the risk occurs very often, it is wiser to tackle the risk sources at their root by inhibiting their trigger (Hillson, 1999). Whenever the risk probability and the impacts are high, the response strategy should be to reduce both.

2.6.4 Risk Acceptance

When the risk sources fall in the low impact-low probability quadrant of the risk matrix, such risks are deemed acceptable. Acceptance can be passive when the impact is minor for which no prior plans may be required. Acceptance can be active if the impact if it occurs needs to be further reduced and for such risks contingency plan should be put in place by allocating sufficient time and resources (Piney, 2002).

The following steps are involved in the strategy formulation procedure:

1. Identify risk sources
2. Assess the probability of risk and its impact for the identified risk for the project.
3. Plot risks in the risk matrix similar to the one shown in Figure 2.12.
4. Recommend risk response strategies based on where the risk lies on the risk matrix.

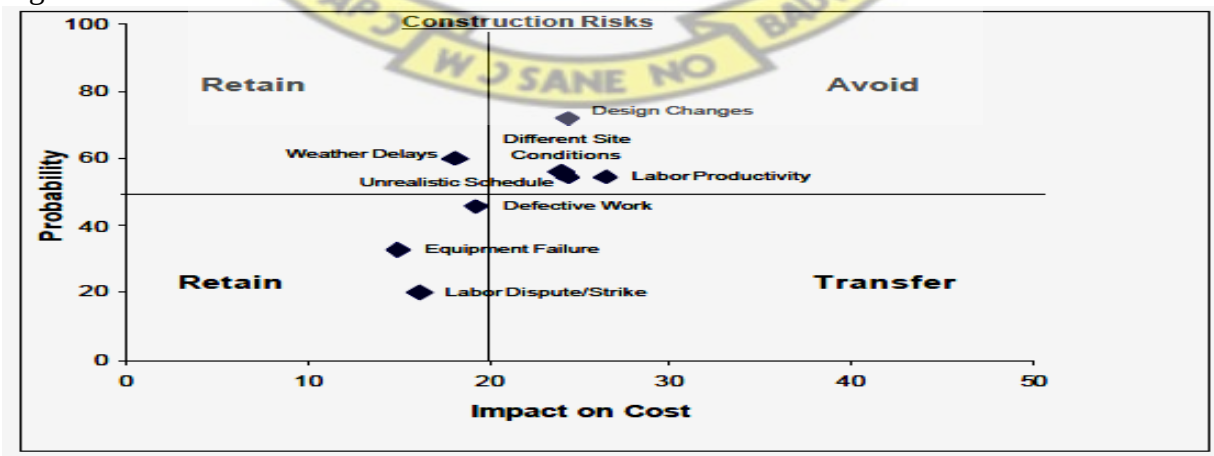
When the risk is beyond an unacceptable level these high risks should be mitigated either by reducing the likelihood of the occurrence of the risk or by reducing the impact of the risk or both.

2.7 Construction Related Risks using Risk Matrix

Design changes were assessed to be critical in construction related risks. The strategy should be to reduce both the likelihood and the impact of this risk. Likelihood can be reduced by starting the construction only after design has been fully completed. However, whenever this is not practical it is worthwhile for the contractor to lessen the impact associated by proposing value engineering solutions to the problems and also discussing constructability issues with the designer before the design is finalized.

When the scope is undefined and the design changes are inevitable, the contractor should not take the cost risks associated with it. Rather contractor should opt for cost plus basis of contract for such kind of projects. Labor productivity is also seen as a risk variable whose impact on the project is quite substantial. This kind of risk associated with low labor productivity should be transferred to the subcontractor. Risk pertaining to different site conditions should be transferred to the owner. Similarly unrealistic schedule risk should be transferred to the third parties, owner as well as the subcontractors. Weather delays are uncontrollable and therefore cannot be avoided.

Figure 2.11 : Risk Matrix- Construction Related Risks



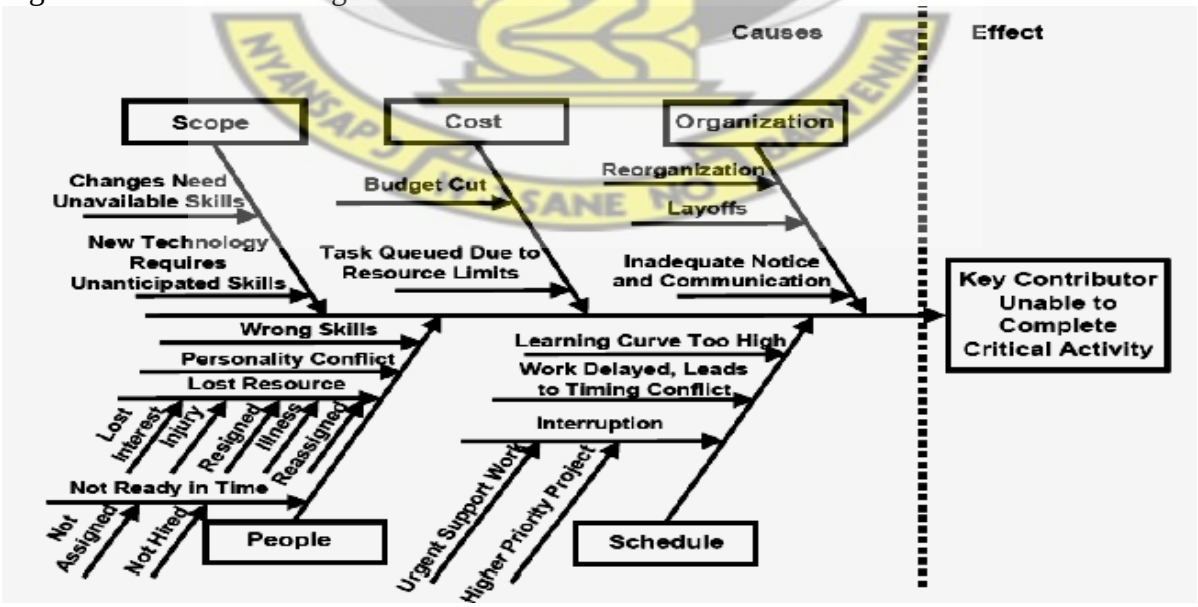
Source: Kamalesh, P., Syed M. A. and Salman, A. (2007).Risk Matrix as a Guide to Develop Risk Response Strategies.

The best strategy would be to lessen the impact due to the inclement weather. This risk should be retained by the contractor by allocating sufficient contingency in the schedule for such delays. Defective work is the responsibility of the contractor and should be retained by the contractor. To bring the risk to an acceptable level, the contractor should emphasize on its quality control and quality assurance. Equipment failure and labor dispute were thought to be of lesser risk rating and should be retained by the contractor.

2.7.1 Cause-and- Effect Analysis Fishbone

This section further reviews other risks strategies which can be used to determine the main strategies to adopt. Route cause analysis is very important for risk management strategy determination (Kendrick: 2003). Kamalesh et al. (2007) buttresses that finding the root causes, different methods can be used such as what-if and cause-and-effect. In this way, it is very effective to consult with expert contributors. Furthermore, in every step brainstorming is very suitable method in finding the risk sources. In a cause-and- effect analysis fishbone diagrams can be used that were developed by Dr. Kaoru Ishikawa for display root causes visually. This approach can be followed for each significant risk.

Figure 2.12: Fishbone diagram

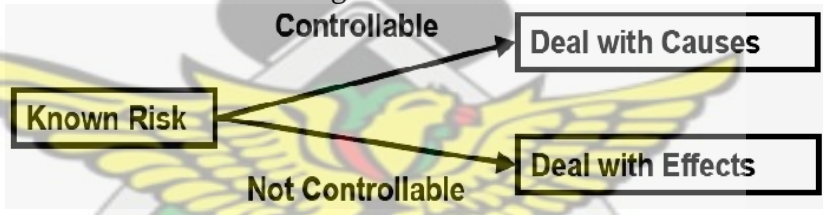


Source: Kamalesh, P., Syed M. A. and Salman, A. (2007).Risk Matrix as a Guide to Develop Risk Response Strategies.

Managing project risks consist of different tactics such as prevention and recovery. Prevention are activities that reduce the probability of identified risks taking place and recovery are activities for after risk taking place. Generally, there are different categories of risks in projects, controllable known, uncontrollable known risks and unknown risks. All the identified risks are known risks that may be or may not be under control. A suitable response plan can be developed for a known risk but for unknown risks should be referred to previous experience. In some cases, reviewing the past projects may lead to a transformation of unknown risks to known risks (Kendrick: 2003).

For known uncontrollable risks, project the management team have no direct role on their causes and therefore the best way is recovery tactics after the risks occur (Kendrick: 2003). It should be noted that in some cases dividing causes to controllable and uncontrollable is not easy.

Figure 2.13: Causes and Effects Risk Strategies



Source: Kamalesh, P., Syed M. A. and Salman, A. (2007).Risk Matrix as a Guide to Develop Risk Response Strategies.

There are some management techniques like "five why" may leads to deeper understanding of risks causes especially about uncontrollable ones. Two approaches can consider for dealing with risks as a risk response plan, dealing with causes and effects. In consideration of causes, the risks factors may be avoided or mitigate the risks factors. In avoidance the project plan will be changed in a way that risks never take place but in mitigation, the probability or impact of the risk factors will be reduced (Kendrick, 2003).

2.8 Sources of Risk in Construction Projects

The common sources of risk in construction projects are listed below:

1) Misunderstanding of contract terms and conditions.
2) Design changes and errors
3) Poorly coordinated work
4) Poor estimates
5) Poorly defined roles and responsibilities
6) Unskilled staff
7) Natural hazards
8) Political and legal problems

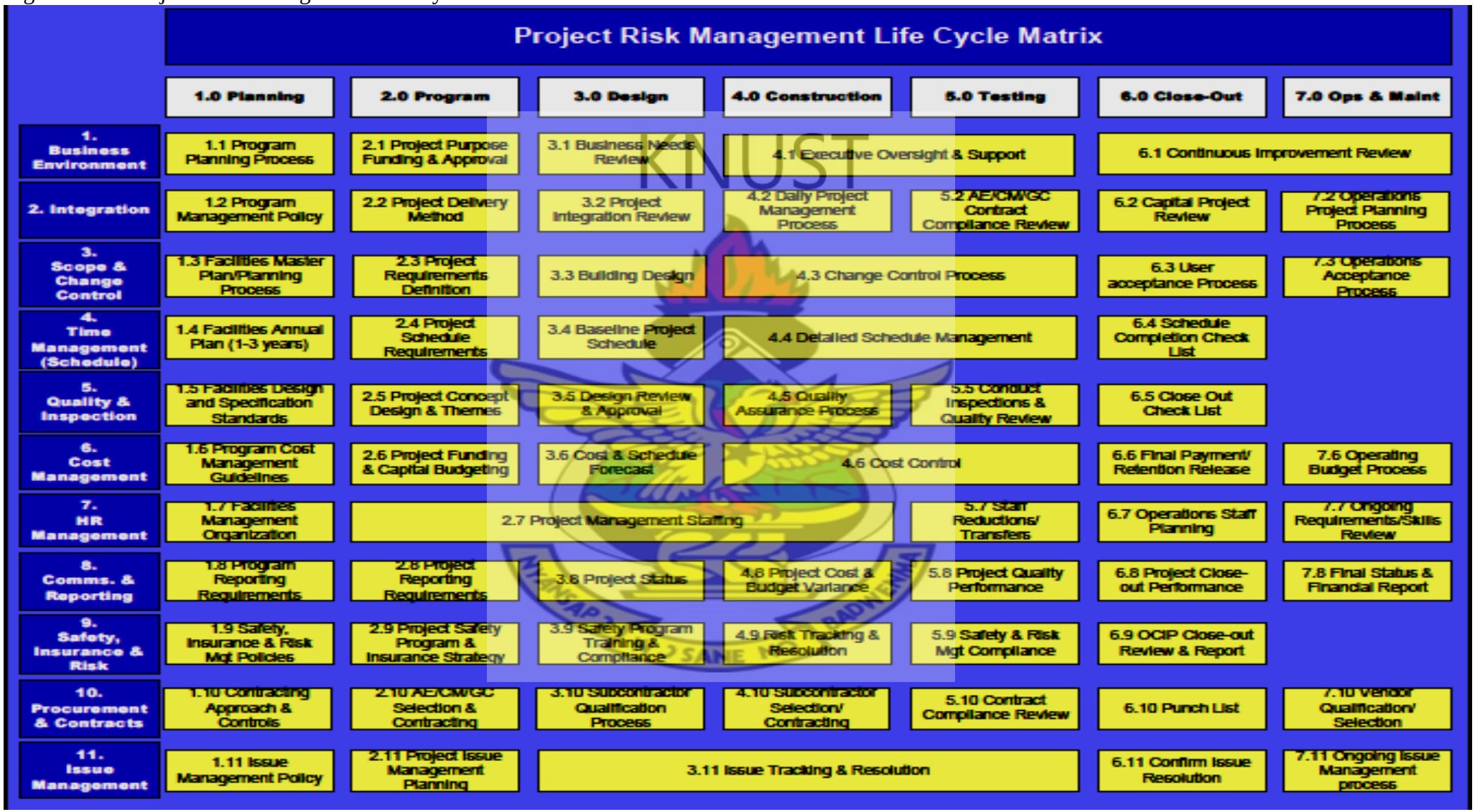
2.9. Risk and the Project Life Cycle

Understanding the relationship between risk management and project phases for capital projects can be a difficult task. International projects are often first- or one-time efforts where project progress and phasing decisions can be isolated from risk management. For most international projects, different participants are responsible for and control the various phases of a project's life cycle. In many cases, the project owner is largely responsible for program analysis, a third-party is often hired to manage and control design and engineering to meet the initial constraints set by the owner, and a contractor is hired to construct the project, who turns the results over to the owner for operations or production.

Mitigating risk by lessening their impact is a critical component of risk management. Implemented correctly, a successful risk mitigation strategy should reduce adverse impacts. In essence a well planned and properly administered risk mitigation strategy is a replacement for uncertain and volatile events with a more predictable or controlled response (Chapman and Ward

2002). Below in figure 2.18 is a PMt life cycle matrix proposed developed by PricewaterhouseCoopers LLP.(2007) for identification and management of risk during the life cycle of the Construction project.

Figure 2.14: Project Risk Management Life Cycle Matrix



Source: PricewaterhouseCoopers LLP.(2007).Managing risk in construction projects – how to achieve a successful outcome.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The research methodology included decisions on the type of data, techniques of data collection and the tools of data analysis to meet the objectives of the study.

3.2 Type of Research

The researcher adopted both a qualitative a quantitative study, to establish the relationships which exist between SRM and project delivery within the construction in Ghana.

3.3 Sampling Procedure

Convenient sampling was used for this study. It was formulated in such a manner that organizations and professionals with accumulated experience in the construction industry were chosen for the study. In terms of sampling, accessibility and data availability were the main reasons for selecting the sampled respondents for the study.

3.4 Sampling Frame

3.4.1 Study Area

As outlined in chapter 1, a structured questionnaire was administered to the various stakeholders of the CIG to explore appreciation and application of SRM . Since most of the artisan employed on Construction Sites can not read a face-face interview was also employed as a tool to solicit information for the study. This research took one week to interview at least 60 staff drawn from various construction companies.

The following categories of people were administered with questionnaires and where deemed necessary interviewed:

3.4.2 The Contractors' Set up

Project Managers – they are responsibility for managing the entire project and the related risks that come along with it.

Site Engineers - they are responsible for interpretation of architectural and engineering designs and propose alternative engineering solution with the approval of the Consultant and ensure compliance to Design Specifications

Site Supervisors – they are responsible for ensuring that artisans carry out their works in according to the specification and also represents the project manager on Site.

Procurement Managers – they are responsible for the purchasing of materials and equipment necessary for carrying out the works and scheduling delivery to Site in accordance to the Programme of works.

Foremen and field Staff - The field staff carry out the critical task of the day to day execution of the project deliverables on site.

3.4.3 The Consultants' Set up

Project Managers – they are responsibility for managing the entire project from pre –construction design to project execution and the related risks that come along with it as per the agreement with the Client.

Architects - they are responsible for architectural designs in compliance with the Clients' Brief

Engineers - they are responsible for structural and civil engineering designs and ensure stability of the architectural designs.

Site Representatives – they are responsible for ensuring that Contractors carry out their works according to the specifications and also represents the Consultants' on Site.

3.4.4 The Clients

The Clients is also the sponsor or proponent of the project. Four main clients are identified in the CIG: the Government (being the major client), Real Estate Developers, Investors and Owner occupiers. The questionnaires was administered to these identified groups to solicit information from their perspective.

3.5 Sample Size

About Seventy (70) questionnaires were selected from the above identified stakeholders to fill the questionnaires and where necessary a further face to face interview would be conducted to broaden the information base for the study. 80% of the questionnaires were filled and returned that is equal to sixty (60) respondents which formed the sample size for the discussions and analyses.

3.6 Procedure for Data Collection

Respondents were given four (4) days to answer the questionnaires and return the filled questionnaires. After the fourth day all non-respondents were contacted on phone and asked to return their completed questionnaire. All personal interviews were recorded using notebooks which supplemented the information from the questionnaire.

3.7 Sources of data

The study made use of both primary and secondary data sources.

3.7.1 Primary data

Primary data was largely used by the researcher. This assisted the researcher to get original information such as eye witness accounts, personal observations and visits to the project sites to administer interviews and questionnaires.

3.7.2 Secondary data

Since primary data alone was not adequate, secondary data was employed to supplement the primary data. Therefore the use of journals, annual reports, magazines, corporate reports and the internet was useful to for study.

3.8 Method of Data Analysis

The method adopted for presentation of findings from the field is frequency distribution table, bar chart and pie charts which enabled meaningful inferences from the field data to set the basis for discussions.

Pearson's product moment correlation analysis and multiple regression was used to determine the weight of each variable of risk management as a predictor of successful project delivery. Risk and PMt characteristics and the extent of efficient project delivery were tested to find out whether the presence of risks during project execution could be the possible source of delays and non-performance. Pearson's product moment correlation analysis was used to determine the correlation of risk management variables with improved project execution at 5% level of significance.

A five point Likert scale was used to rank the extent of correlation amongst such factors as Risk Identification and Classification, Risk Analysis, Risk Mitigation Strategies (such as: Risk Avoidance, Risk Transfer, Risk Mitigation and Risk Acceptance), leadership, risk planning, procurement, quality assurance, etc.

3.9 Instruments for Data Collection

3.9.1 Questionnaire Structure

The structured questionnaire is attached as appendix B. The questionnaire was developed with brevity as an intended goal. The questionnaire was tested within a small section of professionals in the CIG for clarity, ease of use, and value of the information that could be gathered. The structure of the questionnaire and format of the interviews was broken down into the following major sections:

- Section A – Personal Data
- Section B – Risk Management and Project Delivery

3.9.2 Interview Participation

The convenience sampling of interviewees provided for the study a cross-section of organizations and individuals typically involved with construction. The responses garnered from the interviews did not allow for statistical analysis on its own but supplemented the results gathered from the questionnaires. Responses to the interviews have been used to identify consistent themes, common practices, and insight provided by active and influential project participants that provided additional guidance and assistance to the researcher for the study.

The interviewer was free to ask additional questions that focused on issues arising during the course of the unstructured interview. The freedom to follow the interviewee, to ask for clarifications, and to focus on specific projects, risk practices and knowledge, made the interviews insightful.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

The researcher made use of both qualitative and quantitative mode of data analysis for the study. The Sixty (60) respondents for the self administered questionnaires were selected from the various identified stakeholders (individuals and organisations) in the CIG for the research to obtain a precision level of ±5 with a Confidence Level of 95% and P=0.05.

Sixty (60) staff from Contractors' and Consultants' organisations were interviewed and these include but not limited to contractors, architects, engineers, project managers, site supervisors, surveyors and artisans (masons, carpenters, welders, painters, manual labour etc).

Two primary purposes drove the interviews. First, the researcher hoped to gather industry input on risk assessment attitudes, and concerns and general trends in projects delivery. A working assumption that risk identification, assessment and management of construction projects were issues of concern to all stakeholder in the CIG.

Following this assumption the researcher drafted a structured questionnaire that, in addition to gathering risk assessment attitudes and concerns, was expanded to include understanding of risk issues, SRM practices and value of performing risk assessments on projects. The second purpose of the face-face interviews was to solicit industry input on current practices and to seek out practical formats and techniques as well as to allow input from interview participants to suggest improvement.

4.2 Data Analysis and Presentation

The results of the data analysis as presented provided the summary statistics of the results with sample size of (n = 60). In order to understand the functions of the construction industry and the associated risk factors that could impact on its efficiency and effectiveness, the research work made use of self - administered questionnaires and face-face interviews.

The researcher adopted frequency counts and percentages as the main statistical techniques for the interpretation of data. Microsoft Excel 2003, spreadsheet software, was used for the statistical and pictorial presentation of the results. The data collected for Q1-Q22 are as presented below in tables and or figures. This is followed with discussions on the results for each question. The results of the field survey are as discussed below:

4.3 Discussion of Results

Table 4.1: Presentation of Responses for Q1

	Gender	Frequency	% Distribution
Male		35	58%
Female		25	42%
	Total	**60**	**100%**

Source: Field Survey, June 2011

From table 4.1, it is worth noting that, a large population of the respondents were of the masculine gender emphasizing that the Construction industry is male dominated but the number of females have also appreciated as compared to previous studies. This is encouraging since in the immediate past years, the Construction industry was seen as the preserve of the male gender and women relegated to the background as secretaries and office assistants. From the result, there is an increase in the number of females holding technical roles both on site and in the office.

Table 4.2: Presentation of Responses for Q2

Age	Frequency	%Distribution
20 – 30	18	30%
31 – 40	28	48%
41 – 50	11	17%
51 – 60	3	5%
Total	60	100%

Source: Field Survey, June 2011

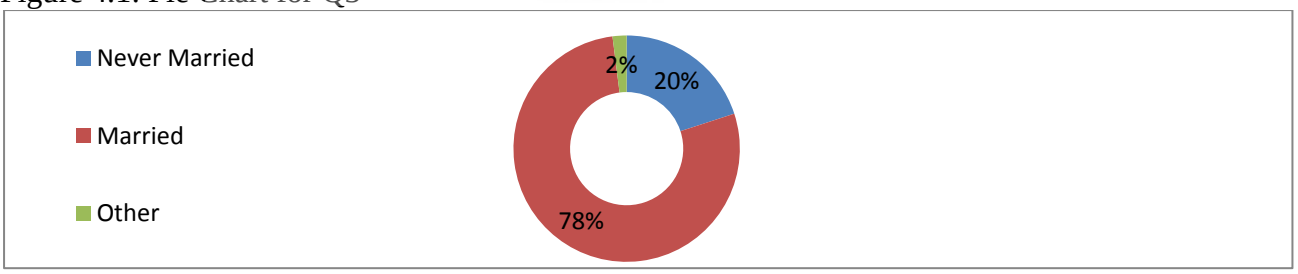
From Table 4.2, the respondents between ages 31-40 are in the majority and followed closely is the ages between 20 – 30 years. This signifies that the construction industry is dominated by employees and workers below the age of 40, which forms 78% of the overall distribution. This also means that the Construction industry has become attractive to the youth. This can be attributed to improved working conditions and an upsurge in the number of private consultancy and construction firms. Also notable is the upsurge in the real estate developments which depends on the young vibrant employees for their success.

Table 4.3: Presentation of Responses for Q3

Marital Status	Frequency	%Distribution
Never Married	12	20%
Married	47	78%
Other	1	2%
Total	60	100%

Source: Field Survey, June 2011

Figure 4.1: Pie Chart for Q3



Source: Field Survey, June 2011

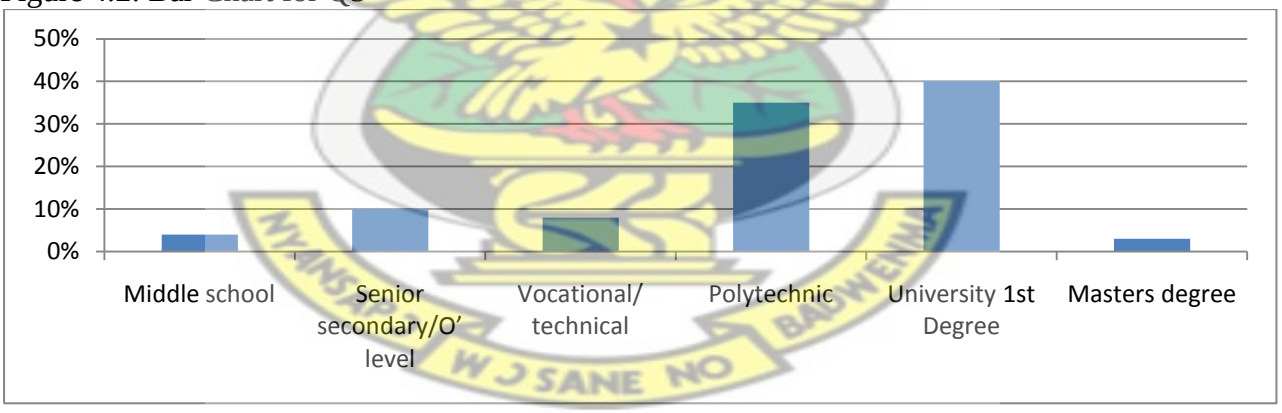
From the above table, the population of married respondents is the highest. Relating it to the ages of the employees in the Construction industry, it can be concluded that most of them marry early and this is can b e linked to the improved working conditions in the industry. In other words, employers prefer married employees to single employees because there is a perception which is not justifiable under this research that, a married person is more responsible compared to a single person.

Table 4.4: Presentation of Responses for Q4

Educational Level	Frequency	%Distribution
Middle school	2	4%
Senior secondary/O' level	6	10%
Vocational/ technical	5	8%
Polytechnic	21	35%
University 1st Degree	24	40%
Masters degree	2	3%
Total	60	100%

Source: Field Survey, June 2011

Figure 4.2: Bar Chart for Q3



Source: Field Survey, June 2011

70% of the respondents are from the University with 1st degree and the Polytechnic. This buttresses the point that most of the respondents are below 40 years since the age for completing tertiary education for 1st degree and Higher National Diploma are below 40years. Again the Construction industry has become very attractive to the young graduates for various reasons amongst them is the improved working conditions. From the results, the industry is not attractive enough for the Master

degree holders and this not surprising since the working conditions and salary levels are usually not adequate for them. There is also a gradual shift from middle school and senior secondary school graduates who once dominated the employee ratio in the Industry.

Table 4.5: Presentation of Responses for Q5

Firm Description	Frequency	%Distribution
Contractor	24	40%
Consultant	24	40%
Private Real Estate	6	10%
Client/ Beneficiary	6	10%
Total	**60**	**100%**

Source: Field Survey, June 2011

80% of the respondents are in the Contractor's or Consultant's set up and this is deliberate since they are directly responsible for the execution of the project so the risk issues are well within their domain and information solicited is very reliable. Additionally, the perspectives of the private developer and the Client also is necessary to have a balance of views .

Table 4.6: Presentation of Responses for Q6

Profession	Frequency	%Distribution
Project Manager	15	25%
Quantity Surveyor	9	15%
Engineer	9	15%
Architect	9	15%
Procurement Analyst	3	5%
Project Accountant	3	5%
Site Supervisor	12	20%
Total	**60**	**100%**

Source: Field Survey, June 2011

From the field survey, 25% of the respondents are project managers and 20% are site supervisors.45% is shared equally between the Quantity Surveyor, Engineer and Quantity Surveyor. The project manager is involved from the inception of projects to completion and thus has reliable information on challenges that face the construction industry both on site and off site.

The Site supervisors are also responsible for daily task execution on project site and it is deemed that they equally are well knowledgeable with challenges that are inherent on the Site. The above distribution also shows gradually an increase in the number of Project Managers in the construction industry, who are taken over roles played traditionally by Engineers.

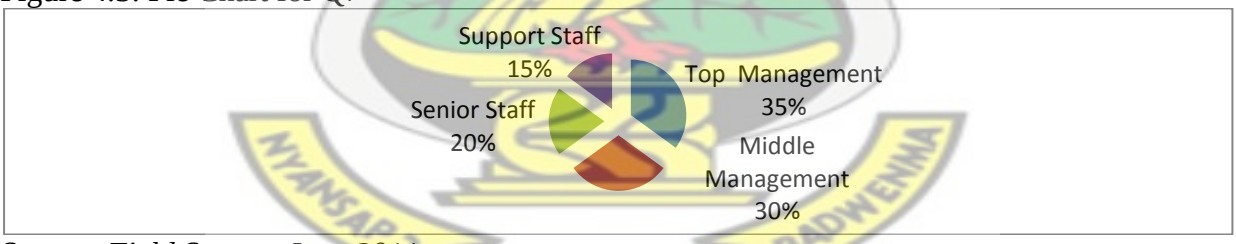
The Project Manager is not necessarily suppose to be a technical person but the position as leader of the project is drawn from the ability to apply management techniques to the construction activities to ensure successful delivery of project.

Table 4.7: Presentation of Responses for Q7

Functional Level	Frequency	%Distribution
Top Management	21	35%
Middle Management	18	30%
Senior Staff	12	20%
Support Staff	9	15%
Total	**60**	**100%**

Source: Field Survey, June 2011

Figure 4.3: Pie Chart for Q7



Source: Field Survey, June 2011

The functional level of respondents is evenly distributed to ensure that information is solicited from a broader perspectives with different dimensions to issues relating to risk. The top management are usually involved in taking risk relating to financial risk where as Senior and Support address issues relating to very limited technical challenges.

Table 4.8: Presentation of Responses for Q8

Work Experience	Frequency	%Distribution
1 -5 years	12	20%
6 – 10 years	15	25%
11-15 years	18	30%
Over 15 years	15	25%
Total	**60**	**100%**

Source: Field Survey, June 2011

The work experience level of respondents is also evenly distributed. This is to aid the in analyzing information from respondents with varying work experiences who have different perceptions to issues related to risk. It can be concluded that the construction industry is now not the preserve of highly experienced employees but rather has now become good starting point for people to undergo training before moving to pursue other career goals.

Table 4.9: Presentation of Responses for Q9 (Project Stakeholders in Ghana are aware risks can have a positive or negative impact on Construction Projects)

Likert Scale	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree	Don't Know	Total
%Distribution	45%	35%	3%	10%	5%	2%	100%
Frequency	27	21	2	6	3	1	60

Source: Field Survey, June 2011

From table 4.9 the following can be inferred:

A significant percentage (80%) of respondents either strongly disagree or disagree that stakeholders are aware of the Risks that impact on projects. This is not surprising since risk management is not mandatory and has not been formally incorporated into the Project Planning Phase for projects that are executed in Ghana. Risk is quite a new subject area of study for students pursing studies in PMt (PM) and Master of Business Administration (MBA). This indicates that the academic knowledge on the subject area of risk is less than 5% and hence the researcher had to further explain the

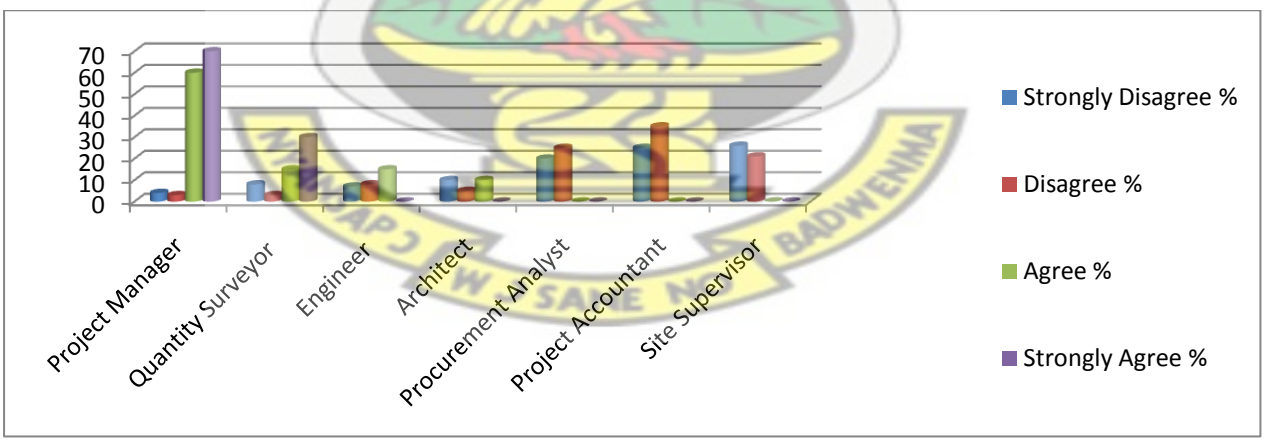
concept to the respondents to enable them understand the objective of the study. However a few respondents who have MBA or PM contributed from the academic front to the research. Generally there is lack of academic knowledge on Risk in CIG. In order to substantiate the above argument, the researcher analyzed the responses for Q9, from the profession basis as captured in Table 4.10 below and Figure 4.3

Table 4.10: Responses to Q9 from the Profession Perspectives

Profession	Strongly Disagree		Disagree		Agree		Strongly Agree	
	%	Freq.	%	Freq.	%	Freq.	%	Freq.
Project Manager	4	1	3	1	60	4	70	2
Quantity Surveyor	8	2	3	1	15	1	30	1
Engineer	7	2	8	2	15	1	0	0
Architect	10	3	5	1	10	1	0	0
Procurement Analyst	20	5	25	5	0	0	0	0
Project Accountant	25	7	35	7	0	0	0	0
Site Supervisor	26	7	21	5	0	0	0	0
Total =57 out of 60 = (95%)		27		21		6		3

Source: Field Survey, June 2011

Figure 4.4: Bar Chart for Table 4.10



Source: Field Survey, June 2011

From the above results, the Project Managers (PMg) agree strongly to the fact that stakeholders are aware of Risk issues and their impact on Project Delivery. This implies that the PMg are more expose to risk issues both academically and practically than any other identified stakeholders in the

industry even though they are in the minority in the Construction industry and have also subjectively devised their own risk management strategies. The respondents therefore strongly agree that the subject of risk awareness is a grey area in the CIG.

However, there is a contrast from the professional perspective on Risk Awareness. Even though there is significant disagreement as to risk awareness, the professionals in the industry general agree that risks has an impact on construction delivery in Ghana. This is possible because of their level of experience and also formal training they have received over the years from symposiums and workshops which is gradually been used as a tool for risk management education in Ghana. This is usually organized by the professional institutions such as GHIS, GHIE etc.

Table 4.11: Presentation of Responses for Q10 (The stakeholders collaboratively perform risk assessment to determine likely impact on project objectives)

Likert Scale	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree	Don't Know	Total
%Distribution	57%	25%	0%	5%	5%	8%	100%
Frequency	34	15	0	3	3	5	60

Source: Field Survey, June 2011

80% of the respondents either strongly disagree or disagree that stakeholders collaborate on Risk Assessment and Impact analysis on the Project. This can also be attributed to lack of knowledge in the Construction Risk subject Area. 10% of the respondents however agree and this can be attributable to the Project Managers who are under the age of 45years who have attained formal training in PMt and can use PMt software's such as MS Project, Monte Carlo Simulation etc to engage in their risk assessment and simulation for Risk exposure to the Project delivery and deliverables expected. From the foregoing, it is implied that most stakeholders are not aware of risk

issues which are inherent in the Industry. From the table, the identified stakeholder in the CIG unanimously disagree that the collaborate to perform risk assessment and determine impact on project delivery. It is also notable that some industry players are not aware of any such arrangement represented by the significant percentage that fall into the 'Don't Know' category on the same figure

Table 4.12: Presentation of Responses for Q11(The construction industry in Ghana has an identified Risk Management Process which Stakeholders are familiar with)

Scale	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree	Don't Know	Total
%Distribution	60%	15%	1%	8%	6%	10%	100%
Frequency	36	9	1	5	4	6	60

Source: Field Survey, June 2011

It is implied from the respondents that the Construction Industry regulators have overlook the impact of Risks on the Project delivery. Some players in the industry about 10% are unaware of any formal risk management process for the CIG.75% also disagree or strongly disagree that there is a formal Risk Management process for the Construction industry. 14% percent however agree that there is the formal risk process agree for the industry and this only forms a small section which is predominately the Project Managers who attained formal training in PMt and hence device their personalized versions of Risk Management Processes for their firm.

Table 4.13: Presentation of Responses for Q12(Risk management process is used mostly on Projects in Ghana to control the effect of Risk Influence on Project objectives)

Scale	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree	Don't Know	Total
%Distribution	40%	20%	6%	14%	10%	10%	100%
Frequency	24	12	4	8	6	6	60

Source: Field Survey, June 2011

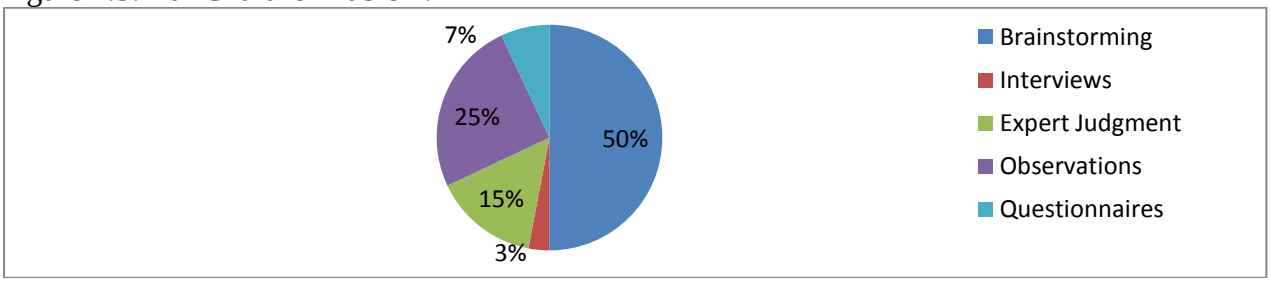
The application of risk management is not widespread across the industry and indeed this is buttressed with the percentage distribution by the stakeholders with only 24% making use of risk management to control risk influences on projects.10% also falls into the category of stakeholders who have no idea about the existence of risk management options applicable to projects in Ghana. This implies that most of the respondents in the industry are not aware of any formal Risks management process or procedures and their impact on project delivery for the CIG.

Table 4.14: Presentation of Responses for Q13(How is Risks impacting on Projects in Ghana identified)

Possible Answers	Frequency	%Distribution
Brainstorming	30	50%
Interviews	2	3%
Expert Judgment	9	15%
Observations	15	25%
Questionnaires	4	7%
Total	**60**	**100%**

Source: Field Survey, June 2011

Figure 4.5: Bar Chart for Table 4.14



Source: Field Survey, June 2011

From Table 4.14 and Figure 4.4, the following inferences can be made:-

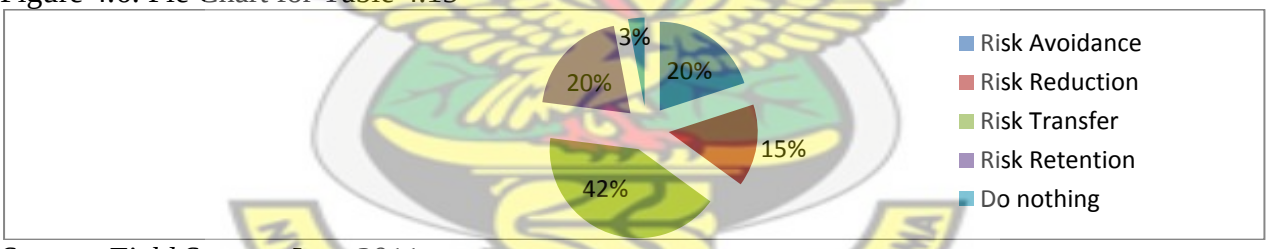
Risk issues that impact on projects are largely identified through brainstorming and also from previous occurrences in the delivery of project. The latter is a largely historical and can be very misleading if appropriate measures to control the variables impacting are not control. The brainstorming is however very subjective and would depend on the experience of the professional undertaking the study and can be very unreliable because of lack of empirical methodology.

Table 4.15: Presentation of Responses for Q14(What Risk Strategies are used after Risk Identification)

Possible Answers	Frequency	%Distribution
Risk Avoidance	12	20%
Risk Reduction	9	15%
Risk Transfer	25	42%
Risk Retention	12	20%
Do nothing	2	3%
Total	**60**	**100%**

Source: Field Survey, June 2011

Figure 4.6: Pie Chart for Table 4.15



Source: Field Survey, June 2011

The risks strategies used are predominately transfer of risk through third party guarantees and bonds. This is common in the industry when contractors' are requested to provide performance bonds and guarantees, advance payment guarantees etc before award of Contracts,. This measure transfers the risk to the Contractor who intend transfers to the third party who issues the bonds or guarantees.

Table 4.16: Presentation of Responses for Q15(Method(s) used in the Analysis of the Risk Impact on Projects in Ghana are)

Possible Answers	Frequency	%Distribution
Qualitative Analysis	27	45%
Quantitative Analysis	9	15%
Both	6	10%
Unaware	18	30%
Total	**60**	**100%**

Source: Field Survey, June 2011

Table 4.17: Presentation of Responses for Q16(Have you in your professional practice used any Quantitative Risk Methods before?)

Possible Answers	Frequency	%Distribution
Yes	6	10%
No	54	90%
Total	**120**	**100%**

Source: Field Survey, June 2011

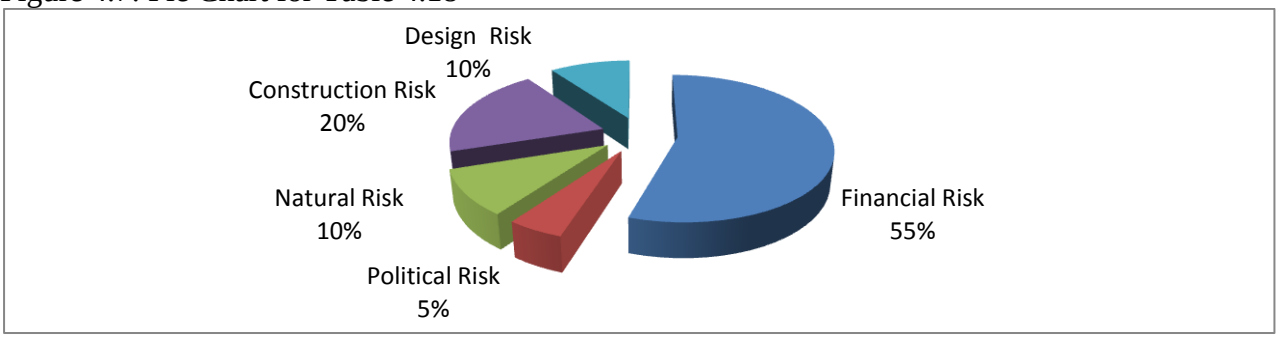
The responses to Q15 and Q16, buttress the point that qualitative means are mostly used to identify risk issues as identified from the response to Q13 which is the use of brainstorming for the Risk Identification. From Q17, most of the respondents have used the brainstorming method to qualitatively conduct risk identification and they agreed that is very subjective and is not an adequate solution in itself to solving risk issues. .Additionally, respondents are not very exposed to quantitative methods for identification and analyzing risk issues.

Table 4.18: Presentation of Responses for Q18 (Which of these Risk Classification impacts most on the Ghanaian Construction Industry ?)

Possible Answers	Frequency	%Distribution
Financial Risk	0	55%
Political Risk	3	5%
Natural Risk	6	10%
Construction Risk	12	20%
Design Risk	0	10%
Total	**21**	**100%**

Source: Field Survey, June 2011

Figure 4.7: Pie Chart for Table 4.18



Source: Field Survey, June 2011

The distribution of responses to Q 18, depicts that financial risk is what prevails mostly in the industry and affect the delivery of projects in the CIG. This implies that most projects in Ghana are exposed to financial risk and this can be attributed mostly to delay in payments from Employers for work done by Contractors and Consultants. The Banks in Ghana are unwilling to financial support the Industy due to the financial risk that comes with it in terms of uncertain repayment dates and the high default rate amongst the stakeholders in the industry.

Table 4.19: Presentation of Responses for Q19(Which of these Risk Classification impacts most on the Ghanaian Construction Industry ?)

Possible Answers	Frequency	%Distribution
Financial Risk	27	45%
Political Risk	9	15%
Natural Risk	6	10%
Construction Risk	6	10%
Design Risk	12	20%
Total	**60**	**100%**

Source: Field Survey, June 2011

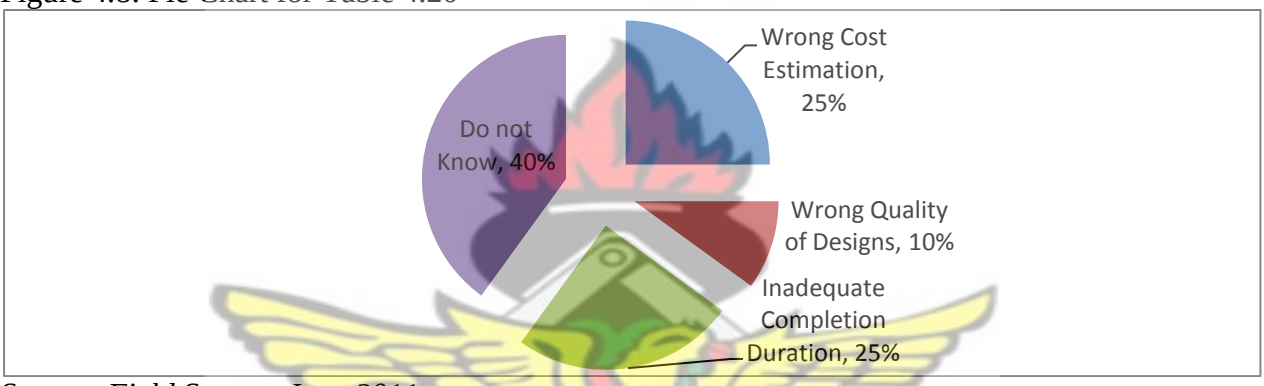
The distribution of responses to Q 19, This implies that most projects in Ghana are exposed to financial risk. As discussed above this has negative impact on project delivery in Ghana since stakeholders are unable to borrow from the Banks to support their operations because of the high loan default rate attributed with the CIG.

Table 4.20: Presentation of Responses for Q20(Why are most projects in Ghana left abandoned and not completed ?)

Possible Answers	Frequency	%Distribution
Wrong Cost Estimation	15	25%
Wrong Quality of Designs	6	10%
Inadequate Completion Duration	15	25%
Do not Know	24	40%
Total	**60**	**100%**

Source: Field Survey, June 2011

Figure 4.8: Pie Chart for Table 4.20



Source: Field Survey, June 2011

The response to Q 20 identifies strongly inadequate completion duration and wrong project cost estimates as other possible sources of premature termination of projects. 40% of the respondents do know why projects are abandoned in Ghana . This implies that reasons for the failure of projects has not been investigated detail enough for good conclusions.

This is not surprising since most of the respondents are not even aware of the risks that impact on project and their identified solutions. Therefore it can be inferred that projects failure is mostly due to the impact of risk events during the execution phase of the project where its effect are maximized.

Table 4.21: Presentation of Responses for Q21 (Do you think by setting realistic TIME, COST and QUALITY objectives, project can be successfully completed ?)

Possible Answers	Frequency	%Distribution
Yes	45	75%
No	15	25%
Total	**60**	**100%**

Source: Field Survey, June 2011

From the responses to Q 21, 75% of the respondent answered Yes, which implies setting realistic time, Cost and Quality objectives project delivery in Ghana can be improved. However 25% of respondent think project success is not solely attributable to the setting of realistic Time, Cost and Quality targets but there is more to these three objectives that are necessary for projects to be successful. The researcher is of the opinion that responses from Q22 will clarify this argument.

Table 4.22: Presentation of Responses for Q22 (Do you think Project Delivery in Ghana can be improved by understanding and applying appropriate Risk Management Strategies?)

Possible Answers	Frequency	%Distribution
Yes	39	65%
No	21	35%
Total	**60**	**100%**

Source: Field Survey, June 2011

65% of respondents agree that application of appropriate risk management strategies can help improve the delivery of projects. This implies that the successful delivery transcends the three objective stated above but rather a combination of realistic targets and risk management strategies will ensure the successful delivery of projects in Ghana.

4.4 Results Of Regression

Using STATA Statistical Analysis Software Version II, the results of data analysis using regression to determine the correlation between SRM in the CIG and project delivery are presented in Tables 4.18 and 4.19. Table 4.18 represents the Pearson Product Moment Correlation Analysis of the relationship between SRM (n = 60) and Table 4.19 shows the multiple regression analysis of SRM variables in the determination of improved project implementation efforts in the industry.

Table 4.23: Pearson Product Moment Correlation Analysis of the relationship between SRM and project delivery n=60

Strategic risk management / **Variables (X)**	ΣX / ΣY	ΣX^2 / ΣY^2	ΣXY	r_{xy}
Construction industry (Y)	46,922	2,278,822		
Risk Awareness	3,718	46,612	526,112	.30*
Formal Training in Risk	6,977	52,212	533,661	.41*
Risk documentation	5,014	53,166	617,745	.44*
Realistic Time, Cost and Quality Targets	3,666	44,512	482,668	.68*
Risk identification and planning	28,224	182,628	2,149,982	.77*

* Significant at 0.05 level ($p < .05$); critical r = .077

Source: Pearson Product Moment Correlation of Field Survey, June 2011

Table 4.24: Multiple Regression Analysis of strategic risk management variables on project delivery in the construction industry (n = 60)

Strategic risk management Variables		Weight	SE	t-value	prob.
Risk Awareness		3.34	.281	8.06	0.010
Formal Training in Risk		4.22	.246	7.12	0.050
Risk documentation		3.64	.262	5.44	0.050
Realistic Time, Cost and Quality		4.00	.248	3.52	0.050
Risk identification and planning		2.78	.255	9.86	0.050
Risk identification and planning Constant		17.98	1.292	34	
Source of variation	SS	df	MS	F	Prob.
Regression Residual	45.34804	4 694	13336.6	9.1	.000
Total	47.6544.63	45.2	12.5		
	125892.67				

R = .812; R 2 = .704; critical F = 4.0

Source: Pearson Product Moment Correlation of Field Survey, June 2011

The results of the Pearson Product Moment Correlation Analysis show that:

- Risk awareness is significant to the successful project delivery within the construction sector in Ghana. This is the starting point to any SRM process to be deployed on projects.
- Formal risk training can significantly impact positively on project delivery. It was observed that most respondent have not received any formal training so are not able to apply scientific methods to solve risk exposure issues. This will improve the delivery of projects in the CIG.

- Risk documentation is considered as the lifeblood of project implementation and that contractors must strive to systematically document risks inherent in their operations.

- Realistic Time, Cost and Quality targets has significantly impacted on project risk management as well as its delivery since they are key indicators for construction projects.

- Risk identification and planning are important predictors of how risks impacting on projects would be strategically managed. The earlier stakeholders are able to identify risks, then adequate measures can be develop to contain them.

- Generally, the results of the analysis showed that all the factors of SRM are significant predictors' of project delivery in the CIG. Put differently, for contractors to execute projects properly they must have a demonstrated ability to reduce the risk complexion associated with the project and to achieve marked results.

4.5 Discussion on face to face Interview

The backgrounds of the interviewees varied but most were mid-to-upper-level management with forty from contractor organizations, twenty from owner organizations, and the remainder in the "other" category distributed among procurement firms, professional consultants, academics, and financial and insurance entities.

Most respondents had management responsibilities or provided professional services for projects. Participants noted that labour is typically less expensive per hour in building construction, but productivity and quality can sometimes offset this lower cost .Respondents were asked to identify

the reasons why they pursued projects. Contractors reported that their major reasons to pursue project work were to seek-out business opportunities and to pursue work with existing clients.

The percentage of projects compared to total projects undertaken varied considerably between respondents. Some firms in the road construction industry experienced most of their project activity has grown exponentially but payment was a problem, whereas for others, in the housing industry growth is largely driven by the purchasing power of customers to buy.

For almost all of those we interviewed, some level of risk assessment and management was performed when undertaking projects, and about a third of the companies reported a subjective structured process carried out by a specific company unit or group. If a process existed, company practice rather than policy dictated its use. A number of firms undertook risk assessments on an ad hoc basis where location or project size dictated whether an assessment or analysis would take place. It appeared that larger projects had a much greater chance for a formal risk assessment.

The interviewed financial and insurance representatives were familiar with the use and applications of both qualitative and quantitative and financial techniques for assessing the impact of risk, but expressed the difficulties with transforming the results to risk management strategies for project managers or for use on specific projects. These organizations were very knowledgeable of risk management theory, concepts, and principles, however they noted the difficulties of determining the relevance of issues and what risks are of most significant for their own concerns as well as for other project participants.

Investors, owners and contractors reported that they would at times use consultants to perform specific tasks that focus on issues such as procurement and insurance risks. A few firms reported

ongoing relationships with political risk assessment services—such as receiving general country information on a monthly basis, but the majority used such service on a project by- project basis.

The lawyers interviewed made it clear that contracts and contract language were viewed by many of the owners, contractors, designers, and investors as the most important method to control and allocate project risks. They also noted that they dealt with few organizations that fully understood how risks should be allocated by contract.

Project owners responded that contracts were seen as the mechanism to avoid or shift risks to the contractor and in their opinion, there was a mutual understanding that they were paying contractors to accept this risk.

Respondents were asked to judge the effectiveness of their risk assessment practices for construction projects. Only one respondent noted that their current process and practices were completely adequate in identifying and assessing the portfolio of risks for projects they are implementing.

Many interviewees described their procedures as either too subjective or too quantitative, and most noted that analysis results could not be used from project to project. About one-eight of the respondents reported the use of quantitative methods to assess project risk, with the majority relying on subjective and qualitative judgment.

Conducting detailed analyses of economic, competition, and construction trends were relatively standard activities for investors, owners consultants and contractors. However determining the likelihood and impact of current and future risk situations is difficult to do. According to most

respondents, decisions on project-specific risks were often made by top management and separated from other business, technical and operation risks of the project. Some noted an increasing tendency to seek out mechanisms to transfer risks– through government-backed insurance – rather than pursuing mitigating, retaining and absorbing of risk events.

4.6 General Findings

The results of the analysis have shown that SRM is a significant predictor of the success of project delivery. This is because when these issues are addressed in the construction industry, it has a lot to offer in terms of ensuring that appropriate measures are put in place to deal with the risks. This is consistent with Hastak (2000) international risk management concept, which deals with risk assessment and quantification as key indicators for project success. He contended that risk inherent in the construction industry is unique and multivariate and that practitioners must endeavor to develop their risk appetite in relation to the type of project they are implementing.

This finding corroborate the empirical study of Mawhinny(2001) on risk management who indicated that a significant outcome of effective PMt is the identification of many risks that may influence the construction project delivery. He opined that "price escalation of material" pertaining to resource factors, "inaccurate cost budget" and "supplier or subcontractors' default" pertaining to management factors, and "excessive interface on PMt " pertaining are the most significant risks issues.

Overall, our findings support Uher and Toakley (1999) who investigated the various structural and cultural factors concerned with the implementation of risk management in the conceptual phase of a project life cycle and found that while most construction practitioners were familiar with risk management, its application in the conceptual phase was relatively low; qualitative rather than

quantitative analysis methods were generally used; widespread adoption of risk management was therefore impeded by a low knowledge and skill base, resulting from a lack of commitment to training and professional development. According to him, this translates into risk and could impinge on successful implementation of projects.

4.7 Key Findings

The research activities were necessary to identify key industry-wide issues and provide the basis for a comprehensive analysis of management of risk strategically. It outlines the findings from these initial tasks and provides guidance for PMt professionals.

The interviews, deliberations and other activities—resulting in contributions from over 4 industry organizations—have highlighted the complexity of project risk management, participants' concerns, and the diversity of risk assessment and management techniques employed by owners, contractors, and others associated with the construction industry.

Overall, most contractors and owners engage in some type of risk assessment, although the depth and quality of these efforts vary, and are often conducted as a solitary one-time effort at the onset of a project. Even if organizations have an in-house risk assessment/management programme, no standard terminology exists and typically there are no procedures in place to carry lessons learnt forward.

Systematic risk management of project activities is not fully recognized as valuable by practitioners in the construction industry. No common view of risk exists since the owner, investor, designer, and contractor have differing project goals and objectives, and historically adverse relationships are common.

Coordinating SRM between project participants is not typically done in a formalized manner and this is especially true between contractors and owners. The value of identifying and managing project risks rather than each participant giving exclusive consideration to only their risks was acknowledged by many but practiced by few.

Most organization reported a process in place for early identification of hazards and opportunities although few were able to translate this to management actions such as establishing ownership of risks and risk mitigation actions. Few organizations used their initial assessment of risk to create or enhance risk-based decision-making.

Project participants are often segmented into phases that create information and communication disconnects between project participants. Combined with historically adverse owner-contractor relationships, difficulties are often magnified. Many times this is exacerbated by disconnects between the project team and management.

Risks can run across the life cycle of a project or they can appear at various times throughout the project. Compartmentalization exists where participants only look at risks with a specific perspective—not project lifecycle and with own intentions in mind and irrespective of other project parties.

Few project participants have an understanding of all the risks involved, and few organizations have the ability to knock down the traditional barriers between the owner and contractor to improve efficiency and productivity.

Interviewees reported that many of the risks that influence project delivery can significantly impact on quality of execution. As such, almost all participants in the research investigation agreed that an improved process is needed to identify and assess risks and there would be the benefit of having a structured tool or process in place for holistically dealing with project related risks and strategically.

Interviewees were asked to identify, based on their own experience, the critical risk factors to consider when developing projects. The issue identified as most important by nearly all respondents was the financial stability and funding sources for the project.

Investors and insurance respondents made the point that they often require regular monitoring of risks by studying the likelihood of specific events or trends at the beginning of a project and/or during its progress. Interviewees involved with such analyses reported that they usually had limited input from key members of the project team, results were often closely guarded as proprietary, and information was rarely shared with other project participants.

The interviews with those representing insurance companies revealed that as a whole, and not surprisingly, the industry has a variety of techniques and practices to identify and assess risk their clients would encounter. What is not clear is how the insurance industry uses its knowledge of risk to improve project performance.

Legal experts and investors noted the difficulties they encounter with project participants linking projects to specific business strategies, recognizing what risks are involved, and determining responsibilities and management. They also noted that country and political issues tend to augment already complex business relationships and financial structures common to large-scale projects.

The Legal experts interviewed as well as the engineering consultants and insurance companies reported that advice was obtained from experts when dealing with complex political, environmental, technical and financial topics to minimize their own or their clients risk exposure. Contractors repeatedly emphasized their concerns on receiving guarantees for payment and understanding the financial stability of their clients. Contractors identified the importance and difficulty of dealing with human resources issues in a construction environment.

Workforce availability, skill levels, and the ability to use expatriate labor were among the most common labor related concerns for contractors. Respondents were asked to identify the benefits of undertaking risk assessment and management for projects. Responses fell into two discrete groups: those with tangible benefits related to decision-making, contingency determination, etc., that could be quantified; and intangible benefits related to people issues.

Tangible benefits include:

1. Improved understanding of the project, resulting in better control of resources
2. Increased knowledge of risk impacts and a strategy to manage and control
3. Better use of contracts to identify and allocate risk
4. Improved assessment of contingencies that reflect the risks
5. Facilitation of rational risk taking, including an understanding of the benefits gained from risk taking
6. Providing an early warning system for extreme risks

Some interviewees stated that a well-planned risk management program would encourage a more proactive and strategic approach to dealing with risk rather than seeing risks as only a detriment to project performance. By taking such a view, the links between risk and PMt are emphasized and SRM becomes part of the PMt process as opposed to an isolated activity.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study sought to shed light on SRM on project delivery within the CIG. Although a variety of techniques and practices exist to identify and assess risks that occur on construction projects, there is no standard technique or practice within the CIG. Decisions on country-specific risks were often made by top management and separated from other business, technical and operation risks of the project. Few stakeholders in the industry have a complete understanding of the portfolio of the risks that happen with a projects life cycle view of risks.

Construction project are often organized and managed in ways that create information and communication disconnects. Contracts and contract language are often viewed as the most important method to control and allocate project risks, but few organizations understand how risks should be allocated by contract.

Misconceptions and assumptions about who owns and controls the risk are common. As a result, interviewees were receptive to the development of a structured risk identification, assessment, and management process that gives consideration to the entire life cycle of construction projects.

5.2 Conclusion

It can be concluded that, the construction industry has always been and continues to be risky. A large segment of Stakeholders have also not received any formal training in Risk Management. To compound the issue is the absence of any formal process, options or procedures for the mnagenet of risk both retrospectively or strategically in the CIG. Due to this knowledge gap, stakeholders expend little time and effort on assessing and strategically planning for known, probable, or even

unknown risks. Without a proactive risk management process, problems that occur on a project are likely to increase delays, costs and eventually affect the quality expected.

Identifying, allocating, and managing risks at the front end of the project planning process can improve project performance. Strategic management of construction related risks is a process that assists all project participants to manage risks events before they become significant problems and eventually lead to unplanned but largely adhoc processes or procedures.

Although a project can be divided into a number of separate phases and the risks assessed and managed as such, there is the need to manage risks as a continuum over the project life cycle. Maximizing the process of assessing and managing project risks requires initial recognition combined with a systemic method of monitoring changes and impacts over time.

Risks and their impacts have a greater tendency to vary over the life cycle of construction projects. Some risks remain constant while other arise and diminish as the project progresses. Improvements in project performance can be achieved by recognizing which risks occur across the entire project life cycle and giving them due consideration. Few stakeholders have developed a process to optimize the portfolio of project risks across the entire project life cycle.

Cost, Time and Quality are the three most important parameters of project performance. It has been stressed that in today's highly competitive and uncertain construction environment, clients are demanding for better VfM from their investments. They want their project to be completed on time, within the estimated cost and with the right quality.

While previous studies have focused on some aspects of construction risk management, this research endeavored to identify key risks associated with the achievement of all project objectives in terms of cost, time and quality. On the basis of a survey with industry practitioners owning robust experience and knowledge of construction projects, key risks were highlighted on a comprehensive assessment of their likelihood of occurrence and level of impacts on project objectives.

An attempt to analyze these key risks from the perspectives of project stakeholders and project life cycle presented the following insights – clients, designers and government bodies should work cooperatively from the feasibility phase onwards to address potential risks effectively and in time; contractors and subcontractors with robust construction and management knowledge must be employed early to make sound preparation for carrying out construction activities to ensure successful delivery.

5.3 Recommendations

Based on the foregoing, the following recommendations would guide the actions of stakeholders to effectively develop and implement risk-based strategies in construction settings:

Risk analysis and management is most effective when deployed early and contractors must strive to identify all potential risks and adopt strategies to mitigate their effects .

Construction firms must have properly structured risk identification, analysis and mitigation processes or options to moderate the risks associated with construction projects.

Project stakeholders must endeavour to plan and coordinate their projects well to avoid risk. In instances where they cannot avoid the risks, they should put in place the necessary mitigants to insulate their organizations against possible losses.

Documentation is critical, and properly recording the identification, analysis, and risk mitigation plans and results for each risk element allows for lessons to be learnt and actions to be taken if necessary. It is expedient that contractors would document all risk in order to know how to deal with them.

It is recommended that risk management should be incorporated into the academic curriculum of tertiary institution who undertake engineering biased course so that graduate are introduced to the subject before practicing after school.

5.4 Suggestions for further study

Due to varying limitations encountered during the study, the researcher acknowledges that adequate investigations were not conducted into identification of an appropriate SRM options or procedures for the CIG. The researcher therefore recommends a further study into this area to highlight the most acceptable SRM options which stakeholders would adopt and adapt for the CIG.

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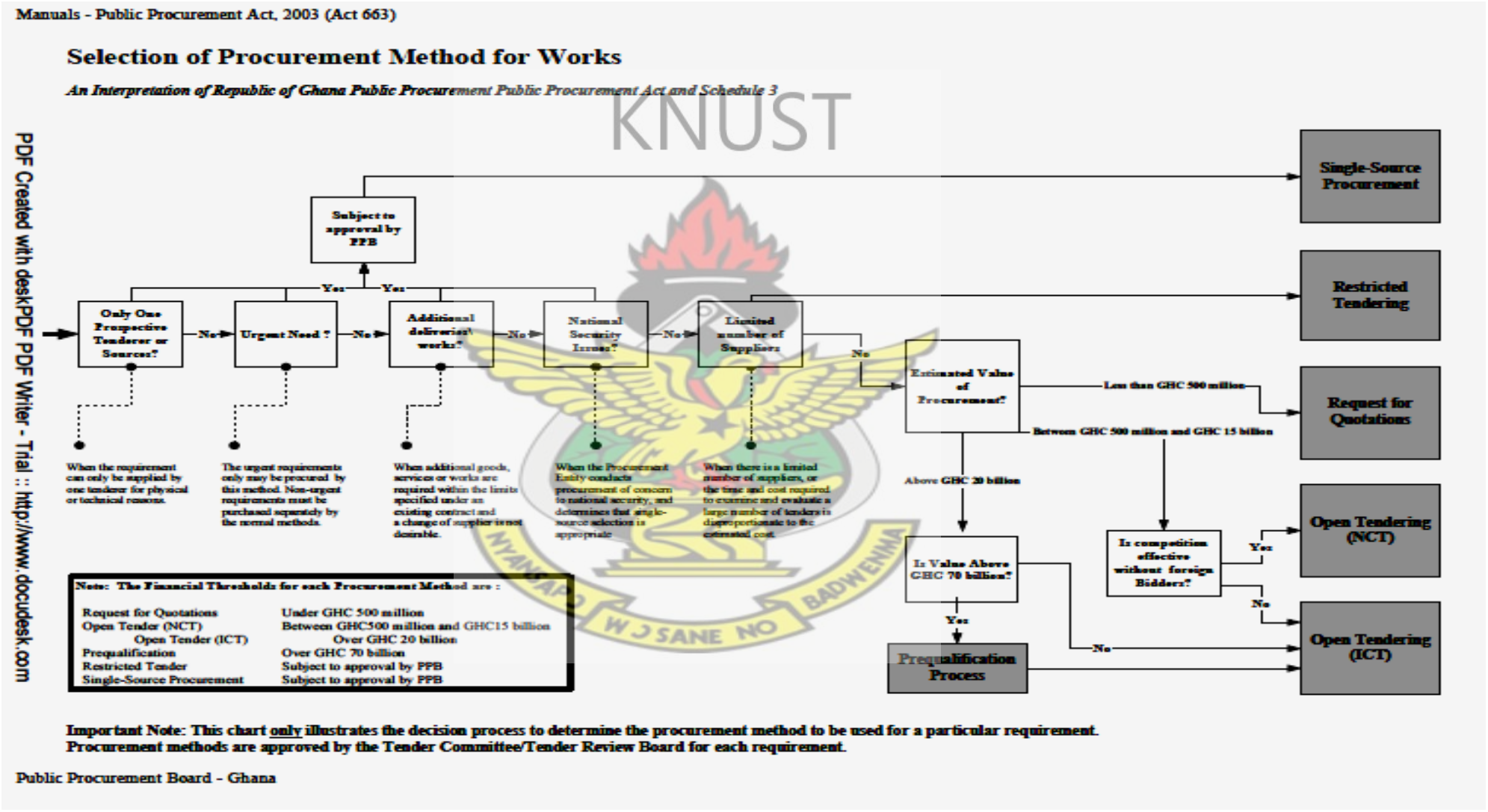
APPENDICES

Appendix A - Selection of Procurement Method for Works



Appendix B - Sample of Questionnaire