



Sudan University of Science and Technology



College of Graduate Studies

RISK MANAGEMENT IN THE PRE- IMPLEMENTATION STAGE IN THE CONSTRUCTION INDUSTRY IN SUDAN

**إدارة المخاطر في مرحلة ما قبل التنفيذ في صناعة التشييد في
السودان**

**A Thesis Submitted to College of Graduate Studies in Partial
Fulfillment of the requirement for the Degree of M.Sc in
Construction Management**

Prepared by:

ALAA OMER MOHAMED MOHAMED NOUR

Supervisor:

Dr: SALAH ELDIN ABDELAZIZ AJBAN

October 2017

**IF RISKS ARE NOT PROPERLY
ANALYZED, AND STRATEGIES ARE
NOT TRAINED TO BE DEALT WITH,
THE PROJECT IS LIKELY TO LEAD
TO FAILURES...**

ACKNOWLEDGMENT

*In the beginning, thanks to Allah The Almighty, who helped us
accomplish this work,*

ALL Praise be to Allah,

*Thanks and gratitude to everyone who helped me complete this
research and thank you very much*

*For suffering hardship and fatigue with me and for raising your hands
to pray for me*

My parents

To those who paved the way for me

My brothers and sisters

Who gave me a beacon of hope, science and experience

Dr. Salah Eldin Abdelaziz Ajban

*Who went with me through the study and lent a hand to me in times
of adversity*

My colleagues

DEDICATION

To science

To creation

To the illiterate teacher

Our Holy Prophet Muhammad, peace be upon him

To my wisdom, and my knowledge

To my supporter

To the spring of patience, optimism and hope

Dad

*Who taught me and faced the difficulties to enable me get what I
want*

And when I suffer I go the sea of tenderness to ease my pain

Mom

Who supported me

And gave me strength and to whom I refuge after Allah

To those who taught me the science of life

My brothers and sisters

To those who teach us letters of gold and

*To those who teach us letters in science, whom their thoughts were a
minaret that enlightened our road of science and success*

Our teachers

Who were my refuge

Whom I have spent the most beautiful time with

To whom I miss so much

My colleagues

To those whom I don't know.... They don't know me

Islamic Nation

ABSTRACT

The risk in construction industry is a global phenomenon and construction industry in Sudan is not an exception. Generally, many factors affect construction industry and it is very important to manage these factors to ensure the implementation of projects and continuity of development.

Recently, most of the projects in Sudan were found not accomplished within the specified constraints (time - cost - quality), the thing that made it substantial to go deep into one of the main reasons which is embodied in (risk management in the pre-implementation phase) as it is deemed the most important stage that affect the implementation process.

In this research, a descriptive analytical method is used, which based on the study of facts or phenomenon on the ground, for the purpose of accessing to the results of the study, by the design of a questionnaire and collecting data by selecting a community of random samples consist of 99 single study, that targeted engineers working for Construction Industry companies in Khartoum state.

In the research, a Statistical Package for Social Sciences (SPSS) is used as tools for data analysis.

The most important results reached by the researcher include the following:

- There is no clear vision for risk management in the initial stages of projects.
- There is a gap between planning and implementation.
- Lack of estimation of the components of engineering projects
- The majority of conflicts are a result of poor risk management.

The recommendations can be summarized as follows:

1. It is essential for any project to have a risk plan in advance.
2. Policymakers should work for changing the muddle thinking through developing plans or making a checklist in order to avoid any negative impact of risks.
3. It is vital to introduce the concept of planning for engineers since the beginning of their university studies.

Recommendations for future research:

There are many chances for further researches abstracted in this thesis such as:

1. The implementation of risk management in the execution stage of construction projects in Sudan.
2. Ways to reduce risk impacts on construction projects in Sudan.

مستخلص

تعد المخاطر في صناعة البناء والتشييد ظاهرة عالمية، وصناعة البناء والتشييد في السودان ليست استثناء. وعلى وجه العموم، تؤثر العديد من العوامل على صناعة البناء، الشيء الذي يجعل إدارة هذه العوامل أمراً أساسياً لضمان تنفيذ المشاريع واستمرارية التنمية.

ونجد في الآونة الأخيرة أن معظم المشاريع في السودان لا يتم إنهاؤها ضمن القيود المحددة (الوقت - التكلفة - الجودة)، فكان لابد من التعمق في واحدة من أهم الأسباب التي تؤدي إلى عدم إنتهاء المشاريع ضمن هذه القيود ألا وهي إدارة المخاطر في مرحلة ما قبل التنفيذ بإعتبارها أهم المراحل التي تؤثر بشكل كبير على عملية التنفيذ.

اهتم هذا البحث بالمخاطر في مرحلة ما قبل التنفيذ، وقد إشتمل على الإطار النظري للظاهرة كما تم تناول النظريات المختلفة في إدارة المخاطر. أما فيما يتعلق بالإطار العملي لهذا البحث فقد تم استخدام المنهج التحليلي الوصفي الذي يعتمد على دراسة الواقع أو الظاهرة كما هي في الواقع لغرض الوصول إلى نتائج الدراسة وذلك عن طريق تصميم استبيان وجمع البيانات عن طريق اختيار مجتمع البحث من عينة عشوائية شملت 99 مفردة، واستهدفت الدراسة المهندسين بشركات صناعة التشييد في ولاية الخرطوم .

تم تحليل البيانات الإحصائية باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية

من أهم النتائج التي توصل إليها الباحث :-

- عدم وجود رؤيا واضحة لإدارة المخاطر في المراحل الإبتدائية للمشاريع.
- وجود فجوة بين التخطيط والتنفيذ.
- عدم التقدير الجيد لمكونات المشاريع الهندسية .
- تنشأ أغلبية النزاعات من ضعف إدارة المخاطر.

يمكن تلخيص التوصيات على النحو التالي:

1. من الضروري جداً أن توضع لأي مشروع خطة مسبقة للمخاطر.
2. يجب أن يعمل صناع السياسات على تغيير التفكير المشوش من خلال وضع خطة أو قائمة مرجعية لتجنب أي آثار سلبية للمخاطر.
3. من الضروري إدخال مفهوم التخطيط للمهندسين منذ بداية دراستهم الجامعية.

توصيات للبحوث المستقبلية:

هناك مزيد من البحوث المقترحة المستخرجة في هذه الأطروحة مثل:

1. تنفيذ إدارة المخاطر في مرحلة التنفيذ لمشاريع البناء في السودان.
2. طرق التخفيف من آثار المخاطر على مشاريع البناء في السودان.

TABLE OF CONTENTS

SUBJECT	PAGE
ACKNOWLEDGMENT	III
DEDICATION	IV
ABSTRACT	VI
مستخلص	VII
TABLE OF CONTENTS	VIII
LIST OF TABLES	XI
LIST OF FIGURES	XVI
CHAPTER 1	
INTRODUCTION	
1.1	PREAMBLE 2
1.2	RESEARCH COMPONENTS 2
1.2.1	RESEARCH SCOPE 2
1.2.2	RESEARCH PROBLEM 2
1.2.3	RESEARCH HYPOTHESES 3
1.2.4	RESEARCH OBJECTIVES 3
1.2.5	RESEARCH IMPORTANCE 3
1.2.6	RESEARCH METHODOLOGY 4
CHAPTER 2	
LITERATURE PREVIEW	
2.1	INTRODUCTION 6
2.2	PROJECT LIFE CYCLE 6
2.3	PROJECT MANAGEMENT 7
2.3.1	DEFINITION OF PROJECT MANAGEMENT 7
2.3.2	PROJECT MANAGEMENT KNOWLEDGE AREA 8
2.3.3	PROJECT MANAGEMENT PROCESSES 8
2.4	RISK MANAGEMENT 9

2.4.1	DEFINITION OF RISK	9
2.4.2	TYPE OF RISK	9
2.4.3	COMMON SOURCES OF RISK IN CONSTRUCTION PROJECTS	11
2.4.4	DEFINITION OF RISK MANAGEMENT	12
2.3.5	CONCEPT OF RISK MANAGEMENT	13
2.3.6	FACTORS AFFECTING RISK	13
2.3.7	RISK MANAGEMENT PROCESS	15
2.3.8	THE RISK MANAGEMENT MODEL	20
CHAPTER 3 RESEARCH METHODOLOGY		
3.1	VARIABLES OF THE QUESTIONNAIRE:	23
3.2	STATISTICAL TREATMENT PERFORMED	23
3.3	THE FIVE- DIMENSIONAL LIKERT SCALE	23
3.4	QUESTIONNAIRE DESIGN:	23
3.4.1	INDEPENDENT VARIABLES	23
3.4.2	DEPENDENT VARIABLES	24
3.5	ANALYSIS OF QUESTIONNAIRE	27
3.6	THE FIVE- DIMENSIONAL LIKERT SCALE	27
CHAPTER 4 ANALYSIS AND DISCUSSION OF QUESTIONNAIRE		
4.1	DESCRIPTIVE ANALYSIS OF STUDY FIELD DATA	30
4.2	DESCRIPTIVE ANALYSIS OF PERSONAL DATA	30
4.2.1	DESCRIPTIVE ANALYSIS OF DEPENDENT VARIABLES DATA	30
4.2.2	DESCRIPTIVE ANALYSIS OF DEPENDENT VARIABLES DATA	35
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS		
5.1	CONCLUSION	46

5.2	RECOMMENDATIONS	46
	REFERENCES	48
	APPENDIX	51

LIST OF FIGURES

Fig number	Figure title	Page
Fig no (1)	The risk management model	20
Fig no (2)	HYP (1)	24
Fig no (3)	HYP (2)	25
Fig no (4)	HYP (3)	25
Fig no (5)	HYP (4)	26
Fig no (6)	HYP (5)	26
Fig no (7)	Age of sample questionnaire	31
Fig no (8)	Qualification of sample questionnaire	32
Fig no (9)	Experience of sample questionnaire	33
Fig no (10)	Company of sample questionnaire	34

LIST OF TABLE

Table number	Table Title	Page
Table no (1)	The five dimensional likert scale	28
Table no (2)	Age of sample questionnaire	31
Table no (3)	Qualification of sample questionnaire	32
Table no (4)	Experience of sample questionnaire	33
Table no (5)	Company of sample questionnaire	34
Table no (6)	Frequency ,standard deviation, mean and result of sample questionnaire for HYP (1)	35
Table no (7)	Frequency ,standard deviation, mean and result of sample questionnaire for HYP (2)	38
Table no (8)	Frequency ,standard deviation, mean and result of sample questionnaire for HYP (3)	40
Table no (9)	Frequency ,standard deviation, mean and result of sample questionnaire for HYP (4)	42
Table no (10)	Frequency ,standard deviation, mean and result of sample questionnaire for HYP (5)	44

CHAPTER 1

INTRODUCTION

1.1 PREAMBLE

The construction sector is the most important sector of engineering and it plays a key role in economic growth. This sector employs skilled and unskilled labour, therefore the economic growth is only achieved when risk in the sector is controlled.

There are some projects still remain as ideas, although there is no problem in the feasibility study, but the main dilemma is how the risk can be managed from the beginning of the project till the end, in a world that everything daily changes.

1.2 RESEARCH COMPONENTS:

1.2.1 RESEARCH SCOPE

The construction industry always faces challenges and constraints, the project team should have plans to manage such problems.

One of the challenges confronting construction projects is the phenomenon of risk.

This research addresses the different types of risks that a construction project in Sudan can face.

1.2.2 RESEARCH PROBLEM

Recently, most of the projects in Sudan were found not accomplished within the specified constraints (time - cost - quality)

The above mentioned situation leads to risk impacts, where the construction projects can be affected by such incidents, the thing that may represent a bad indication of the project status, hence it is important to study these challenges in order to find ways to mitigate their impacts.

1.2.3 RESEARCH HYPOTHESES:

This research adopted the following hypotheses:

- 1) There are no plans for risk in the pre-implementation stage in the construction industry in Sudan.
- 2) Managing risks in the pre-tendering stage is useful and helpful in the construction phase.
- 3) Risks always impact project duration and cost severely.
- 4) The omission of risk management could lead to claims and disputes.
- 5) Educational institutions and companies in Sudan care about risk management.

1.2.4 RESEARCH OBJECTIVES

The main objectives of this research are:

1. Identifying the effect of risk in the pre-implementation stage in the construction industry in Sudan, regarding the project objectives.
2. Identifying the relationship between (claims and disputes) and risk management, and determining the relationship between education, risk management and company risk management.

1.2.5 RESEARCH IMPORTANCE:

Risk Management in the pre-implementation stage in the construction project is important to accomplish the project within the specified cost, time and quality.

Most of the projects are subject to many risks, such as cost increase, delay, poor quality and many other technical and financial risks. Such risks can be mitigated or eliminated through a clear definition, hence corrective provisions and actions may be required

Risk management ensures perfect precaution to manage, mitigate or completely eliminate the risk that may arise later, and helps control the negative effects.

1.2.6 RESEARCH METHODOLOGY:

Researcher in this study adopted the descriptive analytical method for the purpose of reaching the outcomes of the research study.

Methods of data collection:-

The methods used in the study to collect data are as follows:-

The initial data is divided into:

1 - Questionnaire:

Adoption of a special form of a questionnaire to collect the study necessary information and distribution of the questionnaire targeting selected samples of project managers and engineering department managers in order to determine the effect of risk management in the pre-implementation.

2 - Secondary sources:

Books, web sites, papers, journals and researches related to this research.

CHAPTER 2

LITERATURE REVIEW

2.1

The construction industry is highly risk prone, with complex and dynamic project environments that create an atmosphere of high uncertainty and risk. The industry is vulnerable to various technical, sociopolitical and business risks. The track record to cope with these risks has not been very good in the construction industry. As a result, the people working in the industry bear various failures, such as failure of abiding by quality and operational requirements, cost overruns and uncertain delays in project completion. In light of this, it can be said that an effective system of risk assessment and management for the construction industry, remains a challenging task for the industry practitioners. The aim of the research is to identify risks in pre-implementation and how can the owner or consultant deal with these risks and lead the project to complete within the specified cost, time, and good quality, and to find out on the ground, why most of construction industry projects in Sudan fail, whether there is no risk or no awareness of the importance of risk plan.

2.2 PROJECT LIFE CYCLE

Every project has a beginning, a middle period during which the activities move the project towards completion, and an end (either successful or unsuccessful). A standard project typically has the following four major phases (each with its own agenda of tasks and issues): initiation, planning, implementation and closure. Taken together, these phases represent the path that a project takes from the beginning to its end, and are generally referred to as the project “life cycle.”
Adrienne Watt

The process each manager follows during the life of a project is called the Project Management Life Cycle. A proven methodical life cycle is necessary, to repeatedly implement and manage projects successfully. During the life cycle of any project, proven and tested project management processes or best practices should be initiated.

2.3 Project Management:

More specifically, what is a project? It's a temporary endeavor undertaken to create a unique product, service or result. A project is temporary, that it has a defined beginning and end in time, and therefore defined scope and resources. A project is unique, that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal. So a project team often includes people who don't usually work together – sometimes from different organizations and across multiple geographies.

2.3 1.DEFINITION OF PROJECT MANAGEMENT:

Project Management is the process of achieving project objectives (schedule, budget and performance), through a set of activities that start and end at certain points of time and produce quantifiable and qualitative deliverables. Successful project management is the art of bringing together the tasks, resources and people to accomplish the business goals and objectives within the specified time constraints and within the monetary allowance. Projects and programs are linked directly to the strategic goals and initiatives of the organization support.

Project management is the planning, organizing, monitoring and control of all aspects of a project and the motivation of all involved, to achieve project objectives safely and within a defined time and cost. It is the application of knowledge, skills, tools and techniques to project activities to meet its requirements.

Project management involves planning and organizing of the company's resources to move a specific task, event or duty towards completion. It typically involves a one-time project rather than an ongoing activity, and resources managed include human capital and financial capital. A project manager helps to define the goals and objectives of the project and determines when the various

project components are to be completed and by whom, also creates quality control checks to ensure that the completed components meet a certain standard.

2.3.2 PROJECT MANAGEMENT KNOWLEDGE AREA:

1. Project integration management
2. Project scope management.
3. Project time management
4. Project cost management
5. Project quality management
6. Project human management
7. Project communication management
8. Project risk management
9. Project procurement management
10. Project Stakeholder management

All of the above mentioned items are very important .They include many steps. In this research, the researcher touched on risk management, precisely risk management in the pre-implementation phase.

2.3.3 Project Management Processes

1. Initiation processes
2. Planning processes
3. Execution processes
4. Contorting processes

5. Closing processes

2.4 RISK MANAGEMENT:

2.4. 1.DEFINITION OF RISK

Risk is the future impact of a hazard that is not controlled or eliminated. It can be viewed as future uncertainty, created by the hazard.

The event or the accumulation of a series of events that may be present implicitly (in a non-visible or estimated) during the project, and they affect the final output of the project, whether the effect is positive or negative.

“A stage where there is a lack of information, but by looking at past experience, It easier to predict the future events where the outcome is known and expected” “Winch 2002”.

“Risk is a situation in which he possesses some objective information about what the outcome might be. Risk exposure can be valued either positively or negatively” “ Webb 2003”.

“Risk is exposure to the consequences of uncertainty” “Cooper et al 2005”.

“Risk is the statement of what may arise from the lack of knowledge. Risks are gaps in knowledge which we think constitute a threat to the project” (Cleden 2009).

“Risk is a possibility of loss or injury” (Darnall and Preston 2010).

2.4.2 TYPE OF RISKS:

Risks can be associated to technical, operational or business aspects of projects.

Risks can be either acceptable or unacceptable. An unacceptable risk is one which has a negative impact on the critical path of a project. Risks can either have

short term or long term duration. In case of a short term risk, the impact is visible immediately, such as a requirement change in a deliverable. The impact of a long term risk is visible in the distant future. Acceptable risk is the part of identified risk that is allowed to persist without further engineering or management action. Making this decision is a difficult yet necessary responsibility of the managing activity. This decision is made with full knowledge that it is the user who is exposed to this risk.

Risks can also be viewed as manageable and unmanageable. A manageable risk can be accommodated, for instance, it can be a small change in project requirements. An unmanageable risk, on the other hand, can't be accommodated, such as turnover of critical team members.

Finally, the risks can be characterized as internal or external. An internal risk is unique to a project and is caused by sources inherent in the project, for example, it can be the inability of a product to function properly. While an external risk has origin in sources external to the project scope, such as cost cuts by senior management.

Risks associated with the construction industry can be broadly categorized into:

a) Technical risks:

- Inadequate site investigation.
- Incomplete design.
- Appropriateness of specifications.
- Uncertainty over the source and availability of materials.

b) Logistical risks:

- Availability of sufficient transportation facilities.

- Availability of resources-particularly construction equipment, spare parts, fuel and labor.

c) Management related risks:

- Uncertain productivity of resources.
- Industrial relations problems.

d) Environmental risks:

- Weather and seasonal implications.
- Natural disasters.

e) Financial risks:

- Availability and fluctuation in foreign exchange.
- Delays in payment.
- Inflation.
- Local taxes.
- Repatriation of funds.

f) Socio-political risks:

- Constraints on the availability and employment of expatriate staff.
- Customs and import restrictions and procedures.
- Difficulties in disposing of plant and equipment.
- Insistence on use of local firms and agents.

2.4.3. COMMON SOURCES OF RISK IN CONSTRUCTION PROJECTS:

The common sources of risks in construction industry are listed below:

- Changes in project scope and requirements.
- Design errors and omissions.
- Inadequately defined roles and responsibilities.
- Insufficiently skilled staff.
- Subcontractors.
- Inadequate contractor experience.
- Uncertainty about the fundamental relationships between project participants.
- New technology.
- Unfamiliarity with local conditions.
- Force majeure.

2.4.4. DEFINITION OF RISK MANAGEMENT:

RM is not only solving problems in advance, but also being prepared for potential problems that can occur unexpectedly. Handling potential threats is not only a way to minimize losses within the project, but also a way to transfer risks into opportunities, which can lead to economical profitability, environmental and other advantages (Winch, 2002).

Risk management embodies an organizational culture of prudent risk-taking within an agency. It is the process of identifying, assessing and responding to risks, and communicating the outcomes of these processes to the appropriate parties in a timely manner.

Risk management is the process of identification, analysis and acceptance or mitigation of uncertainty in investment decisions. Essentially, risk management occurs anytime an investor or fund manager analyzes and attempts to quantify the

potential for losses in an investment and then takes the appropriate action (or inaction) given his investment objectives and risk tolerance.

2.4.5 CONCEPT OF RISK MANAGEMENT

Smith et al. (2006), provide a comprehensive description of the concept of RM and how it can be used in practice. According to the authors, Risk Management cannot be perceived as a tool to predict the future, since that is rather impossible. Instead, they describe it as a tool to facilitate the project in order to make better decisions, based on the information from the investment. In this way, decisions based on insufficient information can be avoided, and this will lead to better overall performance. In the literature, RM is described as a process with some predefined procedures. The scope of its definition differs among the authors however, the core information is the same.

From a number of definitions which can be found in the management literature, Cooper et al. (2005) explanation brings the essence of this concept:

“The risk management process involves the systematic application of management policies, processes and procedures to the tasks of establishing the context, Identifying, analyzing, assessing, treating, monitoring and communicating risks” (Cooper et al., 2005).

Risk management process (RMP) is the basic principle of understanding and managing risks in a project. It consists of the main phases: identification, assessment and analysis.

2.4.6 FACTORS AFFECTING RISK:

Several factors expose projects to normal than higher risk:

- a) **History:** Newer projects pose more risk because the process has not been refined with the passage of time. If a project of similar nature has been done many times before, then the likelihood of success with the current project is also enhanced.
- b) **Management Stability:** Management stability means that the whole management team shares the same vision and direction, thereby leading successful achievement of goals. If the management is unstable, then it can lead to unrealistic and impractical schedules for the project and inefficient use of resources.
- c) **Staff expertise and experience:** In the event that the members of a project team lack the direct working knowledge and experience of the area, there is a likelihood of time delays, estimated cost upsets and poor quality.
- d) **Team Size:** In case of large teams, the probability of problem occurrence increases due to the team size. One of the reasons can be the difficulty of communication due to the large team size.
- e) **Resource availability:** If the availability of resources is easy, the probability of responding to problems in real time also increases. For example, easy availability of money makes securing human, material and equipment resources easy as needed basis. However, an abundance of resources does not provide guarantees against risks, all it does is to equip the project team with the tactics to respond to risks.
- f) **Time compression:** In case of highly compressed time schedule, the risks are magnified in the project. When more time is available, more flexibility is present in the project and there is an opportunity to mitigate and reduce the impact of occurring risks.
- g) **Complexity:** In case of a highly complex or sophisticated project, the opportunity of a mistake or a problem is also enhanced.

2.4.7 RISK MANAGEMENT PROCESS:

Risk management is the process which consists of identification, assessment, response and review.

1. RISK IDENTIFICATION:

The identification of risks may be considered as the most important stage in risk management, if only in terms of bringing considerable benefit to all parties in the greater understanding of the project, irrespective of whether further action is taken or not. When identifying risks, it is important to appreciate not merely the risk itself, but the source, the event that may lead to the risk materializing and the effect of the risk if it does not materialize. Risk identification can be done by the following methods:

a. Brainstorming: This is one of the most popular techniques. Generally, it is used for idea generation; it is also very useful for risk identification. All relevant persons associated with the project, gather at one place. There is one facilitator who is briefed about various aspects with the participants and then after note down the factors, before closing it the facilitator review the factors and eliminate the unnecessary ones.

b. Delphi technique: This technique is similar to brainstorming, but the participants in this technique do not know each other and they are not at the same place. They will identify the factors without consulting other participants. The facilitator like in brainstorming, sums up the identified factors.

c. Interview/Expert opinion: Experts or personnel with sufficient experience in a project can be a great help in avoiding /solving similar problems over and over again. All the participants or the relevant persons in the project can be interviewed for the identification of factors affecting risk.

d. **Past experience:** Past experience from the same kind of project, and the analogy can be formed for identification of the factors. When comparing the characteristics of projects, that will provide insight about the common factors.

e. **Checklists:** These are simple, but very useful predetermined lists of factors that are possible for the project. The check list which contains a list of the risks identified in projects undertaken in the past, and the responses to those risks provide a head start in risk identification.

2 RISK ASSESSEMENT:

2.1. Quantitative methods:

a. **Sensitivity analysis:** This is carried out to identify the uncertain project components which will have maximum impact on the outcome of the project. After a risk model is made, a sensitivity analysis is carried out to check the sensitivity of different elements of the model on project outcome. To do this, values of one variable at a time are changed and the impact of these changes is then seen on the project.

b. **Scenario analysis:** Scenario analysis gives the impact of different scenario of the project or impact of different risks if that occurs simultaneously. A fair decision can be made after this analysis, the option which will give lesser loss or hazards can be opted.

c. **Probabilistic analysis (Monte Carlo Simulation):** A project simulation is done using a model to show the potential impact of the different levels of uncertainties on project objectives. Monte Carlo Simulation is generally used for this analysis. It can quantify the effect of uncertainties and risks on project budget and schedule. It simulates the full system many times, each time randomly choosing a value for each factor from its probability distribution. It uses a three point estimates, like, most likely, worst case and best case duration for each task in time management.

d. **Decision trees:** This analysis is carried out by decision tree diagram. Decision trees are very helpful to both formulate the problem and evaluate options. In this analysis, there are graphical models used to represent a project and can clearly reflect the effects of each decision taken in the project.

2.2. Qualitative methods:

Qualitative methods for risk assessment are based on descriptive scales, and are used for describing the likelihood and impact of a risk. These relatively simple techniques apply when quick assessment is required in small and medium size projects. Moreover, this method is often used in case of inadequate, limited or unavailable numerical data, as well as the limited resources of time and money. They are listed as follows:

a. **Risk probability and impact assessment:** By applying the method called risk probability and impact assessment, the likelihood of a specific risk to occur is evaluated. Furthermore, risk impact on a project's objectives is assessed regarding its positive effects for opportunities, as well as negative effects which result from threats.

b. **Probability/impact risk rating matrix:** Probability and impact, which were assessed in the previous step, are used as a basis for quantitative analysis. For this reason, the findings from the assessment are prioritized by using various methods of calculation, which can be found in the literature. Westland computes the priority score as the average of the probability and impact. The range of priority score, the rating and color are assigned to indicate the importance of each risk. Threats with high impact and likelihood are identified as high-risk and may require immediate response, while low priority score threats can be monitored with action being taken only if or when needed.

c. **Risk categorization and Risk urgency assessment:** Risk categorization is a way of systematizing project threats, according to their sources, in order to

identify areas of the project that are most exposed to those risks. Tools which can be used in this method are work break down structure (WBS) or risk breakdown structure (RBS), and their role is to develop an effective risk response. WBS breaks down large activities into small manageable units and creates linked hierarchical series of independent activities. RBS categorizes risks and shows their dependencies. The role of the second method, risk urgency assessment, is to prioritize risks according to how quick response they require.

3. RISK RESPONSE:

This third step of the (RMP) indicates what action should be taken towards the identified risks and threats. The response strategy and approach chosen, depend on the kind of risks concerned.

a. **Risk avoidance:** Risk can be warded off by removing the cause of the risk of executing the project in a different way.

b. **Risk transfer:** Transferring risk involves finding some other party who is willing to accept responsibility for its management, and who will bear the liability of the risk should it occur. Transferring a threat does not eliminate it; the threat still exists, however it is owned and managed by another party. Transferring risk can be an effective way to deal with financial risk exposure. The aim is to ensure that the risk is owned and managed by the party best able to deal with it effectively.

c. **Risk mitigation/reduction:** Risk mitigation reduces the probability and/or impact of an adverse risk event to an acceptable threshold. Taking early action to reduce the probability and/or impact of a risk is often more effective than attempting to repair the damage after the risk has passed.

d. **Risk exploit:** This strategy seeks to eliminate the uncertainty associated with a particular upside risk, by creating the opportunity definitely happens. Eliminate

the uncertainty associated with a particular upside risk. An opportunity is defined as a risk event that if it occurs, will have a positive effect on achievement of project objectives.

e. **Risk sharing:** Allocate risk ownership of an opportunity to another party who is best able to maximize its probability of occurrence and increase the potential benefits if it does happen.

Transferring threats and sharing opportunities are similar in that a third party is used, those to whom the threats are transferred, take on the liability and those to whom opportunities are allocated, should also be allowed to share in the potential benefits.

f. **Risk enhance:** This response aims to alter the “size” of the positive risk. The opportunity is enhanced by increasing its probability and/or impact, thereby maximizing the benefits gained from the project. Seeking to facilitate or strengthen the cause of the opportunity, and proactively targeting and reinforcing its trigger conditions.

g. **Risk acceptance:** Ultimately, it is not possible to eliminate all threats or take advantage of all opportunities. We can document them, and at least provide awareness that these exist and have been identified. This strategy is adopted when it is not possible to respond to the risk by the other strategies or a response is not justified by the grandness of the risk. When the project manager and the project team decide to accept a risk, they are agreeing to address the risk if and when it happens.

h. **Contingency Plan:** This involves the use of a fallback plan if a risk occurs. Contingencies can also be in the form of funds sometime kept in reserve to or in the form of costs to deal with unknown risks.

4. RISK REVIEW:

It is the final step of the process. After we have implemented response actions, we must track and record their effectiveness and any changes to the project risk profile. Did the response actions have a positive or negative effect on achieving project objectives? Responses taken in risks should also be documented for future reference and project plans.

2.4.8 THE RISK MANAGEMENT MODEL

Risk management model – developed from the model in the Strategy Unit's November 2002 report: Risk – improving government's capability to handle risk and uncertainty.

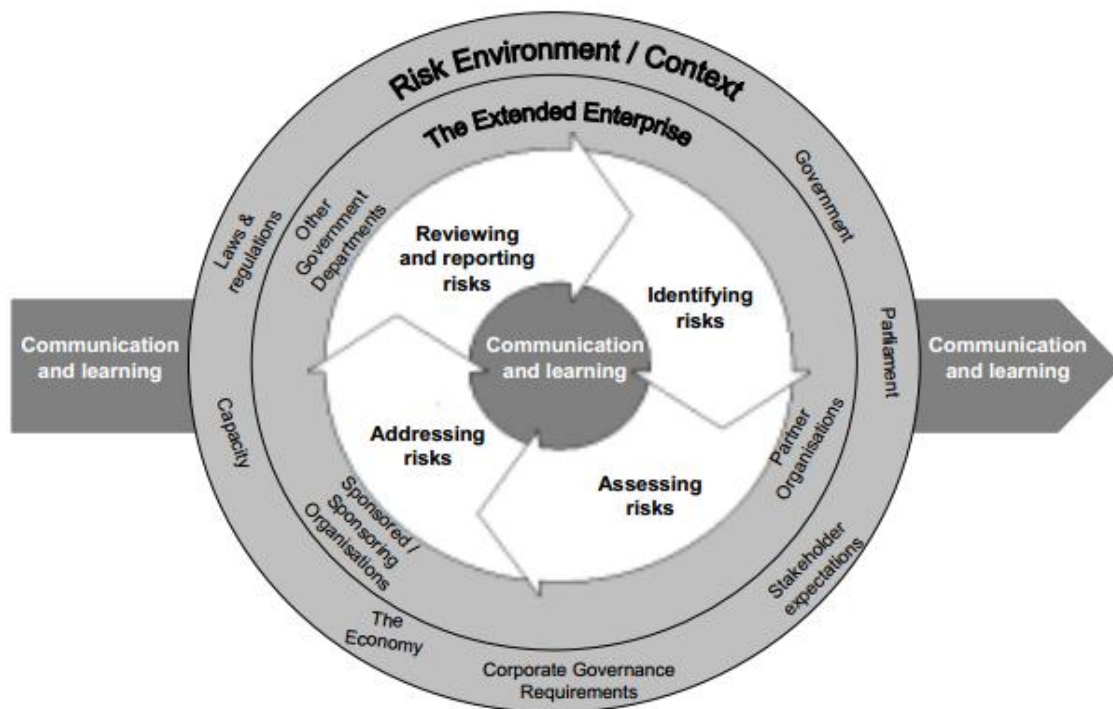


Fig no (1)

THE RISK MANAGEMENT MODEL

NOTES ON THE MODEL:

The management of risk is not a linear process, but rather it is the balancing of a number of interwoven elements which interact with each other and which have to be in balance with each other if risk management is to be effective. Furthermore, specific risks cannot be addressed in isolation from each other; the management of one risk may have an impact on another, or management actions which are effective in controlling more than one risk simultaneously may be achievable.

The whole model has to function in an environment, in which risk appetite has been defined. The concept of risk appetite (how much risk is tolerable and justifiable) can be regarded as an “overlay” across the whole of this model.

The model presented here, by necessity, dissects the core risk management process into elements for illustrative purposes, but in reality they blend together. In addition, the particular stage in the process which one may be at for any particular risk, will not necessarily be the same for all risks.

The model illustrates how the core risk management process is not isolated, but takes place in a context; and how certain key inputs have to be given to the overall process in order to generate the outputs which will be desired from risk management.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION:

This section describes the research methodology and determine the study society and the characteristics of the study, and prove their hypotheses through the collection of data and verify the validity and stability of statistical methods used in the analysis of information.

3.2 RESEARCH METHODOLOGY:

Researcher in this study adopted the descriptive analytical method for the purpose of study results in the search.

3.3 SAMPLE OF THE STUDY

The study society is the total group of elements that the researcher seeks to generalize the results related to the problem studied. The basic society of the study consists of engineers working for construction industry companies in Khartoum State.

3.4 QUESTIONNAIRE DESIGN:

In order to obtain preliminary information and data for this study, the questionnaire was designed to study the views of engineers working in the field of construction industry, based on the method used and the nature of the data and using the research hypotheses. The questionnaire is divided according to the following:

3.4.1 INDEPENDENT VARIABLES

- a) Age
- b) Qualification
- c) Experience
- d) Type of company

3.4.2 DEPENDENT VARIABLES

- a) There are no plans for risk in the pre-implementation stage in the construction industry in Sudan.

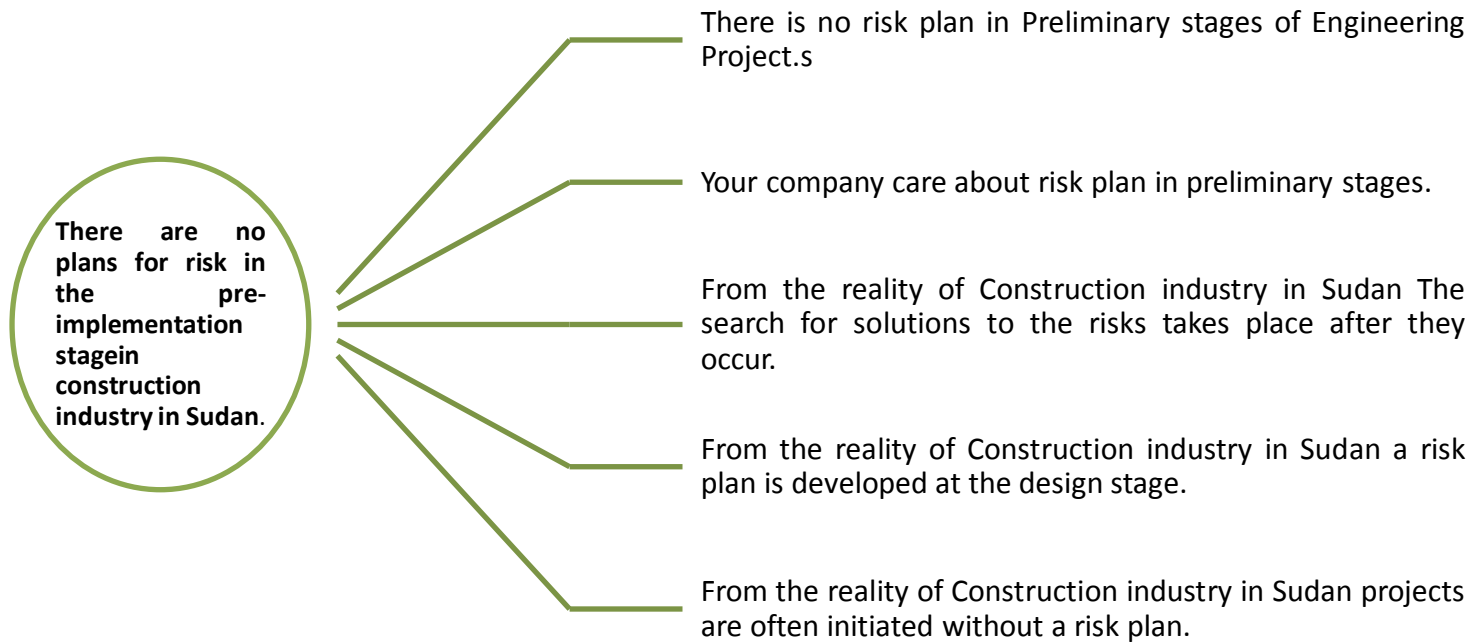


FIG NO (2)

HYP (1)

b) Managing risks in the pre-tendering stage is useful and helpful in the construction phase.

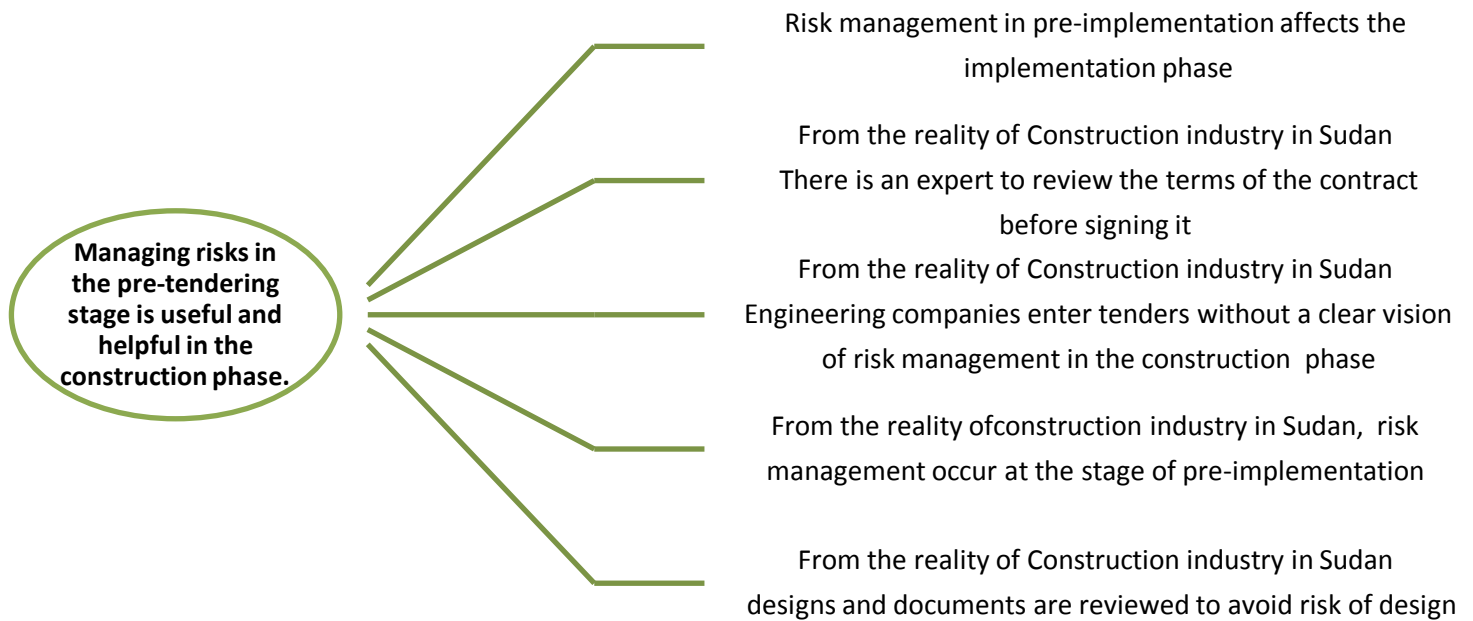


Fig no (3)

HYP (2)

c) Risks always impact project duration and cost severely.

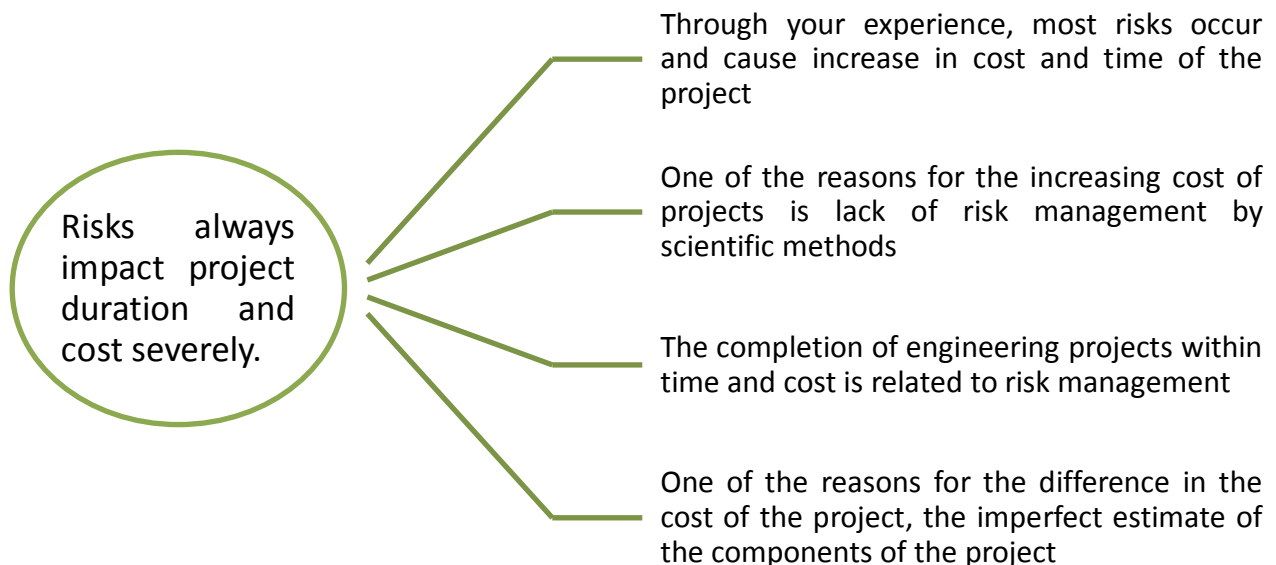


Fig no (4)

HYP (3)

d) The omission of risk management could lead to claims and disputes.

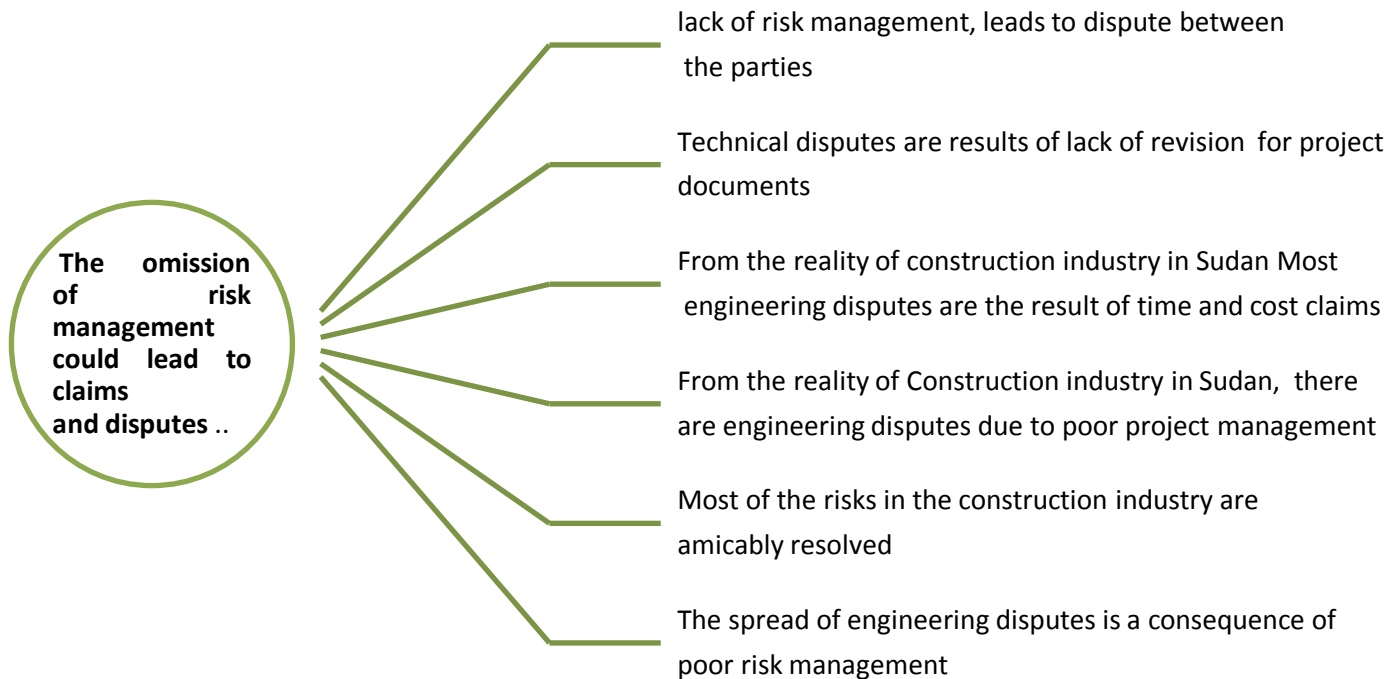


Fig no (5)

HYP (4)

e) Educational institutions, and companies in Sudan care about risk management

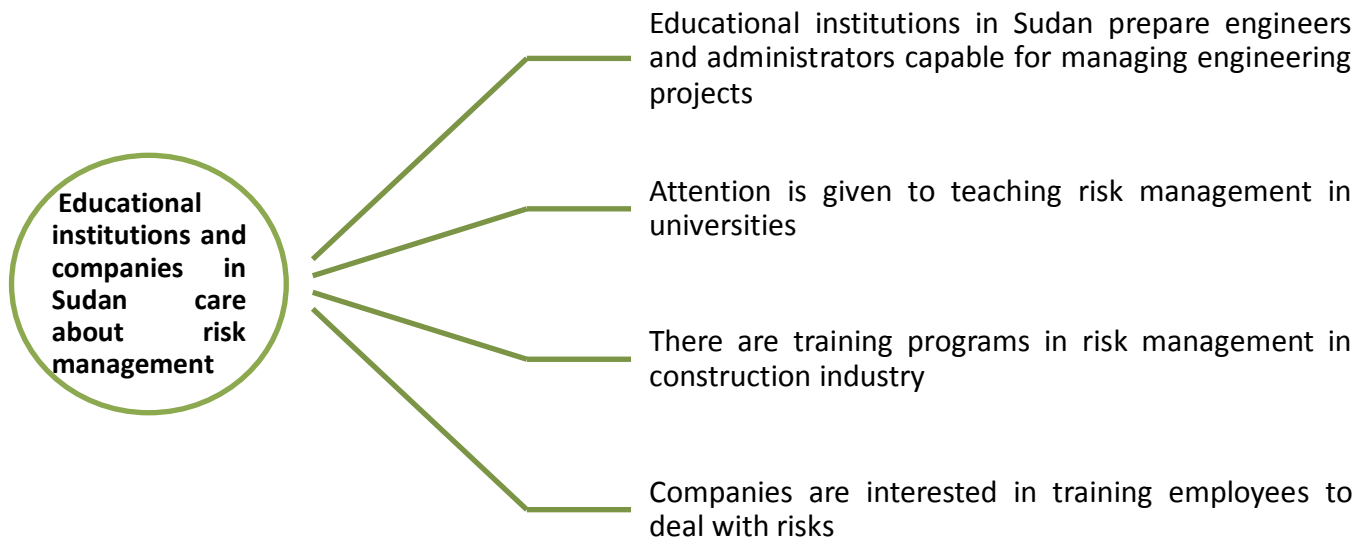


Fig no (6)

HYP (5)

3.5 Analysis of Questionnaire:

STATISTICAL TREATMENT PERFORMED

- a) Duplicates
- b) Mean
- c) Standard deviation

3.6 THE FIVE- DIMENSIONAL LIKERT SCALE

Definition:

A psychometric response scale, primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements. The Likert scale is an ordered scale from which respondents choose one option that best aligns with their view. It is often used to measure respondents' attitudes by asking the extent to which they agree or disagree with a particular question or statement.

Variations:

A psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements.. Respondents are asked to indicate their level of agreement with a given statement by way of an ordinal scale.

The format of a typical five-level Likert item is:

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

TABLE NO (1)

THE FIVE- DIMENSIONAL LIKERT SCALE

Response	Strongly Agree	Agree	Neutral	Not agree	Strongly Disagree
	5	4	3	2	1
Mean	+4.20	3.41to4.2	2.61to3.4	1.8to2.6	1.0to1.8

CHAPTER 4

ANALYSIS AND DISCUSSION OF QUENSTIONNAIR

4.1 Analysis and discussion of the hypotheses of the study:

In this section, the researcher deals with a discussion and the interpretation of the results of the field of study through the information generated by the tables of analysis of statistical data by the distribution of 100 questionnaires according to the methodology used, as well as the results of statistical analysis to test hypotheses field study.

Test the hypotheses of the study: The hypothesis-related terms were identified and then tested using a test Chi-Square Tests, to examine the statistical significance of the hypotheses of the study at a level of 5%. Statistical analysis of the data is intended to test the following hypotheses:

1. There are no plans for risk in the pre-implementation stage in the construction industry in Sudan.
2. Managing risks in the pre-tendering stage is useful and helpful in the construction phase.
3. Risks always impact project duration and cost severely.
4. The omission of risk management could lead to claims and disputes.
5. Educational institutions, and companies in Sudan care about risk management

❖ Chi-Square value is .69. The said value indicates the great consistency and honesty in the responses of the sample of the study, leading to confidence and acceptance of the finding that will result in this study, which enables us to rely on these views in achieving the objectives of the study and analysis of the results.

4.2 DESCRIPTIVE ANALYSIS OF FIELD STUDY DATA

4.2.1 DESCRIPTIVE ANALYSIS OF PERSONAL DATA

The following study sample was included:

Table no (2)
Age of questionnaire sample

AGE				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Less than 30	56	56.6	56.6	56.6
Between 30 and 40	27	27.3	27.3	83.8
Between 40 and 50	10	10.1	10.1	93.9
More than 50	5	5.1	5.1	99.0
12.00	1	1.0	1.0	100.0
Total	99	100.0	100.0	

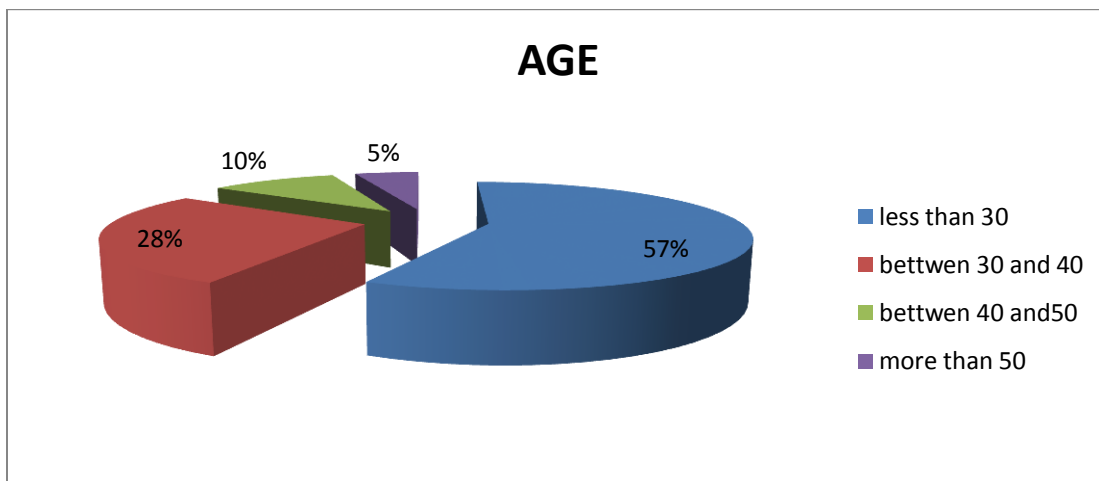


Fig no (7)

Age of sample questionnaire

Table (2) and figure (7) show that the highest frequency of the age group (less than 30 years), is recurred by 56 persons, representing 56.6 % of the sample size, while the age group (30 to 40) is recurred by 27 persons, representing 27.3% of the sample size, followed by the age group (41 to 50) with a frequency of (10) single, representing 10.1% of the sample size, and finally the frequency of the category (more than 50) amounted to (5) single, representing 5.1% of the sample size. We conclude that the highest age group is the category young people.

Table no (3)

Qualification of sample questionnaire

QUALIFICATION				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	University	68	68.7	68.7
	M.A.	27	27.3	96.0
	Ph.D.	4	4.0	100.0
	Total	99	100.0	100.0

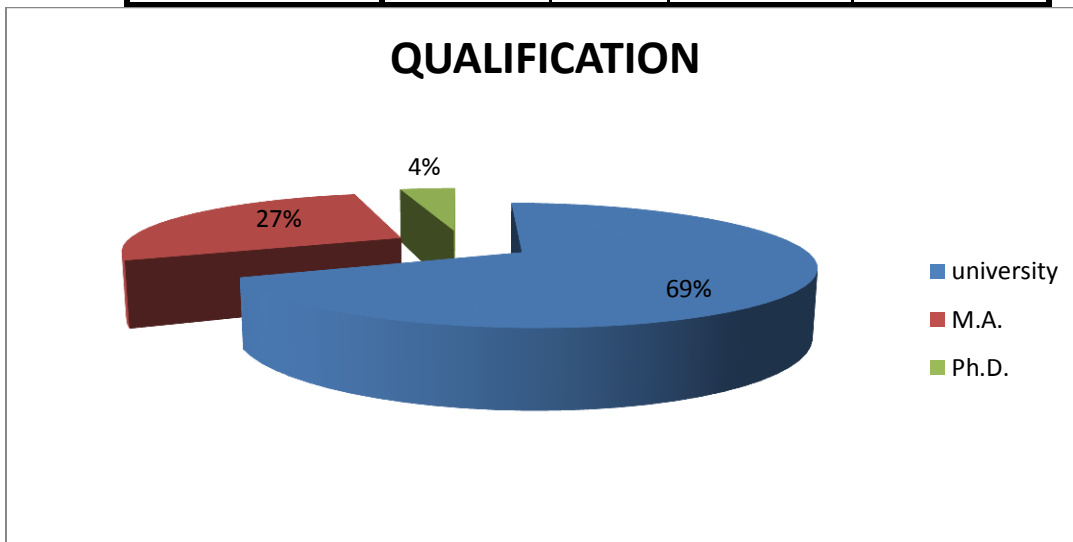


Fig no (8)

Qualification of sample questionnaire

Table (3) and Figure (8) show that the majority of the sample are bachelor degree holders, constitutes of (68) individuals, then the category of master degree holders with a frequency of (27) individuals, and finally the category of PHD holders constitutes of (4) individuals. The aforesaid results demonstrate that the bulk of the sample is bachelor degree holders.

Table no (4)

Age of experience questionnaire

EXPERIENCE				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Less than 5 years	51	51.5	51.5	51.5
Between 5 and 10	21	21.2	21.2	72.7
Between 10 and 15	21	21.2	21.2	93.9
More than 15	6	6.1	6.1	100.0
Total	99	100.0	100.0	

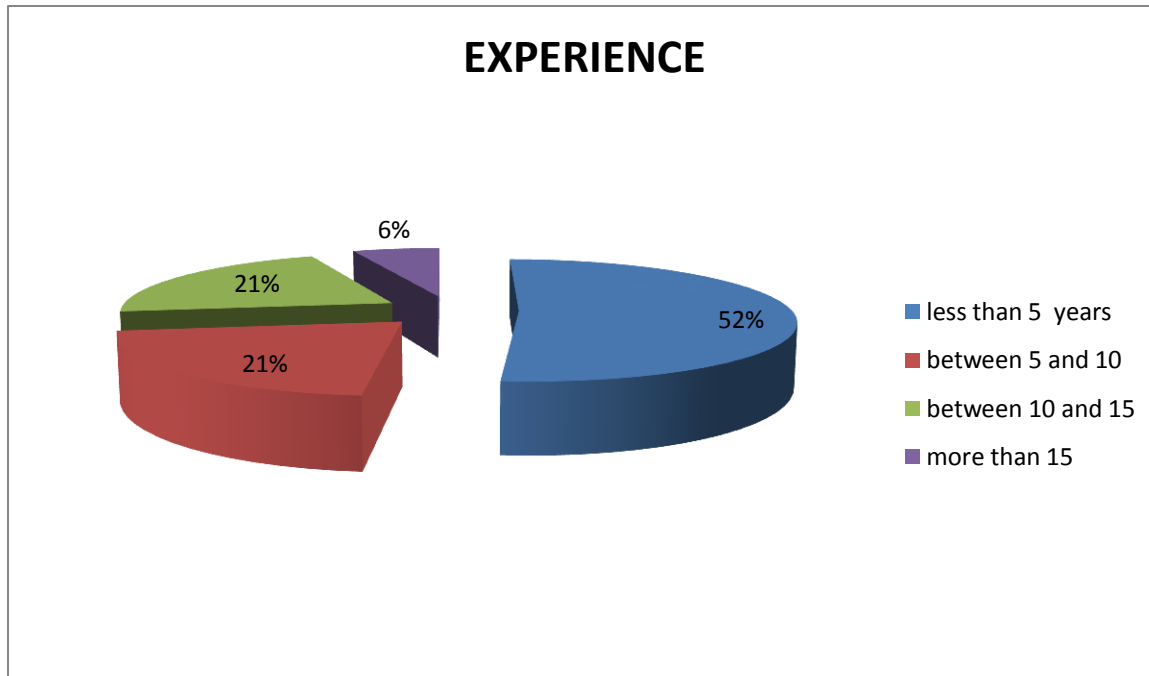


Fig no (9)

Age of experience questionnaire

Table (4) and Figure (9) show that 52% of the sample, has less than 5 years of experience, and 21 % has 6-10 years of experience, while 15% has 11-15 years of experience and 6% have 16 years of experience.

Table no (5)

Type of companies in questionnaire

TYPE OF COMPANY		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Contracting Company	31	31.3	31.3	31.3
	Consulting Company	31	31.3	31.3	62.6
	anther	37	37.4	37.4	100.0
	Total	99	100.0	100.0	

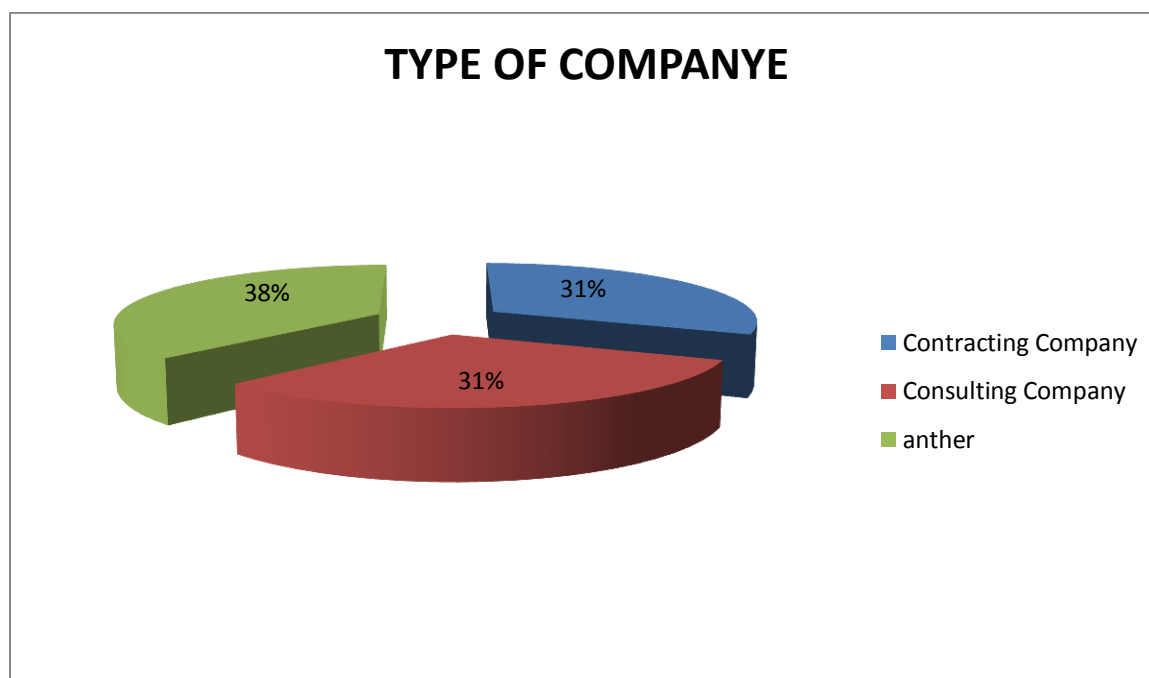


Fig no (10)

Type of companies in questionnaire

Table (5) and Figure (10) show that 31% of the sample is construction companies, 31% is consulting firms, 38% is other companies.

4.2.2 DESCRIPTIVE ANALYSIS OF DEPENDENT VARIABLES DATA

Table no (6)

Explain the Frequency, Standard deviation, Mean and Result of sample questionnaire HYP (1).

HYP 1- There are no ns for risk in the pre- lementation stage in construction industry Sudan	Question	1-There is no risk plan in Preliminary stages of Engineering Projects	2- Your company cares about risk plan in preliminary stages	3- From the reality of the construction industry in Sudan, the search for solutions to the risks takes place after they occur	4-From the reality of the construction industry in Sudan, a risk plan is developed at the design stage	5-From the reality of the construction industry in Sudan, projects are often initiated without a risk plan
	Strongly Agree	15.20%	%12.10	%33.30	%18.20	%28.30
	Agree	62.60%	%29.30	%46.50	%35.40	%50.50
	Neutral	6.10%	%19.20	%9.10	%16.20	%8.10
	Disagree	12.10%	%28.30	%8.10	%24.20	%9.10
	Strongly Disagree	3%	11.10%	3%	%6.10	%4
Result		Agree	Neutral	Agree	Neutral	Agree
Mean		3.8	3	4	3.4	3.9
Result		3.62		Agree		

In table (6), the researcher found that 62.6 % of the study sample agree with (there is no risk plan in preliminary stages of engineering projects), 46.5 % agree with (the search for solutions to the risks after they occur), 50.5 % agree with (projects are often initiated without a risk plan). This result explains why most engineering projects fail. Risk plan in preliminary stage reduces negative results due to the risks in engineering projects and allow the managers make a good decision. 29.3 % disagree with (your company cares about risk plan in preliminary stages), vs 28.3% disagree. 35.4 % agree with (a risk plan is developed at the design stage) vs 24.20% disagree.

Results of HYP1 3.62, demonstrate that there are no plans for risk in the pre-implementation stage in the construction industry in Sudan. The general trend of the type is Agree.

This result explains the gap between planned projects and finished projects in the construction industry in Sudan.

Table no (7)

HYP 2- Managing risks in the pre-tendering stage is useful and helpful in the construction phase	Question	6-risk management in implementation affects the Pre-implementation phase	7-From the reality of the construction industry in Sudan, there is an expert to review the terms of the contract before signing it	8-From the reality of the construction industry in Sudan, Engineering companies enter tenders without a clear vision of risk management in the construction phase	9-From the reality of Construction industry in Sudan, risk management occur at the stage of pre-implementation	10-From the reality of Construction industry in Sudan, designs and documents are reviewed to avoid risk of design
	Strongly Agree	49.50 %	28.30 %	19.20%	13.10 %	16.20 %
	Agree	36.40 %	%29.30	53.50%	43.40 %	43.40 %
	Neutral	4 %	21.20 %	15.20%	20.20 %	17.20 %
	Disagree	7.10 %	18.2 %	11.1%	17.20 %	18.20 %
	Strongly Disagree	2 %	3 %	1 %	6.10 %	5.10 %
Result		Strongly Agree	Agree	Agree	Agree	Agree
Mean		4.3	3.6	3.8	3.4	3.5
Result		3.72		Agree		

Explain the frequency, Standard deviation, Mean and Result of sample questionnaire HYP (2).

In table (7), the researcher found that 49.5 % strongly agree with (risk management in Pre-implementation affects the implementation phase), 29.3 % agree with (there is an expert to review the terms of the contract before signing it), 53.5 % agree with (engineering companies enter tenders without a clear vision of risk management in the construction phase), 43.4% agree with (risk management occur at the stage of pre-implementation), and 43.40% agree with (designs and documents are reviewed to avoid risk of design).

The mean of HYP 2 is 3.72, (Managing risks in the pre-tendering stage is useful and helpful in the construction phase), the general trend of this HYP is Agree.

The views of engineers regarding the aspect (Managing risks in the pre-tendering stage is useful and helpful in the construction phase) are the same, even in construction, consultant or sponsor, because the occurrence of any risk will affect the company.

As a result of recurrence of engineering claims and disputes, companies give more attention on terms and conditions of contracts before signing.

As a result of increasing risk due to design errors, companies become punctual to include special terms and conditions in contracts relevant to design, in order to avoid any additional risk or cost related to design errors.

Table no (8)

Explain the frequency, standard deviation, mean and result of sample questionnaire HYP (3).

HYP 3- Risks always impact project duration and cost	Question	12-Through your experience, most of the risks occur and cause Increase in cost and time of project	13-One of the reasons for the increasing cost of projects is lack of risk management through scientific methods	14-The completion of engineering projects within time and cost is related to risk management	15-One of the reasons for the difference in the cost of the project is the imperfect estimate of the components of the project
	Strongly Agree	%58.60	%59.60	%27.60	52.50%
	Agree	%37.40	%32.30	%44.90	37.40%
	Neutral	%2	%5.10	%12.20	7.10%
	Disagree	%2	%2	%13.30	2%
	Strongly Disagree	%2	%1	%2	1%
Result		Strongly Agree	Strongly Agree	Agree	Strongly Agree
Mean		4.4	4.5	3.8	4.4
Result		4.28		Strongly Agree	

In table (8), the researcher found 58.6 % strongly agree with (through your experience, most risks occur and cause increase in cost and time of a project), 59.6 % strongly agree with (One of the reasons for the increase in cost of a project, is lack of risk management through scientific methods, 27.60 % strongly agree with (the completion of engineering projects within time and cost is related to risk management) and 52.50% strongly agree with (One of the reasons for the difference in the cost of a project is the imperfect estimate of the components of the project).

The mean of HYP 3 is 4.28. Risks always have impact on project duration and cost. The general trend of this HYP is strongly agree.

In all cases of occurrence of a risk related to change of scope, design, specifications, etc..., more time is needed for studying such risk, and more cost is needed to apply the change.

From the reality of construction industry in Sudan, most of the projects are finished with additional cost, sometimes up to double the total cost in the contract, which is not a result of a change in scope or additional terms, but arises due to external risk, financial risks, technical risk and any other type of risks lead to the rapid surge in the cost of the project. We conclude that all risks except environmental risks and socio-political risks, can reduce the influence on a project when such a risk is identified by one of the methods, and making an optimum response.

Table no (9)

Explain the frequency, standard deviation, mean and , result of sample questionnaire HYP (4).

HYP 4 The omission of risk management could lead to claims and disputes. .	Question	14-lack of risk management leads to dispute between the parties	-16Technical disputes are results of lack of revision for project documents	-17From the reality of Construction industry in Sudan Most engineering disputes are a result of time and cost claims	-18From the reality of Construction industry in Sudan, there are engineering disputes due to poor project management	-19Most of the risks in the construction industry are amicably resolved	20-The spread of engineering disputes is a consequence of poor risk management
	Strongly Agree	42.40%	39.40%	40.40%	47.50%	22.20%	26.30%
	Agree	47.50%	50.50%	46.50%	38.40%	35.40%	55.60%
	Neutral	4%	6.10%	8.10%	8.10%	23.20%	13.10%
	Disagree	5.10%	4%	4%	5.10%	10.10%	5.10%
	Strongly Disagree	1%	0%	1%	1%	9.10%	0%
Result		Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Strongly Agree
Mean		4.3	4.4	4.3	4.3	3.5	4.3
Result		4.28			Strongly Agree		

In table (9), the researcher found that 42.4 % strongly agree with (lack of risk management leads to dispute between the parties), 39.40% strongly agree with (technical disputes are results of lack of revision for project documents), 40.40% strongly agree with (From the reality of Construction industry in Sudan, most engineering disputes are the result of time and cost claims), 47.50% strongly agree with (From the reality of Construction industry in Sudan, there are engineering disputes due to poor project management), 22.20% strongly agree with (most of the risks in the construction industry are amicably resolved) and , 26.30% strongly agree with (the spread of engineering disputes is a consequence of poor risk management).

The mean of HYP 4 is 4.28. The omission of risk management could lead to claims and disputes. The general trend of this HYP is strongly agree.

Lack of risk management can affect the time, in which a project can be delivered, as well as the overall cost. These events can lead to labor inefficiencies, increase in material and labor prices, disruption of the works and delays, which can increase the cost as well as the time needed to complete the entire job. If the tasks impacted are on the Critical Path, and managers become unable to address this risk, the cost and time will increase.

From the reality of the construction industry in Sudan, the construction companies have been interested in project management that gives the attention to project scope management, project time management, project cost management, project quality management, project human management, project communication management, project risk management, project procurement management, while neglecting project stakeholder management and how they can manage them while mismanagement is the major cause of most conflicts.

Table no (10)

Explain the frequency, standard deviation, mean and result of sample questionnaire HYP (5).

HYP 5 Educational institutions and instruction companies in Sudan care about risk management	Question	21-Educational institutions in Sudan prepare engineers and administrators capable for managing engineering projects	22-Attention is given to teaching risk in management universities	23-There are training programs in risk management in construction industry	24- Companies are interested in training employees to deal with risks
	Strongly Agree	12.10%	15.20%	14.10%	10.10%
	Agree	35.40%	18.20%	43.40%	27.30%
	Neutral	13.10%	14.10%	16.20%	20.20%
	Disagree	26.30%	36.40%	17.20%	33.30%
	Strongly Disagree	12.10%	16.20%	9.10%	8.10%
Result		Neutral	Neutral	Neutral	Neutral
Mean		3.2	2.8	3.4	3
Result		3.1		Neutral	

In table (10), the researcher found that 12.10% strongly agree with (educational institutions in Sudan prepare engineers and administrators capable for managing engineering projects), while 12.10% strongly disagree, 15.20% strongly agree with (attention is given to teaching risk management in universities), while 16.20% strongly disagree, 14.10% strongly agree with (there are training programs in risk management in construction industry), while 9.10% strongly disagree and 10.10% strongly agree with (companies are interested in training employees to deal with risks), while 8.10% strongly disagree.

The mean of HYP 5 is 3.10 (Educational institutions and instruction companies in Sudan care about risk management). The general trend of this HYP is Neutral.

There is no clear vision of HYP 5 (Educational institutions and instruction companies in Sudan care about risk management).

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion:

Considering the current situation of the construction industry in Sudan:

- No vision for risk management, but in fact most of the Sudanese engineers are aware of the importance of risk management.
- Risk management is useful and helpful in the construction phase and the consequences of neglecting it may lead to claims and disputes.
- Most of these problems are amicably resolved. Cost and time of the projected increase due to claims and disputes.
- From the reality of construction industry in Sudan, applying the concept of risk management is not a problem, but the real one is how to replace the concept of muddle thinking by a new concept and adopting planning process in the beginning.

5.2 Recommendations

5.2.1 Recommendations:

Given the results of the statistical analysis of the study, the recommendations can be summarized as follows:

1. It is essential for any project to have a risk plan in advance.
2. Policy makers should work to change the muddle thinking through developing plans or making check lists to avoid any negative impacts of risks.
3. It is vital to introduce a concept of planning for engineers since the beginning of their university studies.

5.2.2 Recommendations for future research:

There are many topics for further researches abstracted in this thesis such as:

1. The implementation of risk management in the execution stage for construction projects in Sudan.
2. Ways to mitigate risk impacts on construction projects in Sudan.

REFERENCES

Reference

- Mr. Satish K. Kamane , Mr. Sandip A. Mahadik , 1684 , Risk Management in Construction Industry , IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278.
- Eng. Jaser Hmaid Abu Mousa , March, 2005 , Risk Management in Construction Projects from Contractors and Owners , Islamic University of Gaza – Palestine,
- Dr. Nadeem Ehsan /Ebtisam Mirza/ Mehmood Alam Azam Ishaque , Risk Management in construction industry , Engineering Management Department Center for Advanced Studies in Engineering Islamabad, Pakistan.
- Krantikumar Mhetre, B.A.Konnur, Amarsinh B. Landage , JAN 2016 , Risk Management in Construction Industry , Government College of Engineering, Karad 415124 India .
- A. Suchith Reddy , October 2015, Risk Management in Construction Industry - - Case Study, International Journal of Innovative Research in Science, Engineering and Technology Vol. 4, Issue 10.
- Ritz , Mc Graw –hill , 1994 , Total construction project management .
- 2000 , PMBOK^R guide ,.
- Risk Management hand book – FAA-H-8083-2.
- G. Brably , July 2011 , Guide to Risk Management , queensland ,
- October 2004 ,The orange book , Management of Risk, principles and concept
- chandler arizong , Project Management methodology guide lines .
- steve isaacs ,doug jose , rod shap² , 2013 , Introduction to Risk Management .
- Mounir Ajam , 2013 , Managing project , challenges , opportunity ,and methods .
-

- www.adelaide.edu.au.
- www.method13.com.
- www.bookboon.com.

APPENDIX

بسم الله الرحمن الرحيم
جامعة السودان للعلوم والتكنولوجيا
كلية الدراسات العليا
برنامج ماجستير الهندسة المدنية – تخصص إدارة تشييد
إستبيان

تحية طيبة وبعد،

مرفق لسيادتكم إستبيان عن إدارة المخاطر لبحث تكميلي بعنوان إدارة المخاطر في مرحلة ما قبل التنفيذ
ذ لنيل درجة الماستر في إدارة التشييد.
أثمن لكم جهودكم للإجابة عن الأسئلة المطروحة في الإستبيان، علماً بأن جميع المعلومات التي يتم الد
صول عليها من سيادتكم سوف تستخدم لغرض الدراسة العلمية بهدف التطوير مع الإلتزام بالسرية التامة.

أشكر سيادتكم على التعاون وتقبلوا مني فائق الإحترام والتقدير،،،

الباحث

أولاً : البيانات الشخصية:

الرجاء وضع علامة (√) أمام الإجابة المناسبة

1. العمر:

- (أ)- أقل من 30 ☐ (ب)- 31 و أقل من 40 ☐
(ج)- 41 و أقل من 50 ☐ (د)- 51 فأكثر ☐

2. المؤهل العلمي:

- (أ)- ثانوي فأقل ☐ (ب)- بكالوريوس ☐
(ج)- ماجستير ☐ (د)- دكتوراة ☐

3. سنوات الخبرة :

- (أ)- أقل من 5 سنوات ☐ (ب)- من 6 و حتى 10 سنوات ☐

☐

(د)- أكثر من 16 سنة

☐

(ج)- من 11 و حتى 15 سنة

4. تخصص المؤسسة:

☐

(ب)- إستشارية

☐

(أ)- تشييد مقاولات

(ج)- أخرى.....

الجزء الثاني:

الرجاء وضع علامة (√) أمام الإجابة المختارة

1- لا توجد خطة للمخاطر في المراحل الاولى للمشاريع الهندسية

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

2- تهتم مؤسستكم بوضع خطة للمخاطر قبل حدوثها

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

3- من واقع صناعة التشييد في السودان يتم البحث عن حلول للمخاطر بعد حدوثها

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

4- من واقع صناعة التشييد في السودان يتم وضع خطة للمراحل في مرحلة التصميم والدراسات

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

5- من واقع صناعة التشييد في السودان فانه غالبا يتم البدء في تنفيذ المشاريع دون خطة واضحة لمخاطر

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

6- إدارة المخاطر في مرحلة ما قبل التنفيذ تؤثر علي مرحلة التنفيذ

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

7- من واقع صناعة التشييد في السودان فإنه يوجد خبير لمراجعة بنود العقد قبل توقيعه

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوافق ☐ (5) لا اوافق بشدة ☐

8-من واقع صناعة التشييد في السودان تدخل الشركات الهندسية في المناقصات من غير رؤية واضحة لإدارة المخاطر في مرحلة التنفيذ

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

9-من واقع صناعة التشييد في السودان تتم إدارة المخاطر في مرحلة ما قبل التنفيذ

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

10-من واقع صناعة التشييد في السودان تتم مراجعة التصميمات والمستندات لتفادي المخاطر الناتجة من الاخطاء التصميمية

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

11-من خلال خبرتك فإن معظم المخاطر تحدث وتسبب زيادة في تكلفة و زمن المشروع

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

12- من أسباب زيادة تكلفة المشاريع عدم إدارة المخاطر بطرق علمية

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

13- يرتبط انتهاء المشاريع الهندسية وفق الزمن والتكلفة بإدارة المخاطر

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

14-ضعف إدارة المخاطر يؤدي الي الخلافات بين الأطراف

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

15-من أسباب الاختلاف في تكلفة المشروع عدم التقدير الجيد لمكونات المشروع

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

16- النزاعات الفنية ناتجة من عدم تجويد مستندات المشروع

(1)وافق بشدة ☐ (2)وافق ☐ (3)محايد ☐ (4)لا اوفق ☐ (5)لا اوافق بشدة ☐

17- من واقع صناعة التشيد في السودان اغلب النتزاعات الهندسية هي نتيجة مطالبات زمن وتكلفة

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

18- من واقع صناعة التشيد في السودان توجد نزاعات هندسية بسبب سوء إدارة المشاريع

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

19- معظم المخاطر في صناعة التشيد يتم أحتواءها وديا

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

20- إنتشار ظاهرة المنازعات الهندسية نتاج طبيعي لسوء إدارة المخاطر

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

21- المؤسسات التعليمية في السودان تعد مهندسين وإداريين قادرين علي إدارة المشاريع الهندسية

(1) اوافق بشد ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

22- يتم الإهتمام بتدريس إدارة المخاطر في الجامعات

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

23- توجد برامج تدريب لتاهيل المهندسين في مجال إدارة المخاطر

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

24- تهتم الشركات بتدريب العاملين علي كيفية التعامل مع المخاطر

(1) اوافق بشدة ☐ (2) اوافق ☐ (3) محايد ☐ (4) لا اوفق ☐ (5) لا اوافق بشدة ☐

1- There is no risk plan in preliminary stages of Engineering Projects

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

2- Your company care about risk plan in preliminary stages

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

3- From the reality of construction industry in Sudan, the search for solutions to the risks takes place after they occur

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

4- From the reality of Construction industry in Sudan, a risk plan is developed at the design stage

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

5- From the reality of Construction industry in Sudan Projects are often initiated without a risk plan

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

6- risk management in Pre-implementation affects the implementation phase

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

7- From the reality of Construction industry in Sudan, there is an expert to review the terms of the contract before signing it

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

8- From the reality of Construction industry in Sudan, Engineering companies enter tenders without a clear vision of risk management in the construction phase

9- (1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

10- From the reality of Construction industry in Sudan, risk management occurs at the stage of pre-tendering

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

11- From the reality of Construction industry in Sudan, designs and documents are reviewed to avoid risk of design

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

12- Through your experience, most risks occur and cause increase in cost and time of project

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

13- One of the reasons for the increasing cost of a projects is lack of risk management by scientific methods

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

14- The completion of engineering projects within time and cost is related to risk management

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

15- lack of risk management leads to dispute between the parties

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

16- One of the reasons for the difference in the cost of the project is the imperfect estimate of the components of the project

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

17- Technical disputes are results of lack of revision for project documents

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

18- From the reality of Construction industry in Sudan, most engineering disputes are a result of time and cost claims

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

19- From the reality of Construction industry in Sudan, there are engineering disputes due to poor project management

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

20- Most of the risks in the construction industry are amicably resolved

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

21- The spread of engineering disputes is a consequence of poor risk management

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

22- Educational institutions in Sudan prepare engineers and administrators capable for managing engineering projects

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

23- Attention is given to teaching risk management in universities

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

24- There are training programs in risk management in construction industry

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐

25- Companies are interested in training employees to deal with risks

(1) Strongly Agree ☐ (2) Agree ☐ (3) Neutral ☐ (4) Disagree ☐
(5) Strongly Disagree ☐