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**A Study on Construction Contract Risk Management
Practices in Ethiopian Building Construction Projects**

A Thesis submitted to School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements of the Degree of Master of Science in Civil Engineering (Construction Technology and Management)

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Certification

The undersigned certify that he has read and hereby recommends for acceptance by Addis Ababa University Institute of Technology a dissertation entitled: **A Study on Construction Contract Risk Management Practices in Ethiopian Building Construction Projects**, in fulfillment of the requirements for the degree of Master of Science in Civil Engineering (Construction Technology and Management)

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Declaration

I, Addis Mesfin, declare that this thesis is my own original work and that it has not been presented and will not be presented to other university for a similar or any other degree award.

.....
Addis Mesfin

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Abstract

This research deals with the study of construction contract risk management practices in Ethiopian building construction projects. The objectives of the research were to identify the level of use of construction contract risk management techniques in Ethiopian building projects, to test the level of awareness of different contractual parties involved in Ethiopian building construction projects and to study the effect of different areas and causes of risk in meeting project objectives.

Different literatures were assessed to show that risk management is a very important management process that helps in making projects successful. Questionnaire survey was performed on different randomly selected building construction companies in Ethiopia to observe their awareness and how they deal with risks in their projects.

The research finding indicated that most of the parties involved in the Ethiopian building construction projects have heard of the concept of risk management but lack adequate knowledge about the principles of the risk management. The common excuse given for not incorporating risk management techniques in projects was lack of awareness about their significance. The methods used to deal with risk in the Ethiopian building construction projects were found to be highly dependent on individual's judgment and past experience. Poor contract management was found to be one of the major causes of risk which has a high probability of occurrence and a high level of impact on project objectives. It was also observed that most building constructions in Ethiopia are not completed in conformity to their original plan, i.e. they usually sustain delay, cost overrun or quality problems. Majority of the parties involved in Ethiopian building construction projects believe that the effect of risk on project objectives can be greatly minimized if construction contract risk management techniques are used.

Keywords: Building, Construction, Risk, Contract, Management, Project and Objectives.

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Abbreviations

BOT.....	Build Operate Transfer
CA.....	Consulting Architects
CAE.....	Consulting Architects and Engineers
CDM.....	Construction, Design and Management
CE.....	Consulting Engineers
CPMS.....	Campbell Project Management Services
DB.....	Design Build
DBB.....	Design Bid Build
EBCS.....	Ethiopian Building Code of Standards
EPC.....	Engineering Procurement construction
FIDIC.....	International Federation of Consulting Engineers
IMCA.....	International Marine Contractors Association
MoWUD	Ministry of Works and Urban Development
PMBok.....	Project Management Body of Knowledge
PMC.....	Project Management Consultants
PPA.....	Public Procurement Agency
RAMP.....	Risk Analysis and management of projects
TOR.....	Term of reference

1. INTRODUCTION

1.1 Research background

Risk is commonly defined as the possibility of loss, injury, disadvantages or destruction. Risk arises when uncertainty has the potential to affect objectives. The Association of Project Management (2004) defined risk as “Any uncertain event or set of circumstances that, should it occur, would have an effect on one or more objectives”. According to the literatures reviewed, risk has significant impact on a performance of any construction project i.e. it is an uncertainty that significantly affects project objectives. Some of the risks involved in construction projects are force majeure, differing site conditions, delays and extension of time, liquidated and consequential damages, occupational health and safety of workers and unexpected termination or suspension of work. If the construction contract does not contain some provisions to deal with these risks, they will lead to claims and disputes which would cause further delay and cost.

Risk management is a very important management process which helps to achieve projects’ objectives. It helps to gain a greater awareness and understanding of the types and nature of risks inherent in the project, and the likelihood of their occurrence. It also helps to assess the potential impact of the risks on the viability of the project and contract and to determine how best to eliminate or control the risks.

Previous researches similar to this show that the main causes of delay and cost overrun in building construction is improper project management and claim administration. Due to unforeseen incidences and contract management problems, building projects sometimes face many kinds of claims. According to Liu Yi (2009), during the execution of the contract, sometimes claims might show up due to different factors. Some of the factors are Ambiguities in the contract document: like inaccurate design information and incomplete tender information; inadequate contract

administration: Capacity and willingness of parties to administer the contract such as slow decision making, irresponsibility of the contract administration parties and changed circumstances like inadequate site investigations, uncontrollable external events and unclear risk allocation, etc. Abdissa Dessa (2003) puts unclear and unfair risk management as one of the root causes of claims and disputes in construction.

According to the parties involved in Ethiopian building construction projects, most projects are not completed in conformity to the original plan i.e. they face various problems and changes that lead to delay, cost overrun or lower quality. The risks involved throughout the life of a building project might be causes for variations in project objectives if they are not managed well. According to Francis K. Adams, (2008), risk management in the contractual stage can especially be very important in preventing the effect of risk on project objectives. There are different risk management techniques used in different stages of the construction in the outside world; Risk management in the contractual stage, i.e. before signing the contract is used very frequently. If risks are identified and allocated to the contracting parties in the contract document, it makes dealing with the risks if and when they arise very easy. A construction contract risk management approach that uses a team of experienced construction professionals or experts will lead to better achievement of project objectives.

This research presumes lack of preparation for the different situations that might arise during the construction process and lack of awareness of the parties about the significance of risk management are some of the major causes for most building projects failing to meet their objectives. This thesis tries to study the effect of lack of risk management on the Ethiopian building construction projects and aims to identify the level of use of risk management especially in the contractual stage and its significant role in meeting project objectives.

1.2 Objectives of the research

This research assumes there is a probability of increasing the chance of achieving project objectives by designing the contract carefully and using proper contract risk management techniques. The research tries to show the practice of Ethiopian building construction projects related to using different risk management techniques to achieve project objectives and it also tries to create the right awareness about the significance of risk management especially in the contractual stage.

The general objective of this research is to study the practice of using construction contract risk management techniques in Ethiopian building projects and to emphasize the importance of such practice in achieving project objectives.

The specific objectives are:

1. To identify the level of use of construction contract risk management techniques in Ethiopian building projects
2. To test the level of awareness of different contractual parties involved in Ethiopian building construction projects about construction contract risk management principles
3. To study the effect of applying contractual risk management techniques in meeting project objectives

The last objective was modified since it was not believed to be fully achieved by the research. Hence the new specific objective is:

- ✓ To study the effect of different areas and causes of risk in meeting project objectives.

1.3 Significance of the research

The research findings may help parties involved in construction to improve their risk management strategies. Some of the claims and disputes that arise during and after construction can be avoided by improving risk management, e.g. if the contract

contains specific provisions for evaluating change order costs, it will be easy to negotiate payment for change orders and claim settlement later. This research is significant in helping alleviate some of the problems facing the construction industry by enlightening the parties involved in the construction industry about risk management starting from the contractual stage and in turn making the projects achieve their objectives effectively and efficiently.

1.4 Scope and limitation of the research

The scope of the research is limited to the study of risk management in Ethiopian building projects. Hence, the research involved contractors and consultants only that undertakes building construction projects.

There are only a few researches done on risk management in Ethiopia, hence the research only reviewed these few theses done on the subject. It took a very long time to collect all the data necessary for the research since most of the managers working in building construction companies were not willing to return the questionnaire on the set date claiming they were very busy.

1.5 Organization of the research

This thesis contains five chapters as described below;

- Chapter one is an introductory part containing discussions on background, research problems, aim and objective of the research, significance of the research, scope and limitation of the research and organization or layout of the research.
- Chapter Two presents literature review with general descriptions by different researchers on construction, contract, risk and risk management.
- Chapter Three discusses about research design and methodology
- Chapter Four presents results and discussion of the research findings.
- Chapter Five contains conclusions and recommendations based on what is discussed in the previous chapters.

2 LITERATURE REVIEW

2.1 Introduction

This chapter presents the findings from different reviewed literatures on the subjects of construction, project delivery systems, contract, risk and risk management. The risk facing any project depends on the type and methods of construction, the stage of construction, the type of contract and delivery system and project type and complexity etc. similarly the risk management technique that should be applied also depends on the above factors. Hence, the literature review tried to highlight these issues in relation to risk with the main focus being on management of construction risk starting from the contractual stage.

2.2 Building construction projects

A construction in simple words is a process of constructing something by human for one purpose or another. It may be a road, bridge, a dam, a private residence, an airport, a commercial building, etc. According to Wikipedia, construction is a process that consists of the building or assembling of infrastructure. Construction is the recruitment and utilization of capital, specialized personnel, materials, and equipment on a specific site in accordance with drawings, specifications, and contract documents prepared to serve the purposes of a client. According to Moavenzdadeh F. (1976), construction contributes to the economic development of any country by satisfying some of the basic objectives of development including output generation, employment creation and income generation and re distribution; it also plays a major role in satisfying basic physical and social needs, including the production of shelter, infrastructure and consumer goods.

Wikipedia, the free encyclopedia, defines building construction as the process of adding structure with walls to real property or construction of buildings. It further discusses that if this buildings are not designed and constructed by professionals they

might lead to undesirable results such as structural collapse, cost overrun and disputes.

A project is a temporary endeavor undertaken to create a unique product, service or result (Project Management institute, 2008). According to Hillson D., (2009), all projects are risky and there are three separate reasons for that. The first reason is that all projects share common characteristics which inevitably introduce uncertainty. Some of this common characteristics are projects are unique, complex, involve assumptions and constraints, performed by people and involve change from a known present to an unknown future. The second reason is that all projects are undertaken to achieve some specific objectives. The final reason is that all projects are affected by the external environment they exist in.

A building construction project, like any other project, also faces different risks throughout the life of the project. According to Nafishah B., (2006), this is due to the uniqueness of every project, the uncertainties introduced by the project stakeholders, statutory or regulatory protocols and other intrinsic and extrinsic constraints. He further discusses that risk can constrain the achievement of key project objectives, time, cost and quality. Inability to achieve the project objectives has great consequence on all project stakeholders involved in the construction. For the client it could mean extra cost and less return on investment, for the consultants it could result in loss of confidence placed in them by the clients, for the contractor it could mean loss of profit and bad reputation etc.

The construction industry is a very important part of any country. It highly contributes to the growth and development of the economy in developing countries like Ethiopia (JillWells. 2001; Moavenzdadeh F. 1976). According to these studies, the construction industry plays a major role in developing countries since it constitutes a significant portion of Gross national product and employment; at least three-quarters of the world's construction workers are in the less developed countries.

The studies also state that construction workers in the less developed countries are more exposed to accidents and endure much poorer terms and conditions of work than workers in the developed countries. According to the general labor office meeting report, Geneva, JillWells, 2001, the construction industry has a poor report image due to poor construction and inadequate inspection. The report says this poor image is directly a result of the nature of the work which is difficult and dangerous.

Construction is a major component of investment; hence expansion in construction activity is closely related to economic growth. Numerous studies have shown that construction output grows particularly fast, often exceeding the rate of growth of the economy as a whole, as countries put their basic infrastructure in place during the early stages of development. This implies that construction plays a major role in improving the economic growth of a country.

Despite improvements in the project risk management practices across the developed countries construction industry, in the developing countries construction projects are still suffering from ill defined scope, design and mismanagement. And as a result, the projects are accompanied by clear time, cost and quality gaps (Monvenzadeh F., et al, 1976; Jill Wells, 2001)

Risk is unavoidable in almost all construction projects. Because of exposure to the outdoors, construction is affected by both daily and seasonal weather variations. It is also often influenced significantly by the availability of local construction financing, labor, materials, and equipment etc. These and all the above mentioned factors make construction a very risky undertaking. Construction is especially important in developing countries since it can greatly contribute to the economic growth but as mentioned above the industry is faced with a lot of problems. Hence, to make the construction effective and efficient there should be some way to manage and control the risks and minimize the problems. According to Hillson D., (2009), since all projects are exposed to risk, successful projects are the ones where that risk is properly managed.

2.3 Construction in Ethiopia

Ethiopia is a country located in the Horn of Africa. It is a large country with an area of 1.13 million square kilometers. Ethiopia is home to a large population of inhabitants, according to a report by self help Africa, 2013, these amounts to about 91 million. The average number of inhabitants per km² can be estimated to be around 80 people. According to Alem T. (1999), the majority of the Ethiopian population lives in the rural areas of the country and only a few live in the urban areas.

From the above statements it can be observed that the construction industry is only confined within a small portion of the country since majority of construction is undertaken in urban areas. The rural area, where majority of the population live, is uncivilized, i.e. there are only small traditional constructions used for habitation of people and cattle and in few places there are small scale school and health center constructions. According to Abraham A., 2007 and Kassim S., 2008, the construction industry is the most important enabler for the overall development specifically for least developing countries like Ethiopia. They also state that the construction industry is among the leading industries in producing employment and it contributes to the national development of any country.

The above discussion is trying to show that construction is very important for countries like Ethiopia. As mentioned earlier, any construction project involves risk and the impact it causes can be very critical in developing countries like Ethiopia. According to Hillson D. (2009), the most important thing that can be done in projects is make sure that the inevitable risk associated with every project is at a level which is acceptable by the organization and is effectively managed. This statement implies that different organizations have different risk acceptance levels and Ethiopia as a country or the organizations involved in construction can only afford to accept small levels of risk due to their low capital. This implies risk management is especially important in developing countries to avoid loss and make the projects more successful.

The Ethiopian construction industry consists of different types and size of firms.

These operate in the different sub-markets characterizing the construction industry. Construction firms must be registered and licensed by the Ministry of Works and Urban Development in order to undertake any construction work in Ethiopia. There are different requirements that need to be fulfilled by qualified professionals before getting a license to undertake construction projects.

The firms are classified according to size, expertise and financial capability by the Ministry of Works and Urban Development (MoWUD). The professional services sector consists of architects, civil engineers, electrical engineers, sanitary engineers, and mechanical engineers, quantity surveyors and surveyors who provided the design expertise. Construction firms are broadly classified based on trend of work as follows: General Contractors, Building Contractors, Road Contractors and Specialized Contractors. The first three categories are again divided into ten grades with different resource requirements. Consultancy firms are broadly classified as follows: CA – Consultancy Architects, CAE – Consultancy Architects and Engineers, HBC – Consultancy Highway and Bridge, CE – Consultancy Engineers and SC – Specialized Consultancy. All of the above consultancy firm categories are divided into six grades with different resource requirements.

Currently there are over 6000 contractors, out of which only 60 are grade one contractors. The number of consulting firms has reached 187 and among these, only 20 are grade one consultancy firms with CAE license. This number is very small compared to the total population of the country. As discussed earlier, construction is very important tool for development of any country and the number needs to increase to help achieve the desired development.

As mentioned above, the Ministry has placed the basic human and equipment requirements to attain different licenses with different grades i.e. only when these conditions are fulfilled can the people or companies be allowed to practice the profession. This is a good mechanism which is used to make sure the companies are qualified. These qualified firms can only participate in works according to their category and grade. This helps in creating a specialized team in different sectors and

creates an opportunity for all levels of work to be performed by professionals which are qualified for that type of work.

This division by category can lead to fragmentation and sometimes cause some problems. According to different researchers; (Getachew T. 2009, Abdissa D. 2003, Liu Y. 2009) there exists a great partition between the design consultants and the contractors which can be one of the causes for dispute in the construction process. This in turn can result in project delays and cost escalations due to claims. But they believe this can be prevented by preparing the contract document properly and by including sub clauses that deal with claims and dispute resolution mechanisms.

Another major problem facing the Ethiopian construction industry is shortage of construction materials. According to a research done (Alem T. 1999), this situation can in fact be improved if proper management and good quality control of materials were available.

The Great Rift Valley passes through Ethiopia; this makes some cities around the valley prone to earthquakes. Hence these cities are categorized as seismic zones. Hence, every building is designed considering the expected maximum earthquake loads. According to the Ethiopian Building Code of Standards (EBCS), comparisons between wind loads and earthquake loads are considered and every building is designed based on the worst condition. This good practice can be seen as a sort of risk management.

2.4 Project delivery systems

Project delivery system is the way project owners along with project regulators and financiers determine the assignment of responsibilities to project stakeholders along the construction process. It is often determined during the basic planning phase of the construction project. According to (Cristian P. et al, 2009; Zewdu T.), Project delivery systems describe how the project participants are organized to interact, transforming the owner's goals and objectives to finished facilities.

Generally, there are six types of Procurement and Contract Delivery systems. The party has to select the right type of delivery system which incurs the smallest risk for his/her project.

2.4.1 Force Account

When the project owners engage themselves to undertake the project, it is called a force account delivery system. According to Zewdu T, (2009)., often such a system is promoted if the Project Owners believe that there is a comparative advantage in Cost, Time and Quality issues. And when there is a lack of capacity from the private sector to undertake very large and technologically new projects, public companies do undertake such projects using Force account delivery systems.

This type of delivery system is often used when projects are small and places are remote such that reaching them is difficult and in general when they are not attractive enough to call the attention of Bidders.

2.4.2 Design-Bid-Build (D-B-B)

After the project owner prepares the basic plan that identifies construction project program, they call upon the participation of design/ supervision consultants. These consultants will carry out the design and the necessary tender documents which will be the basis for selecting contractors. Here the design and the construction are performed by two separate parties. Cristian P., et al, (2007), states that the most outstanding character of DBB, also called the traditional approach, is that the procedure of the project construction has to follow the order of Design Bid Build, i.e. only when the former has finished, the later can start.

According to Abreham A. (2007), this is the most practiced type of delivery system in the Construction Industry of Ethiopia. In this type of delivery system, projects are divided into different packages following each other. The design and supervision consultant will be the prime professional on behalf of the owner and plays the part of administrator of the construction contract but the employer might take the

responsibility of coordinating the various project packages if found necessary.

According to Cristian P., et al, (2007), the advantage of DBB is that the owner, contractor and consultant are clearly assigned their responsibilities and tasks. The disadvantage is, since the procedure is linear the lifetime is too long; Project owner would be responsible for risks associated with both the design and contract administration and usually there exists severe adversarial relations between the consultant and the contractor. Zewdu T, (2009) also agrees with this saying in DBB contract delivery system, the employer carries a lot of risk. The employer signs different contracts with the consultant and the contractor, hence is exposed to risks associated with both contracts.

2.4.3 Design-Build (D-B)

Design build delivery system is also known as “turnkey”. The term turnkey indicates that the system is delivered to the client ready for operations. The project is largely contractor managed and the cost and control of risk are weighed towards the contractor and away from the owner. (Cristian P., et al, 2007), in this type of contract delivery system, both the design and construction liability rests with the contractor. On the other side the owner’s ability to control the project is low.

According to Abraham A. (2007), Design Build or Turnkey in principle reduces numbers of procurement processes engaged in the fragmented process and employ only one procurement process and a single contractor to provide the entire Construction Implementation Process (Design and Construction Implementations). He further states that contractors’ tender cost is higher for DB than in the case for DBB delivery system in order to provide reasonable offer. The project is largely contractor managed and the cost of risk and control are weighted towards the contractor and away from the client. The increase in risk transferred onto the contractor will be counterbalanced by the increase in contract prices which can be taken to include these costs of risks.

According to Cristian P., et al, 2007, some of the disadvantages of this turnkey delivery system are; the owner's ability to control the project is low and the contract price is relatively high. The contractor carries a lot of risk in this type of delivery system and if these risks are not properly managed they can lead to bankruptcy of the company in addition to not achieving the project objectives.

2.4.4 Construction management

Under this type of delivery system, the owner contracts separately but concurrently with a design consultant and with a firm whose primary expertise is construction (construction management consultancy firm). The construction management consultancy firm is used to coordinate all activities from concept inception through acceptance of the facility. The construction management firms are not in charge of the construction, they just have to manage the construction. This system is suitable when the project is large scale and complex and when the owner doesn't have the ability to manage the project organization.

According to Cristian P., et al, 2007, one disadvantage of this system is the owner chooses a management contractor which means the owner has one more department to manage, which leads to an increase in overhead expenses.

This type of contract delivery system is relatively uncommon in the Ethiopian building construction industry (Getachew T. 2009). The clients find it difficult to pay the additional cost required for hiring the project management team. But this is a well established system which is found to be effective in achieving project objectives in the developed countries.

2.4.5 Finance / Build Operate Transfer (BOT)

BOT is a form of contract delivery system that promotes public private partnership in which a private company is contracted to finance, design, construct and operate for a certain period (usually 10 years) and transfer the facility for to the project owner (Cristian P, et al, 2007).

If the government doesn't have enough money for the construction of the project, they will try to attain investors from home and abroad to help with the project. The government grants a concession to investors to develop and operate the project for a given period of time known as the concession period and when this period ends the facility would be owned by the government. According to Abraham A. (2007), this requires that projects should first be viable for revenue generation in order to payback their debts.

The Operation period between completion and transfer gives the contractor an opportunity to verify the quality of the output of the services and works, and train the employer personnel on how to manage the facility afterwards. In some BOT contracts, defect liability period will be included in order to ensure the quality of the facility during transfer. According to Cristian P., et al, 2007, some of the advantages of BOT delivery system are: The government is released from financial burden; the government can avoid large numbers of project risks because investors/private parties share most of the risks. The disadvantage is during the concession period, the government will lose the right to control the project.

2.4.6 EPC – Engineering Procurement Construction

In this type of contract delivery system, the engineering and construction contractor will carry out the detailed engineering design of the project, procure all equipment and materials necessary, and then construct to deliver a functioning facility or asset to their clients (www.epcengineer.com). According to Cristian P. et al, this kind of delivery system is also known as turnkey project service to indicate the system is delivered to client ready for operation. The project is largely contractor managed, i.e. the contractor holds all of the responsibility and the risk involved is weighted towards the contractor and away from the owner.

Companies that deliver EPC projects are commonly known as EPC contractors. The contractor has to execute and deliver the project within an agreed time and budget. Hence as mentioned earlier the risk for schedule and budget is placed on the EPC

contractor. According to Cristian P. et al, 2007, one disadvantages of this delivery system is the owner's ability to control the project is low and to control this the client can sometimes hire Project Management Consultants(PMC) to ensure the EPC contractor is carrying out the agreed scope of work in accordance with the conditions of contract.

The first three types of delivery systems; force account, DBB and DB are mostly utilized in different building projects of Ethiopia. As mentioned above the construction management consultancy is relatively not common in Ethiopian construction industry. But there are some construction management firms which are taking part in different constructions of Ethiopia; Campbell project management services [Ethiopia] PLC (CPMS) can be taken as an example, which is a well established and growing business providing project management services in Ethiopia.

The EPC delivery system is used for large scale projects in Ethiopia. Some of these projects are; The Ethiopian government signed an EPC contract with an Indian company (Overseas Infrastructure Alliance) for the construction of Tendaho sugar factory and the expansion of Fincha and Wonji sugar factories on January 10, 2007 (Fitsum B., 2014). According to Yehualashet J., 2012, EPC turnkey contract was signed on September 3, 2009 between Ethiopian Railway Corporation and the EPC contractor, CREC, to undertake the Addis Ababa Light Rail transit Project. The hugest project yet, The Grand Ethiopian Renaissance Dam, was awarded to Salini Construttori using engineering Procurement and construction (EPC) contract in April 2011. The project owner, Ethiopian Electric Power Corporation (EEPCO), also previously commissioned Salini Construttori for the Gibe III hydroelectric project on a turnkey, Engineering Procurement Construction (EPC) bases in July, 2006. Since the focus of this research is on building construction projects, this delivery system was not included in the questionnaire.

The above basic project delivery systems are not independent but have close relationship with each other (Cristian P. et al, 2007). These project delivery system classifications help us to gain a good perspective of the rules involved in the project

construction, and allow us to find ways to complete the project with high efficiency. Choosing the right type of delivery system for a particular project can help achieve project objectives successfully. It can be observed that there are different risks involved for the stakeholders in the different types of delivery systems and hence the risk management technique utilized should consider these factors.

2.5 Construction Contract

2.5.1 Introduction

A construction contract is a contract specifically negotiated for the construction of an asset or a combination of assets that are closely interrelated or interdependent in terms of their design, technology and function or their ultimate purpose or use. Construction contracts are formulated in a number of ways for rendering services from consultants or contractors.

Since most of the time the owner cannot perform the actual construction of his project, he hires a contractor that will undertake the task. A contractual agreement is signed between the owner and the contractor stating all the responsibilities of both parties. According to Au T., et al, 1969, the contractor in addition to completing the project, should share some of the risks that might arise during construction. All parties involved in the project need to understand the risks they are accepting and how the contract is dealing with them. In addition to stating the rights and obligations of the different parties, the parties are also agreeing how the risks are to be allocated among them when they enter into any kind of contract.

According to Abraham A. 2007 and Zewdu T. 2009, various contract types might be utilized in construction projects depending on the type of delivery system. The forms of contract should suit to the selected project delivery system. Accordingly there are different types of contracts for the execution of civil engineering works.

2.5.2 Lump Sum Contract

In this type of contract, the contractor offers to do the whole work as shown in drawings and described by specifications, for a total stipulated sum of money. Lump sum contract are typically used for buildings. The qualities of the materials required can be calculated with sufficient accuracy during the bidding process to allow contractors to submit a single lump sum price for the work.

A lump sum contract is more suitable for works for which contractors have prior construction experience. The experience enables the contractors to submit a more realistic bid. The contractor carries some cost risk since it has to carry out the work it has agreed to with the fixed lump sum. This type of contract is not suitable for difficult foundations, excavations of uncertain character, and projects susceptible to unpredictable hazard and variations. In addition the contractor may jeopardize the end outcome of the project by trying to decrease costs in an attempt to increase its profit. On the other hand if there is an encounter of unexpected difficulties, the contractor carries the risk of making a loss instead of a profit.

Therefore this type of contract carries a lot of risk for the contractor and if used some means of managing this risk should also be incorporated in the contract document. Generally this type of contract is more suitable for fairly predictable, small and uncomplicated projects.

2.5.3 Unit Price or Bill of Quantity

In this type of contract, the contractor undertakes the execution of work on an item rate basis. The amount to be received by the contractor depends upon the quantities of various items of work actually executed. The payment to the contractor is made on the basis of detailed measurements of different items of work actually done by him.

Unit-price contracts are used for work where it is not possible to calculate the exact quantity of materials that will be required. Unit-price contracts are commonly used for heavy/highway work. Contractors submit a price for each item on a unit-price

contract. Unit prices are multiplied by the engineer's estimated quantities and totaled. The winner would be the firm with the lowest responsive total.

This type of contract involves small risk to the parties since the payment is according to the amount of work required and hence, it is mostly preferred by most parties involved in the Ethiopian building construction projects.

2.5.4 Lump sum and scheduled contract

This is similar to the lump sum contract but schedule of rates is also included in the contract agreement. In this type of contract, the contractor offers to do a particular work at a fixed sum within a specified time as per plans and detailed specifications. The rate for various items is also provided which regulates the extra amount to be paid or deducted for any additions or deletions made during the progress of work. Any extra items of work are required to be measured for payment. The original work shall however be checked and compared with the drawings and specifications.

2.5.5 Cost plus

Cost plus, also known as cost reimbursable, contracts are used in situations that make it difficult or impossible for either the owner or the contractor to predict their costs during the negotiation, bid, and award process.

Cost plus contracts take many forms, the most common being cost plus fixed fee and cost plus a percentage. Most owners prefer cost plus fixed fee because then the amount of profit the contractor will earn cannot increase, thereby removing any incentive for the contractor to increase the cost of the project in hopes of increasing his profit.

2.5.5.1 Cost plus Fixed Fee Contact

Cost plus fixed fee contract is desirable when the scope and nature of the work can at least be broadly defined. The amount of fee is determined as a lump sum from a

consideration of the scope of work, its approximate cost, nature of work, estimated time of construction, manpower and equipment requirements etc.

In order to negotiate such a type of contract, it is essential that the scope and some general details of the work are defined. The contractor's fee is fixed and does not fluctuate with actual cost of work. Once this fee is fixed, the contractor cannot increase the profit he earns from the project.

2.5.5.2 Cost plus Percentage of Cost Contract

In this type of contract, the contractor's fee is given by certain percentage of the actual cost of construction. The actual cost construction is reported by the contractor and the payment is made to him by the owner together with a certain percentage as agreed earlier. In this type of contract, the contractor has a tendency to increase the cost of work in order to earn more profit. This is the major disadvantage of this contract type.

Cost plus contract types are not mostly practiced in the Ethiopian building construction projects.

According to Zewdu T. 2009, three types of contracts are identified based on the method of pricing and payment. These are lump Sum contract, cost reimbursement contract and measurement contract.

In lump sum type of contract, some fixed amount of money is paid to the contractor to complete the project. The work of the consultant is minimized as he only supervises quality of work. It saves time because of less measurement activity and it is good for smaller projects.

In measurement type of contract, the contractor is paid based on how much work he executes. It is possible to vary the amount of work and pay the contractor for extra work.

In cost reimbursement type of contract, the contractor works with his money and when he is done, his money will be returned to him. It is suitable for rich contractors.

The contractor agrees to carry out certain activities and gets paid for how much of it he performs.

2.5.6 Contracts and risk

The construction contracts can help in allocating risks to the different parties involved in the project. The owner has the power to decide the type of contract to be used for a specific project; hence it is very important that he understands the terms of the contractual agreement and also identify the risks associated with the different types of contracts

In lump sum contracts the owner assigns almost all of the risk to the contractor. The contractor in return can ask a higher price in order to take care of unforeseen contingencies. If the actual cost of the project is under estimated, the contractors profit will decrease by the underestimated amount. An over estimate has an opposite effect but may reduce the chance of being the low bidder and winning the project.

According to Partnership Victoria guide, (2001) and Francis K. A., 2008, large numbers of contracts are completed under the lump sum/turnkey regime. This is mostly because the owner wants to know the budget and schedule at the start of the project and they don't want to have any role during construction. But as mentioned above this arrangement faces many problems if it is not well defined at the beginning. All the risks associated with the contract should be identified and different managing techniques incorporated before signing the contract to make the project successful.

Regardless of the type of contract selected by the owner, the contractor recognizes that the actual construction cost will never be identical to its own estimate because of imperfect information. The contractors' gross profit at a completion of a project is affected by the type of contract, the accuracy of its original estimate and the nature of work change orders. It is also common for the owner to place work change orders to modify the original scope of work for which the contractor will receive additional payments, the conditions of payment should be included in the contract documents to

avoid disputes. The contractor should place appropriate contract prices at the time of bidding or negotiation depending on the condition of the market and the different risks involved in the type of contract (Building Research Advisory board, 1978).

Most owners want quality construction with reasonable cost but not all are willing to share risks or provide incentives to enhance the quality of construction. As a result there are only a few responsible contractors responding to their invitation to submit bids or the bid prices submitted exceed their engineers estimate. And even if the initial bid prices are close to the engineer's estimate, claims and disputes on the contracts become frequent. This claims and disputes can easily be avoided by improving the contract provisions and incorporating clauses that deal with management of risk. According to building research advisory board, (1978), one of the most controversial issues in contract provisions concerns the payment for change orders. If the contract does not contain specific provisions on cost disclosures for evaluating change order costs, it will be difficult to negotiate payments and claim settlement later.

Delay can have cost consequences in most building contracts which can in turn disrupt the agreed cost estimates of the project. Considering time as a standalone risk, there are some circumstances in which an employer must achieve a particular end date. In such circumstances the contractor is taking an absolute time risk and can require additional cost provisions in the contract for taking the time risk. When we come to the situation in the Ethiopian building construction projects, according to Lui Y., (2009), most projects are completed past their due completion date, i.e. they face delay; and as stated above, this almost always leads to cost overrun.

Au T., et al, 1969, the language used for specifying the risk assignment must conform to legal requirements. Unfortunately, standard legal language for this purpose might be difficult to understand. Hence the parties may have difficulty interpreting their responsibilities. Parties to a contract should read and review all contract documents very carefully. Each of the different contracts should come with its own set of guidance notes and flowcharts which should aid understanding of the intent of the

drafted clauses. The guidance notes should give extra substance and intent as to how a clause should be understood and interpreted. The flowcharts then map out each of the main processes within each contract and demonstrate how it should operate and what to do next if a party has or has not carried out the next contractual action.

When selecting a contract document one should consider the allocation of risk each form of contract uses and should have an understanding of the commercial balance of a contract and the likely effect of its provisions on the end result and to match this to the parties' needs. Careful contract review is one of the most crucial steps in the risk management process. There is no substitute for reading each contract very carefully before signing it. Beyond the obvious problems of errors and inaccurate information that creep into negotiated contracts, careful review may reveal additional risks, improperly allocated risks, and other issues that might need clearing up before the signing of the contract.

2.6 Project contract lifecycle

Every project, not just those in the construction industry, goes through a series of identifiable phases, wherein it is 'born', it matures, it carries through to old age and it 'expires'. In the construction project life cycle we identify different phases each with different purposes and characteristics. It usually takes a long period of time from the contract formation till the construction end since it usually involves many processes. According to Hillson D., (2009), contract management must be carried out throughout the entire project life in different stages to achieve the intended project objectives.

Hillson D. 2009, argues that there is no universally accepted definition of a project lifecycle and different books and standards use different terminologies to divide the life of a project into different phases. He used three simple stages to structure the way in which risk management is used across the project lifecycle; these are before the project starts, when the project starts and after the project has started. The first stage includes conception, viability and initiation of the project. The second stage is the elapsed time between the decisions to initiate the project to the actual launch of the

project. The final stage is the project execution phase which is the application area of the project.

According to Cristian P. et al, 2009, the construction contract goes through two main phases which are the establishment of the contract and the implementation of the contract. The establishment of the contract includes bidding and contract negotiation and the implementation phase is from signing of the contract till the end of the contract. The bid period, which is the initial period of the construction contract, is from the preparation of the bid document to the bid opening. Contract negotiation starts when the tender is made and ends when the contract is signed. In this stage the owner and the contractor discuss the future of the contract and how they plan to complete it and finally sign the contract after reviewing all the provisions carefully. During the contract implementation phase, the contractors complete the construction work according to the contract agreement.

As an alternative to the above classifications, an applicable classification for stages of the construction lifecycle which is believed to contain all the stages is used for this research which include inception and feasibility stage; planning and design stage; tendering stage; construction stage; commissioning and acceptance stage and maintenance stage (Abraham A, 2007; Zewdu T, 2009 and Kasiem S., 2008 and Eskesen S. D., 2009).

2.6.1 Project lifecycle and risk

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

Some risks remain constant while other arise and diminish as projects progress. Improvements in project performance can be achieved by recognizing which risks

occur across the entire project life cycle and giving them due consideration. Within the project life cycle, optimal risk identification and assessment procedures and timing, as well as the identification of the most favorable decision points need to be outlined. Unfortunately, according to different researches done earlier, most project owners and contractors don't estimate the effects of risks throughout the entire projects lifecycle (CDM regulations, 2007).

For most projects, different participants or parties are responsible for and control the various phases of a projects' lifecycle. According to Walewski G., et al, (2003), structuring distinct phases and responsibilities can increase the risk by isolating the project participants in such a manner that minimal attention is given to the overall project i.e. individual project participants become concerned with only their own project risks and either willingly or unwillingly try to transfer these risks to other project participants.

2.7 Risk

Before discussing about risk management it would be better to understand what the terminology 'risk' means. Risk is associated with every aspect of our daily life, i.e. risk is involved in every step we take. According to the Oxford English Dictionary (2009), risk is a situation involving exposure to danger or the possibility that something unpleasant will happen.

Different literatures, professionals and standards define risk in their own way. But most of them confirm that the view towards risk is most of the time negative. Farlex, (2007) defines risk as a factor, thing, element, or course involving uncertain danger or a hazard. Risk is also defined by other scholars as the probability that unfavorable outcome will occur. According to (Nasir et al., 2003), risk is "the probability of occurrence of some uncertain, unpredictable and even undesirable event(s) that would change the prospects for the profitability on a given investment". According to (Suleman A.B., 2007), risk in relation to construction is defined as "a consideration in the process of a construction Project whose variation results in uncertainty in the final

cost, duration and quality of the project".

Risk is a chance of an event occurring which would cause actual project circumstances to differ from those assumed when forecasting project benefits and costs (Partnership Victoria guidance material, 2001). Risk decreases the chance of meeting project objectives which in turn minimizes the overall project benefits i.e. risk has a direct impact on project objectives. (Walewski J. et al, 2003) states that in the construction industry, risk is often referred to as the presence of potential or actual treats or opportunities that influence the objectives of a project during construction, commissioning or at the time of use. And he also defined risk as the exposure to the chance of occurrences of events adversely or favorably affecting project objectives as a consequence of uncertainty. According to Hillson D, (2009), risk is defined as an uncertainty that matters. This uncertainties that matter could include threats or adverse conditions which have negative effects on achievement of objectives and opportunities which if they were to occur would be helpful towards achieving the goal or objective of the project.

Regardless of the continuing debate among risk management practitioners about the definition of risk; there exist several attempts from different professional bodies and standard institutions to propose a definition of risk that capture broad acceptance. However there is no one official definition for risk. But it was discovered most standards use the word risk in its negative sense to mean, chance of bad consequences, or exposure to mischance and some standards like the UK define risk as an uncertain event or set of circumstances which, should it occur, will have an effect on achievement of objectives. Since the effect is not specified it could mean either negative or positive and taking this into consideration risk has been defined by PMBoK[®], (2008), as an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more of the project's objectives.

Risk events are expected to take place in the future; hence they are events that have not yet happened. This makes the measurement of their probability of occurrence

very difficult and hence assessment of the probability would be influenced by different factors which need to be taken into consideration. According to (Simu K.,2006) Risk is defined as something that occurs and which was neither foreseen in the project description nor in the contract, often being caused by lack of knowledge with one or many of the parties involved.

Risk has long been recognized in the construction industry. Contractors are required to accept a certain level of risk due to unforeseen costs that they incur during construction. Risk is also an issue for clients. This risk can be minimized by including contingency sum in the contract document. This contingency sum is used when and if the unexpected occurs. According to Stephen M. et. al (2000), the contingency amount allowed is only some percentage of the overall cost.

Francis K., (2008), states most contractors tend to resort to the addition of a single arbitrary percentage cost contingency to give their overall impression of the total risk rather than assessing the risks that they are asked to carry. These kinds of decisions are based on the individual's perception and judgment and hence appropriate analytical methods for construction contract risks are needed to enhance risk management efficiency.

One of the major problems in evaluating the risk of a project is the identification of the full range of risks to which the project could be subjected to. The identification process is especially difficult because what is considered risk is influenced by the person's perception. Therefore in order to reduce the effect of these individual perceptions, multiple experts on risk management should be involved in the contract design stage. A better result of managing risk can be obtained if a risk management is involved starting from the contractual stage and work throughout the life of the project (Hillson D., 2009).

Risk should be fully understood by all the contracting parties; otherwise it might cause many problems to all involved. The effect of poor understanding is that the contractual parties might adapt risks they don't understand and be subject to different

problems and bankruptcy.

According to the (CDM guideline, 2007), there are three categories of risk. These are

1. Not likely to be obvious to the contractor: The contractor, at the pricing stage, may not appreciate some of the less obvious risks, such as: interim stability; sequencing major plant installation with construction/demolition; structural issues associated with working around existing foundations; use of sealants or other materials with a health risk; departures from standard details or practice; fragile roofs etc...

2. Unusual: These may be 'common' risks but occurring in unusual circumstances or because of the nature of the construction or site, including: structural stability attained through diaphragm action or dependence on existing structures; contamination; industrial effluent; use of building; unstable ground etc...

3. Difficult to manage: These may be common risks but be in awkward situations, such as: working at height; 'health' and 'safety' issues in existing/old buildings; confined spaces; lack of space for erection of standard scaffolding; proximity of gas mains or they may relate to the nature of the risk, for example injury to the public.

(Cristian P., et al, 2009) describes risk in an equation form: Risk = (Probability of Event) (Consequences of Event). This implies that risk is measured in terms of the probability of the risk occurrence and the level of impact of its occurrence. The research identified various sources of risk in construction projects, the most significant risk source being the vagueness of contract conditions about risk allocation.

Vagueness of contract conditions about risk allocation

Contract conditions represent the legal reference showing the relation between the contract parties. Risk associated with construction projects should clearly be allocated to the responsible party through the contract conditions. The absence of understanding of risk accountability between the parties will result in negligence of risk events which leads to parties assuming the risk event and its consequence may be

out of their responsibility coverage.

When the contract conditions related to risk allocation are vague and not clearly defined several problems might be encountered. If any conflict is faced and the contract conditions does not address how to resolve the conflict then it may lead to endless disputes.

Contract conditions should not be subject to interpretation and they should be understood by all parties and they should clearly state how risk should be managed.

Undefined quality requirements

Quality is an important issue in building construction projects. The objective of any construction project is to finish the construction within the estimated budget, time and according to the quality requirements. Poor quality of work leads to loss of money and time. The owner has the right to ask for rework when the executed job is not complying with the agreed quality standards. But if the required quality standards are not clearly defined in the contract, the client might overstate the quality requirement which will create problems with the contractor.

Low percentage of the advance payment

The advance payment which is the payment provided by the owner to help out the contractor manage his obligations towards the contracts is very important to the contractor as it will provide a cash to start the project with. Typically on a construction project, an advance payment will be provided by the client if the contractor requests it to meet significant start up costs incurred before construction begins. Usually the advance payment represents a percentage from the total amount of the contract, usually 15 to 20% depending on the nature of the work. An advance payment provides the contractor with working capital at the start of the contract in order to commence the work. In order to protect the client/ employer against the risk of the contractor failing to repay the amount, advance payment should only be made against an approved advance payment guarantee provided by the contractor. Clause 14.2 of the FIDIC conditions of contract for construction (Red book) allows the

employer to make an advance payment as an interest free loan for mobilization, should the contractor provide a valid and enforceable guarantee until the advance payment has been repaid in full. If the percentage agreed on the contract is low or if the client fails to provide the payment on time the risk of delay will be encountered caused by shortage of cash to continue the work.

Some parties can accept more risks than others depending on their skill, personnel, equipment, time, desire etc, as well as their risk acceptance profile. According to IMCA, (2006), all parties need to understand the risks which they are accepting and know how the contract is dealing with them. Nearly all the risks involved in construction have the capacity of eroding profit margin and transforming the project from profit making into a loss making venture. Generally if risk is poorly understood by the contractual parties and incorrectly allocated, it is likely to be incorrectly managed resulting in poor project delivery.

The parties involved in construction contracts can't predict the future, but accurately estimating the degree of risks inherent in their projects can help them quickly adapt to it. In the construction project sense, risk can be defined as the economic lose arising from the involvement in construction (Nafsah A., 2006). Any project decision-making without regard to risks will lead to unexpected outcome.

The IMCA risk guideline (2006) identifies five classifications of risk according to where control lies. This classification is believed to be helpful for this research and is presented as follows:

1 External: Unpredictable

These are risks beyond the control of the individual or operator and are totally unpredictable. They arise from external influences such as third parties, acts of god, etc.

2 External: Predictable but Uncertain

These risks are also beyond the control of individuals or companies. They are

expected, but to what extent is not known. There is usually data to determine a norm or average, but the actual impact can be above or below this norm. Bad weather is an example.

3 Internal: Technical

These are risks arising directly from the technology of the project work, of the design, construction or operation of the facility.

4 Internal: Non-Technical

These are within the control of individuals or the operator and usually arise from a failure of a project team to achieve its expected performance. They may result in schedule delays, cost over-runs or an interruption to cash flow.

5 Legal: Civil and Criminal

Risks under civil law can arise from contractual arrangements, patent rights etc. Risks under criminal law can arise under statute, e.g. Health & Safety requirements.

(Cristian P. et al, 2009) categorizes project risks into five, which are Management risks, Engineering risks, Procurement risks, Construction risks, and Commissioning risks based on the stages of the project they occur in.

Angelo W. et al. (2001), says risk is an important part of any project. If risk is properly managed it will lead to better achievement of project objectives. It further states that a critical element for controlling the cost, schedule and scope of a project is gaining and maintaining the control of the design process. Failure to control and manage this process will result in delay and increased construction costs. Care should be taken to avoid incorrect understanding and appointment of risk.

When an accident happens it is difficult to find who should answer for it if there is no risk management system in place. By setting up a contract management system the company will be able to hold people responsible when an accident occurs since each department will be working closely with the contract management department. During the establishment phase of the contract, each department or party should work

with the contract engineer on what their specific needs are, to make sure that there is not anything left out. This will make the implementation phase of the contract more efficient (Cristian P. et al, 2009).

According to IMCA, (2006), during difficult commercial times, contractors are forced to bid too high and miss the award. If this happens their expensive facilities will be idle. If there is large incentive to keep this site facilities active then bids can be submitted too low with no or negative profit margin in desperation to win work. In this case the work is completed at a loss which is undesirable by both the client and the contractor, i.e. the contractor loses his profit and the client won't get a quality end product and might encounter delay. But both situations can be avoided by applying different methods of risk management in the contractual stage.

Parties to construction projects, i.e. consultants, contractors, sub-contractors and suppliers, are all, in their own right, exposed to various risks. No matter how small or simple the project, it can still go wrong and as soon as the contract is signed, the contractual parties inherit risk. The guideline further discusses that risk awareness is of paramount importance to all parties to ensure that any possible risk occurrence may be reduced.

According to IMCA-risk guidelines, the handling of risk in construction contracts varies considerably. This depends on the nature and location of the work, the operator and contractor involved and the prevailing contracting climate. Each of these varies over time and there are also outside influences such as banks, governments and the insurance market.

Parties to a contract often do not realize that the person who manages the risk under a contract may not necessarily be the person who carries the financial consequences of the risk becoming a reality. The risks should be allocated to the party best to assume the risk.

Areas of risk

IMCA risk guideline groups risks into the following main areas of risk in construction contracts which are briefly discussed below;

- **Contractual risk:** is risk which result from not clearly defining the responsibilities and duties of the contracting parties. The contract clauses should be clear and easily understood by everyone involved
- **Performance risk:** is a risk due to clearly undefined scope and nature of work. The contractor is expected to perform the work with some standard including safety. Different situations that could hinder performance should be included in the contract. Incomplete information at the time of bid can negatively affect the performance of the contractor.
- **Financial/Economical risk:** are risks that are a result of not understanding the terms of payment, performance bond, bank guarantee etc. The payment terms should reflect the progress of the work and the parties should have the required financial backing from a reliable source.
- **Political risk:** are risks that are especially significant when the construction is on a host government's site/country. The host country might interfere in the bidding and construction process by changing laws and standards. The contractor needs a secure environment for performing the construction and should be clearly stated in the bid as well as the contract document.
- **Technical risk:** this risk arises from lack of understanding of the system and the technology that would be utilized at the time of bid and during construction.
- **Geographical risk:** arise as a result of the location of the site. The location of the site is very important and should be selected very carefully because it can lead to additional risks like political risk. The stability, material supply

interruptions, mobility and access should all be considered during bid and contract agreement.

- **Operator risk:** are due to the operators influence on the bid, contract, supervision, and approval etc...the operator should have the required insurance coverage which should be clearly stated in the contract document, for example, so that claims would lead to payment instead of dispute. Underperformance of the operator should not affect the work of the contractor; therefore there should be clear statements in the contract specifying the operator's obligations and the consequences to the contractor.

The contractual risks are a function of the wording of the contract whereas the other risks evolve from elsewhere but the contract will be used where necessary to deal with them. The above statement implies that the contract document plays a very important role for preventing and controlling all areas of risk.

This research aims in exploring how the Ethiopian building industry deals with risks and study the level of use of risk management and suggest ways of improving the situation. The classification discussed above was used to assess the situation in Ethiopia.

According to Cristian P et al, (2009), risks can be broadly classified into two categories. These are project tender risk and implementation risk. Project tender risk includes the risks of pre-tender risk and the risks at the tender offer phase, while project implementation risk includes engineering, procurement, and construction risk. Quality risk, cost risk, security risk, etc all belong to the construction risk.

2.8 Risk versus uncertainty

Often risk is confused with uncertainty and it is common to hear the two terms being used interchangeably. Both risks and uncertainties are future outcomes which are products of performance and their likelihoods. But various researchers believe that in risk management the two terms have distinct meanings and they tried to clarify a

distinction between the terms risk and uncertainty.

According to Deviprasadh A., (2007), uncertainty is the unpredictability of environmental and organizational variables that might impact the performance of the organization or the party. Risk is the consequences of uncertainty and it is the chance of something happening that will have an impact upon project objectives which includes the possibility of loss or gain, a variation from a planned or desired outcome as a consequence of the uncertainty associated with following a particular course of action.

(Gary R. Heerkens, 2002) defined uncertainty as an absence of information, knowledge or understanding regarding the outcome of an action, decision or event and risk as the measure of the uncertainty that exists.

According to Suleman A., (2007), uncertainty is related to the probability of occurrence of an event. The research further explains that an event is assumed to be certain if the probability of its occurrence is 100% or totally uncertain if the probability of its occurrence is 0%. The existence of uncertainty makes it difficult to predict future events.

Two aspects of uncertainty should be carefully distinguished to adequately manage uncertainty; firstly variability and secondly ambiguity. Variability describes an event which is defined but its outcome undefined because it is variable. Ambiguity can be used when a particular event may or may not occur at all and sometimes something else unexpected might take place i.e. there is incomplete knowledge about the situation under consideration.

Not all uncertain events are considered as risk. If the uncertainty is irrelevant to the desired objectives then it will not be risk. Risk is uncertainty that when it occurs could affect one or more objectives. Project risks are uncertainties that could prevent achievement of project objectives i.e. within budget, on time and required quality. Risk is distinguished from uncertainty in that it considers the consequences of the uncertainty. Hillson D., (2009), states risk is always uncertain while not every

uncertainty is a risk. It further explains that risk is a subset of uncertainty, which contains only those uncertainties that matter. Risk management should try to focus on identifying and managing these uncertainties that matter i.e. risks.

Risk cannot be defined without linking it to objectives. The relation between the objectives and the risk allows for adequate risk management process. While assessing the significance of risk and the methods of handling it the objectives of the project should be considered. The degree to which an organization is willing to take risk depends on the objective of the organization and the extent to which uncertainty is seen critical.

According to Smith, N. J. et al, (2006), all project risks can be divided into three main categories based on the ability to predict or foresee the risks. These are known risks, known unknowns and unknown unknowns. A known risk is an item or situation containing no uncertainty. Known unknown is an identifiable uncertainty i.e. things we know but we don't know how they will affect us. An unknown unknown is an item or situation whose existence had yet to be encountered or imagined. Taking into account the probability of their occurrence and their consequence on project objectives, the events that have high probability and high impact should be subjected to risk management. It further explains that risk has two elements, the likelihood of something happening and the consequence or impact on objectives if it does occur. Risks with high consequence or impact on project objectives should be identified at the start of any project and should be managed before they cause problems and hinder the progress of the project.

2.9 Risk management systems

Management is a means of integrating resources in order to achieve organizational objectives efficiently and effectively. Project management is the application of knowledge, skills, tools and techniques to project activities to meet project objectives.

There will always be some uncertainty associated with any project which represents

risk. If risk exists then the way to manage it has to be found. According to Suleman A., (2007), formal risk management in the construction industry became an integral process only within the past 20 years. The rise in the need to manage risk was caused by the rapid development in technology. The incorporation of risk management in construction will lead to more precise estimates of cost and more profit. Since there is a great concern about project risks affecting the outcome of the project, different methods of managing risks are attempted. Management of risks holds the key to project success or failure. Managing risk is an integral part of good management (risk management guideline, 2004).

The first thing the risk management team should try to do is identify and eliminate the risk if that is possible. If the risk cannot be avoided then they should try to reduce the risk or minimize the effect it has on the project. The project risk management depends on the companies' experience, the contract type, project delivery system and the available data.

Shehu Z. et al (2006) defined Risk management as a process of controlling the level of risk and mitigating its effects. Risk management is a systematic approach for identifying, evaluating and responding to risks encountered in a project. Kerzner (2003) defined risk management as the act or practice of identifying, analyzing, and evaluating risk. Angelo and Day (2001) see risk management as an important part of any project that limits delays, budget overruns, and claims between parties.

Walewski J., et al, (2003) states that increased concerns about project risk have given rise to various attempts to develop risk management methodologies such as Risk Analysis and Management of Projects (RAMP) which was produced by the institute of Civil Engineers in the United Kingdom (RAMP, 1998). The researcher further discusses that this method uses a project framework to identify and mitigate risk by using the accepted framework of risk identification and project controls by focusing on risks as they occur during the project life cycle. It requires users to follow a rational series of procedures and to undertake this analysis at scheduled intervals during the life cycle of a project.

Risk management should be done starting from the contractual stage. Dealing with risk involves planning for risk, assessing risk issues, developing risk handling strategies, and monitoring risks to determine how they have changed. Risk management includes all activities required to identify and control the risks relating to the preferred project option. According to Partnership Victoria guidance material (2001), risk management is used to identify, prevent, contain and mitigate risks in order to achieve project objectives. It further explains risk management as ongoing process throughout the project containing the following five steps.

(i) Risk identification- The process of identifying all the risks relevant to the project;

(ii) Risk assessment- Determining the likelihood of identified risks materializing and the magnitude of their consequences if they do materialize;

(iii) Risk allocation- Allocating responsibility for dealing with the consequences of each risk to one of the parties to the contract, or agreeing to deal with the risk through a specified mechanism which may involve sharing the risk;

(iv) Risk mitigation- Attempting to reduce the likelihood of the risk occurring and the degree of its consequences for the risk-taker; and

(v) Monitoring and review- Monitoring and reviewing identified risks and assessing, allocating, mitigating and monitoring new risks as the project develops and its environment changes. This process continues during the life of the contract.

(IMCA, 2006) defines Risk management as the process by which the likelihood of risk occurring or its impact on a project is reduced. Similarly it explains that the risk management function contains the following five steps.

- Identify the potential sources of risk on the project.
- Determine their individual impact and select those with a significant impact for full analysis.
- Assess the overall impact of significant risk.

- Determine how the likelihood or impact of risk can be reduced.
- Develop and implement a plan for controlling the risks and achieving the reductions.

A research done by Cristian P. et al, (2009), says risk management is comprised of four steps which contain risk identification, risk analysis, risk response and risk controlling.

Similarly (Kajsa Simu, 2006) described risk management process consisting of risk analysis followed by the risk response. Here risk analysis refers to the inclusion of identification and assessment.

As can be observed from the above discussion of risk management, different researchers include various steps, that are generally similar, which they believe are helpful for managing risk. This research assumes the most important steps of risk management include risk identification, risk assessment, risk allocation and risk mitigation.

2.9.1 Risk identification

Risks need to be identified early enough to do something about them. Project risks should be considered from the earliest conceptual stage. The earlier the risk is identified the better.

There are a number of methods that can be used to identify risks in construction projects. According to Dr. Francis K. (2008), some of the risk identifications are pondering or “what can go wrong” analysis; free and structured brainstorming; checklists; risk records; prompt lists; and structured/expert interviews.

The consequences of incorrectly identifying risks are that when these risks are considered in the management system, incorrect assessments and responses will follow. According to Kajsa Simu, (2006), the risk identification process should include all sources of uncertainty and associated responses, i.e. includes many steps regarding risks and uncertainties related to who, why, what, which way, where, when

in the Project Life Cycle etc... By using a model that includes all of these factors, the threat of missing risks along the way becomes minimal or is at least decreased.

According to Francis K. (2008), risks are usually identified by reference to generic risk categories and/or risks based on different phases of the project. But using this risk categories can create some problems if not done carefully as some of them may overlap and if used separately, they might mislead and even skilled practitioners may fail to comprehensively and accurately identify all relevant risks. I.e. one risk can be part of various generic risk categories.

An effective risk identification technique would aim at answering the question: “What are the distinct features of the project and its general environment or risk sources which might cause failure?” (Kajsa Simu, 2006). The technique would therefore involve an investigation into all possible potential sources of project risks, the interrelationships among them, and the extent to which they can be controlled.

According to Hillson D., (2009), since risk is defined in terms of objectives, the first step of risk management is defining those objectives which are at risk. The book says risk identification is the most important step of the risk process since it is impossible to manage a risk which is not identified first. Some of the techniques which can be used for identifying risks, similar to discussed earlier, include brainstorming, checklists, interviews, review of similar completed projects etc.

In the process of identifying risks in a project, it is necessary to consider the different sources of risks present in the project and the different classifications of risks that could be of current interest. It is also important that there is a clear distinction between the risk source (present conditions that give rise to risk) and a risk effect (direct impact the risk would have if it happens). A checklist of the risks which are expected in the typical kind of construction project can be used to begin the identification process. But detailed consideration of the risks for the typical project should be performed by experienced personnel. Every phase of the construction

should be viewed and the risks present in each stage clearly identified. It is also helpful to use a combination of risk identification techniques rather than rely on just one approach (Hillson D., 2009).

2.9.2 Risk assessment

The risk identification process would have highlighted risks that may be considered by project management to be more significant and selected for further analysis. According to Francis K. (2008) the objective of a risk analysis technique is therefore to determine probability numbers that quantify beliefs about uncertainty and thereby quantify the effects on the project of the identified major risks, their frequency, severity, and probability of the risk event. The risk analysis process tries to estimate the consequences and impact of the risks on the project objectives.

(Partnership Victoria, 2001), the two most important factors involved in risk assessment are the likelihood of the risk occurrence and the size of its consequence if it occurs. If a risk is very unlikely to occur and if its consequence is minor then it's of less importance to the parties involved. On the other hand if the risk is likely to occur and cause major consequences, then the risk is of major concern to everyone involved. In some circumstances a party may prefer to walk away from the project rather than assume such a risk.

According to Francis K., (2008), the different techniques that are used to assess the likelihood of the risk occurrence are quantitative probability assessments based on historical data; subjective probability assessments based on expert judgment. A conventional risk analysis can be used based on experience to rank the importance of the risks in descending order from high risk to low risk. A risk ranking matrix, as shown in the figure 2.1, can be used for categorizing the risk as minor, moderate or major and decide on the action to be taken. Minor risks can be accepted, moderate risks need some management measures and for major risks with high probability of occurrence and high impact a serious risk action schedule needs to be devised to

manage the risk. If the risk is too big, the party might decide to walk away from the project instead of assuming it.

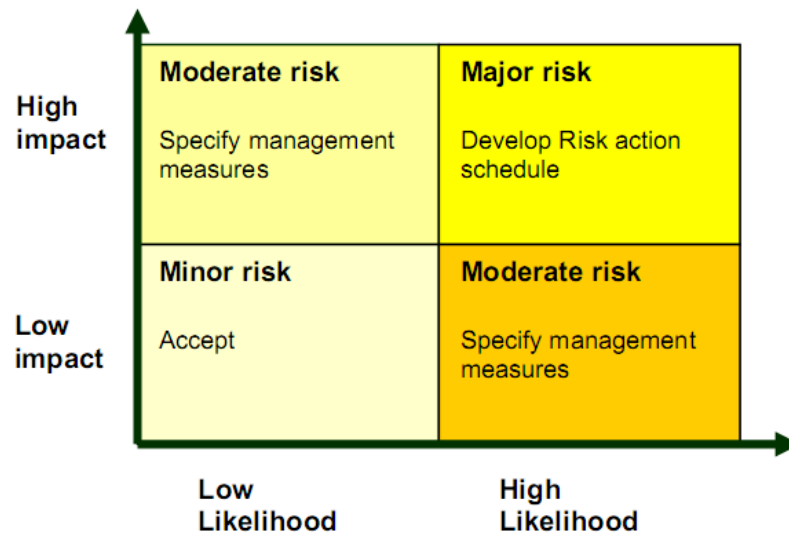


Figure 2.1 Risk ranking matrix, (Risk management guideline, 2004)

In order to estimate risk severity, detailed calculations of the cost to be incurred to time to be lost are done for each key risk, assuming the risk occurred. The impact of the risk on the project objectives can be calculated by using different methods like decision trees analysis; probability analysis; sensitivity analysis; scenario analysis; simulation analysis; and ranking options (Francis K., 2008).

2.9.3 Risk allocation

After the risks are identified, it is critical to see which parties retain this risk in practice and through the contract clauses. Optimal risk allocation minimizes both project costs and risks to the project by allocating particular risks to the party in the best position to control them. This is because the party in the greatest position of control with respect to a particular risk has the best opportunity to reduce the likelihood of the risk eventuating and to control the consequences of the risk if it materializes. Allocating the risk in line with those opportunities creates an incentive

for the controlling party to use its influence to prevent or mitigate the risk and to use its capacity to do so in the overall interests of the project (Partnership Victoria, 2001).

According to James P. Bobotek, (2011), a major part of risk management is “risk allocation,” whereby a party assigns by contract the responsibility for a certain risk to another party, who will then bear that risk. Some of the most important risk management tools at a party’s disposal are the contracts into which it enters with others involved in the construction project. From a risk management perspective, it is important to assign a project risk to the party best able to control and manage it. For example, a project owner will want to allocate the risk that someone is hurt by construction operations to the contractor, who is in the best position to provide a safe work site. A contractor will want to allocate the risk of design errors to the owner, who often holds the contract with the architect and therefore is in a better position to address and minimize these losses. Different types of risks should be addressed in the construction contract, so that the parties know in advance who is responsible for what risk.

The study further discusses that within the contract, risk is primarily allocated through indemnity and insurance requirement provisions. An indemnity provision generally is a section in a contract that requires one party to pay for losses incurred by the other party as a result of claims made by third parties.

Another important fundamental way to manage risk is insurance. Contractual indemnity provisions included in contracts are only as good as the indemnitor’s ability to honor them. According to James P. Bobotek (2011), when transferring risk through an indemnity provision, it is important to ensure that the transferee (or the indemnitor) has, or is able to procure in a cost-effective manner, insurance coverage sufficient to pay for the assumed indemnity obligations. If a party has responsibility for a type of loss on a project, it will want to obtain insurance for that loss to minimize its costs, should the loss be realized.

Some risks like force major are very difficult to allocate since no party has control

over them. This kind of risks can be dealt with providing some provision in the contract, e.g. an agreement to negotiate if they arise.

The client might agree to pay risk premiums for the contracting party for allocating the risk. But they should make sure the premium it is paying for allocating the risk is less than assuming the risk themselves. This is because sometimes assuming the risk might cause less than the risk premium.

Allocating a risk that is predominantly within the control of one party to another party is unwise, because it is only accepted by a non-controlling party at a costly premium, thereby diminishing the value for money. If a risk is within clients control and can be managed and mitigated, it does not make sense to pay a high premium for its allocation to the contractor. Similarly, if a risk is within the contractor's control and can be appropriately managed and mitigated, it should not attract a high risk premium.

The allocation of risk to the different parties involved should be clearly discussed in the construction contract to avoid any type of misunderstanding in the future. For example, for international projects, a discussion on risk sharing is included in the FIDIC Red Book that includes a series of flow diagrams of the risks in construction, and their consequent responsibilities, liabilities and how these are dealt with.

2.9.4 Risk mitigation

Risk mitigation is any action that can be taken to reduce the likelihood of a risk materializing or to reduce the consequences to the contracting party taking the risk, if it does materialize. Mitigation practices vary depending on the risks being considered and whether the party concerned is a private or public one.

The most commonly used and readily available risk mitigation option for private parties is to pass the risk on to other parties who are able to control it at a lower risk premium. According to partnership Victoria, (2001), this risk allocation creates a chain of risk bearers, each best placed to control the particular risk, and each insulated

from the collective risks which the private party would otherwise have to bear. In this situation, however, it is important to point out that, notwithstanding the chain of risk bearers, the private party (as the contracting party) still retains the primary liability for the risk under the contract.

The party should always bear different mitigation options in mind; according to Partnership Victoria guide the most obvious of these is to pass the risk to an insurer which transfers the duty of dealing with the consequences to the insurance company at the level of the insurance premium. Insurance is a specialized form of passing through risk to a third party. The private sector has different alternative to a wide range of insurance products covering project risks such as owner's liability, some force majeure events, owner's risks (to the asset), business interruption, some legislative and government policy risks relating to the convertibility of local currency, and change of law events etc.

Risk is further reduced if the private party chooses the best and most experienced partners for each aspect of project delivery. Thus a construction contract risk management approach that uses appropriate methods of eliciting and aggregating opinions from multiple experts will be better at reducing the impact of individual perceptions and biases on the estimates and enhancing risk management effectiveness.

Generally there are two mitigation options; one tries to limit the likelihood of the risk occurrence or reduce its effect on the project if it does occur. The other involves corporation between the parties to reduce the direct financial impact of the materialized risk on the project.

The payment structure can also be used to mitigate the risk. Payments should only begin to be made when services begin and for as long as they continue under the terms of the contract. According to Partnership Victoria guide, 'No service, no payment' is an uncompromisingly effective means of allocating risks away from client. I.e. the payment schedule is also a mitigation tool from a client's point of view,

because it gives the contractor the strongest possible incentive to meet the project specifications, complete the project on time, and develop an asset that is fit for its purpose and begin service delivery at the earliest possible date to enable payment to start.

The guide argues that risk mitigation is not separate from risk allocation, because an ability to mitigate may lead a party to assume a risk it would not otherwise assume. Similarly, awareness of the other party's mitigation opportunities might make it appropriate to insist on the risk being allocated to that party and/or paying a smaller premium.

The uncertainty of a risk event as well as the probability of occurrence or potential impact should decrease by selecting the appropriate risk mitigation strategy. According to Walewski J., et al, (2003), four mitigation strategy categories commonly used, these are avoidance, retention/ acceptance, control/ reduction and transfer/ deflect.

Although risk management is a relatively known and practiced process, few organizations have conquered its successful implementation. According to Kajsa Simu, (2006), much of what is practiced is based on intuition or personal judgment. The action taken to control the risks that are analyzed earlier are called risk responses. Responses is often graded in four levels, namely risk retention, risk reduction, risk transfer and risk avoidance.

Risk retention concerns accepting the presence of risk and still conducting business as usual. The reasons for retaining the risk could be that the estimated probability, consequence or the combination of the two is low and at an acceptable level.

Risk reduction is about decreasing the probability, the consequences or a combination thereof for a risk to breakout. This could be done in several ways, of which sharing with other parties or taking some action where the probabilities or consequences become reduced is common. There could also be involvement of a third party as an extra assurance and quality control of projects to ensure that nothing is

forgotten or overlooked. A common way to reduce risks at construction sites is through work planning. The work plans consist of timetables and allocation of resources such as staff and equipment.

Transferring the risk to another party is a fairly common way to deal with risks in the construction sector. It is transferred from the client to the contractor through the agreements in the contract, or from the contractor to the sub-contractor. Another way to transfer the risk is to have insurance, which is a way to transfer the uncertain cost for a potential loss to a certain cost of money for the premium.

Risk avoidance is about refusing to accept a risk. This is either done by simply refusing a project that is too risky to begin with or by writing exceptional clauses in the tender.

2.10 Risk management in Ethiopian building construction contracts

Most standard construction contracts contain some clauses that deal with common risks like none or under performance of the parties and war. But the specific risks that might hinder the project from achieving its objectives are not thoroughly identified and managed using clearly placed contractual clauses. The fact that most building construction projects are not completed on time, within budget and to the required quality standards shows that these contracts need some improvements and additional clauses that deal with managing risks. Unidentified and undefined risks have big effects on project objectives; therefore, the contract should contain clearly identified and defined risks and suggest ways of managing them to minimize their effect on project objectives.

Some of the risks which are discussed in the civil code of Ethiopia and in the standard conditions of contract are briefly discussed below.

According to the civil code of Ethiopia, (1960),

Article 1790 (1) states “Apart from or in addition to the enforcement or cancellation of the contract, a party may require that the damage caused to him by the other party,

failing to perform his obligation be made good". This means the party that failed to perform his task should face the consequence of his actions and fix the damages. According to this article, any performance risks can be managed by checking the contractual clauses that deal with obligation and the consequences of not performing them. The contract, hence, should clearly contain the obligations and rights of the parties as well as the penalties of non performance of the duties specified in the contract.

Article 1791(1) further states that "the party who fails to perform his obligation shall be liable to pay damages notwithstanding that he is not at fault". This implies that a party that did not perform his duties according to the contract should pay for any damages that are found to be his fault i.e. the result of his non performance.

Article 1795 states "A party may not claim damages on the ground of non-performance of the contract by the other party, unless he can show that the other party is in default". This means if a party cannot prove the non performance of another party, in relation to the contract, he cannot claim the damages that resulted from the non performance. This statement shows the power of the contract, if the obligation of the parties is clear and unambiguous in the contract then it can easily be proven if there is any non performance.

Article 1924 (1) of the civil code states "a guarantee may not exceed the amount owned by the debtor, nor be constructed on more burdensome terms". This means the amount of the insurance should cover the damage. As mentioned earlier insurance is one way of dealing with risk but the amount of damage the risk may cause to the project should be assessed and the exact amount known to have an equivalent insurance cover. In simple terms the insurance should cover every cost that arises because of the manifestation of the risk and its consequences.

The general conditions of contract, 2006, prepared by the Public Procurement Agency (PPA) of Ethiopia also have different clauses that deal with the general risks common to most projects.

Clause 20: states that “the consultant should have an insurance coverage against risks specified in the special conditions of contract”. This implies that the risks which are believed to have an effect on the execution of the project should be clearly identified and dealt with in the specific conditions of the contract by providing enough insurance coverage. The article further discusses that a consultant needs to have professional indemnity insurance before award of any contract. This is one way of dealing with risk by making sure the consultant is covered for any fault that might occur during the design and supervision of the project.

The general conditions of contract by the ministry of works and urban development (MoWUD), identifies some special risks which the contractor is not liable for. Some of these special risks are war hostilities, invasion, act of foreign enemies; contamination by radio-active components, pressure wave caused by aircraft or other aerial devices; riot, commotion, or disorder, unless solely restricted to employees of the contractor or his sub-contractor and arising from the conduct of the works; rebellions, revolution, military or usurped power, or civil war. This general condition of contract further states in the following statement that the contractor should be provided with payment to rectify any damage or destruction caused by the special risk and to replace any material or property needed to complete the project.

If the works or any materials on the site or any property of the contractor used or intended to be used for the purpose of the works, sustain destruction or damage by reason of any of the said special risks, the contractor shall be entitled to payments in accordance with the contract for any permanent work duly executed and for materials so destroyed or damaged and, so far as may be required by the Engineer or as may be necessary for the completion of the works.

As mentioned above, the standard contract documents used in Ethiopian building construction industries deal with some risks which are common in all building construction projects. And in most cases, only the risks which are included in these standard documents are included in the contracts. But in addition to that, it is

recommended that risks that are unique and specific to any particular project be identified and included in the particular conditions of the contract so that they can easily be managed if and when they occur.

2.11 Summary of the literature review

It has been learnt from the literature review that the construction industry in developing countries is more exposed to different risks and it lacks proper management. It has been also learnt from the literatures that the construction industry contributes greatly towards the growth and development of these countries. Therefore to make the construction in developing countries effective and efficient there must be some way to manage and control the risk and minimize the problems. The literature review indicated that all projects are exposed to risk, and the impact it causes can be very critical to developing countries like Ethiopia; the only way to make projects successful is by using different risk management techniques. This research therefore aims in identifying the level of use of different risk management techniques in the Ethiopian building construction industry.

The reviewed literature indicated that there are different types of delivery systems that can be adapted for a project and choosing the right type of delivery system for a particular project can help achieve the project objectives by decreasing the risk involved. The reviewed literature also indicated that the contract plays a very important role in managing risk and it is vital to understand the terms of the contractual agreement and identify the different risks associated with the type of contract selected before signing it. It has been learnt from the literature that risk should be managed continuously throughout the lifecycle of the project. Project performance can be improved by recognizing at what stage of the project the risk materializes and giving it due consideration. This research therefore aims in testing the level of awareness of the parties involved in the Ethiopian building construction industry about the principles and use of risk management.

It has been learnt from the literature review that if a project is to fulfill its objectives in an efficient manner, there is a need to involve the risk management processes starting from the contractual stage. Risk is an uncertainty that has an effect on achieving project objectives and risk management should be performed to identify, prevent, contain and mitigate risk in order to achieve project objectives. The research therefore aims in studying the effect of contractual risk management techniques in meeting objectives in Ethiopian building construction projects.

3 RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The previous chapter discussed about the influence construction contract delivery systems, stage of construction, type of risk and type of contract have on managing risk effectively to achieve project objectives. It tried to give an in depth understanding of construction contract risk management by discussing the findings of other researches. This research presents the findings of the research conducted to assess the practice of using different contract risk management techniques in the Ethiopian building construction projects.

3.2 Research design

Data for the research was collected using both primary and secondary sources. The primary data was obtained through questionnaire directed to contractors and consultants that are involved in Ethiopian building projects. The secondary data was obtained from the internet, thesis, journals, books and different articles in published documents. The secondary data was used to get an insight of the problem and was used as criteria for developing and analyzing the primary data. The questionnaire also contained an introduction part which briefly defined the different terms that were used in the research. This part was included to be used as an optional reading for any interested respondents who might find it hard to remember the technical terms used in the research.

The research was both qualitative and quantitative in nature. Some of the data collected was in descriptive form while some of the data was in numeric form. The research is an observational descriptive research i.e. it involves observing the situation as it is without getting involved and changing things.

Cluster sampling was used first to select representative samples from contractors and consultants, and then random sampling was used for selecting samples within the group of consultants and contractors. A level of confidence of 80% and a margin of error of 0.06 were used in selecting a sample size of 112 for a population size of 6000. Since grades one to six were only used for the research a representative sample size of 105 were believed to be enough.

A total of 105 questionnaires were sent to contractors and consultants in the Ethiopian building construction industry. 69 responses were obtained, out of which 2 were rejected. This means an effective response rate of 63%. This was believed to be acceptable for the research.

The following tables (3.1 and 3.2) show the informants general profile. A total of 67 respondents were used for the research, out of which 49 were building and general contractors and 18 were consultants. Grades one up to five were used for the research. The respondents had different years of experience in the building construction industry and as shown in table 3.2, twelve respondents had more that fifteen years of experience, twenty five respondents had six to fifteen years of experience and the rest thirty had up to five years of experience in the Ethiopian building construction industry.

Category	Number of respondents
Contractor	49
Consultant	18
Total	67

Table 3.1 General profile of respondents (category)

Description	Number of respondents
0-5 years	30
6 to 15 years	25
More than 15 years	12
total	67

Table 3.2 General profile of respondents (year of experience)

3.3 Questionnaire design

The questionnaire had four sections. The first section consisted of questions about the general profile of the respondent. The second section was compromised of questions to test the level of awareness of the parties about risk management. In the third section questions that were believed to test the level of use of construction contract risk management techniques were asked. The fourth and final section of the questionnaire investigated the causes and effect of different areas of risk on building project objectives.

Both close and open ended questions were asked in the questionnaire. The close ended questions had a number of choices of possible answers and the respondents selected whatever they feel was most appropriate. The closed ended questions were selected because they are easier to assess and answer considering how busy the respondents were. Open ended questions were used only in few places where the response options were relatively wide and not known but unfortunately none of the respondent used these parts to specify their answers.

3.4 Data analysis

Descriptive statistics method was used to analyze the responses in actual numbers. Counts or frequencies were used to figure out how many times something occurred or how many responses fit into a particular category and the findings were presented in a table. Percentages are easier to interpret and in this analysis, they were implemented to express the findings as a proportion of the whole. The findings were presented in the form of pie charts to help understand easily. Measures of central tendency, mean, was also used to characterize what is typical for the group. The mean scores were presented in forms of tables and when necessary bar diagrams were used.

4 RESULTS AND DISCUSSION

4.1 Introduction

The results and discussion below is devised in three parts in line with the objectives of this research and also the sections of the questionnaire. These divisions can help tackle one objective at a time. The first part tries to present the findings of the questions asked to test the level of awareness of different parties involved in Ethiopian building construction projects and discuss about what this findings mean. The second part of the results and discussion contains the findings of the questions directed towards identifying the level of use of different construction contract risk management techniques and the results are discussed. The third part is focused on the effect of different areas and causes of risk on project objectives and presents the results of the questions directed towards this. The effect of incorporating or not incorporating different contract risk management techniques on Ethiopian building projects is discussed in this part.

4.2 Awareness of the concept of risk management

Risk is defined in different ways by various researchers as shown in the literature review. Most standards used risk in its negative sense and for the purpose of this research this negative term was adapted. Hence risk is an uncertain event or set of circumstances if they occur would have a negative effect on one or more of the project objectives. Risk management is a very important part of any project which tries to identify, analyze and evaluate risk to minimize the effect it has on projects. From the questionnaire survey of this research, it was discovered most of the respondents were aware of the concept of risk management. Table 4.1, shows the responses of the respondents when they were asked if they were aware of the concept of risk management. Among the 67 respondents 65 were aware of the concept of risk

management. This shows that most of the parties involved in Ethiopian building construction projects, 97%, know about the concept of risk management, the next question tried to assess how they became aware and if they are confident enough to implement their knowledge into action.

Response to awareness of risk management	Frequency	Percentage
Yes	65	97%
No	2	3%

Table 4.1 Awareness of the concept of risk management

Most of the respondents who answered yes to the above question became aware of the principle of risk management through study and training. Figure 4.1 shows 70.8% of the parties became aware of the principles of risk management through study and 26.2% became aware through training.

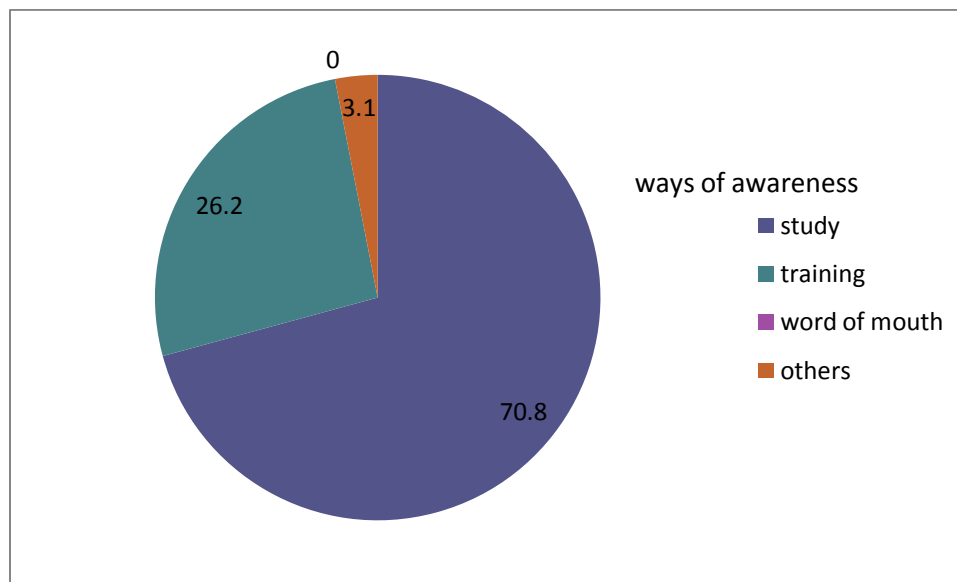


Figure 4.1 Ways of the respondents' awareness of risk management principles

The above results show that study and training in the field of risk management is a good way of creating awareness and making the parties competent in the principles of contract risk management. But when the respondents were asked to evaluate their knowledge of risk management principles, most of them answered as medium or fair. Table 4.2 and figure 4.2 show only ten of the respondents, i.e. 15.4%, rated their knowledge of risk management principles as high. This result shows out of those who claim to have knowledge of risk management, most of them are not fully confident enough to rate their knowledge as high. This implies that a lot needs to be done in increasing awareness and making the parties involved in the Ethiopian building construction projects confident enough to implement their knowledge of risk management to increase the efficiency and effectiveness of their projects.

Responses	Frequency	Percentage
Low	9	13.8
Medium	46	70.8
High	10	15.4

Table 4.2 Rate of knowledge of risk management of the respondents

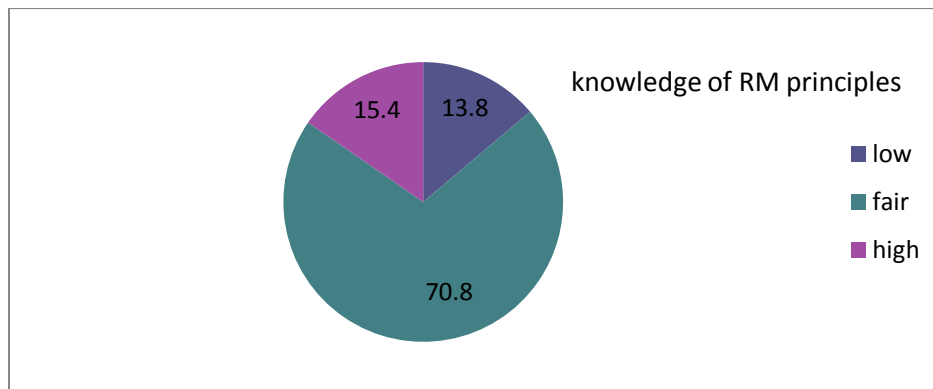


Figure 4.2 Knowledge of risk management principles of the respondents

From the above result it can be observed that only a small number of parties involved in the Ethiopian building projects evaluated their knowledge on principles of risk management as high. This shows that most of the respondents may feel like their knowledge about the principle of risk management is not enough to implement its applications in their building construction projects. Hence, as stated above it is very necessary to increase their knowledge of the principle of risk management techniques.

4.3 The level of use of construction contract risk management techniques

The risk management function heavily depends on the type of risk inherent in the construction project and the contractual agreement. For the purpose of this research, the definition of risk is limited to the one that has a negative impact on a project; and hence the risk management is limited to the process of dealing with negative risks, as these pose inconveniences in achieving project objectives.

According to the literature review handling of risk is very important in construction industries. Risk management helps improve the awareness of handling risks in the contractual stage and in turn improve the relation among parties and increase efficiency. It depends on the nature and location of the work, the parties involved and the contracting climate and the type of risk inherent in the project.

There are different areas of risk discussed in the literature review; these are contractual risk, performance risk, financial/economical risk, political risk, technical risk, geographical risk and operator risk

Risk management was defined as a process by which the likelihood of the risk occurring or its impact/consequence on projects is reduced. If a risk is very unlikely to occur and if its consequence is minor then it's of less importance to the parties involved. On the other hand if the risk is likely to occur and cause major consequences, then the risk is of major concern to everyone involved.

In this section, the respondents were asked to rate the probability of occurrence of the different areas of risk and the level of consequence they lead to if they occur. Table 4.3 presents the number of responses for each risk area and the mean values for each item. Low, moderate and high were assigned values of ‘1’, ‘2’ and ‘3’ respectively as shown in the table. The mean values for each item were calculated by multiplying the number of answers in a category by its rating value, obtaining a sum and dividing by the total number of answers for that item. Figure 4.3 is a bar diagram that shows the different areas of risk with their probability of occurrence and level of consequence on project objectives with value ‘1’ representing low, ‘2’ representing medium and ‘3’ representing high probability of occurrence and level of consequence.

Risk Areas	Number of responses									
	Probability of occurrence				mean	Level of consequence/significance				mean
	1(L)	2(M)	3(H)	total		1(L)	2(M)	3(H)	total	
i. Contractual	8	38	18	64	2.2	10	22	30	62	2.3
ii. Financial	6	16	38	60	2.5	6	8	47	61	2.7
iii. Political	46	10	2	58	1.2	28	15	12	55	1.7
iv. Performance	12	24	26	62	2.2	10	22	24	56	2.3
v. Technical	18	34	10	62	1.9	10	28	25	63	2.2
vi. Geographical	32	16	12	60	1.7	20	20	15	55	1.9
vii. Operator	16	22	18	56	2.0	6	34	16	56	2.2
viii. Other	16	6	4	26	1.5	2	2	1	5	1.8

Table 4.3 Mean scores of the probability of occurrence of different risk areas and their level of consequence.

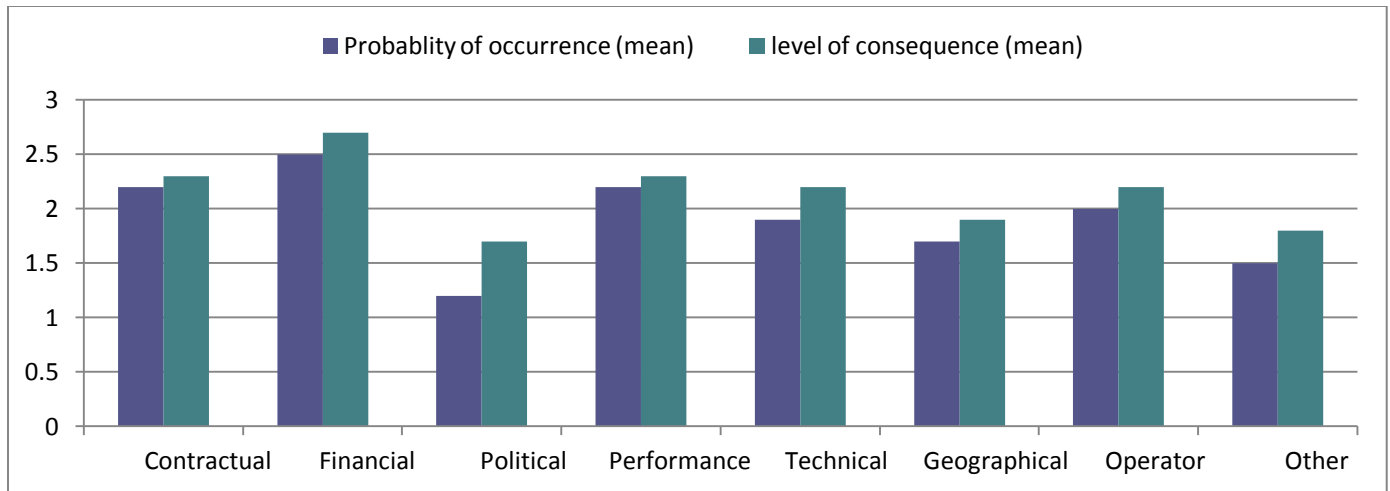


Figure 4.3 Probability of occurrence and level of consequence of different risk areas

These results show that the risk area with the highest probability of occurrence and the highest level of consequence is financial risk. This tells us that financial problems almost always occur in Ethiopian building construction projects and their effect on objectives is very high. Because of financial shortage and delay on payment certificates, projects are most of the time finished with delay, beyond budget and without meeting quality requirements. Hence, to improve the situation, financial sources should be available on time starting from the beginning of the project till the end and all payment certificates should be issued, approved and paid on time.

As shown in the above bar chart contractual risk is among the top risk areas which have a high probability of occurrence and high level of impact or consequence on project objectives. These risks are caused by poor contract formulation and bad or no contract administration or generally lack of contract management. The contract can be a very useful tool to minimize risks and their consequences if utilized well. If the contract agreement is not clear, it might lead to different problems which in turn will have great consequence on project objectives. On the other hand if the contract is unambiguous and if it contains different provisions which deal with identified risks and their management techniques it might serve as a very important tool in achieving project objectives.

Political risk is rated to have lowest probability of occurrence as well as lowest consequence on project objectives. This is because this kind of risk is very significant when the construction is being done in a host country which relatively has an unstable environment. When we see the situation in Ethiopia, the respondents believe it is relatively a peaceful environment and there is limited risk posed by the government on construction companies undertaking different building constructions.

Generally these findings help to identify the areas of risk that have high probability of occurrence and great impact on project objectives and these areas of risk need to be thoroughly investigated and managed to successfully complete building construction projects.

It was observed from the literature review that risk should be assessed and managed throughout the life of the project since some risks arise and diminish as project progresses. The need to manage risks is important to all project stakeholders and critical for project success and a structured process for risk management is needed across the entire life cycle. Few project participants have an understanding of all the risks involved and few organizations consider the entire portfolio of risks that can occur across the life cycle of a project.

To test the importance of risk management during each stage of construction in Ethiopian building construction projects, the respondents were asked to rate the importance of risk management as Very low (1), low (2), moderate (3), high (4) and very high (5). The results are shown in table 4.4; the numbers of respondents were placed under each category for each stage of construction. The mean values were calculated to get the average values of the importance of risk management at each stage of construction. Figure 4.4 presents this results as a bar diagram with 1 being the importance of risk management at that stage is very low and five being the importance of risk management at that stage of construction is very high.

Project stage	Importance of risk management						
	1	2	3	4	5	total	mean
i. Inception and feasibility	2	0	24	12	28	66	4.0
ii. Planning and design	2	2	7	28	28	67	4.2
iii. Tendering stage	0	4	22	19	22	67	3.9
iv. Construction stage	0	4	0	22	40	66	4.5
v. Commissioning and acceptance	2	10	36	8	11	67	3.2

Table 4.4 Importance of risk management at different stages of construction

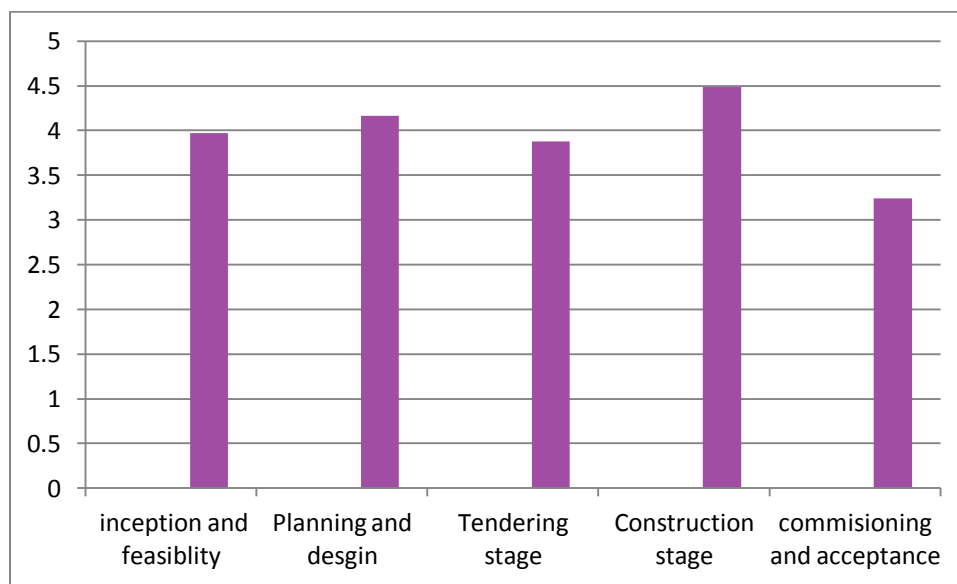


Figure 4.4 Importance of risk management at different stage of project lifecycle

As can be observed from table 4.4 and figure 4.4, risk management is believed to be important at all stages of the project lifecycle, i.e. above moderate. But it was discovered that it is especially very important during the construction stage and during the planning and design stage. This implies that the different risks should be identified and managed starting from the planning and design stage. The identified risks should be considered in the contract formulation and discussed before signing the contractual agreement. And as can be seen from the findings, risk management is mostly needed during the construction stage; this implies contract administration is

essential to make sure the risks included in the contractual documents are managed according to the agreement. Risks which were not anticipated during the contractual stage should also be dealt with if they ever manifest. A risk management team should work closely with the contract administrators to decrease the effect of all risks on project objectives.

It had been learnt from the literature review that there are various types of project delivery systems which describe how the project team is organized to achieve project objectives. The most common types of delivery systems are Force account, Design bid build (DBB), design build (DB) or Engineering procurement construction (EPC) for large projects, Construction management (CM) and Build operate transfer (BOT).

The right type of delivery system which is believed to involve the least level of risk should be selected and used for any project. Therefore, the respondents were asked to rate the level of risk that the different delivery systems incur. Table 4.5 shows the number of responses for each category (1=very low, 2=low, 3=moderate, 4= high, 5= very high) and for each delivery system. The mean values were taken to get an overall average of all the responses. Figure 4.5 is a bar diagram that presents this results, i.e. the different delivery systems with their level of risk.

Delivery system	Level of risk						
	1	2	3	4	5	total	mean
i. Force account	7	4	22	11	16	60	3.4
ii. Design bid build, (DBB)	6	12	19	15	10	62	3.2
iii. Design build, (DB)	0	6	18	30	9	63	3.7
iv. Construction management	2	20	20	12	6	60	3.0
v. Build operate transfer (BOT)	4	14	20	16	8	62	3.2

Table 4.5 Different contract delivery systems and their level of risk

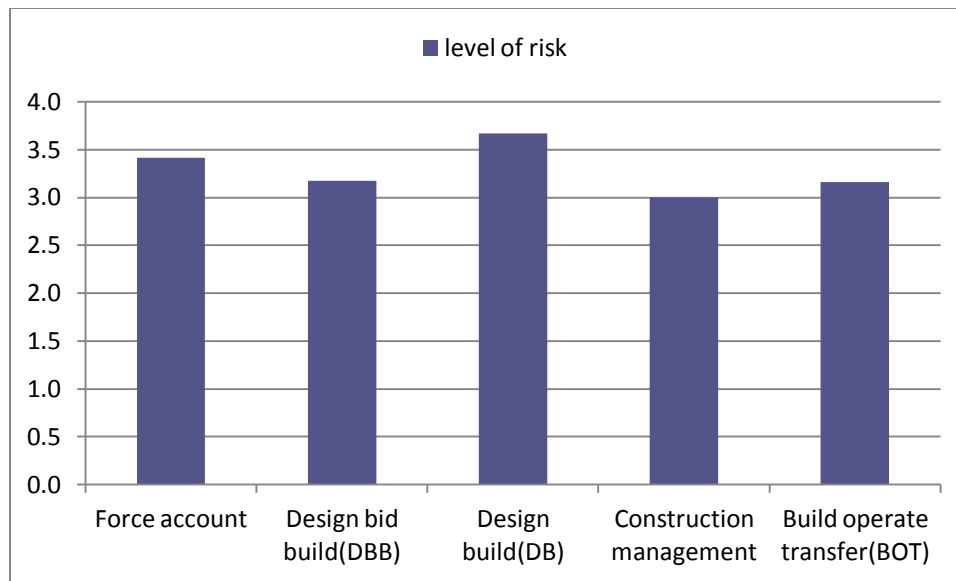


Figure 4.5 Levels of risk of different contract delivery systems.

Majority of the respondents state design build (DB) type of contract delivery system involves the highest level of risk. This is because DB type of contract delivery system makes one party responsible for both design and construction risks. The next delivery system that was believed to involve high risk is force account. It can be observed from this result that when one party takes full responsibility of delivering the project the risk involved increases but when the responsibility is divided among different parties the risk is relatively lowered since it is shared by all the parties.

According to most of the respondents when a construction management consultancy firm is involved in a project it decreases the risk involved. It had been learnt from the literature that in many countries construction management is a common and effective type of delivery system. If the responsibility of managing and controlling construction of projects is given to professionals who specialize in managing projects, the risk involved and the effect could be greatly minimized. The construction management consultancy is relatively not common in Ethiopian construction industry. But there are some construction management firms which are taking part in different constructions of Ethiopia, e.g. CPMS [Ethiopia].

It was seen from the literature review that the first three types of delivery systems; force account, DBB and DB are mostly utilized in different building projects of Ethiopia. In some researches, DB and EPC are used interchangeably but they have a basic difference in that EPC delivery system is mostly used for large scale projects. In Ethiopia, some of these large projects which use EPC delivery system are; the construction of Tendaho sugar factory and the expansion of Fincha and Wonji sugar factories, the Addis Ababa Light Rail transit Project, Gibe III hydroelectric project and The Grand Ethiopian Renaissance Dam. These large EPC projects are prone to various risks similar to DB since the risk is retained by the EPC contractor.

According to different researches, in the developed world construction risk management is a relatively known concept and it is utilized widely. There is different risk management technique used in different stages of the construction. Risk management in the contractual stage, i.e. before signing the contract is used very frequently. Risks are identified and allocated to the contracting parties in the contract document, making dealing with the risks if and when they arise very easy.

In the previous section it was stated that most of the parties involved in Ethiopian building construction industries have heard of risk management but only a few are confident enough to say they have high knowledge about the risk management techniques. This section tries to assess the level of use of the different risk management techniques in Ethiopian building projects.

The next question tried to assess the utilization of risk management techniques in Ethiopian building construction projects. Majority of the respondents, 62.7% said they use risk management techniques while the remaining 37.3% stated they don't use any risk management techniques. Among the group which don't use risk management techniques around half (53%) put down lack of awareness as their main reason. From the other half (30%) put fear of the need to hire additional staff as an

excuse for not using risk management techniques. A small portion (6.7%) doesn't use this techniques fearing they are time consuming.

As mentioned above, even if most of the parties involved in the building construction industry have awareness about the general concept of risk management, only a few have high knowledge about the principles and techniques involved in managing risk. This is why the majority of the respondents that don't use risk management techniques put down lack of awareness as an excuse for not using it. Therefore, regular trainings on the subject need to be given to the parties involved in different Ethiopian building projects to create better awareness.

The literature review showed that if risk management is performed throughout the project life, the project objectives can be achieved successfully. But it was also observed from the literature that most parties don't estimate the effect of risk throughout the project lifecycle. This research contained a question to assess when the risk management techniques are used in Ethiopian building projects. Most respondents, 79%, say their company uses risk management techniques at all stages of construction i.e. different risk management techniques are applied starting from the contractual stage up to the end of construction. 16.3 % of the respondents only apply risk management techniques during the construction stage; this is not recommended since the risks involved in any project should be identified first in the contractual stage and management techniques put in place so that the parties can be better prepared to deal with them if they arise during the construction stage.

The literature shows that it is very important to identify all the risk involved in any project as early as possible to come up with a strategy to avoid or decrease its effect. Some of the methods that can be used to identify risks in a project are expert opinion, checklist, risk records and risk analysis.

Among the respondents that use risk management techniques, majority of them said they use checklists and risk records to identify important risks for the building

project, this can be observed from figure 4.6. Only 24% use risk analysis which investigates all potential sources of project risks and the interrelation among them. Checklists and risk records might be enough to identify risks for small building projects but for important and complex projects risk analysis is recommended since it investigates all potential sources of risks related to the particular building construction project.

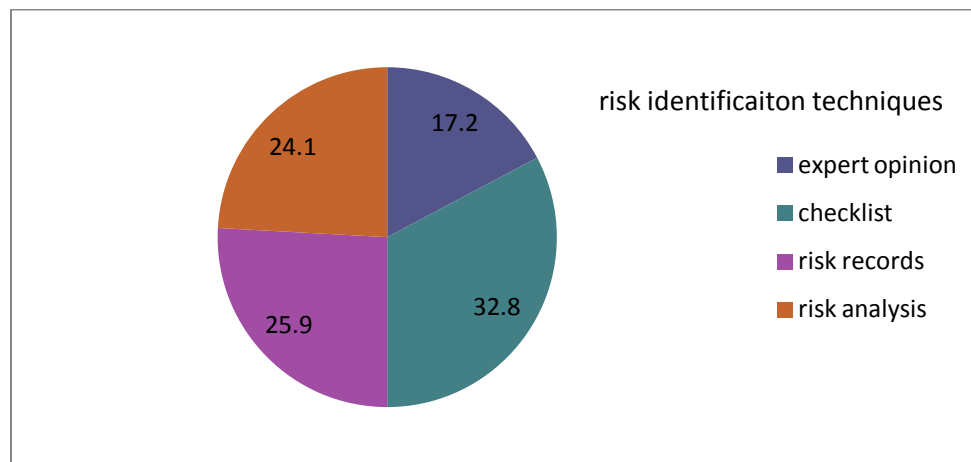


Figure 4.6 Risk identification techniques used in Ethiopian building projects

As discussed in the literature, the next step is risk assessment to determine the likelihood of the risk occurrence and the size of its consequence if it occurs. As presented in figure 4.7, the research findings show that most of the respondents, 61.4%, said they rank the importance of risks based on past experience to assess the likelihood or probability of the risk occurrence for the identified risks.

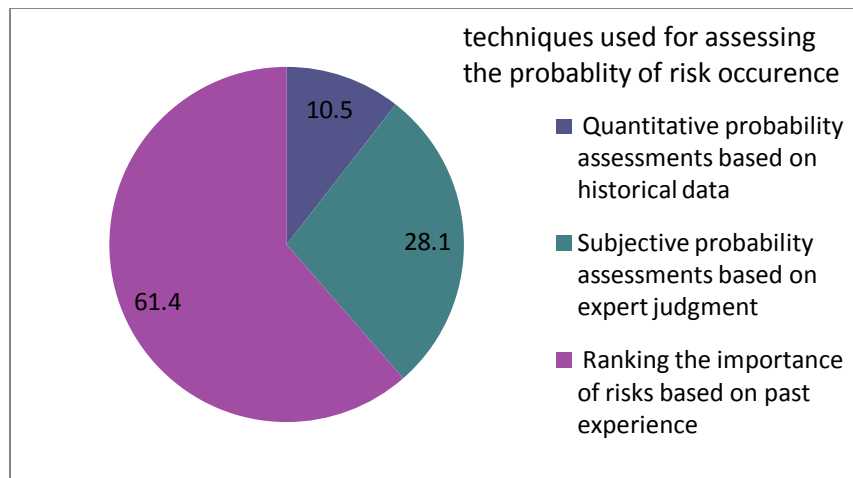


Figure 4.7 Techniques used for assessing the probability of risk occurrence

According to this research, most parties involved in the Ethiopian building construction industry attempt to estimate the probability of risk occurrence by using past experience and expert judgment. This tends to make the process subjective and the result obtained might not be reliable and maybe variable based on the individual performing the assessment.

Probability analysis is found to be the most common method used for estimating the size of the risk severity or its consequence on project objectives. This is presented in figure 4.8. The respondents also agree that Scenario analysis is widely used as well to determine the consequence of the risk on project objectives.

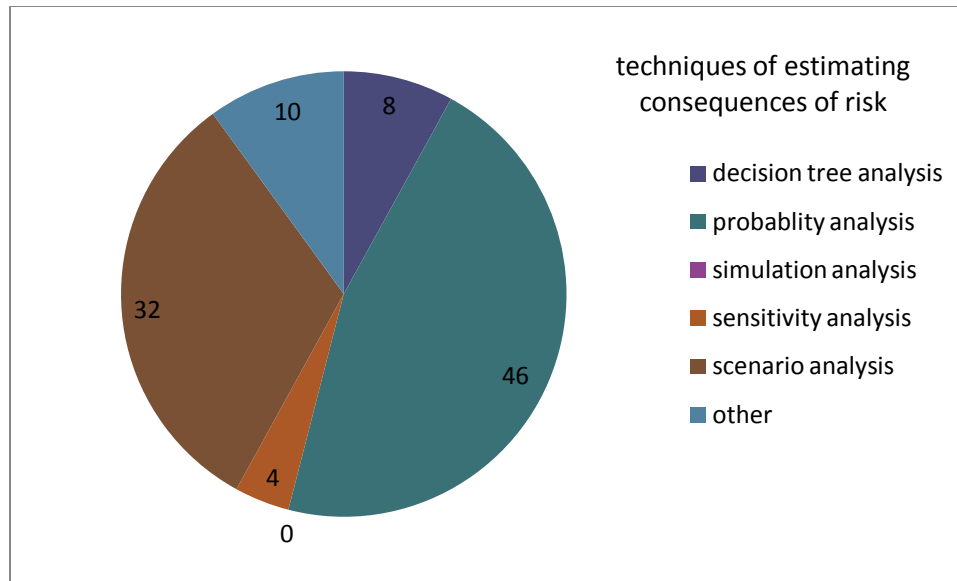


Figure 4.8 Methods of estimating consequences of risk in Ethiopian building construction projects

It can be observed from this result that most of the respondents don't use decision tree analysis and sensitivity analysis which were found to be very effective for determining risk severity by different studies and researches.

As seen in the literature review, the likelihood of risk occurrence usually both affects and is affected by how it is allocated. Allocating a risk to the party best able to control its occurrence and consequences, reduces the likelihood of the risk eventuating by giving the party best able to control it an incentive to prevent its occurrence. The party with the greater knowledge of the project's technical characteristics and/or structure and financing arrangements is also generally in the best position to manage the consequences if the risk materializes.

According to 47% of the respondents (figure 4.9) risk is allocated to different parties involved in a project mostly by considering the party which is in the best position to control them through the contract clauses. This method minimizes the effect of risk since the risk is transferred to the party that has power to control its occurrence or

decrease its effect when it becomes evident. Around 42% of the respondents deal with the risk by negotiation when and if the risk occurs. This means the risk, instead of being allocated before it occurs, is dealt with after it occurs after the parties negotiate on which party is in the best position to deal with it. A few respondents (11%) said they pay risk premiums for the party willing to take the risk; this method follows similar procedures as insurance.

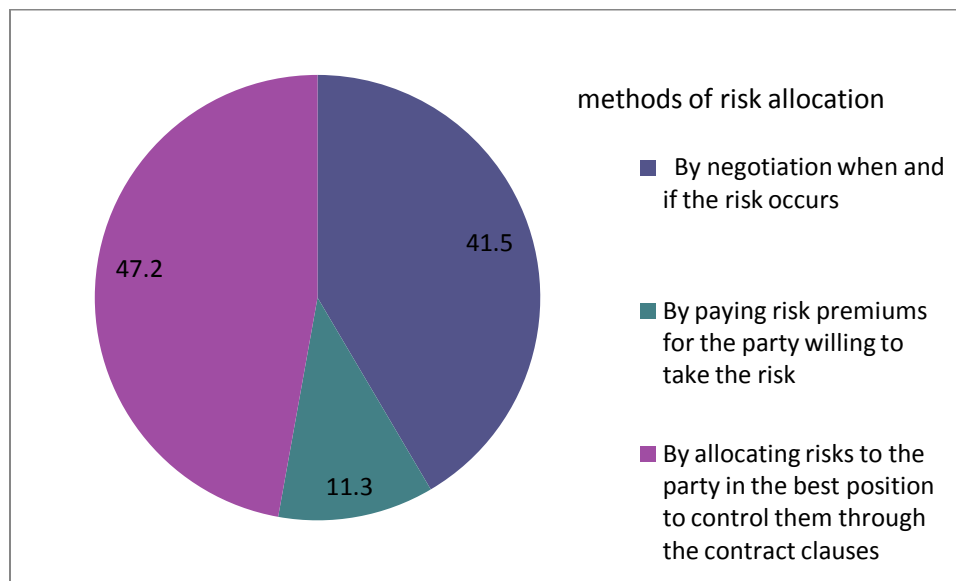


Figure 4.9 Risk allocation mechanisms commonly used in Ethiopian building construction projects.

Risk mitigation is an important risk management process which tries to reduce the likelihood of the risk materializing or reduce its effect if it does materialize. According to the literature review there are four common risk mitigation options, i.e. avoidance, retention, control and transfer. The most common risk mitigation method identified by majority of the respondents was control or reduction of the risk as can be seen in figure 4.10. This means majority of the respondents try to decrease the effect of risk or manage it to decrease its consequence after the risk has been identified.

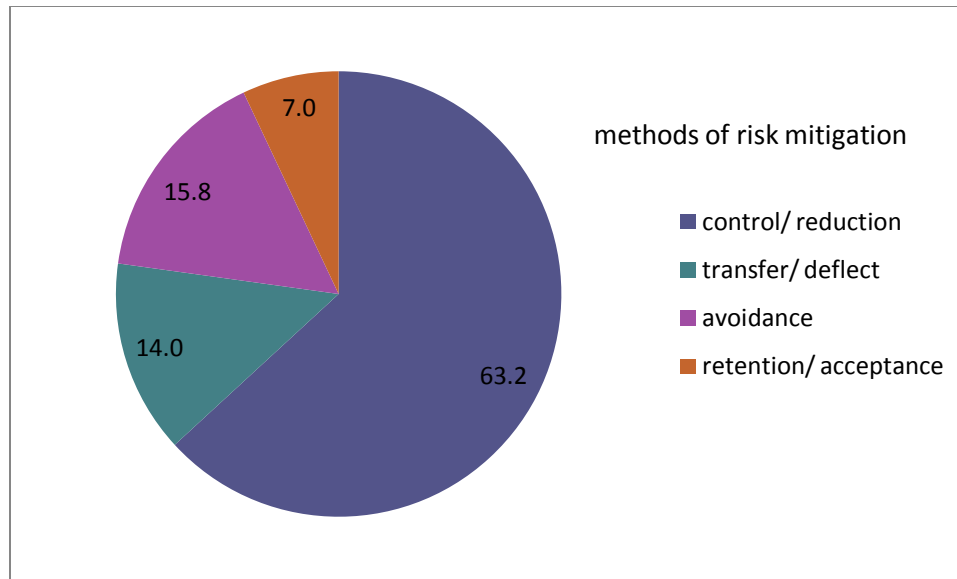


Figure 4.10 Common risk mitigation methods used in Ethiopian building construction projects

As discussed in the literature review, risk management is very important in any project and it should be performed starting from the contractual stage by specialized people. According to majority of the respondents, there is no specialized risk management team responsible for managing risk (figure 4.11); 50% believe the project manager is responsible for managing of risk. This practice might work on small construction projects but when the project is big and complex a team of people need to be organized to identify the risks and manage their consequences on project objectives. None of the respondents believe the client is responsible for managing risk and only a few believe the consultant has a risk management responsibility.

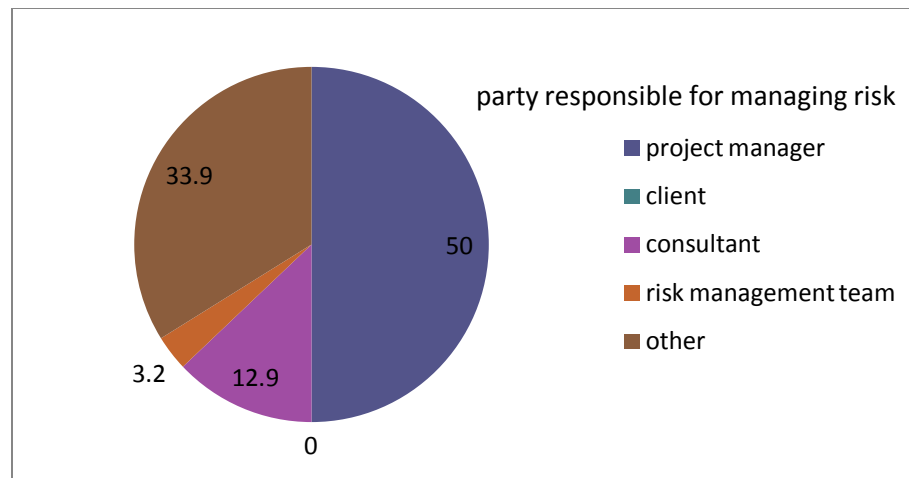


Figure 4.11 Parties responsible for managing risk in Ethiopian building construction projects

The fact that most respondents believe there is no need to have a specialized risk management team shows that a lot needs to be done to disclose the importance of risk management in achieving project goals. The project manager alone cannot be expected to deal with all the risks that are encountered in his project especially for big and complex projects.

4.4 The effects of different areas and causes of risk on project objectives

This section contained responses to questions that relate to management of risk in the contract document and the effect it has on the project objectives. As seen in the literature review, the contract is an important tool to manage risk. It can be seen from the literature review that if the risks associated with each type of contract are identified and if an appropriate type of contract is selected for the project, the effect the risk has on the project objectives can be greatly minimized.

Different contract types can be selected depending on the project type and complexity. The contract can be between the client and the consultant or the client and the contractor. Different contract types involve various risks. Most of the

respondents (89%) identified unit rate contract as the most widely used type of construction contract document in the Ethiopian building construction projects as can be seen in figure 4.12 below.

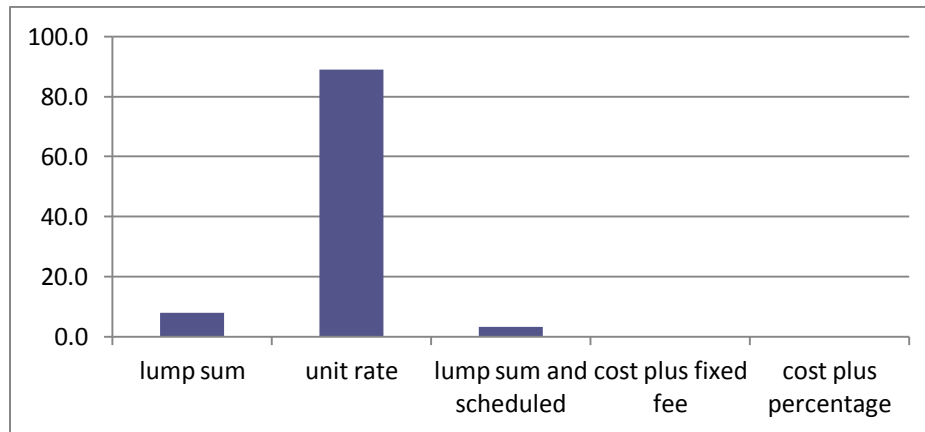


Figure 4.12 Types of contract mostly used in Ethiopian building construction projects.

As can be observed from figure 4.12, lump sum is identified as the second popular contract document by the respondents (8%) but the other forms of contracts are seen as non important by the respondents for their building construction projects (figure 4.12). Hence, according to the respondents, Ethiopian building construction projects are executed using either unit rate or lump sum contract. And sometimes a combination of the two contracts is used.

Then the respondents were asked to rate contract documents with their level of risk and identify the contract document which offers less risk. Figure 4.13 shows the contract documents with their level of risk; '1' representing 'very low', '2' representing 'low', '3' representing 'moderate' and '4' representing 'high' levels of risk. The unit rate contract was identified to offer the least level of risk by the respondents.

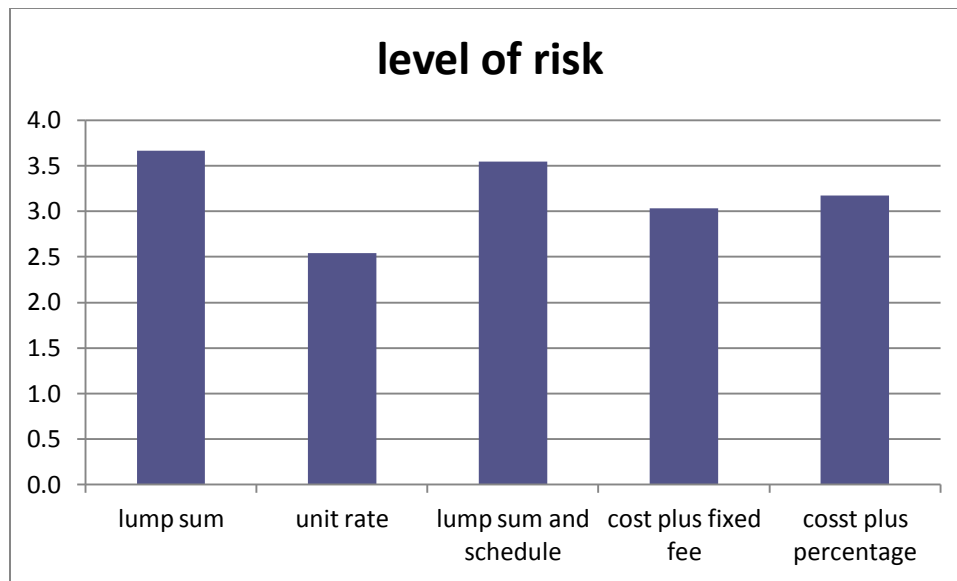


Figure 4.13 Level of risk of different contract documents

As can be observed from the above figure, the lump sum contract is identified to involve the highest level of risk. As can be seen in the literature review, in lump sum contract almost all the risk is assigned to the contractor. The risk might be caused by under estimation of the project cost at the start of the project. Since the price is fixed for the project, all uncertainties and risks need to be carefully taken into consideration when calculating the total lump sum amount. Since lump sum contract is common in Ethiopian building construction projects and also contains the highest level of risk, risk management is especially important to minimize the effect of these risks.

Almost all the respondents, 90.8%, admitted that their previous projects failed to meet their objectives i.e. they encountered delay, cost overrun or quality problems and they believe this could have been avoided by incorporating risk management clauses in the contract. For most respondents, 38.5%, the most important reason for incorporating risk management clauses in the contract is to achieve project objectives as can be observed from figure 4.14. The respondents also believe in addition to helping achieve project objectives, risk management clauses in the contract help to be better prepared for uncertainties and to decrease claims and disputes among contracting

parties. This research, therefore, confirms that most parties involved in the Ethiopian building construction projects believe that if the contract is prepared well and if it contains clauses that deal with different risks, many of the problems caused by them and their effect on project objectives can be minimized.

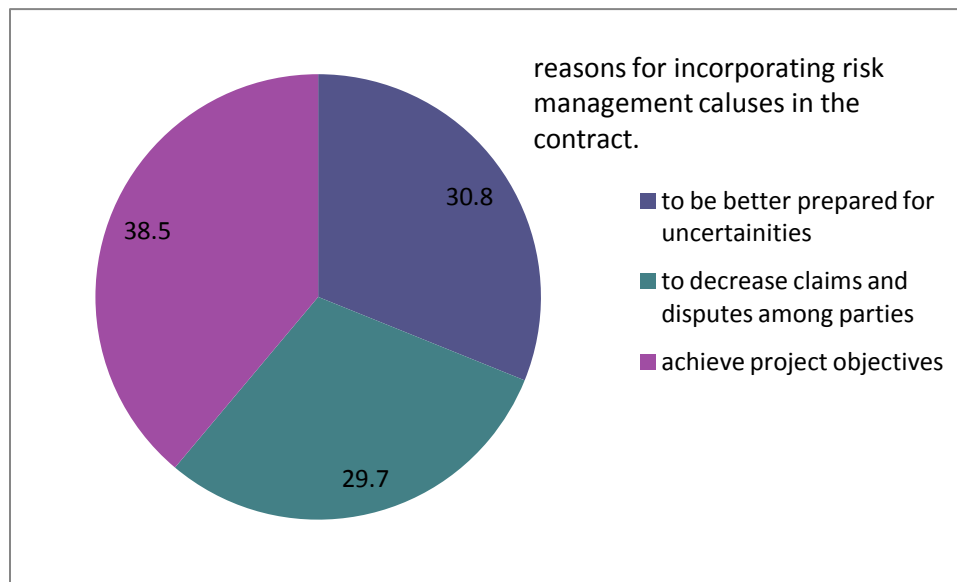


Figure 4.14 Important reasons for incorporating risk management clauses in the contract

The respondents were also asked to rank the impact different risk areas have on project objectives. Table 4.6 below shows the no of responses under each category of risk and the level of impact the risk areas have on project objectives. The impact each risk area has on different objectives, i.e. time, cost, and quality were calculated separately and the average of these values was taken to get the total effect of these risk areas on the overall project objective.

Risk Areas	No of responses and mean values												Average
	Impact												
	Time			Mean	Cost			Mean	Quality			Mean	
	low	moderate	high		low	moderate	high		low	moderate	high		
i. Contractual	4	19	44	2.6	4	28	28	2.4	12	23	28	2.3	2.43
ii. Financial	2	18	47	2.7	4	15	48	2.7	8	16	35	2.5	2.63
iii. Political	16	19	8	1.8	35	20	8	1.6	36	20	6	1.5	1.63
iv. Performance	4	12	51	2.7	4	28	35	2.5	8	16	36	2.5	2.57
v. Technical	4	39	24	2.3	6	35	24	2.3	6	23	38	2.5	2.37
vi. Geographical	19	24	20	2.0	10	32	19	2.1	12	36	15	2.0	2.03
vii. Operator	15	24	24	2.1	10	24	27	2.3	6	31	23	2.3	2.23

Table 4.6 Impact of different risk areas on project objectives

Figure 4.15 shows the impact the different areas of risk have on project objectives, with '1' representing 'low', '2' representing 'medium' and '3' representing 'high' impact. It can be observed from this figure, that the majority of the respondents believe financial and performance risk area have the highest impact on time followed by contractual risk. While political risk has the lowest impact on time. The financial risk and performance risk areas were found to have the highest impact on cost while political risk was said to have the lowest impact on cost. Technical and performance risk areas were evaluated to have the highest influence on quality while political risk area was believed to have the lowest impact on quality. Overall the respondents believed financial, performance and contractual risk areas have the most influence on project objectives.

As already discussed earlier political risk has low probability of occurrence and even if it occurs, its impact on project objectives is very low. Hence political risk is not a major concern in the Ethiopian building construction projects. On the other hand, financial and contractual risks have high probability of occurrence and high impact or consequence on projects. Performance risk was also identified to have a big effect on time, budget and quality in Ethiopian building construction projects.

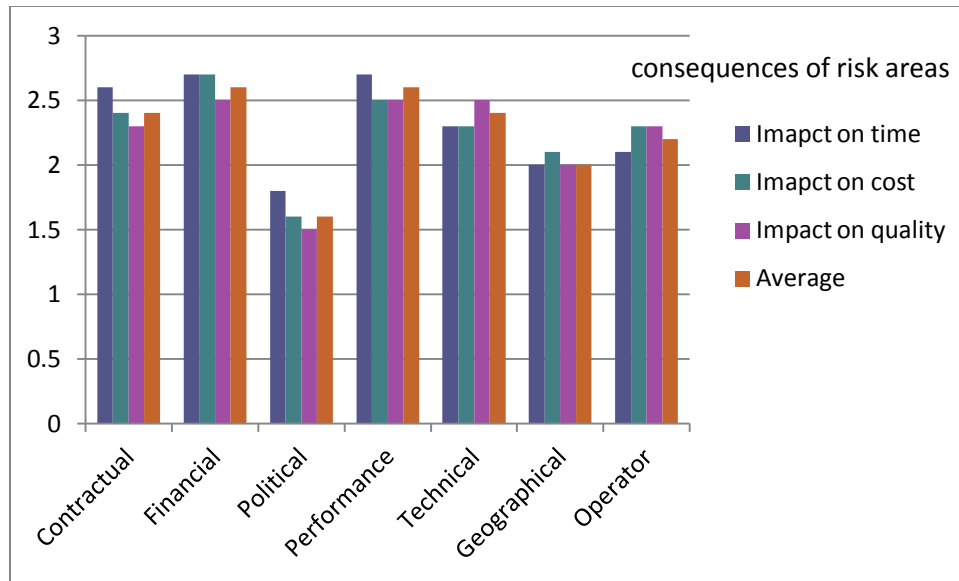


Figure 4.15 The consequences or impacts of the different risk areas on project objective

Next the respondents were asked to rank the major causes of construction contract risks based on their probability of occurrence and their level of impact on project objectives.

As can be observed from the table 4.7 the major causes of risk that are believed to have the highest probability of occurrence are poor contract management, financial difficulties and inaccurate time, quantity and quality estimates with a mean value of 2.6 (1=low and 3=high). The major cause of risk that is identified by most respondents to have the highest influence on time is inaccurate time estimate with a mean score of 2.8. A financial difficulty is believed to have the highest influence on cost with a mean value of 2.9, and poor quality control was identified to have the highest influence on quality with a mean score of 2.6.

Major causes of risk	No of responses																	
	Probability of occurrence				Level of impact													Average
					Time				Cost				Quality					
	1	2	3	mean	1	2	3	mean	1	2	3	mean	1	2	3	mean		
Change in scope of work and design	6	19	42	2.5	4	15	48	2.7	3	24	40	2.6	20	28	19	2.0	2.4	
Vagueness of contract conditions about risk allocation	8	34	19	2.2	12	32	16	2.1	14	31	16	2.0	18	35	8	1.8	2	
Ambiguous clauses in the contract	20	28	17	2.0	15	28	22	2.1	20	24	20	2	24	24	16	1.9	2	
Force major and Unforeseen events	24	35	8	1.8	11	20	35	2.4	10	27	30	2.3	18	31	18	2.0	2.2	
Incomplete or poor specification	6	27	34	2.4	10	23	32	2.3	10	19	38	2.4	10	16	39	2.4	2.4	
Inaccurate quantity and cost estimate	2	25	40	2.6	6	24	35	2.4	0	15	48	2.8	26	16	22	1.9	2.4	
Incompetent project team	8	32	27	2.3	8	24	31	2.4	8	28	30	2.3	6	20	40	2.5	2.4	
Unclear scope of work	16	40	11	1.9	18	19	30	2.2	18	24	24	2.1	24	20	23	2.0	2.1	
Inadequate insurance cover	27	24	15	1.8	36	23	6	1.5	19	24	22	2.0	32	20	12	1.7	1.7	
Slow payment for completed works	8	15	44	2.5	4	11	50	2.7	12	11	40	2.4	16	28	19	2.0	2.4	
Unrealistic contract clauses	27	28	4	1.6	20	16	22	2.0	27	16	14	1.8	27	16	15	1.8	1.9	
Improper planning	6	23	36	2.5	4	15	46	2.6	4	19	42	2.6	20	20	24	2.1	2.4	
Inadequate contractor experience	6	39	20	2.2	4	24	36	2.5	2	32	31	2.4	10	22	32	2.3	2.4	
Poor contract management	0	24	40	2.6	2	16	42	2.7	4	16	43	2.6	12	12	39	2.4	2.6	
Lack of consultant experience	4	40	20	2.3	4	39	22	2.3	8	32	24	2.3	8	20	36	2.4	2.3	
Lack of communication between consultant and contractor	2	36	27	2.4	4	24	35	2.5	4	32	27	2.4	2	32	29	2.4	2.4	
Undefined quality requirements	16	36	12	1.9	15	24	20	2.1	6	28	27	2.3	12	20	28	2.3	2.2	
Poor quality control	8	36	20	2.2	20	28	16	1.9	10	24	31	2.3	6	15	44	2.6	2.3	
Inflation	6	24	35	2.4	11	22	30	2.3	6	12	47	2.6	16	19	30	2.2	2.4	
Availability of material	2	40	20	2.3	0	28	35	2.6	2	24	32	2.5	6	24	30	2.4	2.5	
Weather conditions	20	39	6	1.8	11	36	16	2.1	22	27	16	1.9	22	27	14	1.9	2	
Low bid price	6	24	32	2.4	8	14	40	2.5	6	12	45	2.6	6	16	39	2.5	2.5	
Legal disputes among different parties involved in the project	32	28	4	1.6	12	22	27	2.2	15	24	24	2.1	22	31	8	1.8	2.0	
Change orders	2	32	31	2.4	4	22	36	2.5	2	27	36	2.5	22	28	15	1.9	2.3	
Inaccurate time estimates	2	19	44	2.6	0	12	52	2.8	4	20	40	2.6	14	27	24	2.2	2.5	
Accident during construction	28	36	0	1.6	24	35	4	1.7	19	32	12	1.9	39	22	2	1.4	1.7	
Financial difficulties	0	24	40	2.6	2	12	47	2.7	0	6	55	2.9	10	19	34	2.4	2.7	
Equipment breakdown and maintenance problem	4	32	27	2.4	6	20	35	2.5	8	20	32	2.4	12	31	18	2.1	2.3	

Table 4.7 Major causes of risks and their probability of occurrence and consequences in Ethiopian building construction projects.

According to the reviewed literature, risks which have low likelihood of occurrence and low impact if they manifest are said to be minor risks and they require no further action. The biggest concern of risk management is handling the major risks i.e. risks with high probability of occurrence and which have great impact if they take place.

In this research, as can be seen in figure 4.7, financial difficulty was identified to be the most important cause of risk with a very high level of occurrence and a high level of impact on project objectives (mean=2.7) followed by poor contract management with a mean score of 2.67. This implies how important it is to manage the contract and the budget to facilitate meeting of project objective in Ethiopian building construction projects.

Most of the respondents believe the odds of project objectives being achieved can be improved in the Ethiopian building construction projects by using appropriate contract risk management techniques at all stages of the project. This can be seen in the figure 4.16 below. The respondents also suggested using relevant clause in the contract that deal with risk and allocating risk to the party that is in the best position to control and manage the risk can greatly aid the process of risk management.

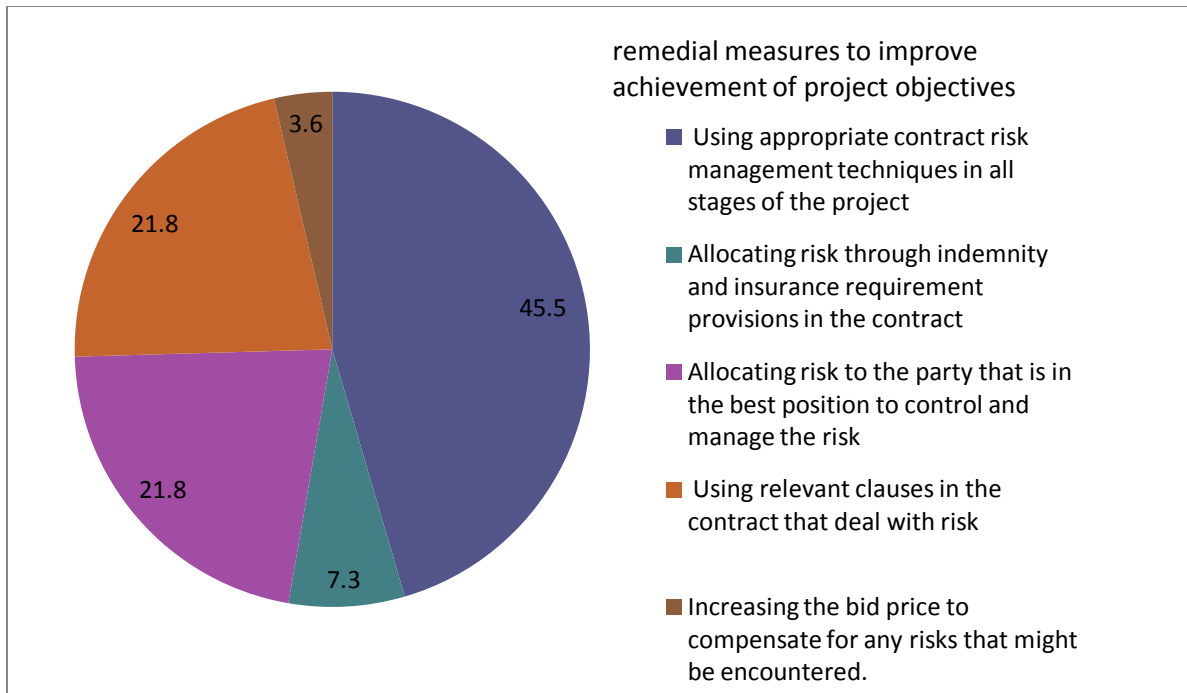


Figure 4.16 Suggested remedial measures to increase the odds of achieving project objectives in Ethiopian building construction projects

Almost all of the respondents, around 97%, believe managing risk in the contractual stage would play a major role in successful completion of projects.

5 CONCLUSIONS AND RECOMMENDATIONS

This research had three major objectives which were to identify the level of use of construction contract risk management techniques in Ethiopian building construction projects, to test the level of awareness about construction contract risk management of different contractual parties involved in these projects and to study the effect of contractual risk management in meeting project objective. The reviewed literature showed that construction contract risk management is vital in any construction and that different risk management techniques should be used starting from the contractual stage to make projects successful. Most building construction projects in Ethiopia fail to meet their objectives and the questionnaire was devised to discover if lack of proper risk management procedures might be contributory to this effect among other things. The questionnaire survey was believed to contain all the important research questions which were helpful in fulfilling the research questions.

The results of the questionnaire survey and discussion of the findings in line with the literature review were presented in the previous section. In this section the conclusions derived from the research findings and the recommendations are presented.

5.1 Conclusions

1. Most of the parties involved in the Ethiopian building construction projects are aware of the concept of risk management but only a relatively smaller number of this group believe they have an adequate knowledge needed for applying these risk management techniques to make their projects successful.
2. Most parties involved in Ethiopian building construction projects don't use risk management techniques in their projects because of lack of awareness about their significance and some don't use them fearing they need to hire additional staff and acquire more resources.

3. The type of contract selected for the construction has a great influence on the level of risk encountered. The most widely used type of contract in the Ethiopian building construction projects is believed to be the unit rate contract and it is found to involve least level of risk.
4. The type of delivery system selected for the project has influence on the level of risk encountered. The parties involved in Ethiopian building Construction projects believe that Design build (DB) and Force account delivery systems involve high risk while comparatively construction management delivery system is believed to involve the least level of risk.
5. Financial difficulty and poor contract management were identified to be the most important causes of risk with a very high level of occurrence and a high level of impact on project objectives in the Ethiopian building construction projects.
6. The methods and techniques mostly used in the building projects to identify, assess, allocate and mitigate the risks are highly dependent on an individual's judgment and past experience. In most projects, there is no specialized risk management team to deal with different risks that might arise during the life of the project.

5.2 Recommendations

1. Since lack of awareness was identified as a major cause for not having enough confidence for using risk management techniques, regular trainings and workshops on the subject need to be provided for the parties involved in building construction projects. All parties should be encouraged to take part and participate in trainings and workshops and try to increase their knowledge of risk management.
2. A special attention should be given to managing Financial and Contractual areas

- of risk since they were identified as most important risks in Ethiopian building construction projects.
3. Establishing a risk management team is highly recommended in the Ethiopian building construction projects.
 4. Relevant clauses that deal with risk should be included in the construction contract and the risk allocated to the party that is in the best position to control and manage it in order to increase the odds of achieving the project objectives.
 5. I recommend further research be conducted on the subject;
 - ✓ By using case study on few selected construction companies and their projects.
 - ✓ Involving other sectors of the construction industry.
 6. In order for good researchers to come up with very useful findings, I recommend the parties involved in the construction industry be more cooperative by willingly participating and giving any support needed for the research.

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7 APPENDIX

Questionnaire

Dear sir/Madam

My name is Addis Mesfin. I am currently doing my MSc. in Construction Technology and Management at Addis Ababa Institute of Technology. I have finished my course work and now I am doing my MSc. thesis entitled: Studies of construction contract risk management in Ethiopian Building projects.

I believe your experience and educational background will greatly contribute to the success of my research. So it's with great respect that I ask you to fill this questionnaire. I guarantee that your identity will be kept confidential and the information you provide only be used for academic purposes. I will be happy to share the findings of this research when it's completed.

Thank you in advance for taking your precious time to fill this questionnaire. Please try to answer all the questions openly, as your answers will have an influence on the outcome of the research. Your 30 minutes or less will greatly contribute to the growth and advancement of knowledge in the construction industry.

If you have any questions or comments, please don't hesitate to contact me. You can reach me by;

- Mobile: 0913600453/0911203043
- E-mail: addimesfin@gmail.com

With Regards,

Addis Mesfin

Thesis title: Studies of Construction Contract Risk Management in Ethiopian building projects

Introduction:

Risk: Risk is an uncertain event or set of circumstances, should it occur will result in uncertainty in the final cost, duration and quality of the project. Risk is associated with every aspect of our daily life, i.e. risk is involved in every step we take. Many scholars believe if risk is properly managed it will lead to better achievement of project objectives. The contract document, if properly prepared, can be used for preventing and controlling of all areas of risk. According to IMCA risk guidelines, the main risk areas in construction contracts are

- *Contractual risks* result from not clearly defining the responsibilities and duties of the contracting parties. The contract clauses should be clear and easily understood by everyone involved.
- *Performance/construction risk* is due to clearly undefined scope and nature of work. The contractor is expected to perform the work with some standard including safety; hence different situations that could hinder performance should be included in the contract. Incomplete information at the time of bid can negatively affect the performance of the contractor.
- *Financial/Economical risks* are a result of not understanding the terms of payment, performance bond, bank guarantee etc. The payment terms should reflect the progress of the work and the parties should have the required financial backing from a reliable source.
- *Political risks* are especially significant when the construction is on a foreign government's site/country. The country might interfere in the bidding and construction process by changing laws and standards. The contractor needs a secure environment for performing the construction and should be clearly stated in the bid as well as the contract document.

- *Technical risk* arises from lack of understanding of the system and the technology that would be utilized at the time of bid and during construction.
- *Geographical risks* arise as a result of the location of the site. The location of the site is very important and should be selected very carefully because it can lead to additional risks like political risk. The stability, material supply interruptions, mobility and access should all be considered during bid and contract agreement.
- *Operator risks* are due to the operators influence on the bid, contract, supervision, and approval etc. Underperformance of the operator should not affect the work of the contractor; therefore there should be clear statements in the contract specifying the operator's obligations and the consequences to the contractor.

Risk management: Risk management is the practice of identifying, evaluating and responding to risks encountered in a project. It is by which the likelihood of risk occurring or its impact on a project objectives is reduced. Risk management usually contains the following steps

- *Risk identification:* is the process of identifying all the risks relevant to the project. The process involves an investigation into all possible potential sources of project risks and the interrelationships among them. The risks which are identified to be more significant are selected for further analysis.
- *Risk assessment:* is the process of determining the likelihood of identified risks materializing and the magnitude of their consequences if they do materialize. If a risk is very unlikely to occur and if its consequence is minor then it's of less importance to the parties involved. On the other hand if the risk is likely to occur and cause major consequences, then the risk is of major concern to everyone involved.
- *Risk allocation:* is a process whereby the responsibility of dealing with the consequences of a certain risk is assigned to a party in the construction contract. It is important to assign a project risk to the party best able to control and manage it. Risk can also be allocated through indemnity and insurance requirement provisions.

- *Risk mitigation*: is any action that can be taken to reduce the likelihood of a risk materializing or to reduce the consequences to the contracting party taking the risk, if it does materialize. Four mitigation strategy categories commonly used are avoidance, retention/acceptance, control/reduction and transfer/ deflect.

According to different researches, risk management plays a very important role in achieving project objectives in any construction project. In developed countries, projects are pre rated for risk before the bidding process even starts and in many projects there is a risk management team that is responsible for managing different project risks. The risk management team is involved starting from the inception phase of the project. The contract document is prepared by professionals considering different risks to make sure the project meets its objectives. But the concept of risk management is relatively new in most building constructions in Ethiopia and according to different researches, most building projects fail to meet their objectives i.e. they incur delay, cost overrun or quality problems. This research tries to study the practice of using construction contract risk management in the Ethiopian building construction industry and its effect on project objectives.

Objectives of the research:

- To test the level of awareness of different parties involved in Ethiopian building construction projects about contract construction risk management.
- To identify the level of use of construction contract risk management techniques in Ethiopian building projects
- To study the effect of contractual risk management in meeting project objectives
- To suggest ways of improving the practice of using construction contract risk management for better achievement of project objectives in the Ethiopian building projects based on the research findings.

Advisor: Abebe Dinku (Prof. Dr.-Ing.)

This research is conducted for academic purposes, so please try to fill it carefully and truthfully.

SECTION ONE: GENERAL PROFILE OF THE RESPONDENT

1.1 Name: _____ Title: (Mr/Mrs/Miss/Dr. etc) _____

1.2. Company: _____

1.3 Address: _____

1.4. Profession/ job title _____

1.5. Group/party: contractor consultant other, please specify: _____

1.6. Category: _____ grade: 1 2 3 4 5 6 7 8 9

1.7. Years of experience

a) In the construction industry: _____

b) In your current position: _____

1.8. Type of work usually undertaken (please tick as applicable)

Commercial/industrial building

Public/ community building

Others, please specify _____

SECTION TWO: TO TEST AWARENESS

2.1. Are you aware of the concept of Risk Management?

Yes

No

2.2. How did you become aware of the principle of risk management?

Through study

Word of mouth

Through workshop and training

Through other means, please specify _____

2.3. How do you evaluate your knowledge of risk management principles?

- Low fair high

SECTION THREE: TO TEST THE LEVEL OF USE

3.1. Which areas of risks occur more frequently in your building project and which areas of risk cause major problems? Please rate them with their probability of occurrence and level of consequence (1= low, 2= moderate, 3=high) and tick accordingly.

Risk Areas	Probability of occurrence			Level of consequence/significance		
	1	2	3	1	2	3
ix. Contractual						
x. Financial						
xi. Political						
xii. Performance						
xiii. Technical						
xiv. Geographical						
xv. Operator						
xvi. Other						

3.2. Please rate the importance of risk management during every stage, (1=very low, 2=low, 3= moderate, 4=high, 5=very high)

Project stage	Importance of risk management				
	1	2	3	4	5
vi. Inception and feasibility					
vii. Planning and design					
iii. Tendering stage					
ix. Construction stage					
x. Commissioning and acceptance					

3.3. Which delivery system do you think incurs more risk? Please rate the delivery systems with the level of risk which they carry? (1=very low, 2=low, 3=moderate, 4=high, 5= very high)

Delivery system	Level of risk				
	1	2	3	4	5
vi. Force account					
vii. Design bid build, (DBB)					
viii. Design build, (DB)					
ix. Construction management					
x. Build operate transfer (BOT)					
xi. Other					

3.4. Does your company use risk management techniques?

- Yes No

3.4.1. If your answer to (Q. 3.4) is no,

i. what is the reason (you can tick more than one box)

- Lack of awareness They are expensive
 They are unnecessary They are time consuming
 The need to hire additional staff
 Others, please specify _____

ii. What method do you use to deal with different risks that arise during the building project construction? _____

3.4.2 If your answer to (Q. 3.4) is yes, at what stage of the construction does your company use risk management?

- before the start of construction (contractual stage) at all stages
 during construction

3.5. If your company uses contract risk management techniques, i.e. risk management at the contractual stage, please answer the following questions.

- i. What do you use to identify risks?
 - Expert opinions
 - Checklists
 - Risk records
 - ‘What can go wrong’ analysis i.e. an investigation into all possible potential sources of project risks and the interrelationship among them.
 - Others, please specify _____
- ii. What techniques do you use for assessing the likelihood (probability) of the risk occurrence for the identified risks?
 - Quantitative probability assessments based on historical data
 - Subjective probability assessments based on expert judgment
 - Ranking the importance of risks based on past experience
 - Others, please specify _____
- iii. What do you use to estimate the size of the risk’s severity or its consequence on project objectives?
 - Decision trees analysis; Sensitivity analysis;
 - Probability analysis; Scenario analysis;
 - Simulation analysis
 - Others, please specify _____
- iv. How do you allocate risks to the different parties involved in a project?
 - By negotiation when and if the risk occurs
 - By paying risk premiums for the party willing to take the risk
 - By allocating risks to the party in the best position to control them through the contract clauses
 - Others, please specify _____

v. What risk mitigation strategy do you usually use?

- Control/reduction avoidance
- transfer/deflect retention/acceptance
- Other, please specify _____

3.6. Who is responsible for managing of risk in your company?

- the project manager the consultant
- the client a specialized risk management team
- Others, please specify _____

SECTION FOUR: EFFECT OF CONTRACT RISK MANAGEMENT

4.1. What type of contract document do you mostly use for your building project?

- Lump sum contract Cost plus fixed fee contract
- Unit rate contract Cost plus percentage of cost contract
- Lump sum and schedule contract
- Other, please specify: _____

4.2. Which type of contract offers less risk for you? Can you please rate the different contract documents with their level of risk coverage? (1=very low, 2=low, 3=moderate, 4=high, 5= very high)

Type of contract document	Level of risk coverage				
	1	2	3	4	5
i. Lump sum contract					
ii. Unit rate contract					
iii. Lump sum and schedule					
iv. Cost plus fixed fee contract					
v. Cost plus percentage of cost					
vi. Other					

4.3. What is the most important reason, for you, for incorporating risk management clauses in the contract?

- To be better prepared for uncertainties
 - To decrease claims and disputes among parties
 - To achieve the project objectives effectively and efficiently
 - Others, please specify
-

4.4. Did any of your previous building projects fail to meet their project objectives i.e. did they encounter delay, cost overrun or quality problems?

- Yes
- No

4.4.1. If your answer is no, what helped you achieve that? _____

4.5. Which area of risk, do you think, affects project objectives more? Please rank the impact the risk areas have on project objectives

Risk Areas	Impact								
	Time			Cost			Quality		
	high	moderate	low	high	moderate	low	high	moderate	low
iii. Contractual									
ix. Financial									
x. Political									
xi. Performance									
xii. Technical									
iii. Geographical									
iv. Operator									
xv. Other									

4.6. Please rank the major causes of construction contract risks based on their probability of occurrence and their level of impact on project objectives. (1= low, 2= moderate, 3=high)

Major causes of risk	Probability of occurrence			Level of impact									
				Time			Cost			Quality			
	1	2	3	1	2	3	1	2	3	1	2	3	
Change in scope of work and design													
Vagueness of contract conditions about risk													
Ambiguous clauses in the contract													
Force major and Unforeseen events													
Incomplete or poor specification													
Inaccurate quantity and cost estimate													
Incompetent project team													
Unclear scope of work													
Inadequate insurance cover													
Slow payment for completed works													
Unrealistic contract clauses													
Improper planning													
Inadequate contractor experience													
Poor contract management													
Lack of consultant experience													
Lack of communication between consultant													
Undefined quality requirements													
Poor quality control													
Inflation													
Availability of material													
Weather conditions													
Low bid price													
Legal disputes among different parties													
Change orders													
Inaccurate time estimates													
Accident during construction													
Financial difficulties													
Equipment breakdown and maintenance													

4.7. What remedial measures do you suggest to improve the odds of project objectives being achieved in the Ethiopian building construction projects? (Please tick the two most important for you)

- Using appropriate contract risk management techniques in all stages of the project
- Allocating risk through indemnity and insurance requirement provisions in the contract
- Allocating risk to the party that is in the best position to control and manage the risk
- Using relevant clauses in the contract that deal with risk
- Increasing the bid price to compensate for any risks that might be encountered.
- Other, please specify: _____

4.8. In your expert opinion, do you think contract risk management plays a major role in successful completion of a project?

- Yes No I have no idea

.....The End.....

Thank you again for your time,

Addis Mesfin

