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Examining Risk-Sharing Decisions in Construction Contracts in University of Ghana

By

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CERTIFICATION

I hereby certify that this long Essay was supervised in accordance with procedures laid down by the University.

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ABSTRACT

The construction sector involves various activities. This makes it more susceptible to risk compared to other industries. Risk is inevitable in any endeavor; fair and reasonable risk sharing in construction contract is a sure means to enhance successes in construction contracts. The research among other things, sought to explore risk sharing decisions in construction projects and how they can be adopted in University of Ghana so as to enhance the successes of contracts and also reduce the rate at which risk occur. These objectives were set to realize the aim; to identify guidelines for risk sharing decisions in construction contracts; and to document mitigating measures for the allocated risks. The data was gathered through responses from structured questionnaires. Evaluation of responses indicated prevailing risks in construction contract in the University of Ghana. The respondents also provided mitigating measures for the risks assigned to the appropriate risk owners. The study revealed five major risk factors with associated fifteen risks break down structures. The most significant risk factor was financial risk in construction contracts in University of Ghana. Financial risk and delayed payment emerged as predominant major risk factor and risk break down structure respectively. Contractors should submit their cash flow to clients to aid clients‟ investments maturity dates; a clause to force clients to pay interest on delayed payments and also a clause in the conditions of contract to allow contractors to find out clients‟ availability of funds before signing contracts are some of the measures the respondents gave to mitigate delayed payment. The use of these guidelines in risk sharing decisions as well as their suggested mitigation methods will ensure the success of construction projects. These will thus help eliminate problems such as delayed payment which is likely to occur. The study indicates that, there should be principles and guidelines to be followed when allocating or distributing risk to parties in a contract, confirming the works of Groton et al., (2010) and Teh-Chang et al., (2009).

DEDICATION

To my God who gave me the strength, my loving husband Arc. Senyah Sekyere Edmund, my Parents and my children: Maame Konadu and Nana Yaa Abayie Sekyere for their support, love and encouragement.

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All praise belongs to God, the Almighty, Lord of the worlds, who taught me what I now know for having brought me this far in life.

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ABBREVIATIONS

1. GDP- Gross Domestic Product
2. GSS- Ghana Statistical Service
3. GETFund -Ghana Education Trustfund
4. SCC - State Construction Corporation
5. PMBOK – Project Management Book Of Knowledge
6. PMI - Project Management Institute
7. RBS - Risk Breakdown Structure
8. HRBS - Hierarchical Risk Breakdown Structure
9. WAS - Weighted Average Scoring
10. M&E Specialist - Mechanical and Electrical Specialists
11. RII - Relative Importance Index

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Accessibility to infrastructural amenities and services and the effectiveness of these services go a long to measure the success of all production ventures (OECD, 2006). Investments in social amenities encourage economic development and increase productivity in the country (OECD, 2006). This indicates that infrastructural development remains the lifeline for socioeconomic growth and development in every nation be it developed or developing. In light of this, the importance of the construction industry which executes these infrastructural developments cannot be relegated to the background. In Ghana, the construction industry contributes about 6 -10% of GDP and provides employment for 3.1% of the Ghanaian labour force (GSS, 2012). Additionally, the industry employs a wide range of both skilled and unskilled labour on projects all over the country (GSS, 2012).

Ayyub (2003) indicates that, the construction contract is susceptible to risk compared to contracts in other sectors of the economy, due to the difficult means of harmonizing all activities in the construction process. Also, every project is unique and usually involves different expertise with knowledge in modern trends in construction. Project success is anchored on how to meet the triple constraints of a project which are: scope, budget, and duration. In a bid to achieve the goals of a project, risk may hinder the attempt in several ways. Some of the hindrances are events that may lead to: extension of time, additional works, monetary losses, damage to property or life, environmental damage, and so on. Risks should therefore be managed so that the goal or objective of a project is achieved (Ayyub, 2003). Different participants (clients, contractor, consultants and supplier) with diverse practical knowledge and skills usually yield different expectations (Dey and Ogunlana, 2004). Thus a favourable environment to achieve project success is hindered. Due to the complex nature of

construction activities, where slightest omission, addition and misswording could dent the intended outcome of the construction project, these make the industry more susceptible to risk. Ashworth and Hogg (2002) and Shou et al., (2004) stated that, projects have defined stages and activities from inception to closure and usually associated with a probability of risk occurring at each stage. Odeyinka (2000), pointed out that, the inability to manage risk well usually result in poor deliverables from the construction industry.

Risk is the source of difficulties and bottlenecks which hinder successful closure of a project and its objectives (Mark et al., 2004). It is good to note that, risk can be productively managed to minimize its‟ negative outcome on a project‟s goals, irrespective of the fact that risk is bound to occur in all projects. Risks usually emanate from the unknown and matters concerning a firm‟s unstable profits, tight tendering procedures, negative climatic condition, political instability, inflation, contractual issues, and market demand, and so on (Karimiazari et al., 2011). It is imperative that construction firms manage risks by, evaluating their impacts on the project objectives. A risk quantitative method helps to determine projects which have high propensity to risk by, investigating the source of each risk in a project and monitoring each source in the life cycle of the project (Zayed et al., 2008). It is imperative to identify the components of the contract that have high propensity to hinder the set objectives of the project so measures are taken to treat them to either prevent or reduce its impact on the contract.

Considering that construction activities have high propensity to risk which may obstruct the achievement of the project objective, Risk Management then becomes imperative in the construction industry. The Project Management Institute has risk management as one of their thematic arsenal of knowledge (Tuysz et al., 2006). The construction industry is characterized by a high risk exposure and is a field where risk management is crucial (Hastak and Shaked, 2000). Thus, to manage construction contracts, risk mitigation must be core components of

contract management. An effective means of identifying risk and deliberately deciding on the methodology of mitigating risks identified is what risk management is about. It is a technique that is geared towards identification of risk sources, evaluation oftheir effects, and coming out with suitable mitigating measures (Uher, 2003). In addition, the presence of risk may increase a commitment to monitor and control. Evaluating of the effects of risk is a multifaceted bottleneck which demands methodical process. By dividing the process into logical sequence of risk identification, risk analysis and risk response.

Risk Management may have different treatment methods, but for the purpose of this research; the researcher is looking at, using risk sharing decisions to mitigate risks in the construction contract.It can therefore be noted that, as risk is shared among the various participants the impact of risk to be borne by a participant now reduces. Risk should therefore be fairly and reasonably allocated to those who can easily identify, monitor and control it so that they become the risk owners and thus become responsible for that particular risk they are assigned to (Teh-Chang et al., 2009).

1.2 Problem Statement

Risk is inevitable in construction; it could be diminishable, transferable or acceptable but not avoidable (Lam et al., 2007). Project success is measured by the ability to meet the triple constraint of a project which is: scope, budget and duration. To be able to mitigate these constraints, risk may come in several forms such as events that may lead to: extension of time, additional cost, contractual claims, and damage to life, environmental damage, and many more negative outcomes. The presence of risk may have a positive influence on decisions and decision makers may attempt to transform more risk into higher returns. Below are some of the delicate national issues that sparked this research topic.

First and foremost, there is the issue of judgment debt.In recent times the government of Ghana has settled a lot of judgment debts arising from indiscriminate cancellation of contracts. The Proliferation of payment of judgment debts in the country were so worrying that it necessitated the Government of Ghana to engage a sole commissioner on 12-05-2015 to investigate the matter (Michael, 2012). A lot of state resources which could have been used for other developmental projects have gone into the drain by settling judgment debts. Most of these judgment debts which got media attention were all related to improper procurement procedures. The following companies and persons received judgment debt relating to cancellation of construction contracts, they are: Woyome, Isofoton ltd, Waterville Holdings, Construction Pioneers, City and Country Waste Limited and so on.

Also, there is the albatross of delayed payment in the execution of construction contracts nationwide. It is amazing whether the government does not assess its cash flow to determine the viability of its intended projects before entering into contracts. The contractors also do not do due diligence to ascertain whether there is a relation specific investment for a particular contract before they sign contracts. For an example, on Tuesday 6th May, 2014; the Progressive Road Contractors Association and the Association of Road Contractors informed the public of their intention to abandon all government projects because honouring their payments have delayed unduly (Mordy, 2012). Again in August, 2012, some aggrieved contractors for the Ghana Education Trustfund (GETFund) besieged the premises of GETfund to demand for their delayed payment. The fear is that if government keeps on to be a culprit in delayed payments and also devoid in paying interest on delayed payments, very soon, contractors will lose confidence and interest in all government projects and thus most tenders will be uncompetitive which will defeat the object of the procurement reform.

Last but not the least is abandoned government construction contracts. This is a common phenomenon in Ghana, where an investment is made to initiate a project and it is halted abruptly for diverse reasons. This sort of behaviour mostly on the part of government locks the investment of contractors and also waste State resources as a whole. The affordable housing project which was started by the erstwhile Kufour administration in 2008, has since not been completed (Ghanaian Times, 2011). It is surprising to note that most contractors who were engaged to execute these contracts have not been paid monies they are due. Change in government with its attendant problem with change in policy goes a long way to hinder the construction contracts in the country.

Seeing the susceptibility of risk associated with construction contracts, players that is to say the procurement entities, project managers, general contractors and subcontractors should be mindful of portion of risks allocated to them so as to achieve successes for contracts they are engaged in. A just and realistic risk-sharing is necessary for a successful completion of construction contracts with associated meeting targeted budget and reduction of contractual disputes. It is against this back ground, that the research topic:Examining Risk Sharing Decisions in Construction Contract in University of Ghana has been chosen.

1.3 AIM

The aim of the study was to explore risk sharing decisions in construction projects and how they can be adopted in construction project by the University of Ghana.

1.4 RESEARCH OBJECTIVES

The following objectives were chosen to accomplish stated aim:

1. To identify the various risks that beset construction contracts in University of Ghana;
2. To identify guidelines for risk sharing decisions in construction contracts; and
3. To document mitigating measures for the allocated risks.

1.5 SIGNIFICANCE OF THE STUDY

This research work adds to the arsenal of knowledge in risk sharing guidelines. The belief is that if previous works are carefully explained, leading to new works being discovered in the construction industry, people will look at the subject matter in different dimensions and think differently. This research is seeking to address risk sharing decisions in the lifecycle of construction contracts by relying on the risk management process (identification of risk, assessment of risk and allocation of risk)

Findings of this study are to provide a wide range of information for use in both industry and academia. It will help the construction key players to also set up principles and guidelines as enablers to plan risk sharing decisions as they draft contracts.

1.6 SCOPE AND LIMITATIONS

Geographically this research was carried out in the University of Ghana located in Accra, Ghana. The study mainly looked at the construction contracts in the University of Ghana. The research also targeted professional involved in the contracting and contract administration in the named entity, for the administration of structured questionnaires. Each respondent answered respective questions in the questionnaire based on their area of specialty. It was expected that, the opinions, perceptions and beliefs of participants formed the source and basis for the discussions here. There was therefore the issue of subjectivity in the data to be generated. Assessing contractors to administer questions was a little difficult since they were always on

the move because they manage more than one site sometimes. They however had representatives; they also kept changing jobs and as such information gathering from their end was a little bit difficult.

1.7 RESEARCH METHODOLOGY

This section discussed the approach adopted for the study and the type of data used in the study. Extensive investigation of risk sharing decisions was conducted. This was realized through literature review and survey research which involved the use of structured questionnaire. The structured questionnaire employed both closed ended and open ended questions. The aim of this approach was to allow the respondents to synchronize the findings in the literature review to what is actually prevailing in the construction contracts in University of Ghana. The study was conducted in three phases to achieve the aim and objectives of the research.Review of literature in the knowledge area of risk management was employed as the first phase in gathering data followed by questionnaire developments which were tailored to address the research objectives formed the core of the second phase in data collection; and in the third phase, the results of the questionnaire were analysed using statistical techniques for the responses from closed ended questions and coding was also used to analysed the responses from the open ended questions in the questionnaire .

Finally the results from the analysis were used to generate recommendations suitable in providing guidelines when sharing risks and also mitigating measures for the risks allocated to appropriate risk owners.

1.8 ORGANISATION OF CHAPTERS

This research is organised in five (5) chapters and presented as; This chapter which is chapter one provides an overall background to the research work by examining and presenting the aim, objectives, problem statement, scope of the study and the research methodology.

Chapter 2 consists of literature of authors relevant to the aim and objectives of the study. Information was collected from previous study, research findings, publications, journals, articles and on the internet.

The general research methodology and procedures, comprising method of data collection, treatment of data and data responses were discussed in chapter 3. Data collected were analysed in chapter 4.

The final chapter, chapter 5 incorporates the review of objectives, conclusion and recommendations of the study. Two (2) appendices were attached, appendix one (1) contains sample questionnaire and appendix two (2) contains figures of bar graphs and tables from the analysis.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Reviewing literature of works in the area of risk management is the basis of this chapter. The purpose of this review of literature is to tap into the existing knowledge areas of identifying, assessing and sharing risk in the construction industry so as to aid this research to get a road map as to how its objectives would be achieved.

2.2 OVER VIEW OF THE GHANAIAN CONSTRUCTION INDUSTRY

Ghana‟s state owned construction firm known as the State Construction Corporation (SCC) which was established in 1961 employed 27% of working population of the country, (Assibey-Mensah, 2008). In the view of Assibey-Mensah (2008), the SCC did not operate without problems; inaccurate preparation of bill of quantities and inability to deliver projects according to programme of works prepared were the bottlenecks the SCC was facing and thus led to cost overruns, making the firm insolvent.

In Ghana, the construction industry contributes about 6 -10% of GDP and provides employment for 3.1% of the Ghanaian Labour force (Ghana Statistical Service, 2012). According to Ayirebi (2005), works contractors are classified into four financial classes (14); this classification determines the scope of a project a firm can tender for, from any agency or institution that is funded by tax payers‟ money. Building contractors are classified into various groups. These grouping are: D1, D2, D3 and D4 with reference to the financial classes 1 to 4.The D1 group has no financial limit, class 2 can do works up toUS$500,000, class 3 can execute works up to US$200,000 and lastly, class 4 can undertake works up to US$750,000 (Ayirebi, 2005).

Agents (1998) and Anvuur & Kumaraswamy (2006) are of the view that, the performance of the Construction industry in Ghana is poor and faced with several setbacks which span from contract administration, complex, lengthy and bureaucratic payment procedures which causes delayed payments. This delay in payments run into several months and thus, contractors find it difficult to continue paying their staff. Ashworth (2004), on the other hand claims that in Ghana, the construction industry is a regulator of the economy. Construction workers therefore result to strikes to demand for their pay so they can provide financial needs of their families. This action is likely to delay progress of the construction activities.

The construction industry usually involves very varied activities, spanning from simple residential undertakings to highly multifaceted projects which demands coming together of professionals with diverse background, (Loosemore et al., 2003). Loosemore et al., (2003) is of the view that because the participants in the construction industry come from different background; an unclear instruction or slightest omission could be a disaster for the project. Construction contract execution has been identified to have budget, duration overruns and poor scope. Anvuur et al., (2006) indicated that, it takes long for government agencies to honour payment to contractors due to their bureaucratic processes. This has been characterized by cash flow difficulties and poor procurement processes which usually lead to financial risks ant it attendant problems in the construction industry.

There are enormous challenges in the industry as have been studied by various authors. The **Table 2.1** below presents a summary of the notable risk factors affecting the industry with their respective authors that have noted them.

Table 2.1: Summary of Problems Facing Ghanaian Construction Industry

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".

2.3 CONCEPT OF RISK IN CONSTRUCTION CONTRACTS

Risk in the view of Mark et al., (2004) is the possible means of hindering the closure of a project and the realization of project objectives.Project risk may be described as an unknown condition which has a high tendency to affect the project set goals (PMBOK Guide, 2008). Many probable conditions may cause failure of a construction contract, and through the contract life cycle, it is imperative to ascertain which risk factors are acting concurrently on the project.

Most studies have indicated that project managers mostly use the term risk almost solely for the negative consequences of an event occurring, (Agerberg & Ågren, 2012). But Winch (2010) is of the view that risk includes the ingredient of both positive and negative outcomes.

According to Accenture (2010) risk is an integral element of any endeavour-it is an inevitable challenge that almost every organization is bound to face. Risks go a long way to strengthen

the survival rate of a company. For a company to be able to withstand competition, growth and increase profit margins it needs to be able to bear risk; in fact this is all about business

The assertion of Accenture (2010) confirms that of Winch (2010). Risk is important to all the players in the construction contract, that is the contracting authority and the economic operator.However, risk planning is difficult and thus it is difficult to be executed by parties in a contract (Shou et al., 2004).

2.4 RISK MANAGEMENT

Risk management may be described as a group of related activities and tools used to treat risks (ISO, 2009). According to Patel et al., (2013), risk management in a project is globally accepted as part of the tools in the area of project management. Risks are critical to a project as every critical activity is associated with a risk. A detail account on how risk management should be conducted in practice has been provided by Smith et al., (2006). They were of the view that, risk management cannot be used as a tool to do a forecast for the future since every project is virtually different. Rather, the authors view it as a technique to aid parties in a contract to make informed choices anchored on past experiences so as to better their venture. This will go a long way to reduce that rate at which wrong decisions are made for a project and thus positively affect the outcomes of a project. A sequential means of identifying sources of risk and deliberately finding the methodology of mitigating the identified risk is how Uher, (2003) defined risk management. The author went on to explain that risk management is a technique used identify the origins of risk, evaluating the effects of the risk and come out with a suitable mitigating measures for the identified risk. A well defined procedure of risk management has been segmented into risk break down structures, risk identification, risk assessment and risk mitigation. The risk mitigation stage has been divided into four categories and these are: retention, reduction, transfer and avoidance (Flanagan and Norman, 1993). An efficient risk

management tool can help to appreciate not only what kinds of risks are faced with, but also how to minimise these risks in various stages of a project.

2.4.1 Risk Management Benefits

Smith et al., 2006 asserts that, risk management helps to discover risks and also manage them throughout the entire project life. The major motivations are clear assimilation and awareness of likely risks in the project (Gajewska &Ropel, 2011). Thomas (2009) is of the view that, working genuine basis with risk management tools increases the extent of management over the entire project and come out with effective mitigating measures to the risks identified. The risk management tools give procedures which can help lessen likely and abrupt surprises, (Cooper et al., 2005). Winch, (2010) came out with three company‟s approaches using risk management; they are: firms which does not devote much capital in risk management but are privy to most of the basic risks, risk-averse, refers to a condition where a firm invest in to risk management so as to limit the rate of occurrence of a risk and the last one which is the riskseeker this also explains a firm which prepares to treat all risks and is often called a risk bearer or some ne who takes chances. The author again argues that, in the long run, the riskseeking companies are highly; lower their profit margins with reference to the natural risk bearing firms. This is true in the sense that big investments and losses occurring over a long period automatically cause a firm to develop mastery over the trend of a particular risk.

2.4.2 Risk Management Process

In creating the environment, identifying, analyzing, assessing, treating, monitoring and communicating risks, risk management procedures are applied systematically to policies activities and procedures (Cooper et al., 2005). To manage risk, risk management follows nine major steps (Li and Akintoye, 2009). This has been shown in Figure 2.

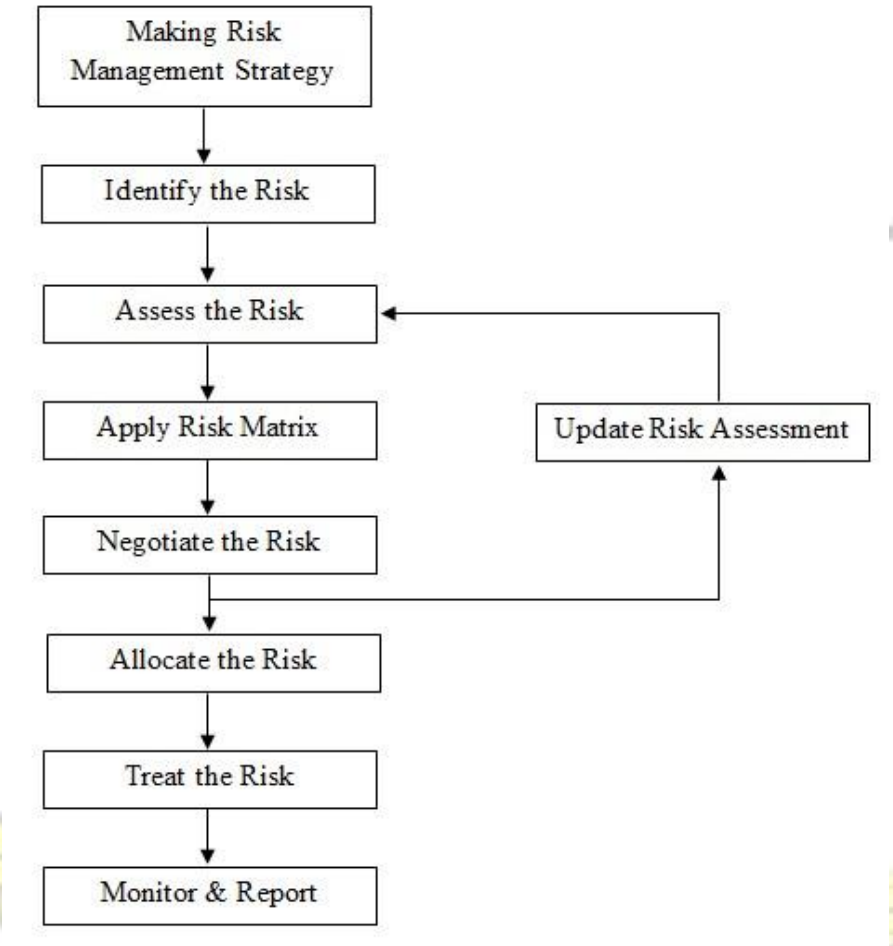

Figure 2: Risk Management Process

Source: Li and Akintoye, (2009)

2.4.2.1 Risk Identification

Winch, (2010) is of the view that the initial stage in the risk management process is informal in most times and can be conducted in a lot of ways, the nature of the organization and the project team goes a long way to determine how the risk identification is conducted. The import is that risk identification relies heavily the organization memory and thus previous experience is applied on new projects. The author is of the view that, to find a potential risk, an allocation is inevitable.

Elimination of risk in a project is extremely difficult, it becomes easier when they are identified and necessary actions are applied. For effective risk management, possible causes of troubles should be identified and assigned in advance (PMI, 2004). This implies that risk management is about being ready for eventual risk that will occur and taking care of problems that may occur. According to Winch, (2010), treating risks can be a way of handling threats and can bring gains in economic profits and environment.

PMI, (2004) is of the view that obtaining a list of potential risks to be managed is what risk identification is associated with. Different authors have described how to acquire a list of potential risk that constitutes risk identification. The authors are of the view that, the aim of risk identification is to bring out likely threats, to prompt project teams. The table below gives alternative methods by which (Smith et al., 2006 and PMI, 2004) have proposed to be used when conducting risk identification.

Table 2.2 Risk Identification Techniques

Information Gathering Method	Workshop
	Brainstorming
	Interviews
	Questionnaires
	Benchmarking
	Consultancy

	Past Experience
	Delphi Technique
	Risk Breakdown Structure
	Visit locations
Documentation	Databases, historical data from similar projects,
	Templates
	Checklists
	Study project documentation(files)
Research	Stakeholder analysis
	Research Assumptions
	Research interfaces

Source: Gajewska and Ropel, (2011) Categorisation of risk is done through a risk breakdown structure. Categorization of the cause of risk can also help better the risk identification process. (El-Sayegh, 2008).Figure: 2.1 below give a summary of identified risks drivers and their causes in Ghana.

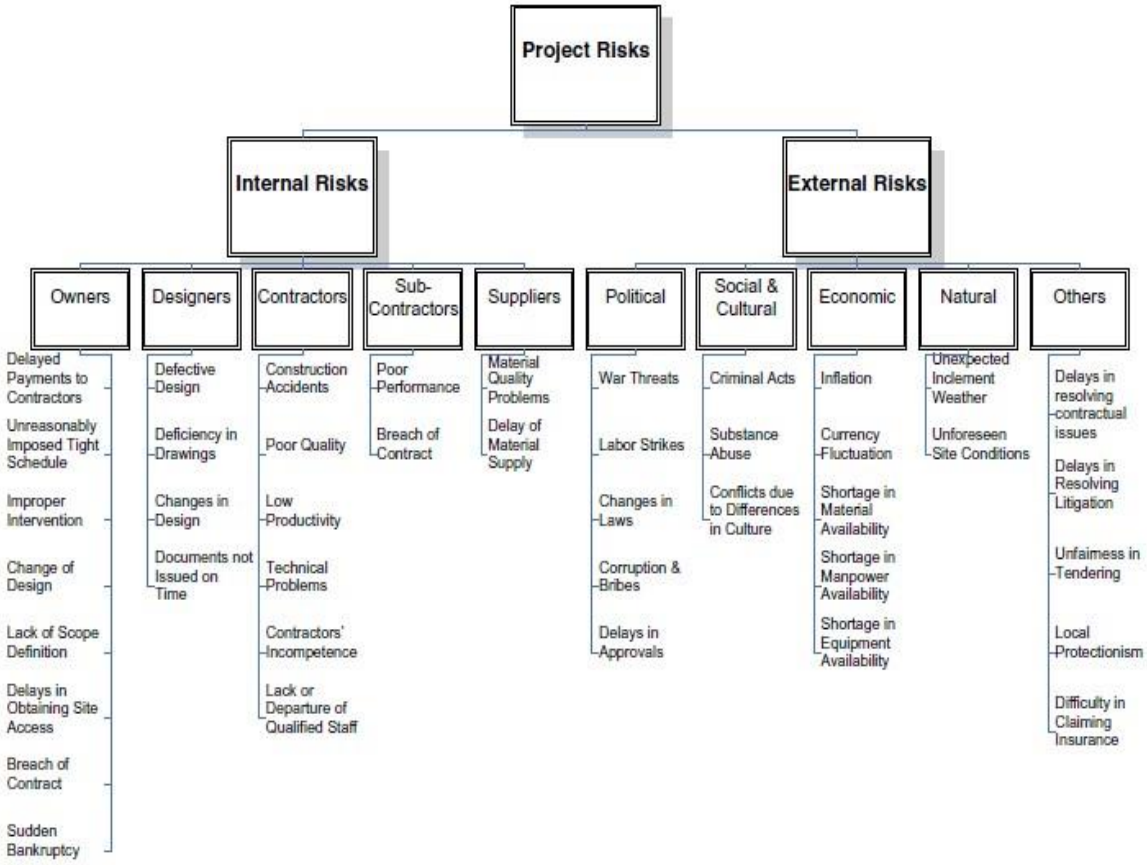

Figure 2.1: Risk Drivers

Source: El-Sayegh, (2008)

2.4.2.2 Risk Classification in TheConstruction Industry.

Tah and Carr, (2000) categorizes risks as internal and external risks in relation to the origin of the risk. Chileshe & Yirenkye-Fianko, (2011) in their study the perception of risk and its impact prevailing in the Ghanaian construction sector identified ten risks the Ghanaian construction industry is faced with. These include monetary; resources; technological; market; ecological,

operational; administrative; political; relationship; security; and legal. The authors also analysed risk that the Ghanaian construction sector is facing from the perspective of internal and external factors of risk. „Internal‟ and „External‟ factors in the project situation can be seen as an aspect of strategic development in risk management (Chileshe & Yirenkye-Fianko, 2011). Buertey et al., (2012) reviewed and categorised risk variables in the Ghanaian construction industry based on their cost implication for decision making. The authors categorised risk variables into seven (7) with design, financial and economic risk factors on top of his hierarchical classification of risk. Environmental, operational, owner and projects were the four sub classificationChapman, (2001) outlined.

According to Ehsan et al., (2010), risk is broadly categorised into „External Risks‟ and „Internal Risks‟. In the view of the authors, a risk that has it origin from the project itself is exceptional to that particular project are brought about by the activities conducted within the project; this may be the malfunctioning of equipment. Whiles, an external risk driver emanates from factors outside to the project scope, an attempt to do shoddy work by top officials of a company so as to maximize their profit margin.

2.4.2.3 Risk Break Down in Construction Industry.

Chileshe & Yirenkyi-Fianko, (2011) reviewed literature and came out with risks break down structures which were twenty-five in numbers. These finding were based on both developing and developed countries. The authors came out with the view that, financial drivers were the main source of risk that impact greatly on Ghanaian construction projects. **Table 2.2** below identifies these risks, their drivers and source.

Table 2.2.1Specific Project Risks according to Source & Drivers in Ghana

No	Driver	Source of Risk	Description
1	External	Government	Change of government
			Change of government policy
2		Economic	Poor financial markets
			Inflation
			Price fluctuations
3		Technical	Design changes
			Construction Method
4		Legal	Contract laws
			Local laws
5		Natural Environment	Weather conditions
			Ground conditions and contaminants
			Site conditions
6		Security	Accidents and injuries
			Theft on site
			Vandalism
7		Management	Competence of consultants and contractors
			Quality and performance control
8		Financial	Financial failure
			Delay in payment
9	Internal	Resources	Productivity of labour and factories
			Availability of labour and factories
			Defective materials and Material shortages
10		Relationship	Poor communication amongst project team
			Lack of commitment
			Organisation and co-ordination

Source: Chileshe & Yirenkyi-Fianko (2011)

According to Buertey et al., (2012), 36% of risk impact on Ghanaian Construction Projects are as a result of specific project risks, and the effects of these project specific risks are beyond the prediction and „stochastic effort" of the project team. The works of Buertey et al., (2012\) suggests that, project specific risks can be managed through collaborative communicative efforts of the project team. Ijigah et al., (2013) identified 34 project related risk and classified them into seven broad headings. Fig.2.2 gives the risk drivers and their indicators.

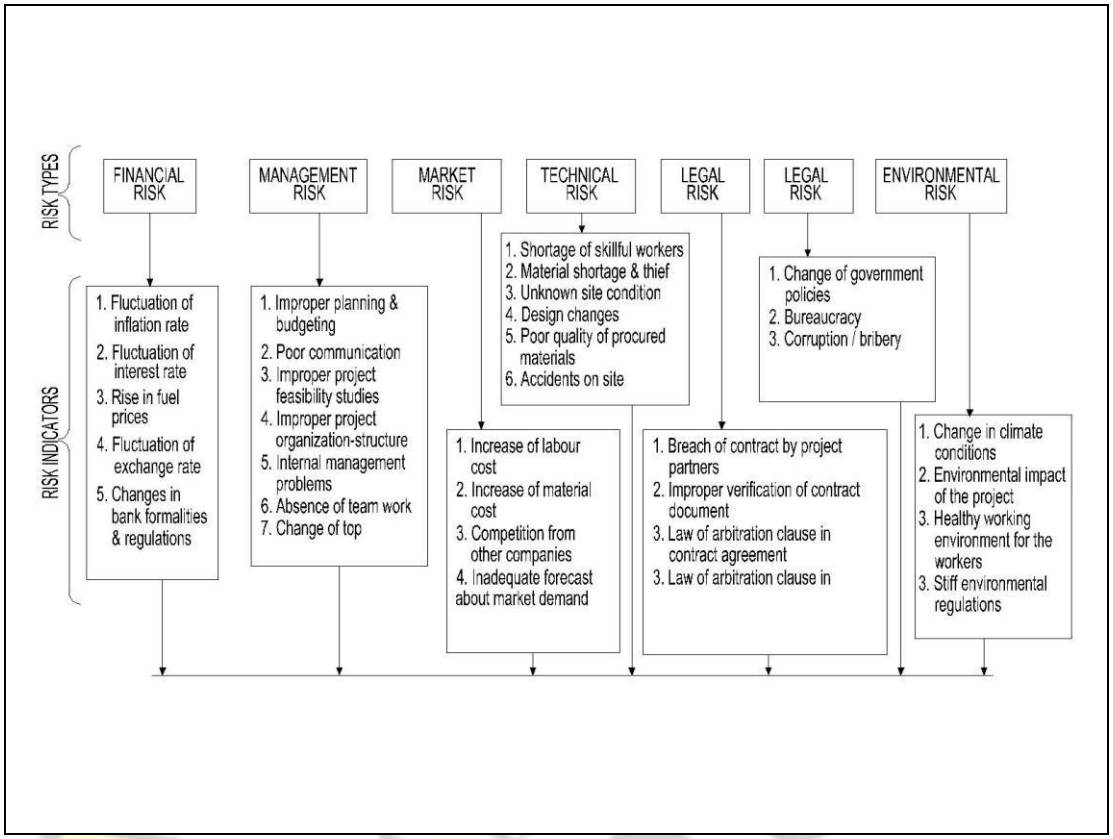

Fig. 2.2:Specific Project Risks by Source and Drivers in Nigeria

Source:Ijigah et al., (2013)

The works of Zou et al., (2006) identifies twenty (20) basic risks indicators that can impact on project objectives from stakeholder and life cycle perspectives of construction projects.

The Construction stage was noted as the most risky phase in terms of project cycle.

The authors classified risks into technical, management, financial, environment, logistical, sociopolitical or natural disasters, the following risk types (Table 2.3 below) were identified by (Ehsan et al., 2010).

Table 2.3 Specific Risk Factors

RISK CATEGORY	RISK FACTORS
Technical Risks	Inadequate site investigation
	Incomplete design
	Appropriateness of specifications
	Uncertainty over the source and availability of materials
Logistical Risks	Availability of sufficient transportation facilities
	Availability of resources-particularly construction equipment spare parts, fuel and labour
Management Related Risks	Uncertain productivity of resources
	Industrial relations problems
Environmental Risks	Weather and seasonal implications
	Natural disasters
Financial Risks	Availability and fluctuation in foreign exchange
	Delays in Payment
	Inflation
	Local taxes
	Repatriation of funds
Socio-political Risks	Constraints on the availability and employment of expatriate staff
	Customs and import restrictions and procedures
	Difficulties in disposing of plant and equipment
	Insistence on use of local firms and agents

Source: Ehsan et al 2010

Karim et al., (2012) as cited by Suleman,(2013) reveals that, in identifying significant risk factors in construction projects from the contractors perspective, proposes twenty – five (25) key risk factors under five (5) broad categories. These categories are construction, politics and contract provision, financial, design; and environmental.

Base on the risk factor Relative Importance Index (RII), the study reveals that, the first five (5) most essential risk break down structures in construction contracts are: late supplies of materials : limited in supply of materials, shortage of equipment, poor quality craftsmanship, and cash flow problems. These risk drivers are noted to fall under the construction and

finance risk factors. **Table 2.4** in appendix 2 illustrates the risks types under the five (5) categories.

In light of the literature above, the researcher agrees with Chileshe &Yirenkyi-Fianko, (2011) summary of risk drivers affecting construction contracts in Ghana in Fig.2. 3 below.

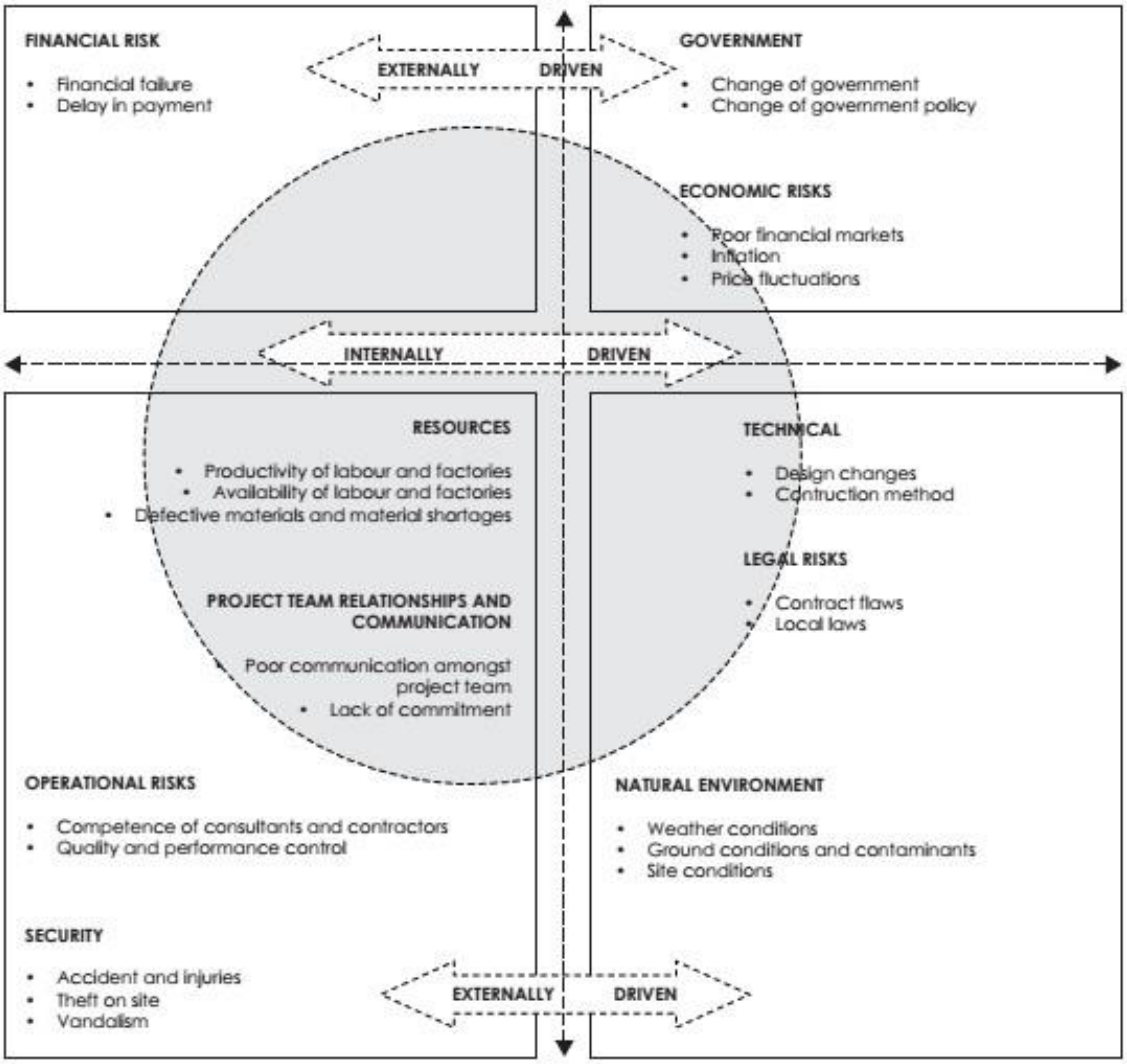

Fig.2.3: Risk Drivers in the Ghanaian Construction industry

Source: Chileshe and Yirenkyi-Fianko, 2011

2.4.3Risk Assessment

According to Cooper et al., (2005), risk evaluation can be describe as the act of selecting appropriate risks from a list which have immersed repercussion on the project, among all the likely risks listed in the discovery stage. Smith et al., (2006) described risk assessment and analysis one process but other authors think otherwise (Gajewska and Ropel, 2011). Qualitative and Quantitative means of evaluating or analysis of risk categorization have been developed by Gajewska and Ropel, (2011). The qualitative means are mostly used when risks can be placed on a graphic scale from high to low level whereas the quantitative means are used to establish the likelihood and repercussion of the risks identified and are based on frequency of occurrence (Winch, 2002). In the view of Lichtenstein (1996), most firms rely on the use of qualitative methods due the fact that it is easier to explain than to determine the frequency of occurance of a particular risks. In another breadth, semi-quantitative analysis which is a hybrid between the qualitative and quantitative methods of analyzing risk, (Cooper et al., 2005).

Gajewska and Ropel, (2011), assert that, qualitative and quantitative methods have different assumptions in each and thus it is usually difficult to ascertain suitable risk evaluation principles for a particular contract. Regardless of the method chosen, the desired outcome of such assessment should be reliable (Lichtenstein, 1996).

Gajewska and Ropel, (2011) found out in their literature review that, the factors listed below should be considered when selecting a particular method for risk assessment.

These are:

- Financial implication of using the method, operations and consultancy cost;
- The adjustability of a firm to the method
- Complexity, nature of the method, whether complex or not.

- Completeness, viability of the method ;
- the method should be easy to use; Validity, the results should be reliable; and Sincerity.

2.3.3a Quantitative methods

PMI, (2009) reveals that, quantitative means determine the effects of a risk in an undertaking. This method needs a considerable amount for the evaluation to be conducted, Heldman, (2005) puts it that, this method is more convenient for both medium to large scale projects based on to the needed tools which includes computer software and people with the know how in the said software. Gajewska and Ropel, (2011) revealed in their literature that, there are three means of assessing risk quantitatively namely:

- Scenario technique - Monte Carlo simulation
- Guidelines technique - Sensitivity analysis
- Diagramming technique

2.4.3.3b Qualitative Analysis:

Radu, (2009) states that, qualitative analysis is suitable for situations where adequate data cannot be found or determined. To Cooper et al., (2005) qualitative analysis is a relatively simple technique and is applied when quick assessment is required. Heldman, (2005) thinks it is used in small and medium size projects. Here, accuracy is limited. Qualitative risk analysis examines the effect and probability of the risks discovered at the identification stage and also come out with an arrange list of risk in order of importance to further develop treatment measures for the risk in the arranged list. Tah and Carr, (2000) developed a feudal risk breakdown structure; this structure represents formal principles for qualitative risk evaluation. PMI, (2004) outlines four qualitative means of risk analysis:

- Risk likelihood and effects assessment;

- Probability rating matrix;
- Risk Categorization; and
- Risk Urgency Assessment.

Table 2.5 Definition of Impact Scales for Four Project Objectives

Defined Conditions for Impact Scales of a Risk on Major Project Objectives (Examples are shown for negative impacts only)					
	Relative or numerical scales are shown				
Project Objective	Very low /.05	Low /.10	Moderate /.20	High /.40	Very high /.80
Cost	Insignificant cost increase	<10% cost increase	10-20% cost increase	20-40% cost increase	>40% cost lincrease
Time	Insignificant time increase	<5% time increase	5-10% time increase	10-20% time ilncrease	>20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless
This table presents examples of risk impact definitions for four different project objectives. They should be tailored in the Risk Management Planning process to the individual project and to the organization's risk thresholds. Impact definitions can be developed for opportunities in a similar way.					

Source: PMI, (2004)

Table 2.6 Definition of Impact Scales for Four Project Objectives

Probability	Threats					Opportunities				
0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05

Source: PMI, (2004)

2.5 Risk treatment:

PMI, (2004) and Winch, (2002) are of the view that, risk mitigating technique and approach selected is based on; the type of risks identified, access to supervisor to monitor development

of the response. Patel et al., (2013) in his work proposed the following means of treating risk in the construction industry namely, risk: transfer, avoidance, reduction, exploit, sharing, enhancement, avoidance and contingency plan. On the other hand, risk response involves a formulation of strategies to deal with identified and assessed risk events when they occur. Four (4) main strategy groups are proposed by PMI, (2013) and they are, risk transfer, risk avoidance, risk acceptance and risk Mitigation. For the purpose of this research risk sharing will be chosen as means to treat risk.

2.5.1 Risk Sharing

The traditional contract theory has assumed that a contract should contain the agreements as to how to deal specifically with all expected incidents which may, or may not, occur in the future, (Kiyoshi et al., 2006). Risk-Sharing discusses about appropriate collection of decisions for allocating risk in a construction contract, risks to certain extent level and scope are shared between owner and/or contractor who can manage it in most cheap and operational means (Teh-Chang et al., 2009). The rational and judicious risk-sharing will assist in the smooth closure of aproject with the benefit of maximizing the correct usage of funds and also hinder contractual disagreement (Teh-Chang et al. 2009). In the view of Patel et al., (2013) risk sharing is to distribute responsibility of a risk to another party who is capable to exploit its likelihood of occurrence and accelerate the likely gains the risk occurs. It may be described as the appropriate distribution of risks to a party in a contract, mainly the contracting authority or the economic operator. Most often, risks cannot be controlled by one party alone so the two parties are normally supposed to share that risk. Usually, risks must be owned to the party that can efficiently control it (El-Sayegh, 2008).

2.5.2 Risk Sharing Principles and Guidelines

Kiyoshi et al., (2006) in their work came out with the following risk sharing principles:

The party who can assess and control the risk should bear it; and if none of the parties can assess or control the risk, the party who can bears it easier or procure the insurance from market should bear it.

On the other hand, Groton et al., (2010) came out with the following risk sharing principles:

1. Risk should be owned by the party who is able to assess, regulate, finance the cost, and profit from, the ownership of risks;
2. Every risk has an associated and unavoidable cost which must be assumed somewhere in the process;
3. Risks are often associated with cost implications and thus are good to be shared; and
4. Everycontract should be measured individually to ascertain, for each risk, the sharing principles that will eventually lessen the project‟s overall financial consequences of risk. Groton et al., (2010), developed tables indicating how various risks are shared using the principles they proposed in risk sharing, below are the tables;

Table 2.7 Allocating Resource and Project Pre-requisite Risks

Risk	To whom allocated & why	How allocated/mitigated
Adequacy of Project Funding	Owner—it's the owner's project	Include contract language giving the contractor the right to confirm availability of funds
Adequacy of Labor Force	Contractor—can best assess at time of bidding	Owner should consider known labor shortage in a particular trade (e.g., ironworkers) in making decisions on alternate materials; owner should consider projected surplus/ shortage in determining project performance time
Permits and Licenses	Shared—both parties have some ability to control	Owner should identify all requirements to extent possible; contractor has some lead role in compliance
Site Access	Owner—it's the owner's site	Owner should identify requirements early and then delineate site availability/ constraints in bidding documents

Source: Groton et al., (2010)

Table 2.7.1 Allocating Operational Related Risks

Risk	To whom allocated &why	How allocated/mitigated
Inadequate Plans	Owner—funds design	Retain a qualified design professional; fund adequate design effort
Underestimation of Costs	Contractor—controllable	Use a competent estimating staff
Owner-furnished Material and Equipment	Owner—elects to use this method	Preplan for purchases, expediting; include contractual remedies for quality or delay problems
Contractor-furnished Material and Equipment	Contractor—typical scenario	Preplan for purchases, expediting; use remedies from vendors

Sourc

e: Groton et al., (2010)

Table 2.7.2 Allocating Technical Related Risks

Means and Methods of Construction	Contractor—area of expertise	Use/follow "standard" language
Delay in Presenting Problems	Claiming party—controls ability to give notice	Use/follow/enforce notice provisions
Delay in Addressing and Solving Problems	Party receiving claim—has obligation to respond	Delegate decision-making authority; empowerment
Subsurface Conditions	Owner—owns site	Use a differing site conditions clause; eliminate disclaimers on geotechnical data
Worker and Site Safety	Contractor—controls means/methods	Use clear contract language assigning responsibility

Source: Groton et al., (2010)

Table 2.7.3 Allocating External Related Risks

Risk	*To whom allocated & why*	*How allocated/mitigated*
Governmental Acts	Shared—not foreseeable or controllable	Include a suspension of work clause
Adverse Weather	Shared—not foreseeable or controllable	Include a time extension clause
Acts of God	Shared—not foreseeable or controllable	Include a time extension clause
Cost Escalation	Shared—not foreseeable or controllable	Provide a contractual formula to pay escalation on long term contracts

Source: Groton et al., (2010)

2.5.3 Risk Sharing Decision Guidelines

This usually focuses on the main contract and its risk allocation between owners and contractors, (Lam et al., 2007). Lam et al., (2007) directed their literature towards quantitative means of assessing and evaluating risk sharing decision by using fuzzy theory where as Teh-Chang et al., (2009) used qualitative and quantitative means of assessing and evaluating risk sharing decision without resorting to the fuzzy theory. For the purpose of this research, the approach of Teh-Chang et al., (2009) in handling risk sharing decision will be reviewed.

2.5.3.1 Assessment Guidelines for Risk Controlling Ability

According to research recommendation made by Teh-Chang et al., (2009) on the principles of risk sharing in construction contracts, set a structure for evaluation for risk-controlling ability (as Fig. 2.4 shows these risk controlling abilities). The authors conclude that, there should be a criteria or guidelines to be able to measure which party in the contract is able to: influence, control and handle risk better should be considered as basis of allocating risk. The authors explain that, the influencing ability entails a party or direct doer of relevant part of the contract. Such ability is required to determine the party that has a larger impact on occurrence and managing of the risk.

The controlling ability verifies the party that is more skilled with dealing with the risk and assessing the likelihood of occurrence for such risk, as well as evidence on degree of influence and the handling ability measures the party that is more capable of handling the risk in most efficient and judicious means through existing system, applicable resources possessed and professional skill provided.

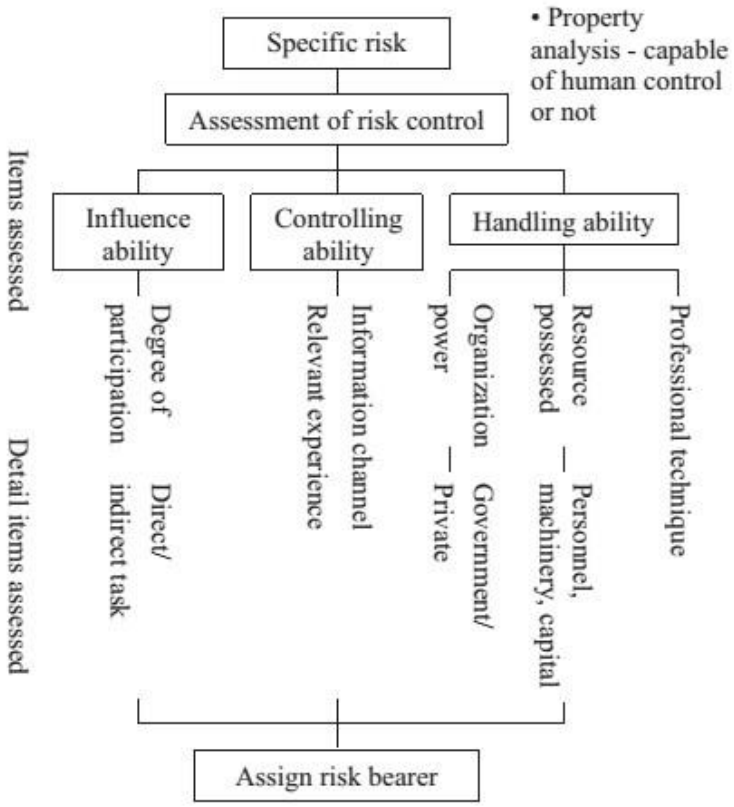

Fig. 2.4: Assessment structure for controlling ability of contract risk

Source: Teh-Chang et al., (2009)

2.5.3b Consideration and Steps of Assessment in Risk Sharing

Teh-Chang et al., (2009) in their literature review found the following guidelines to follow when assessing who a risk should be allocated to. The first step is to find an appropriate means of evaluation that are designated against all the contract risk. This is followed by quantifying and determining which of the contracting party has comparative advantage of controlling the risk according to each assessing item. Lastly is assigning the risk owner based on the outcome of the evaluation for each item.

2.6 ALLOCATION OF RISK IN THE GHANA STANDARD CONDITION OF CONTRACT.

The table below depicts how the current Ghana Condition of Contract for work share major risk it‟s identified. It is seen in the table below that, most risks captured in the condition of contract is distributed or allocated to a party and the contractor is required to provide insurance in joint names for both parties. The table 2.8 below shows how Ghana conditions of contract captures risk and how they are shared

Table 2.8: Risk allocation in Ghana conditions of contract

Subclause	Description of risks	Risk Owner	Jointly owned
11.1 a	The risk of personal injury, death, or loss of or damage to property: which is unavoidable of contractor‟s work or negligence, breach of statutory duty, or interference with any legal right by the Employer	Employer	
11.1 b	The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer‟s design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.	Employer	
11.2	damage to the Works, Plant, and Materials caused by: a Defect which existed on the Completion Date	Employer	
12	the risks of personal injury, death, and loss of or damage	Contractor	
	to property which is caused by contractors performance		
13	Provision of insurance for all the risk above	Contractor	Both parties
14	Site Investigations	Employer	
18	Design of temporary works during construction	Contractor	
19	General Safety at site	Contractor	
21	Possession of the Site-delay of works caused by late possession of the site	Employer	
28	Extension of the Intended Completion Date caused by: Compensation Event or a Variation issued	Employer	
44g	Delay caused by project Manager‟s instruction	Employer	

44h	Delay caused by: Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.	Employer	
47	Price Adjustment (Fluctuation)	Employer	

Source: Ghana Standard Tender Document, (2014)

2.7 SUMMARY OF LITERATURE REVIEW

The chapter brought to light past works in the knowledge area of risk management procedures, the genesis of the Ghanaian construction industry and its associated albatross. Ten (10) broad risk categorizations were identified in the review of literature of earlier works but only seven (7) were used in the development of questionnaires.

Two major risk sharing decision guidelines were discovered in the literature review. Groton et al., (2010) emphasized on quantitative means of assessing and evaluating risk sharing decision by using Fuzzy theory whereas Teh-Chang et al., (2009) also used qualitative and quantitative means of assessing and evaluating risk sharing decision without resorting to the fuzzy theory. The principles of of Teh-Chang et al., (2009) and Kiyoshi et al.,(2006), in assessing and allocating risk to various parties in the construction contracts were adopted for the purposes of this research.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This unit among other things seeks to explain the in-depth methodology adopted to collect data relevant for the research and how they are analyzed to achieve the objective of this study. The chapter begins with the research approach, research design, population and sampling techniques as well as analytical procedures were presented. The chapter further dealt with the presentation of data gathered, sampling techniques, instruments for data collection and sources

of data, as well as scope and limitations of the methodology. The study continued with the development of an interpretive research methodology together with a review of the objective of the research.

3.2 RESEARCH APPROACH

Saunders et al., (2009) as cited by Abdul Razak, (2013) argues that, the extent to which a researcher is familiar and clear about the research theory to use at the beginning of a research work will inform the researcher‟s choice of a project design.

The research is based on a quantitative and qualitative research approaches. Koul, (2009) is of the opinion that, quantitative method enhances precision in description of variables. It uses measurements which are most precise and globally accepted. Advantage of using numbers in measurements depends on number of properties which apply. It uses deductive approach, thus gathering information and making analysis from it. The aim here is to describe, explain and predict phenomenon, thus emphasis is not on understanding of content. Naoum, (2007) is of the view that, the objective of a researcher who uses the deductive research approach is to test or verify a theory rather than develop it. Large samples are used here. Quantitative survey studies which attempts to answer questions about current status of a phenomenon. It involves studying the preferences, altitudes, practices, interest of some group of peoples. Results here are reliable and thus can be generalized. Qualitative approach usually based on open ended questions in collecting data. It is most suitable in the study of human behaviour, (Koul 2009). From the above information, the research employed mixed research approach.

3.3 RESEARCH DESIGN

This research employed mixed model research design. Mixed model research design is a hybrid of qualitative and quantitative research design. With mixed model research design the

researcher usually uses a questionnaire that is made up of closed-ended and open ended structured questions (Tashakkori and Teddlie, 2003). This research employed a structured closed ended questionnaire to test risk sharing decisions that were revealed in the literature review and also employed an open ended questionnaire to collect opinions from respondents on how risk identified and shared could be mitigated for project success.

3.3.1 Survey Research

This is a type of quantitative method of research. The researcher adopted this type of quantitative research to gather data. It describes numerically characteristics, attitude, or the population‟s view on an issue by studying a portion of that population under study. It normally uses questionnaires for the collection of data. The reason is to generalize from a sample to a population (Fowler, 2008). It should be mentioned that quantitative data usually seeks closed-ended responses from a closed-ended question (Creswell, 2014).

A three phased approach was used for the research, so as to realize the aim and objectives of the research. The first phase talked about review of literature in the knowledge area of risk management for gathering data. Both primary and secondary sources of literature with references in research articles, government publication and the internet resources were resorted to during the literature review.

Questionnaire developments which were tailored to address the research objectives formed the core of the second phase in data collection and in the third phase, the results of the questionnaire were analysed using statistical techniques and coding.

3.3.2 The Questionnaire

The questionnaire was prepared so as to assess how respondents identify risk in the building industry, help identify participants in risk management practice, check whether respondents

agree with the risk sharing principles and guidelines discovered in the literature review and also determined how risks identified would be allocated.

The questionnaires were in three main parts in order of sequence as follows:

a) General Questions – Collecting the background Information of the respondents, their personal data and experience in the construction industry;

b) Specific questions on how they rank risks identified; and

c) Specific questions regarding risk sharing – collecting the respondents‟ views on how risks should be distributed and how they major risks identified and distributed be mitigated. These questionnaires were based on the research seeking to assess risk sharing decisions in the lifecycle of construction contracts by relying on the risk management method.

With respect to risk identification and classifications, questions were posed for respondents to prioritize risk identified and classified during the literature review of this research work. A section of the questionnaire was designed for the respondents to bring out the risks that are normally associated with the construction industry.

3.4 SOURCES OF DATA

Primary Data and Secondary data were greatly depended on for gathering information for this research work.

3.4.1 Primary Data

Data was collected through the use of structured questionnaires given to: Works Residence Consultants, External Works Consultant and Contractors constituted primary data for this research. The Works Residence Consultants of Physical Development and Planning division of

Physical Development and Municipal Services Directorate and Pre-Qualified Contractors all of University of Ghana were existent population for this research. Existent population is a type of population which has concrete individual or its element are easily determined, (Koul, 2009).

3.4.2 Secondary Data

The secondary source of data is made up of all related forms of literature resorted to during the literature review of this research and these are: periodicals, research journals, government publications, dictionary past dissertations and internet resources.

3.5 THE CRITERIA FOR ADMISSIBILITY OF THE DATA

Only responses from questionnaires returned were used in the project analysis. The entire respondents have a background in construction contracts. They were: architects, quantity surveyors, clerk of works, mechanical and electrical engineers, project managers and structural engineers.

The admissibility of the data was made on the basis that the respondents were practicing practitioners in the industry and were working for University of Ghana as resident consultant, external consultants, quantity surveyors and engineers working for contractors engaged by University of Ghana as by the time the research was undertaken who are all highly exposed to all forms of construction contract risk the University of Ghana is faced with.

3.6 POPULATION AND SAMPLING FRAME

Koul (2009) refers to population as group of identified set of people or entities such as objects, educational institutions, time units, and geographical areas, prices of wheat or salaries drawn by individuals. The existent population for this research is 101. On the other hand sampling frame is the accurate, complete, and up-to-date list of all the units in the population, (Koul 2009). Below are the details of the sampling frame:

Table 3 Sample Frame

Sampling Frame	**Frequency**
Resident Architects	6
Resident M&E Specialist	4
Resident Quantity Surveyors	5
Resident Clerk of Works	10
External Architects	2
External M& E Specialist-	2
External Quantity Surveyors	3
External Structural Engineers	3
Target from the side of contractors	
Quantity surveyors	33
Project Managers	33
Total	**101**

Source: Field Survey, 2015

3.6.1 Sampling Technique

In the view of Koul (2009), sampling could be described as the act of selecting from the list that constitutes a population. Quota sampling was adopted to determine the sample size of this research. This is a non-probability sampling; it involves the selection of a portion of the population. The basic idea of quota sampling is to set a target number of completed respondents with specific subgroups of the population of interest (Michael, 2008). To get a sample size from a population a desired percentage usually from fifty percent and beyond is applied to the unit in the sampling frame of the population (Michael, 2008). The quota sampling is usually akin to stratified sampling technique.

The sampling frame was used as the basis for stratification of the population. The entire population is not so big and thus it was necessary to use most of the sampling frame into the sample size. In the view of Koul, (2009), sample size of` 30 or more are considered to be large samples and those with fewer than 30 as small sample. In light of this, the researcher applied 85% quota to each unit in the sampling frame to arrive at the sample size. Below is a **Table 3.1** which illustrates how the sample size was arrived at:

Table 3.1 Sampling Frame

Sampling Frame	**Frequency**	**85% of Frequency(to the nearest whole number)**
Resident Architects	6	5
Resident M&E Specialist	4	3
Resident Quantity Surveyors	5	4
Resident Clerk of Works	10	9
External Architects	2	2
External M& E Specialist-	2	2
External Quantity Surveyors	3	3
External Structural Engineers	3	3
Target from the side of contractors		

Quantity surveyors	33	28
Site Engineers	33	28
Sample size	**101**	**87**

Source: Field work

From the table 3.1 above, the sample size for this research was 87 construction professional.

3.7 Data Analysis

Quantitative statistical technique and qualitative analysis method were employed for the study. The data collected was sorted and Relative Important Index (RII), SPSS version 16 and finding of percentages were used to analyse the information gathered. Relative Important Index RII = ∑W/AN,

Where:

W = the weighting given to each variable by the respondent ranging from 1 to 5.

A = the highest weight N

= total number of sample.

This method was used because it yielded a final number (index), which was an overall estimate of the relative importance of a variable. Percentages were also used because of their ability to translate number of respondents into proportionate fractions. The works of Kwok HCA and Skitmore (2000), indicate that weights 1,2,3,4,5 were allocated, representing;

"not occur" "slightly occur", "moderately occur", "often occur" and "very often" respectively. Using the Weighted Average Scoring (WAS) the sum of the products of the number of responses and the weighting was divided by the total number of responses. The higher

„WAS“ score means a risk that faces construction contracts in University of Ghana often occurs.

The research used coding which is a type of qualitative analysis to analyse the responses from the open ended questions from the questionnaire.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This unit consists of logical analysis of data gathered from respondent by the use of percentages, and relative importance index (RII). Logical conclusions were reached after the analysis results was compared to data collected from the literature review.

4.2 Survey Response

Eight-Seven (87) questionnaires were distributed to professionals who were associated with construction contracts in the University of Ghana. These were Architects, Structural Engineers, Quantity Surveyor, M& E Engineers, Clerk Of Works and Project Managers.

Table 4 Overall Survey responds levels

Participants	Percentage Returned%
Resident Professionals	76
External Consultants	70
Professionals from contractors	68.
Total	70

Source: Field Survey

From the table 4 above, each category of the population received more than fifty percent of questionnaires returned, so generalization could be made for each of the category. Also the entire data collection received seventy percent of feedback from the respondents. In all seventy-one (71) questionnaires out of eighty-seven (87) were questionnaires distributed were received for analysis.

4.3Results Analysis and Discussion

4.3.1 Respondents' Job Description

Respondents‟ area of expertise in construction and their participation in risk management practices were sorted. The feedback from the respondents to the questionnaire were analysed as shown in table 4.1 below

Table 4.1Area of specialization

No	Job Title	Resident Consultants	External Consultants	Contractors	Over all response %
1	Architects	5			**7**
2	M&E Specialists	3	2		**7**
3	Quantity Surveyors	4	2	22	**39.4**
4	Structural Engineers		3		**4.2**
5	Clerk of Works	7			**10**
6	Project Managers			23	**32.4**
Total		**19**	**7**	**45**	**100**

Source: Field Survey 2015

Table 4.1 above gives percentages of professionals who responded to the questionnaires that were used for the data collection. It emerged that quantity surveyors formed majority of the respondents.

4.3.2. Work Experience of Respondents

Table 4.2 Work Experience of Respondents

No	Work Experience (Years)	Resident Consultants R%	External Consultants R%	Contractors R%	Overall response %
1	Below 5	21		31	**25.3**
2	From 5-10	26	29	62	**49.3**
3	10-20	37	29	7	**17**
4	Above 20	16	42		**8.4**
Total		**100**	**100**	**100**	**100**

Source: Field Survey 2015

The table 4.2 above depicts that 25.3%of the respondents had 0-5 years working experience, 49.3 of the respondents had 5-10 years working experience, 17% of the respondents had 1020years working experience and lastly 8.4% had above 20 years working experience. This implies that respondents have quite a reasonable working experience in the construction contracts. And thus can contribute in the discussion of risk and sharing as Mitigating in risk management.

4.4 RATE AT WHICH MAJOR RISK FACTORS OCCUR IN UNIVERSITY OF GHANA

The literature review revealed seven major risks with each having at least five risk break down under it; that affect the construction industry in Ghana and Nigeria by the following authors: Yirenkye-Fianko 2011, Buertey et al., 2012 and Ijigah et al 2013. These seven major risks

identified in the literature review are: Financial Risk, Management Risk, Market Risks, Technical Risk, Legal risk, Political Risk, and Environmental risk.

These identified major risk factors were rated or ranked using a likert scale 1-7

Where:1-Not Occur, 2- Slightly Occur, 3-Slightly Moderately Occur, 4- Moderately Occur 5Highly Moderately Occur, 6-Highly Occur, 7-Very Highly Occur. The positions or rankings of these risks were arrived by the help of Relative Importance Index Techniques based on the ratings of the scale. The formula for the Relative Importance index is RII=∑W/AN, Where:

W = the weighting given to each variable by the respondent ranging from 1 to 5.

A = the highest weight N

= total number of sample.

With Relative Importance Index, the item with a fraction closer to one whole number is considered to be the superior. From table 4.3 Financial Risk had a fraction of 0.74. This 0.74 happens to be the highest fraction that is closer to 1 therefore; it implies that financial risk is Very Highly Occurred risk factor among the seven major risk factors identified in the literature review. Followed by Market Risk which also had a Relative importance Index of 0.71 thus Market Risk emerged as the Highly Occurred risk factor. Relative Importance Factor was calculated for each of the Major Risk factors identified in the literature review, to find out the rate at which each occurs and its position in relation to the seven. Table 4.3 in appendix 2 shows the relative importance index and position of each Major Risk with respect to construction contracts in University of Ghana.

From Table 4.3 in appendix 2, top most five frequently occurred risks in order of importance are: financial risk; market risk; political risk; technical risk; and management risk

After determining the five Major Risk Factors with respect to University of Ghana, their corresponding Risk Breakdown Structures will also be ranked to determine the three Risk Breakdown Structures for the five Major Risk factors already identified. This will bring out fifteen most frequently occurred risk break down structures in construction contracts in University of Ghana.

A similar Likert scale ranging 1-5 was used to provide qualitative weights for the various Risk Breakdown Structures in each major risk identified. Where: 1-not occur, 2- slightly occur, 3-moderately occur, 4- often occur, and 5-very often occur. The ranking was done for the risk break down structures based on the ranking position of their corresponding Major Risk Factors. The first Major Risk Factor to rank its risk breakdown structures is Financial
Risk followed by Market Risk and so on in order of the ranking position of the Major Risk Factors.

4.4.1 Ranking Risk Breakdown Structure for Financial Risk

Table 4.4 in appendix two shows the relative importance index for each break down structure under Financial Risk. It could be inferred from the table that, the very often occurred risk break down structure is Delayed Payment, followed by often occurred risk which is
Fluctuation of inflation rate, followed by moderately occurred risk which is Cash Flow Difficulties, followed by slightly occurred risk which is Fluctuation in interest rate and lastly not really occurred risk which is Fluctuation of exchange rate.

From this analysis the three most frequently occurred risks in order of importance are: delayed payment; fluctuation of inflation rate; and cash flow difficulties.

4.4.2 Ranking Risk Breakdown Structure for Market Risk

Table 4.5: Ranking Risk Breakdown Structure for Market Risk

No	**Risk Description**	**RII**	**Position**
1	Increase in the cost of labour	0.75	2nd
2	Increase in the cost of material	0.85	1st
3	Competition from other companies	0.5	4th
4	Inadequate forecast about market demand	0.42	5th
5	Labour strikes	0.65	3rd

Source: Field Survey

With market risk, the increase in the cost of materials ranked 1st because its relative importance index is 0.85 and thus becomes very often occurred risk on the likert scale. Increase in the cost of labour on the likert scale had a relative importance index of 0.75 and thus becomes 2nd position and often occurred risk on the likert scale. Labour strikes scored a relative importance index of 0.65 which becomes 3rd position and moderately occurred risk on the likert scale. Competition from other companies and Inadequate forecast about market demand were ranked 4th and 5th respectively.

From the analysis in Table 4.5, the three most frequently occurred risks in order of importance are: increase in the cost of materials; Increase in the cost of labour; and Labour strikes

4.4.3 Rating Risk Breakdown in Political Risk

On the same Likert Scale, ranging from 1-5 in qualitative weighing. Delay in approvals had a relative importance index of 0.81 which represents very often occurred risk.

Delay in approvals emerged 1st among the five risk break down structure under political risk.

Bureaucracy had 0.71 Relative Importance Index and thus becomes often occurred risk and 2nd in importance of frequency at which political Risk Break Downs structures occurs in University of Ghana.

From the **Table 4.6** in appendix 2, Corruption also had a relative importance index of 0.57 also become 3rd in importance with respect to Political Risk. Next in importance were followed by Change of government policy and Change of government which were in 4th and 5th position respectively.

From this analysis the three most frequently occurred risks in order of importance are: delay in approvals; bureaucracy; and corruption

4.4.4 Rating Risk Break Down in Technical Risk

In the Technical Risk Breakdown Structures; Design Changes with a Relative Importance Index of 0.72, ranked 1st among the five thus very often occurred risk on the likert scale. Construction Method had a Relative Importance Index of 0.7 and became 2nd in the ranking and also implies often occurred risk with respect to Technical Risk. The next ranked Risk Breakdown Structure is Accidents on site. Accident on site had a Relative Importance Index of 0.55 and emerged 3rd in the ranking. Table 4.7 in appendix 2 shows the weighting, Relative Importance Index and the Position of each Risk Break down Structure.

From the **Table 4.7** in appendix 2 : Shortage of skill labour and Unknown site conditions emerged 4th and 5th respectively in order of importance or severity of the frequency at which such risks occur in the Construction Contracts In the University of Ghana.

From this analysis the three most frequently occurred risks in order of importance are: design changes; construction method; and accidents on site.

4.4.5 Ranking Risk Breakdown Structure for Management Risk

Table 4.8 Ranking Technical Risk

No	Risk Description	Weighting	Relative Importance Index	Position
		∑W		
1	Quality and Performance Control	272	0.77	1st
2	Poor communication	242	0.68	3rd
3	Poor Craftsmanship	220	0.61	4th
4	Competence of consultants and Contractors	181	0.51	5th
5	Absence of team work	265	0.74	2nd

Source: Field Survey

The table above indicates that, Quality and Performance Control Relative Importance Index of 0.77 which gives a qualitative weighting of very often occurred risk on the likert scale. That is 5 and emerged 1st in management risk. Absence of team work had a relative performance index of 0.74 which also represents often occurred risk and 2nd in order of importance in the Management Risk. Poor Communication had a relative importance index of 0.68; this places poor communication 3rd in order of importance of management risk. Poor Craftsmanship and Competence of consultants and Contractors were places 4th and 5th respectively in the ranking according to their relative importance index.

From this analysis the three most frequently occurred risks in order of importance are: quality and performance control; absence of team work; and poor communication.

4.5 FIFTEEN MOST FREQUENTLY OCCURRING RISKS

Analysis of both Major Risks Factors and the risk Breakdown Structures results in 15 most frequently occurred risk break down structures. This was arrived at by selecting first three of the Major Risk Factors. The risk break down structures were ranked giving importance to how their Major Risk Factor fed in the rankings. So to list the fifteen most frequently occurred risk, the first three risk break down structures under financial risk were listed first, followed by market Risk and so on. **Table 4.5** in appendix 2 gives fifteen most frequently occurring risks in the construction contracts in University of Ghana.

4.6 RESPONDENTS' OPINIONS ON RISK SHARING PRINCIPLE

For one to be able to distribute or allocate an identified risk to a party, one should have a principle or a guide line to aid his or her decision in the allocation. The literature review reveals that Groton et al., 2010 and Kiyoshi et al., 2006 came out with some principles to aid in risk sharing in construction contract. The respondents‟ agreement to the risk sharing principles was sorted. **Table 4.9** in appendix gives the percentages of those who agreed to the principles and those who did not agree to the principles.

It is seen clearly from the table that more than 50% of the respondents ticked yes for the principles. This implies that more than half of the respondents agree to the risk sharing principles proposed by Groton et al., 2010 and Kiyoshi et al., 2006.

4.7 RESPONDENTS OPINION ON ASSESSMENT GUIDELINES FOR RISK CONTROLLING ABILITIES

Table 4.9.1 in appendix 2, reveals that, the assessment guidelines proposed by Teh-Chang et al. 2009 received 70% and above yes from the respondents. This implies that Teh-Chang et al., 2009 guideline have been accepted by the respondents.

4.8 RISK ALLOCATIONS

The respondents were asked to choose appropriate risk owners for the various risk break down structures. Only allocations for the risk break down structures which were found in the fifteen selected risks break down structures were considered. From **Table 4.9.2** in appendix 2 reveals the following: 6 out of the risk owner analysis of the top 15 identified risks are to be allocated to Clients. The Shared risks are 7 out of the 15, and only 2 risks are allocated to the contractor. This indicates that, construction risks are best shared for contract success. (Appendix 2 table 4.9.2 shows distribution of how respondents allocated ownership to the first fifteen risk break down structures identified).

4.9 Mitigating Measures for Allocated Risks

The respondents were asked to state their views on how the risks they have allocated could be mitigated. The various opinions of the respondents were categorized under similar coding. (Fig. 4 to fig. 4.9.5 in appendix 2, show bar graphs with corresponding percentages; indicating various proposals for mitigating the risks assigned to various risk owners by respondents). Based on this a table was drawn to collate the various mitigating measures to their corresponding risk break down structure. (Table 4.9.3 in appendix 2 shows the various risk breaks down structures with their corresponding mitigating measures). Most of the suggested mitigating measures suggested by the respondents were in line with those recommended by Groto et al., (2010).

4.9.1 Summary of Results

This chapter revealed the findings of the study based on the analysis of the empirical data obtained from the field. The background of respondents were analysed and it was revealed that, respondents were competent, experienced and capable of giving fair judgments in issues concerning to risk in construction contracts. Five out of the seven major risk factors discovered in the literature review were found to be highly prevalent in the construction contracts in University of Ghana. Financial Risk dominated the five identified major risk factor.

Based on these five major risk factors fifteen out of the thirty-five risk break down structures identified in the literature review were observed to be very familiar with construction contracts in University of Ghana. Respondents opinions on risk sharing principles and assessment guidelines for risk controlling abilities discovered in the literature review were sorted. It was revealed that 70% of the respondents agreed to the risk sharing principles and the assessment guidelines on risk controlling abilities identified in the literature review. Risk owners were also assigned to each of the first fifteen identified risk break down structures. Mitigating measures of each of the fifteen identified risk break down structures were sorted from the respondents.

The overall aim of the study was to explore risk sharing decisions in construction projects and how they can be adopted in University of Ghana. Based on the realization of all objectives of the study, it can be concluded that, the aim of the study has been accomplished.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

The core of this chapter is to come out with conclusions on the prevalent risk break down structures in the construction contracts of University of Ghana and how these risks should be allocated. A set of recommendations on how risks allocated be mitigated by parties in the contract.

5.2 Review of Objectives

This section seeks to evaluate how each of the objectives was realized so as to achieve the aim of the overall research. The aim of this research was to explore risk sharing decisions in construction contracts and how they can be adopted in construction contract by University of Ghana. Below are the objectives that were detailed in order to realize the aim;

1. To identify the various risks that beset construction contracts in University of Ghana;
2. To identify guidelines for risk sharing decisions in construction contracts; and
3. To document Mitigating measures for the allocated risks.

5.2.1 Objective # 1: To identify the various risks that beset construction contracts in University of Ghana.

In order to realize this objective, in depth review of literature was done to ascertain various risks that the construction industry is confronted with. The various risks identified were out line in chapter of this study. Questionnaire was designed based on the risks identified in the literature review in order to determine the extent at which the risks identified occur in

University of Ghana. The questionnaire allowed the respondents to rank the risks with respect to the rate of occurrence in University of Ghana. An evaluation of the responses indicated all the risks identified in the literature were prevalent but their level of occurrence varies. The first five major risk factors with respect to the rate of occurrence were; financial risk;market risk;political risk;technical risk; andmanagement risk

Fifteen risk break down structures were also identified to be prevalent in University of Ghana‟s construction contract. (See Table 4.9.2 in chapter four for these fifteen identified risk break down structures.) From the above, it can be concluded that, this objective had been realized.

5.2.2 Objective # 2: To identify guidelines for risk sharing decisions in construction contracts.

Extensive literature review conducted in chapter two (2), Identified risk sharing principles and assessment guidelines for risk controlling abilities. These were included in the questionnaire designed so as to determine whether the respondents agree to them or not. After the analysis it was revealed that more than 70% of the respondent agreed to the risk sharing principles and assessment guidelines for risk controlling abilities. Tables 4.9 and 4.9.1 in appendix 2 depict percentages of those who responded „Yes‟ and „No‟ to the agreement of the risk sharing principles and assessment guidelines for risk controlling abilities. Based on these the risk sharing principles and assessment guidelines for risk controlling abilities have been adopted to provide a guide when allocating risks to parties in a contract. It could be inferred that the second objective of the study was achieved from the above analysis.

5.2.3 Objective # 3: To document mitigating measures for allocated risks

The third objective of this research was to collate mitigating measures for the risk break down structures assigned to various risk owners in the construction contact. To achieve this objective,

respondents were asked to assign risk owners to the various risk break down structures. (Table 4.9.2 in appendix 2 shows the owners of the first fifteen risk break down structures). The respondents were again asked state how the risks they have assigned owners to; could be mitigated. This was an open ended question so the various suggestions were grouped under main headings. These collated suggestions were coded and SPSS version 16 was used to analyse them. (Fig. 4 to fig. 4.9.5 in appendix 2, show bar graphs with corresponding percentages; indicating various proposals for mitigating the risks assigned to various risk owners respondents). A table was then drawn to match each risk break down structures to their suggested mitigating measures. (Table 4.9.3 in appendix 2 shows the various risk break down structures with their corresponding mitigating measures). It can therefore be concluded that objective three of this research was accomplished as well.

5.3 Conclusion

Based on the strength of the findings of the study, the following conclusions were made:

1. The first five major risk factors in order of high prevalent rate of occurrence in the University of Ghana are: financial risk; market risk; political risk; technical risk; and management risk.

2. First fifteen risk break down structures were identified to be prevalent in University of Ghana‟s construction contracts. (Table 4.8.1 in chapter four outlines them). If mitigating measures for these risks are implemented by the University of Ghana, it will aid the smooth successful closure of contracts.

3. Risk sharing principles and guidelines in assessing risk controlling abilities have also been identified. (Tables 4.9 and 4.9.1 in appendix 2 outline the risk sharing

principles and guidelines in assessing risk controlling abilities respectively. The objective two of this research has been realized. This also implies that, should be guiding principles in allocating risk to appropriate owners.

4. Risk owners have been assigned to the fifteen risk break down structures and measures to mitigate the allocated risks have also been collated. (Tables 4.9.2 and 4.9.3 in appendix 2 outline the risk allocation and their mitigating factors respectively. This also implies that objective three of this research has been achieved.

5. The study confirms the works of Groton et al (2010) and Teh-Chang et al (2009) that there should be principles and guidelines to be followed when allocating or distributing risk to parties in a contract.

5.4 Recommendations for the study

The following recommendations are proposed for construction contracts in University of Ghana:

1. Five major risk factors and their corresponding first three risk break down structure were identified to be prevalent in University of Ghana‟s construction contracts. It is strongly recommended that, this risk should be shared fairly among parties and their mitigating measures should be adhered to.

(Table 4.9.2 in appendix 2 should be adopted in allocating risk owners to the risks identified.)

2. The research also recommends that, the risk sharing decisions identified in this research should be considered whenever there is the need to share risk.
3. The mitigating measures captured in table 4.9.3 should be adopted to mitigate the identified risks.

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APPENDIX 1

Sample of Questionnaire

COLLEGE OF ARCHITECTURE AND BUILDING TECHNOLOGY DEPARTMENT OF BUILDING TECHNOLOGY, KNUST

EXAMINING RISK SHARING DECISIONS IN CONSTRUCTION CONTRACTS QUESTIONAIRE

1. Please, state your Job Title/Position in the Company that you work (Please tick)

Assistant Architect ( ) Senior Architect ( ) Assistant Quantity Surveyor ( ) Senior Quantity Surveyor ( ) Clerk of Works ( )

2. How long have you been in the Construction Industry? (Please tick)

Less than 5 years ( ) between 5-10 years ( ) between 10-20 years ( ) More than 20 years ( )

4. Do you perform any form of risk management practices in your company? (Please tick)

Yes ( ) No ( )

5. Indicate your level of understanding of the concept of risk management practices

Only read about it ( ) Understanding from practice ( ) Understanding through reading and Practice ( ) No knowledge about it ( )

6. State who undertakes the risk management practice

Architects ( ) Quantity Surveyors ( ) Clerk of Works ( ) Structural Engineers ( ) M&E Specialists ( ) All participants ( )

7. Which of the following types of Financial Risk affects your outfit greatly? Please rank them using the scale: 1-Not Occur, 2- Slightly Occur, 3-Moderately Occur, 4- Often Occur, And 5-Very Often

Item	Risk Description	Rank
1	Delayed Payment	
2	Fluctuation of inflation rate	
3	Cash Flow Difficulties	
4	Fluctuation of exchange rate	
5	Fluctuation in interest rate	

8. Which of the following types of Management Risk affects your outfit greatly? Please rank them using the scale below:

1-Not Occur, 2- Slightly Occur ,3-Moderately Occur, 4- Often Occur, And 5-Very Often

item	Risk description	Rank
1	Quality and Performance Control	
2	Poor communication	
3	Poor Craftmanship	
4	Competence of consultants and Contractors	
5	Absence of team work	

9. Which of the following types of Market Risks affects your outfit greatly? Please rank them using the scale below:

1-Not Occur, 2- Slightly Occur, 3-Moderately Occur, 4- Often Occur, And 5-Very Often

item	Risk description	Rank
1	Increase in the cost of labour	
2	Increase in the cost of material	
3	Competition from other companies	
4	Inadequate forecast about market demand	
5	Labour strikes	

10. Which of the following types of Technical Risk affects your outfit greatly? Please rank them using the scale below: 1-not occur, 2- slightly occur, 3-moderately occur, 4- often occur, and 5-very often

item	Risk description	Rank
1	Shortage of skill labour	
2	Construction Method	
3	Unknown site conditions	
4	Design Changes	
5	Accidents on site	

11. Which of the following types of Legal risk affects your outfit greatly? Please rank them using the scale: 1-not occur, 2- slightly occur, 3-moderately occur, 4- often occur, and 5-very often

item	Risk description	Rank
1	Breach of contracts by parties	
2	Improper verification of contract documents	
3	Arbitration clause in contract agreement	
4	Lack of enforcement in legal judgment	
5	Disputes	

12. Which of the following types of Political Risk affects your outfit greatly? Please rank them using the scale:1-not occur, 2- slightly occur, 3-moderately occur, 4- often occur, and 5very often

item	Risk description	Rank
1	Change of government	
2	Bureaucracy	
3	Corruption	
4	Change of government policy	
5	Delay in approvals	

13. Which of the following types of Environmental risk affects your outfit greatly? Please rank them using the scale below:

1-not occur, 2- slightly occur, 3-moderately occur, 4- often occur, and 5-very often

item	Risk description	Rank
1	Change in climatic conditions	
2	Environmental impact of project	
3	Health and safety for workers	
4	Stiff environmental regulations	
5	Poor soil conditions	

14. Which of the following Major types of risk affects your outfit greatly? Please rank them using the scale below:

1-Not Occur, 2- Slightly Occur, 3-Slightly Moderately Occur, 4- Moderately Occur 5-Highly Moderately Occur, 6-Highly Occur, 7-Very Highly Occur

item	**Risk description**	**Rank**
1	Financial Risk	
2	Management Risk	

3	Market Risk	
4	Technical Risk	
5	Legal Risk	
6	Political Risk	
7	Environmental Risk	

15. Do you agree with the following Risk Sharing Principles? Please tick

Item	Sharing Principles	Yes	No
1	Risks belong with those parties who are best able to evaluate, control, bear the cost, and benefit from, the assumption of risks.		
2	Every risk has an associated and unavoidable cost which must be assumed somewhere in the process		
3	. Many risks and liabilities are best shared		
4	. Each project should be assessed individually to determine, for each risk, the allocation considerations that will ultimately reduce the project‟s total cost of risk.		
5	If none of the parties cannot assess or control the risk, the party who can bears it easier or procure the insurance from market should bear it.		

16. Do you agree with the following Risk Sharing Assessment Guidelines? Please tick

Item	**Assessment Model on Risk Controlling Ability**	Yes	No
1	Risk should be allocated to the party who has great influencing ability of a particular risk when it occurs.		
2	The party who is more capable of dealing with the risk and evaluating probability of occurrence for such risk, as well as information channel on degree of influence should inherit the risk		
3	the party that is more capable of handling the risk in most economical and effect way via existing system, relevant resources possessed and is able provide professional technique should inherit the risk.		

17. From the information in 13 and 14 above, how would you allocate the following risk and how should the risk allocated be mitigated? Please specify risk owner and propose means of Mitigating.

Item	Financial Risk description	Client /Contractor/Shared	How allocated risk should be mitigated
1	Delayed Payment		
2	Fluctuation of inflation rate		
3	Rise in fuel prices		
4	Fluctuation of exchange rate		
5	Fluctuation in interest rate		
Item	Managerial Risk description	Client /Contractor/Shared	How allocated risk should be mitigated
1	Improper planning and budgeting		
2	Poor communication		
3	Improper project feasibility studies		
4	Internal management problems		
5	Absence of team work		
Item	Market Risk description	Client /Contractor/Shared	How allocated risk should be mitigated
1	Increase in the cost of labour		
2	Increase in the cost of material		
3	Competition from other		

	companies		
4	Inadequate forecast about market demand		
5	Labour strikes		
Item	Technical Risk description	Client /Contractor/Shared	How allocated risk should be mitigated
1	Shortage of skill labour		
2	Material Shortage		
3	Unknown site conditions		
4	Design Changes		
5	Accidents on site		
Item	Legal Risk description	Client /Contractor/Shared	
1	Breach of contracts by parties		
2	Improper verification of contract documents		
3	Arbitration clause in contract agreement		
4	Lack of enforcement in legal judgment		
5	Disputes		
Item	Political Risk description	Client /Contractor/Shared	How allocated risk should be mitigated

1	Change of government		
2	Bureaucracy		
3	Corruption		
4	Change of government policy		
5	Delay in approvals		
Item	Environmental Risk description	Client /Contractor/Shared	How allocated risk should be mitigated
1	Change in climatic conditions		
2	Environmental impact of project		
3	Health and safety for workers		
4	Stiff environmental regulations		
5	Poor soil conditions		

APPENDIX 2

Figures and Tables

Fig. 4 Mitigating Measures for Delayed payment

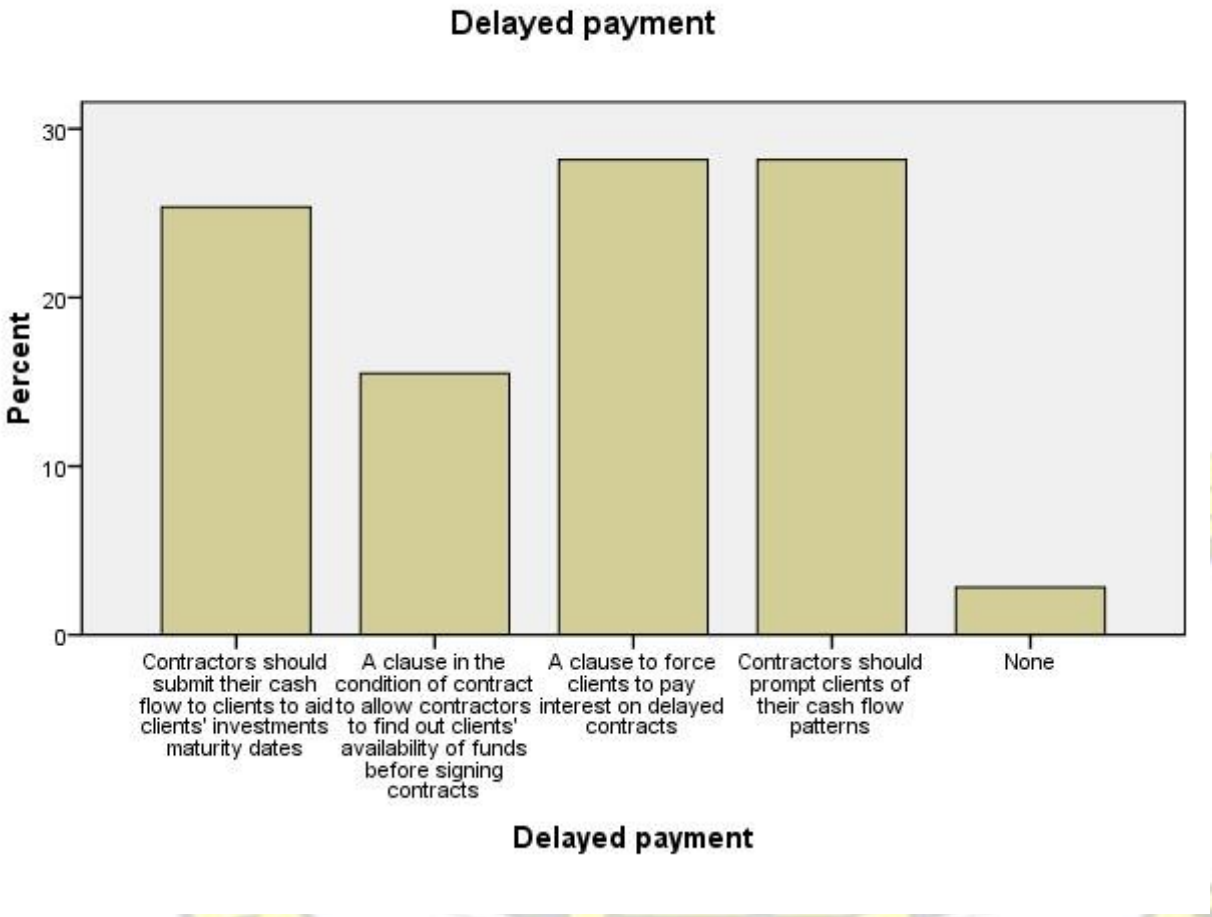

Fig.4: Mitigating Measures for Delayed Payment

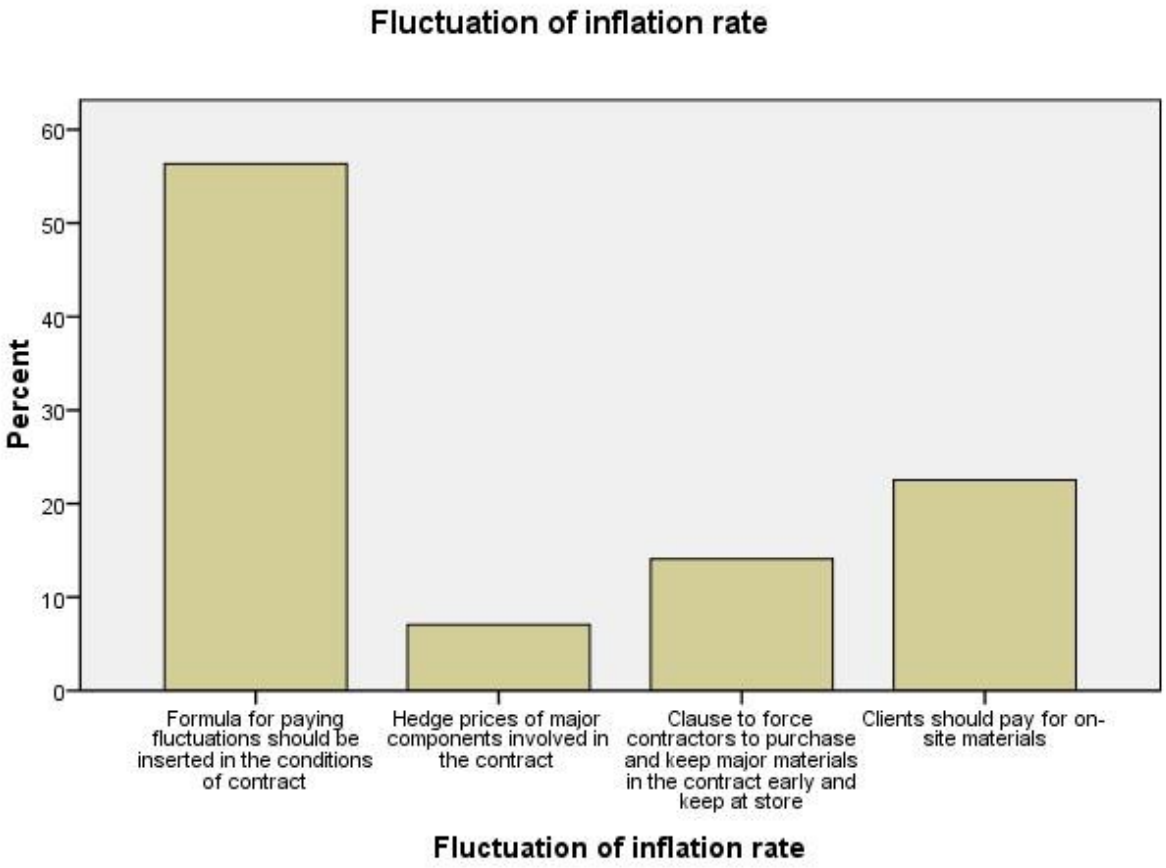

Fig. 4.1: Mitigating Measures for Fluctuation of inflation rate

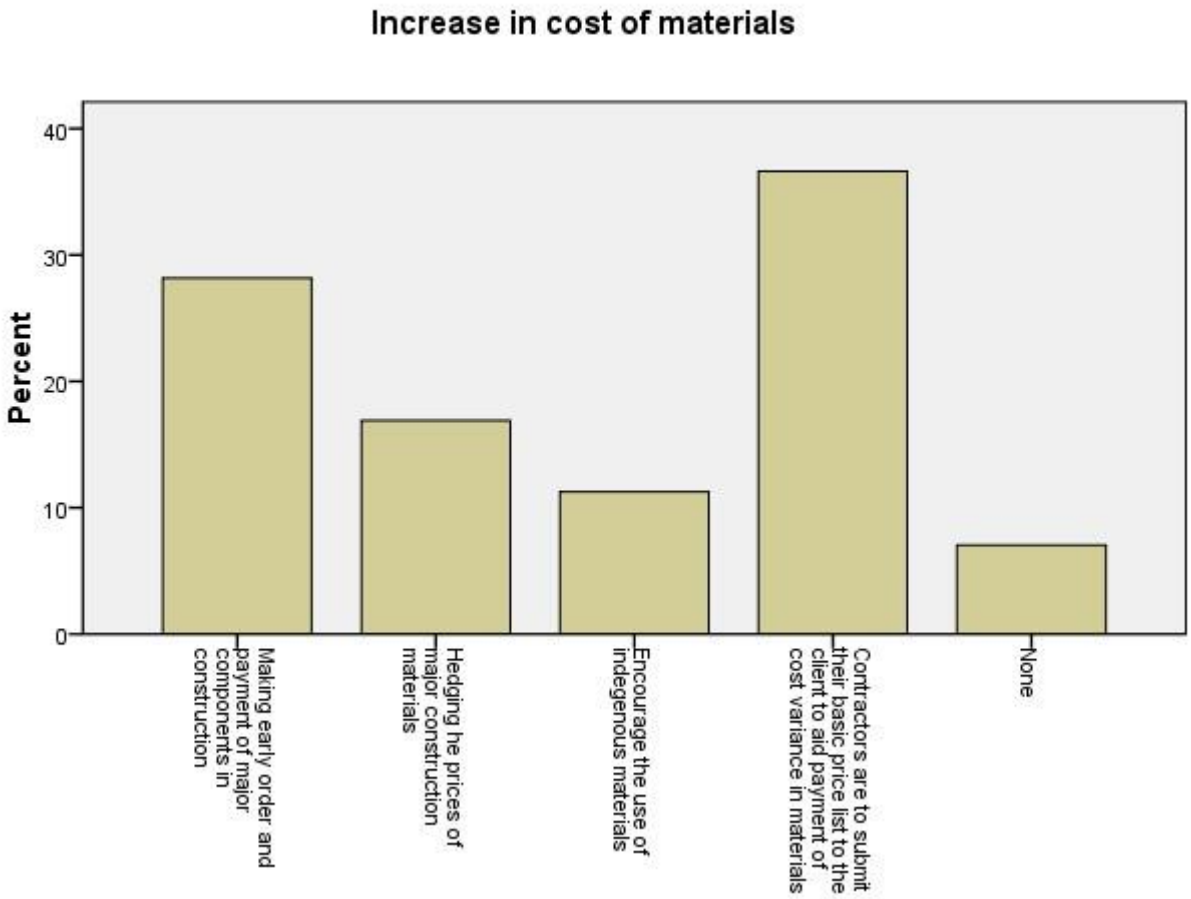

Fig. 4.2 : Mitigating Measures for Increase in the cost of materials

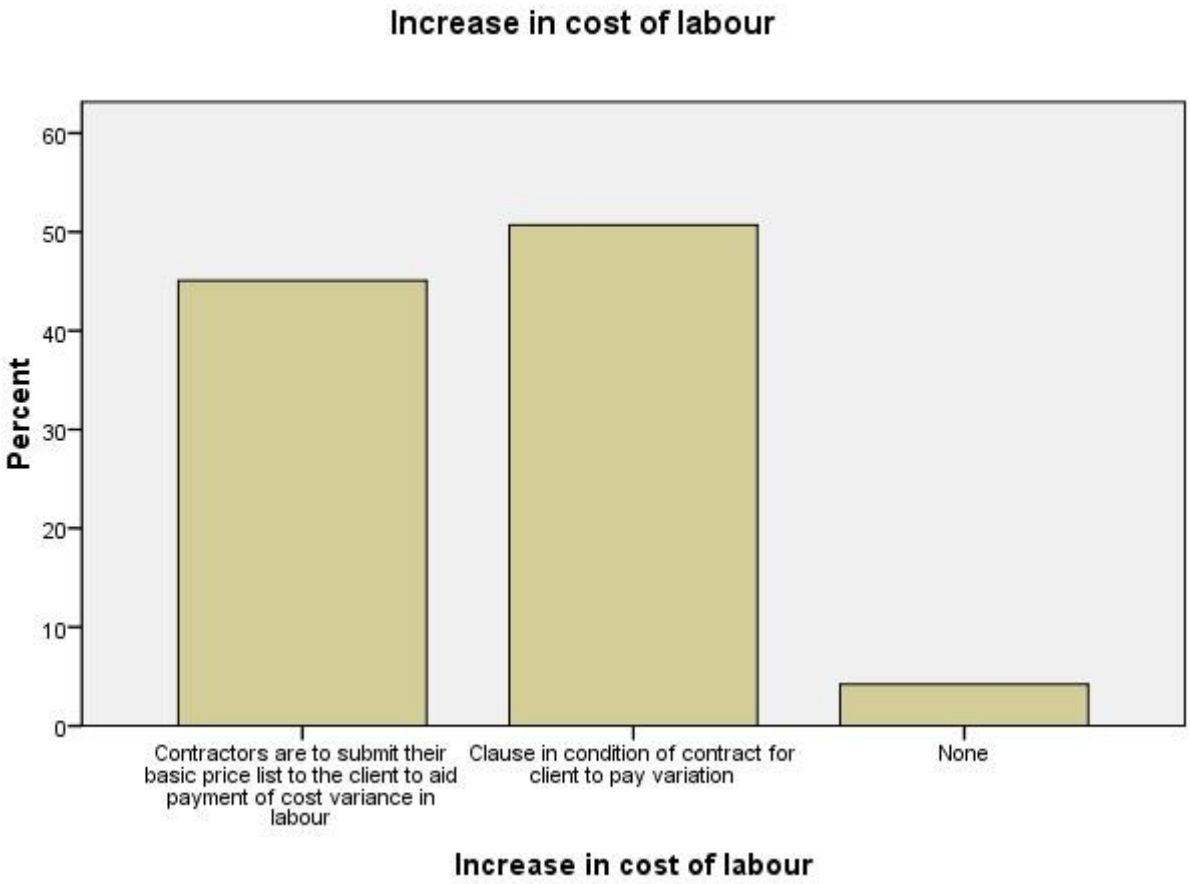

Fig. 4.3: Mitigating Measures for Increase in cost of labour

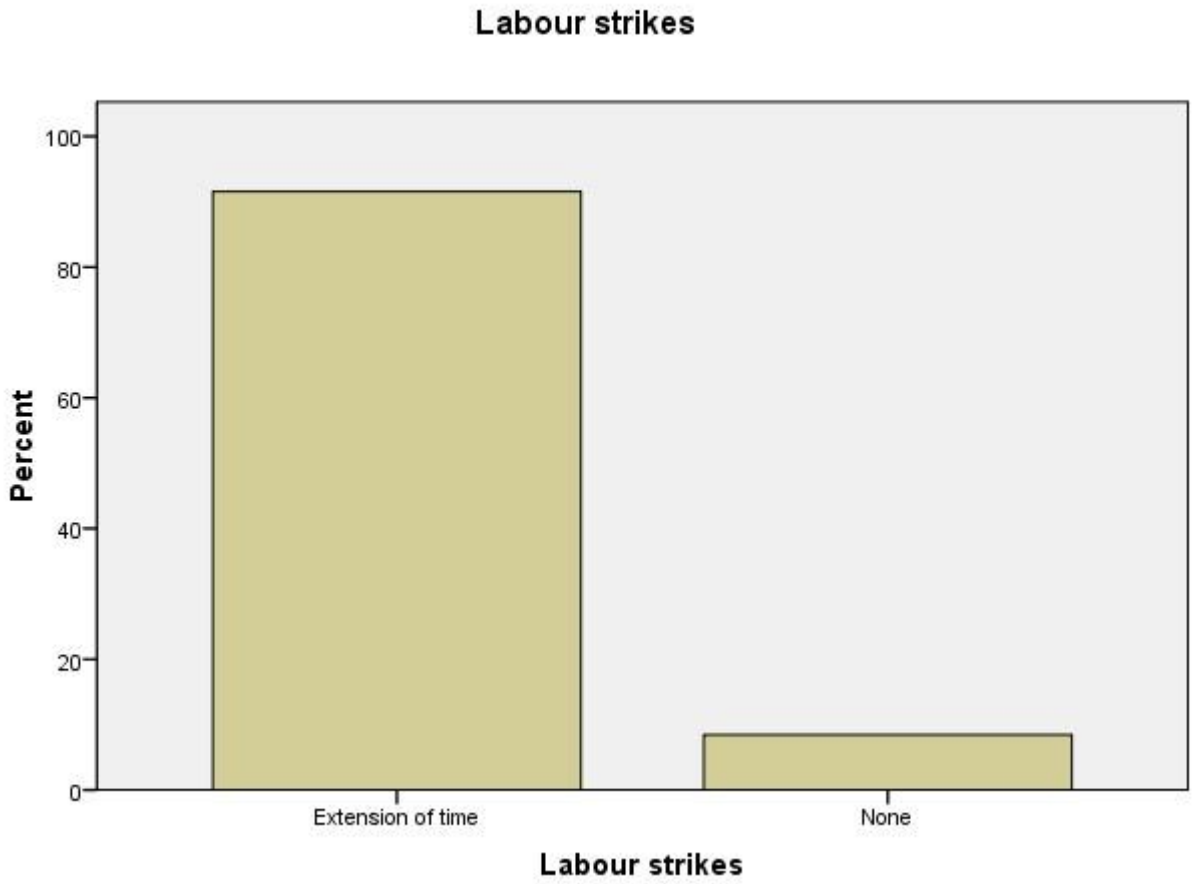

Fig. 4.4: Mitigating Measures for Labour strikes

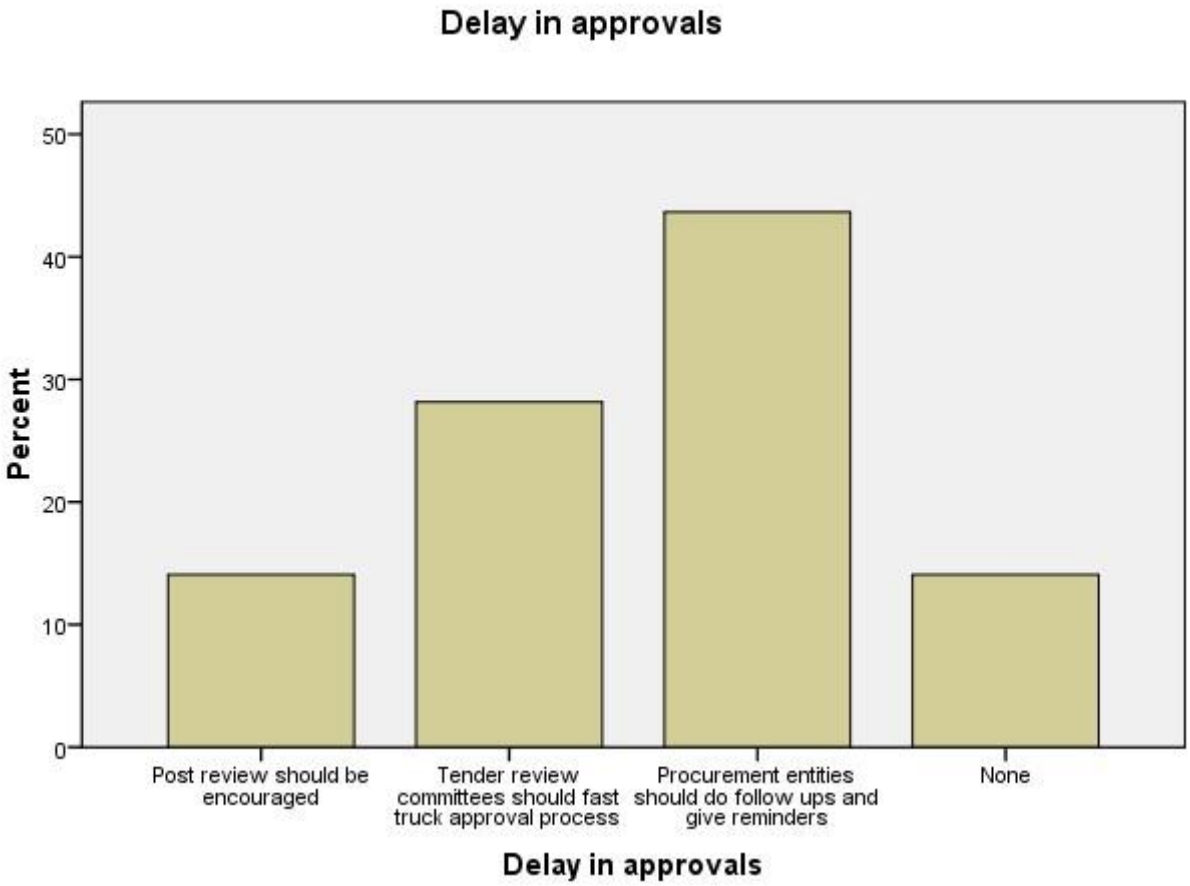

Fig. 4.5 : Mitigating Measures for Delay in Approvals

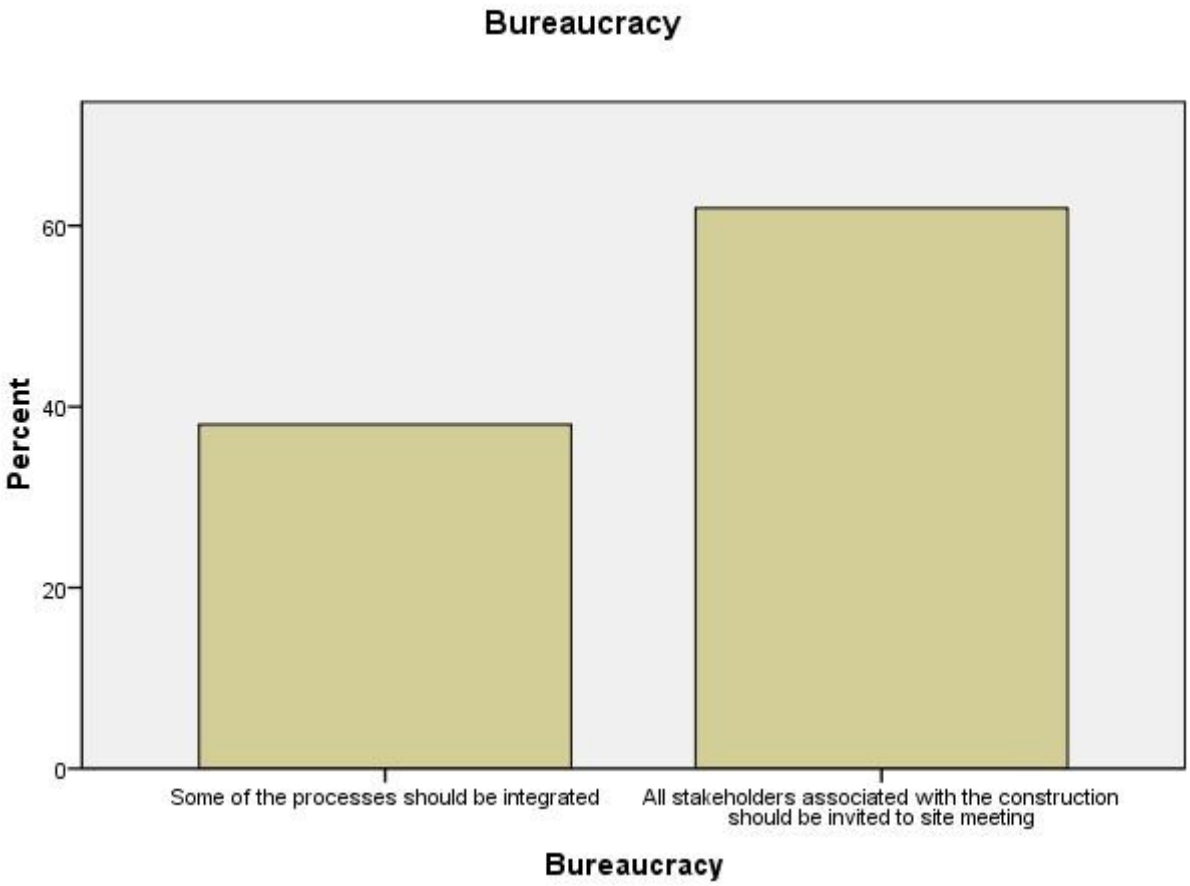

Fig. 4.6: Mitigating Measures for Delay in Bureaucracy

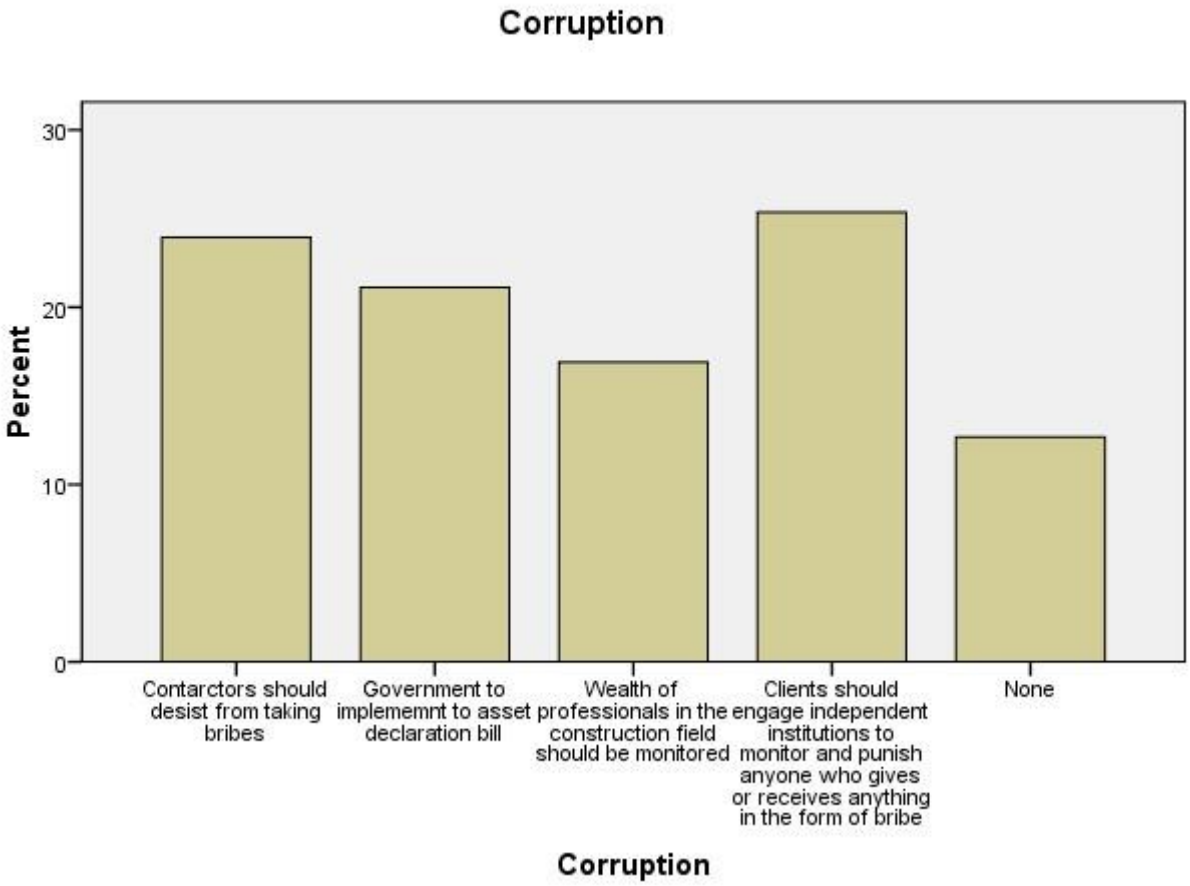

Fig. 4.7: Mitigating Measures for Corruption

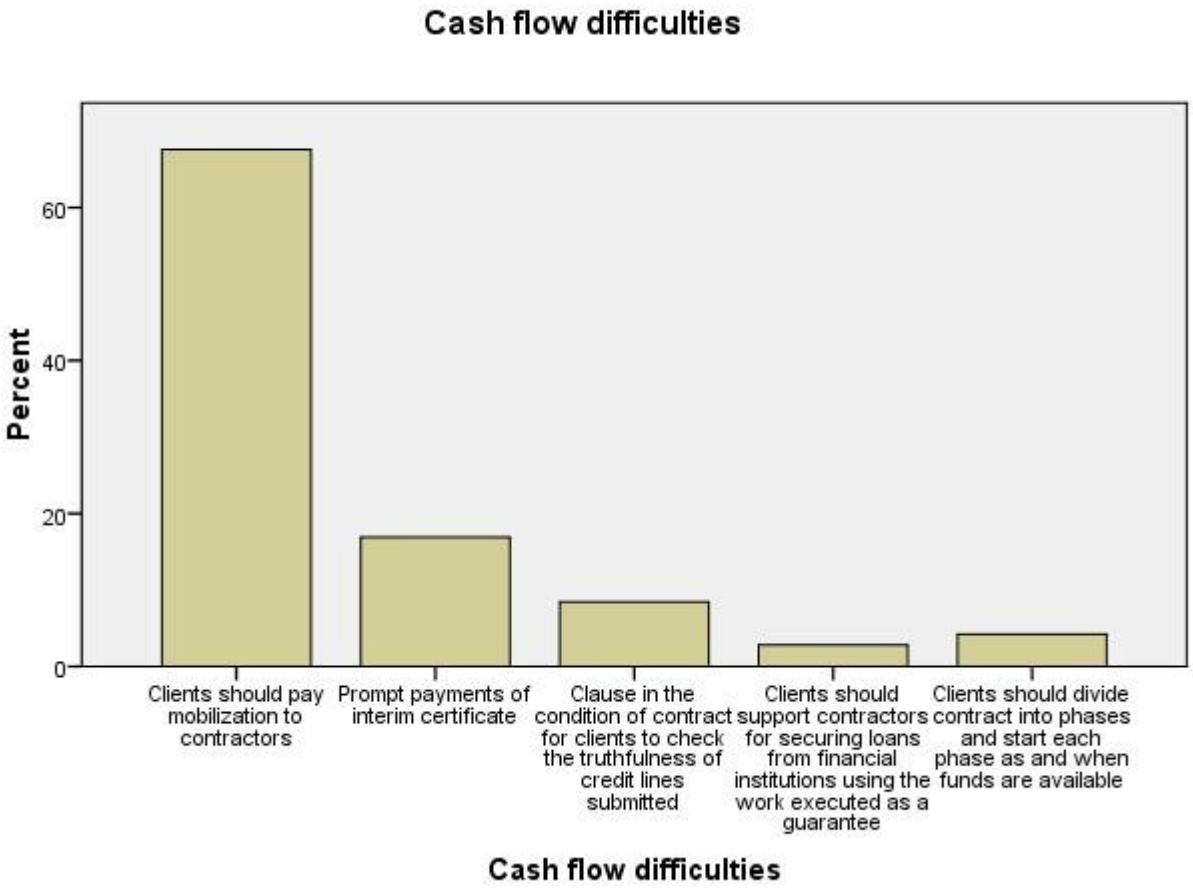

Fig. 4.8: Mitigating Measures for Cash flow difficulties

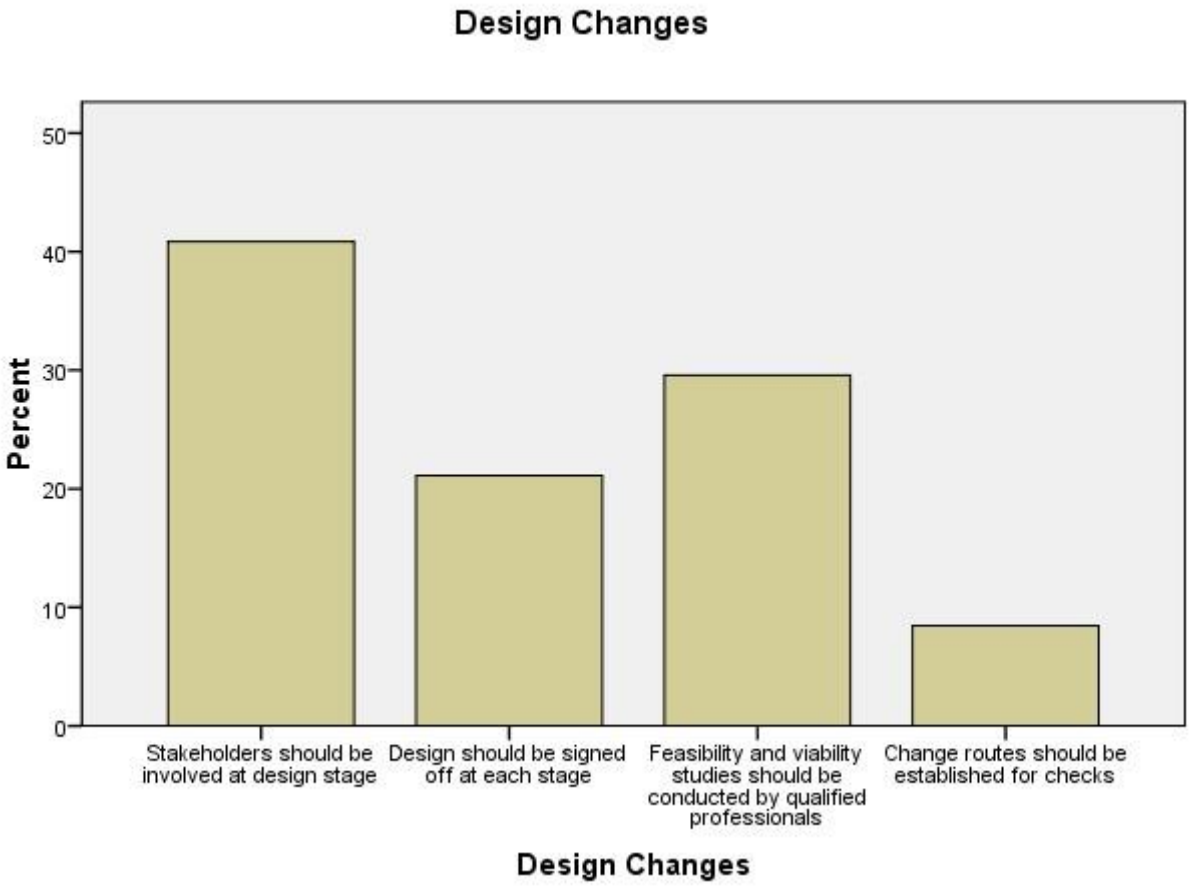

Fig. 4.9: Mitigating Measures for Design Changes

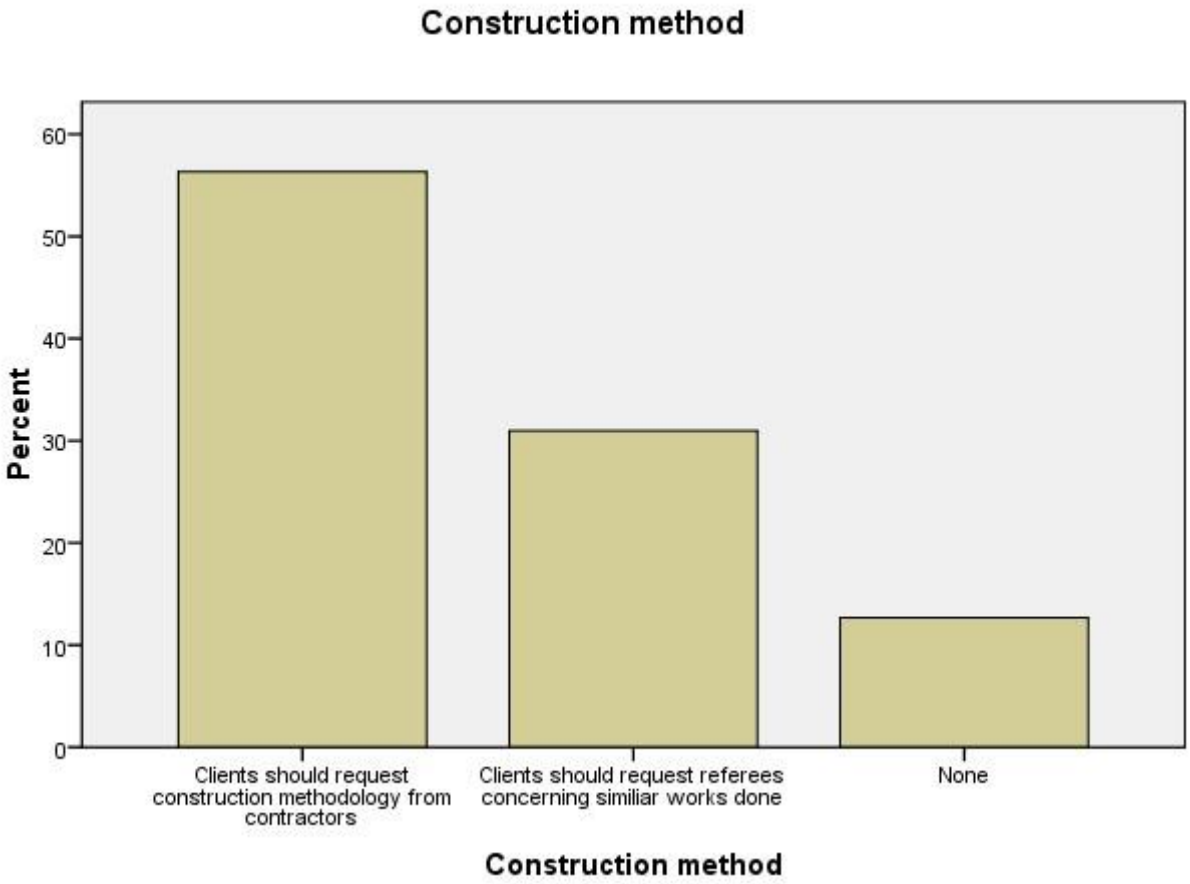

Fig. 4.9.1: Mitigating Measures for construction method

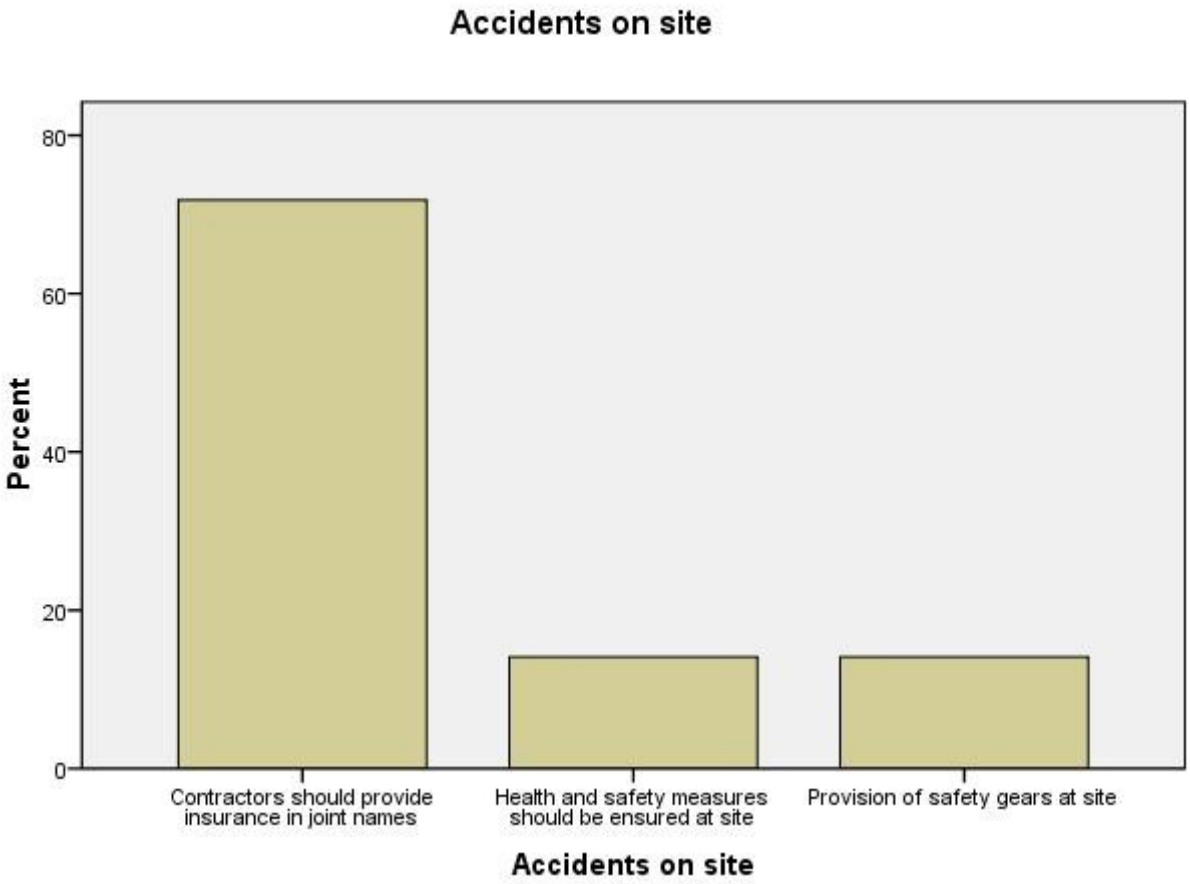

Fig. 4.9.2: Mitigating Measures for Accidents on site

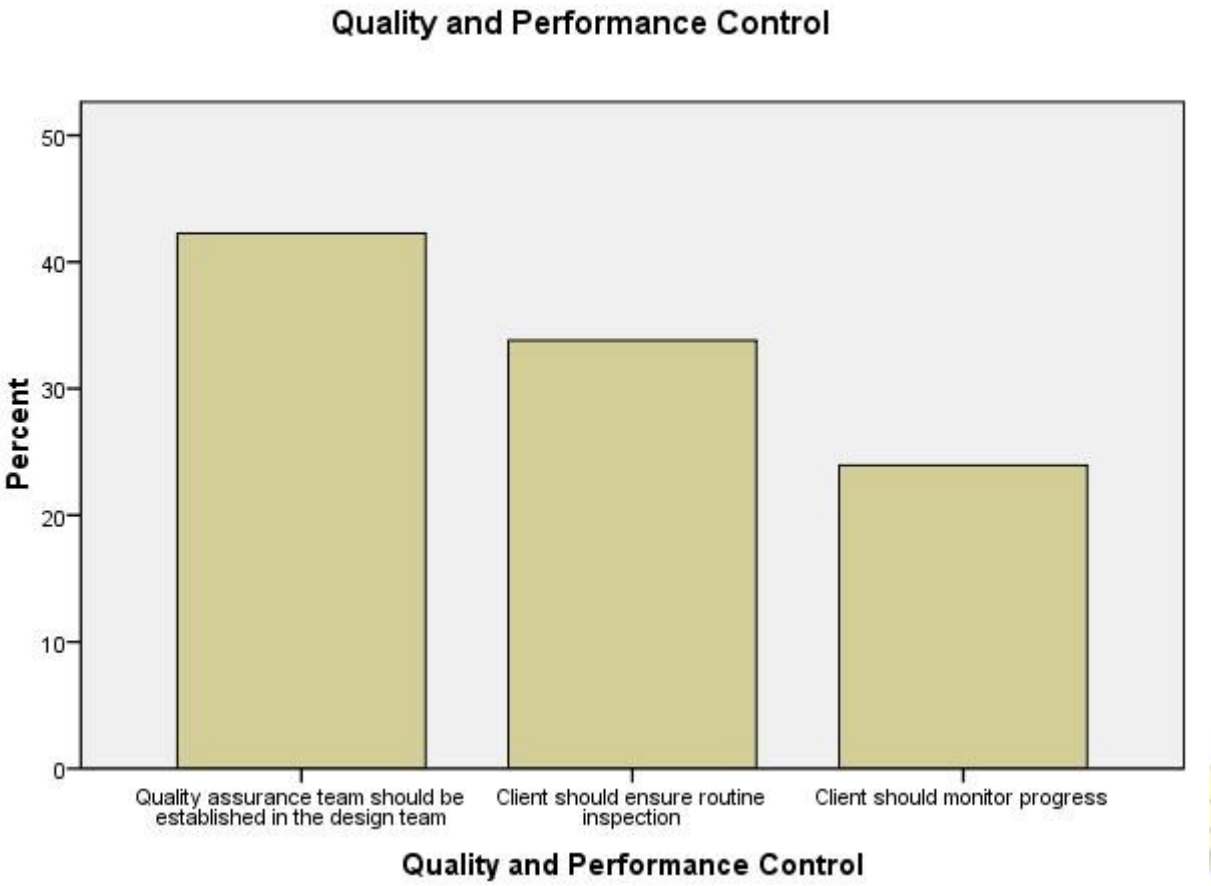

Fig. 4.9.3: Mitigating Measures for Quality and performance control

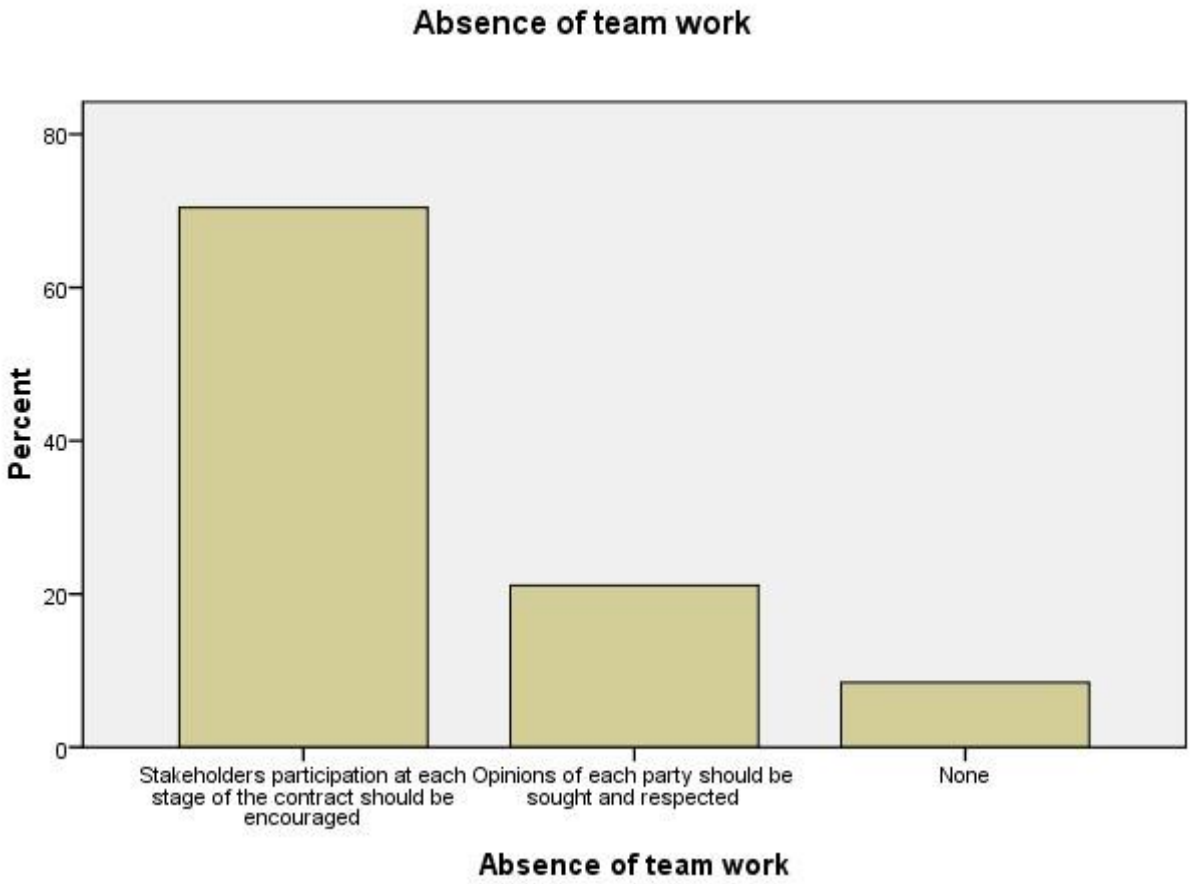

Fig. 4.9.4: Mitigating Measures for Absence of team work

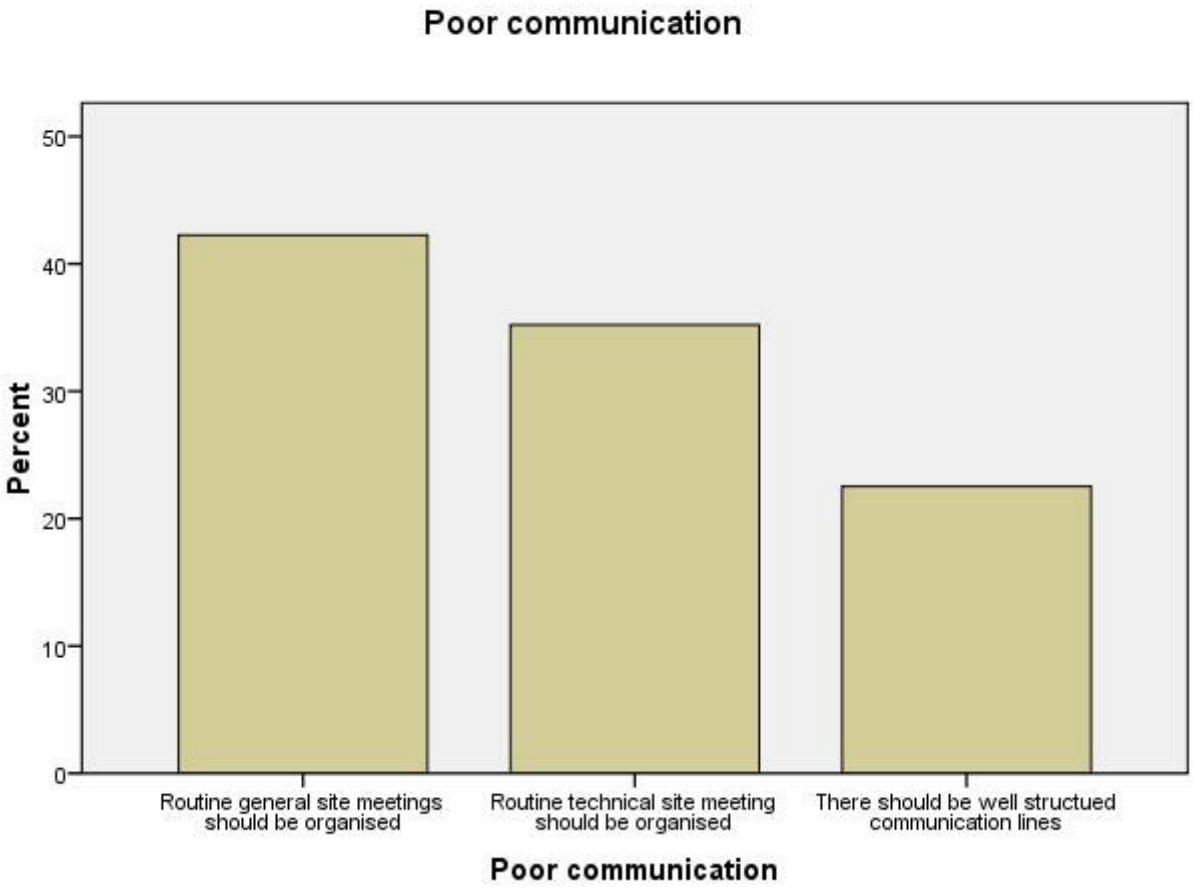

Fig. 4.9.5 :Mitigating Measures for Poor Communication **Table 2.4: Specific Risk Factors**

RISK CATEGORY	RISK FACTORS
Construction	Land acquisition
	Shortage of equipment
	Shortage of material
	Late deliveries of material
	Poor quality of workmanship
	Site safety
	Insolvency of subcontractors
	Inadequate planning
	Weather
	Insolvency of suppliers
Politics & Contract Provision	Change in law and regulation
	Delay in project approval and permit
	Inconsistencies in government policies
	Excessive contract variation
	Poor supervision
	Bureaucracy
	Compliance with Government
Finance	Delay in payment for claim
	Cash flow difficulties
	Lack of financial resources
Design	Improper design
	Change of scope
Environmental	Pollution
	Ecological damage
	Compliance with law and regulation for environment issue

Source: Karim et al (2012)

Table 4.3 Rating Seven Major Risks

No	Risk Description	Score							Weighting	Relative Importance Index	Position
		1	2	3	4	5	6	7			
1	Financial Risk	3	2	3	12	15	17	19	370	0.74	1st

2	Management Risk	10	12	12	10	11	7	9	270	0.54	5th
3	Market Risk	5	3	6	12	13	15	17	351	0.71	2nd
4	Technical Risk	7	12	9	10	11	10	12	297	0.60	4th
5	Legal Risk	16	21	18	6	9	1		187	0.38	7th
6	Political Risk	5	10	9	9	12	12	14	318	0.63	3rd
7	Environmental Risk	15	19	16	10	9	2		198	0.4	6th

Source: Field Work

Table 4.4: Ranking Risk Break Down Structure for Financial Risk

No	**Risk Description**	**Scores**					**Weighting**	**Relative Importance Index**	**Position**
		1	**2**	**3**	**4**	**5**	**∑W**		
1	**Delayed Payment**		**3**	**5**	**15**	**48**	**321**	**0.9**	**1st**
2	**Fluctuation of**	**3**	**4**	**6**	**19**	**39**	**300**	**0.85**	**2nd**
	inflation rate								
3	**Cash Flow Difficulties**	**5**	**12**	**20**	**19**	**15**	**240**	**0.67**	**3rd**
4	**Fluctuation of exchange rate**	**14**	**19**	**18**	**14**	**6**	**206**	**0.58**	**5th**
5	**Fluctuation in interest rate**	**9**	**7**	**30**	**17**	**8**	**221**	**0.62**	**4th**

Source: Field Survey

Table 4.6Ranking Risk Break down Structure for Political Risk

No	Risk Description	Score					Weighting	Relative Importance Index	Position
		1	2	3	4	5	∑W		
1	Change of government	38	26	4	3		114	0.32	5th
2	Bureaucracy	7	12	11	16	25	253	0.71	2nd
3	Corruption	9	22	18	13	9	204	0.57	3rd
4	Change of government policy	25	26	14	6		143	0.40	4th
5	Delay in approvals	3	4	10	25	29	286	0.81	1st

Source: Field Survey

Table 4.7 Ranking for Technical Risk

No	**Risk Description**	**Score**					**Weighting**	**Relative Importance Index**	**Position**
		1	2	3	4	5	∑W		
1	Shortage of skill labour	15	16	27	11	2	182	0.51	4th

2	Construction Method	2	12	18	26	13	249	0.70	2nd
3	Unknown site conditions	20	22	23	5	1	158	0.44	5th
4	Design Changes	2	11	17	24	17	256	0.72	1st
5	Accidents on site	8	20	26	13	4	198	0.55	3rd

Source: Field Survey.

Table 4.8.1 Fifteen Most Frequently Occurred Risk

No	Description
1	**Delayed Payment**
2	**Fluctuation of inflation rate and**
3	**Cash Flow Difficulties**
4	**increase in the cost of materials**
5	**Increase in the cost of labour**
6	**Labour strikes**
7	**Delay in approvals**
8	**Bureaucracy**
9	**Corruption**
10	**Design Changes**
11	**Construction Method**
12	**Accidents on site**
13	**Quality and Performance Control**
14	**Absence of team work**
15	**Poor communication**

Source: Field Survey

Table 4.9 .Respondents' Agreement on Risk Sharing Principles

Item	Sharing Principles	Yes	No	% of Yes	% of No
1	Risks belong with those parties who are best able to evaluate, control, bear the cost, and benefit from, the assumption of risks.	71		100	
2	Every risk has an associated and unavoidable cost which must be assumed somewhere in the process	45	26	63	37
3	Many risks and liabilities are best shared	51	20	71	28
4	Each project should be assessed individually to determine, for each risk, the allocation considerations that will ultimately reduce the project‟s total cost of risk.	62	9	87	13
		Yes	No	**% of Yes**	**% of No**
5	If none of the parties cannot assess or control the risk, the party who can bears it easier or procure the insurance from market should bear it.	53	18	**75**	**25**

Source: Field Survey

Table 4.9.1 Assessment Model on Risk Controlling Abilities

Item	Assessment Model on Risk Controlling Ability	Yes	No	% of Yes	% of No
1	Risk should be allocated to the party who has great influencing ability of a particular risk when it occurs.	**60**	**11**	**85**	**15**

2	The party who is more capable of dealing with the risk and evaluating probability of occurrence for such risk, as well as information channel on degree of influence should inherit the risk	**50**	**21**	**70**	**30**
3	the party that is more capable of handling the risk in most economical and effect way via existing system, relevant resources possessed and is able provide professional technique should inherit the risk.	**55**	**16**	**77**	**23**

Source: Field Survey

Table 4.9.2 Allocation for 1st Fifteen Risk Breakdown Structures

No	Description	**Risk Distribution**			**%Risk Distribution**			**Risk owner**
		Client	**Contractor**	**Shared**	Client	Contractor	Shared	
1	Delayed Payment	**60**		**11**	**85**		**15**	**Client**
2	Fluctuation of inflation rate	**58**	**6**	**7**	**82**	**8**	**10**	**Client**
3	Cash Flow Difficulties	**8**	**8**	**55**	**11.5**	**11.5**	**77**	**Shared**
4	increase in the cost of materials	**15**	**14**	**42**	**21**	**20**	**59**	**Shared**
5	Increase in the cost of labour	**15**	**13**	**45**	**21**	**18.5**	**60.5**	**Shared**
6	Labour strikes	**14**	**11**	**45**	**22**	**15**	**63**	**shared**
7	Delay in approvals	**61**		**10**	**85**		**15**	**Client**
8	Bureaucracy	**62**		**9**	**87**		**13**	**Client**
9	Corruption	**15**	8	48	**21**	**11**	**68**	**Shared**
10	Design Changes	**64**	**7**		**90**	**10**		**Client**

11	Construction Method	**5**	**55**	**11**	**8**	**77**	**15**	**Contractor**
12	Accidents on site	**11**	**50**	**10**	**16**	**70**	**14**	**Contractor**
13	Quality and Performance Control	**55**	**5**	**11**	**77**	**7**	**16**	**Client**
14	Absence of team work	**14**	**8**	**49**	**20**	**11**	**69**	**Shared**
15	Poor communication	**13**	**8**	**50**	**18**	**12**	**70**	**Shared**

Source: Field Survey

Table 4.9.3 Risk Mitigating Measures

No	Description	Mitigating Measures
1	**Delayed Payment**	•Contractors should submit their cash flow to clients to aid clients‟ investments maturity dates. •A clause in the condition of contract to allow contractors to find out clients‟ availability of funds before signing contracts. •A clause to force clients to pay interest on delayed payments. •Contractors should prompt clients of their cash flow pattern.
2	**Fluctuation of inflation rate**	•Formula for paying fluctuations should be inserted in the conditions of contract. •Hedge prices of major components involved in the contract. •Clause to force contractors to purchase and keep major materials in the contract early and keep at store •Clients should pay for on-site materials

3	**Cash Flow Difficulties**	•Clients should pay mobilization to contractors •Prompt payments of interim certificates •Clause in the condition of contract for clients to check the truthfulness of credit lines submitted. •Clients should support contractors for securing loans from financial institution using the work executed by the contractor as a guarantee •Client should divide contract into phases and start each phase as and when funds are available.
4	**Increase in the cost of materials**	•Making early order and payment of major components in construction •Hedging the prices of major construction materials •Encourage the use of indigenous materials •Contractors are to submit their basic price list to the client to aid payment of cost variance in materials
5	**Increase in the cost of labour**	•Contractors are to submit their basic price list to the client to aid payment of cost variance in labour. •Clause in the condition of contract for client to pay variation
6	**Labour strikes**	•Extension of time clause in the conditions of contract
7	**Delay in approvals**	•Post Review should be encouraged •Tender review committees should fast truck approval process. •Procurement entities should do follow ups and give reminders.
8	**Bureaucracy**	•Some of the processes should be integrated. •All stakeholders associated with the construction process should be invited to site meeting.
9	**Corruption**	•Contractors should desist from giving bribes. •Government to implement the asset declaration bill. •Wealth of professionals in the construction in the industry

		should be monitored. •Clients should engage an independent institution to monitor and punish anyone who gives or receives anything in the form of bribe.
10	**Design Changes**	•Stakeholders should be involved at design stage •Design should be signed off at each stage •Feasibility and viability studies should be conducted by qualified professionals •Change routes should be established for checks
11	**Construction Method**	•Clients should request construction methodology from contractors. •Clients should request referees concerning similar works done
12	**Accidents on site**	•Contractors should provide insurance in joint names •Health and safety measures should be ensured at site • Provision of safety gears at site
13	**Quality and Performance Control**	• Quality assurance team should be established in the design team. •Client should ensure routine inspection •Client should monitor progress
14	**Absence of team work**	•Stakeholders participation at each stage of the contract should be encouraged. • Opinions of each party should be sorted and respected
15	**Poor communication**	• Routine general site meeting should be organised. •Routine technical site meeting should be organized. •There should be well structured communication lines.

Source: Field work