

ASSESSMENT OF RISK SHARING IN THE SAUDI PUBLIC CONTRACT

BY

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A Thesis Presented to the
DEANSHIP OF GRADUATE STUDIES

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DHAHRAN, SAUDI ARABIA

In Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE

In

CONSTRUCTION ENGINEERING AND MANAGEMENT

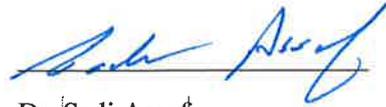
November 2016

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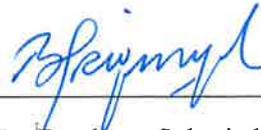
This thesis, written by **Khalid Ashmawi** under the direction of his thesis advisor and approved by his thesis committee, has been presented and accepted by the Dean of Graduate Studies, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE IN CONSTRUCTION ENGINEERING AND MANAGEMENT**.



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Dedicated to my parents and family, for they have done everything that could be done to make this possible. Dedicated to the soul of my late uncle, Waseem, who passed away during this research, whom I attribute my academic success to, who never ceased to be an inspiration to me, even in his last words. May your soul be in a better place now; May God grants you the highest heavens

ACKNOWLEDGMENTS

First of all, for the most merciful and the greatest, our almighty god, who have blessed me with strength and guidance throughout the years, I am eternally thankful for your blessings.

For my parents, my father and my mother, no words can thank you enough for what you have made of me today, may Allah reward you his highest heavens. I owe you my life.

For my university, KFUPM, which have given us every reason to succeed and be distinguished, we shall forever wear your name a badge of honor.

For my thesis adviser, Prof. Sadi Assaf, thank you for your support and motivation, thank you for your patience and understanding, thank you for making this possible, you have been a father to all of us.

For the committee members, Dr. Bambang Suhariadi and Dr. Laith Hadidi, thank you for being part of this, thank you for all of your help and advisory, may god reward you well on my behalf.

For my professors, may Allah award you his blessing for your endless efforts; we will always remember you in our prayers.

For everyone who participated in this study and helped me complete my research, thank you for your kindness, thank you for the knowledge you passed to me.

For all my friends, and for my partner in my journey, Abdullah Al Shaer, thank you all for your morale support, thank you for the good times we had, thank you for being such a relief.

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LIST OF ABBREVIATIONS

FIDIC: International Federation of Consulting Engineers

EJCDC: The Engineers Joint Contract Documents Committee

AIA: American Institute of Architects

UCPW: Unified Contract for Public Works

ANOVA: Analysis of Variance

O: Owner

C: Contractor

A/E: Architect/Engineer

MOMRA: Ministry of Municipal and Rural Affairs

SCE: Saudi Counsel of Engineers

ABSTRACT

Full Name : [Khalid Mahmoud Ashmawi]
Thesis Title : [Assessment of Risk Sharing in the Saudi Public Contract]
Major Field : [Construction Engineering and Management]
Date of Degree : [November, 2016]

The issue of risk sharing in construction contracts has recently gained publicity among researchers and found to play a major role in the success of a project. The need to investigate the Saudi Public contract for the level of risk sharing has been identified and was the subject of this research. The main objective of this research was to assess the Saudi public contract for risk sharing through the investigation of the perceptions and proposals of owners and contractors in Saudi Arabia on the statement of the clauses of the contract.

The data collection tool used in this research was a survey questionnaire comprised of 70 items that refer to each clause of the Unified Contract for Public Works (UCPW). The population of the study was determined to be all contractors in the Eastern Province of the Kingdom and all Public Universities or their respective representative. A sample size of 42 was determined using Kish's formula (20 contractors and 22 owners) and a total number of 46 responses has been received.

The results of data analysis have revealed that no risk sharing is observed in the UCPW and respondents have proposed the sharing of 6 risks. In addition, 9 risks were disagreed upon and 3 of these risks remained unresolved in the proposal of the respondents. Moreover, 11 new areas of disagreement emerged from the proposals of the respondents. Using the Chi-Square Test, the data was tested for dependency on respondent's type, and it was found that the number of risks allocated to each party is independent from the type of respondent. Comparing this result with the perceived and proposed allocation, it was found that the actual dispute is on the type of risk allocated to each party rather than the amount of risks borne by each party.

ملخص الرسالة

الاسم الكامل: خالد محمود عشاوي

عنوان الرسالة: تقييم لمشاركة المخاطر في العقد السعودي للبناء الحكومي

التخصص: إدارة و هندسة التشييد

تاريخ الدرجة العلمية: نوفمبر، 2016

حاز موضوع مشاركة المخاطر في عقود البناء خلال العقدين الماضيين على شهرة بين الباحثين بسبب دوره المهم في نجاح مشاريع البناء و التشييد، و قد تم التعرف على حاجة المملكة لدراسة العقد السعودي الحكومي من ناحية مشاركة و توزيع المخاطر بين المتعاقدين، و جعلت هذه الحاجة موضوعا لهذا البحث. الهدف الرئيسي لهذا البحث هو تقييم مستوى مشاركة المخاطر في العقد الموحد للأشغال العامة في المملكة العربية السعودية، من خلال استفتاء الخبراء في هذا المجال و دراسة مفهوم لبنود العقد و مقترحاتهم لحل المشاكل الواقعة في هذا العقد.

الأداة المستخدمة لجمع المعلومات في هذا البحث هي إستبيان مكون من 70 نقطة مرتبطة بكل شرط من شروط العقد الموحد للأشغال العامة، و قد تم تحديد الشريحة المستهدفة لغرض هذه الدراسة لتكون جميع المقاولين في المنطقة الشرقية من المملكة و جميع الجامعات السعودية و ممثلها في المملكة. بناء على ذلك، حُدد الحجم الأدنى للعينة، باستخدام الأساليب الإحصائية المتاحة، ليكون 42 مشاركا مكونين من 20 مقاول و 22 مالك أو من يمثله، و قد تم استلام ما مجموعه 46 إجابة من العينة المستفتاة بما يحقق الحد الأدنى من كل شريحة.

تمخض عن تحليل نتائج هذا البحث أنه لا يوجد أي مشاركة حقيقية للمخاطر في بنود العقد، و قد تقدم المشاركون في هذا البحث بمقترح لطرح 6 مخاطر للمشاركة بين المقاول و المالك. إضافة إلى ذلك، وجد أن هنالك 9 مخاطر مختلف عليها في العقد و قد تم حل معظم هذه الخلافات في المقترح المقدم باستثناء ثلاثة مخاطر، و قد ظهرت 11 منطقة خلافية جديدة في المقترحات المقدمة. كما تم اختبار البيانات المجموعة لمعرفة إذا ما كان عدد المخاطر الموزعة لكل طرف يختلف بشكل كبير باختلاف نوع المصنف، و قد تبين أنه لا يوجد فرق حقيقي في هذا التوزيع. إنما وجد أن الخلاف قائم على نوع المخاطر المعطاة لكل طرف و ليس على كمية المخاطر المعطاة لهذا الطرف.

CHAPTER 1

INTRODUCTION

1.1 General

The fact that the construction industry is surrounded by risk and uncertainty is undeniable. The construction process itself is unique and is influenced by a large number of internal and external factors. On top of that, the adverse relationship between the employer (owner) and the contractor intensifies the magnitude of risk.

On the basis that risk is inevitable and that it is part of the deal, the contracting parties seek management of risks through: risk avoidance, risk transfer, risk retention or risk control (Assaf, 1982). One of the approaches to minimize risks and facilitate the delivery of a project is risk sharing, where certain risks are shared between the owner and the contractor to alleviate its possible effects on the project and its participants. The allocation of risks usually takes place in the general conditions of the contract.

The general condition of the contract, also referred to as “The Boilerplate” regulate the relationship between project participants. Conflicts that arise during the execution of a project are usually resolved according to a previously established conditions of contract. Contract conditions for public projects are standardized by the government. The higher the quality of these conditions are, the smoother is the delivery of the project.

This research is an effort to investigate the level of risk sharing in the construction industry of Saudi Arabia by studying the Saudi public contract for construction and an endeavor to discover possible areas of improvement. This report addresses the rationale behind this research, the adopted approach and its findings.

1.2 Problem Statement

The Saudi Construction Contract was derived from the FIDIC construction contract and is still relatively new. The articles of the Saudi construction contract are still preliminary and need major review. Moreover, industry professionals have pointed out that the general conditions of contracts represent a problematic spot that needs to be resolved. A need stems from this fact to conduct research on the subject and to investigate for possible solutions. Having this in mind, and looking at the Saudi Public Contract, the following questions arise:

Does the Saudi Unified Contract for Public Works allocate risks properly?

How does it allocate those risks?

Who carries the risk stated in the articles of the Saudi Contract in reality?

Whom should this risk be allocated to?

Do the allocated risks in the contract match the reality?

What is the level of risk sharing in the Saudi contract?

1.3 Significance of the Study

The issue of risk sharing in construction contracts has gained publicity in the recent years due to the rapid growth of construction and the dramatic increase in the sizes of construction projects. Proper risk allocation is one of the major factors that foster the success of a project and improper risk allocation might lead to endless complications and conflicts between the owner and the contractor. The effects of poor allocation of risks are not limited to the contracting parties. The effects might extend to reach the industry as whole, resulting in an increase in bid prices, claims and litigations, creating an unfavorable environment of business.

Risks are allocated through the general conditions of contracts, where the risk is either allocated to the owner, to the contractor, or carried by both. A proper allocation of risks is one that allocates the risk to the party that can control it best. On the other hand, Misallocation of risks leaves the highest portions of risks to the parties with the least control over it. The most important outcome of this research is expected to be finding a better allocation of risks between the contracting parties. In addition, this research is expected to contribute to the improvement of the industry as follows:

- Providing a fair assessment of the risk sharing in Saudi construction contract, for the benefit of the owners and the contractors.
- Presenting an alternative to the current version of the Saudi contract to be used in the rewriting of the new form of the contract.
- The results of this research are expected to provide basis for further investigation and future research on the subject.

- Draw attention of experts to the problem, thus, gearing more research into the subject.

1.4 Objectives

This research aims to investigate the perception of the owners, contractors and consultants on the statement of the clauses of the Unified Contract for Public Works and point out areas of disagreement. Specifically:

- A. To perform an assessment on risk sharing in the Saudi construction contract in Saudi Arabia.
- B. To study the perception of owners and contractors on the allocated risks in the statement of the clauses.
- C. To obtain a proposal from the owners and the contractors for a proper allocation of risks.
- D. To point-out areas of disagreement between the contracting parties.

1.5 Scope and Limitation

- a) This research is limited to contractors and owners in the Eastern Region of the Kingdom.
- b) The research is limited to public owners, specifically, public universities or their representatives (consultants).
- c) This research is limited to building contractors only.
- d) The research is limited to class 1, class 2 and class 3 contractors.

1.6 Thesis Layout

This thesis report is organized as follow:

Chapter 1: Introduction

This chapter introduces the topic and addresses the need to conduct this research.

This chapter also presents the objectives of this research, its significance and the expected outcome upon completion.

Chapter 2: Literature Review

This chapter introduces the concept of risk management and presents an inclusive literature review on the subject of risk sharing and allocation and their implementation in the general conditions of contracts. It also provides an explanation on contracts and their conditions, identifies the most popular construction contract forms, the most important clauses and their effect on project success.

Chapter 3: Research Methodology

This chapter provides a description of the methodology and means employed to meet the objectives of this research. This includes the following: data collection tool, determination of targeted population, sample size calculations, collection method and statistical tools needed to analyze the data.

Chapter 4: Conditions of the Saudi Public Contract

This chapter gives a deeper insight on the Saudi Public Contract, namely, the Unified Contract for Public Works. The contract is introduced in this chapter and the clauses of the contact are thoroughly explained for the reference of the reader.

It also provides comparisons, when possible, with the FIDIC contract which the UCPW contract was derived from.

Chapter 5: Data Analysis, Results and Discussion

This chapter provides a detailed description and explanation of the analysis done on the data and provides a summary and a discussion of the findings of the research. The findings of this research are elaborated on in the discussion and are compared with the findings of previous related studies done on the subject.

Chapter 6: Conclusion and Recommendations

This chapter provides conclusions drawn from data analysis and provides recommendation and suggestions for future research based on the found results.

The general scheme of the methodology at which this research has been approached is described in the flowchart in Figure 1 and further elaboration is provided in the upcoming chapter.

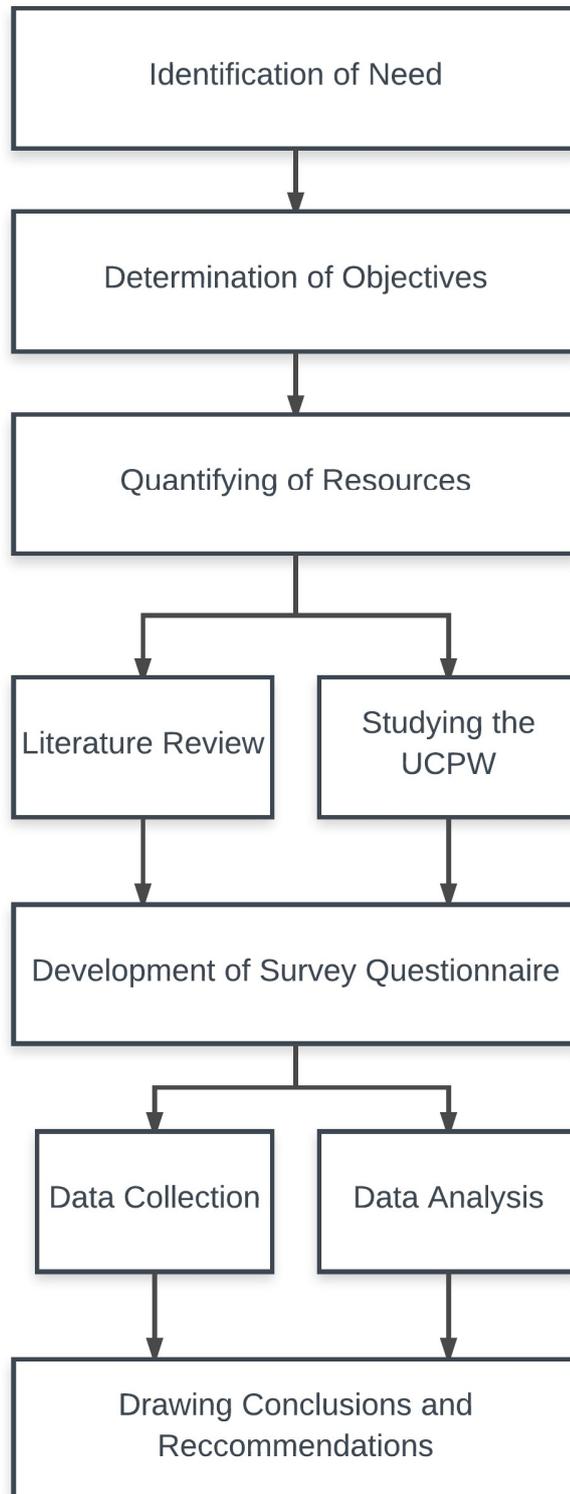


Figure 1: Research Methodology

CHAPTER 2

LITERATURE REVIEW

2.1 General

Generally speaking, all types of projects require risk management. However, construction projects specifically are unique. They are complex as they involve several participants that work together to complete the project. While each participant in the project has some interest, he is also taking risks. Risks in construction projects are many and differ in type. They span from physical to political risks with several other risks in between and under. Due to this complexity, the need for proper risk management arises. Many researches have looked at the subject of risk management and different models have been produced to aid in managing risks. One of the approaches of managing risks is to distribute them to alleviate their effects on project participants. This allocation of risks is usually achieved through the general conditions of the contract. The following sections introduces the concept of risk and risk management in construction and presents a review on the subject of risk sharing and allocation in the general conditions of contracts.

2.2 Definition of Risk:

Risk, according to the Longman dictionary, is “to put something in a situation in which it could be lost, destroyed or harmed”. However, this is a very wide definition. In fact, it is hard to find an accurate definition of risk, because risk has various

concepts from several points of views. From the aspect of project management, risk is defined by Fisk (2010) as “The variations in the possible outcomes that exist in nature in a given situation”. Risk is not to be misunderstood with probability. Each outcome has a probability and this probability is exposed to variations or risks. Furthermore, Assaf (1982) reported that there are two types of risks in general, speculative and pure. Where the risk taker subject to speculative risk is exposed to the chances of either profit or loss. On the other hand, the risk taker subject to pure risk is only prone to loss, with no chance of profit.

2.3 Classification of Risks in Construction

As mentioned earlier, the definition of risk varies from one point of view to another and the types of risks in general cannot be gathered in a single list. However, risks can be classified based on the aspect from where risk is being looked at. Fisk (2010) has grouped risks related to construction projects into the following 5 groups:

1. Construction related risks
2. Physical Risks
3. Performance risks
4. Economic Risks
5. Political and public Risks

The previous list represents a general perspective of the types of risks involved in the construction industry. However, under each of these generic terms, a span of other risks might exist as well. For example, under the construction related risks, as found by Charoenngam & Yeh (1999), there are four significant risk factors. These are:

delays, changes in the work, delayed site access and availability of manpower, material and equipment.

2.4 Construction Process Risks

For the scope of this research, the interest is in the construction related group of risks.

Carl Erickson (1979) gave this group of risks a different name, he named it as “Construction Process Risks” then he classified this risk into the following two classes:

2.4.1 Construction Related Risks

Risks that mainly arise from conditions such as weather, acts of god, availability of resources, geography of the site, etc. Such risks can be reduced or limited to some extent, but they cannot be eliminated. Such risk has to be managed by the party that can control it best (Erikson, 1979).

2.4.2 Contractual Related Risks

Risks that mainly arise from the interaction between the contracting parties. Factors such as contract clarity and communication gaps between the parties influence this type of risk. These risks might represent uncertainties that might result in losses, in time and money, for the owners and the contractors (Erikson, 1979).

Other researchers, such as El-Sayegh (2008) have also suggested that risk can be classified based on its origin to internal risks and external risks as shown in Figure 2. Where internal risks are risks originating from the contractor or the owner’s organization, or the project itself such as financial, labor and materials related risks.

External risks, on the other hand, are risks associated with factors beyond the control of the owner or the contractor. Politics and natural disasters are examples on such risks.

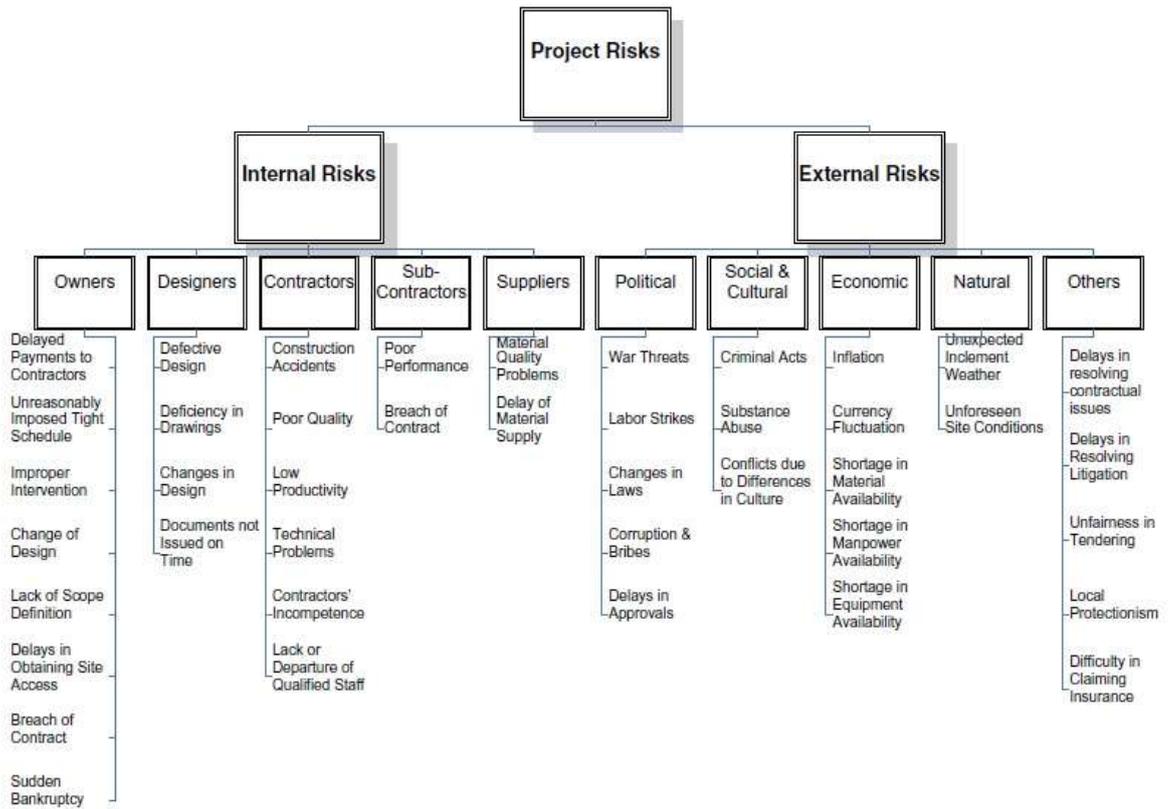


Figure 2: Internal and External Risk

Source: (El Sayegh, 2008)

2.5 Risk Management:

Khaliluddin (2010) described risk management as: “an art of identifying, analyzing, and creating ways to tackle the potential risks arising out of any project and in this case it is studied as a case for construction industry”. No construction project is free from risk. Risk exists in every project and it cannot be escaped, but it can be managed (Kangari, 1995). Risk can be either, assumed, controlled, transferred or avoided, by rejecting the contract. Risk can be transferred entirely or partially through insurance premiums and can be controlled by alleviating the frequency and the severity of that risk (Assaf, 1982). In case that risk was assumed, Fisk (2010) argues that there are two approaches to manage the assumed risk. These are:

1. Minimizing and controlling risks.
2. Risk Sharing and Allocation.

Managing risk usually goes through a systematic process including risk assessment and decision making tree as shown in Figure 3. However, for the scope of this research, the emphasis is on risk sharing through contract clauses and its dimensions. Therefore, the following sections will be limited to the concept of risk sharing and contract conditions.

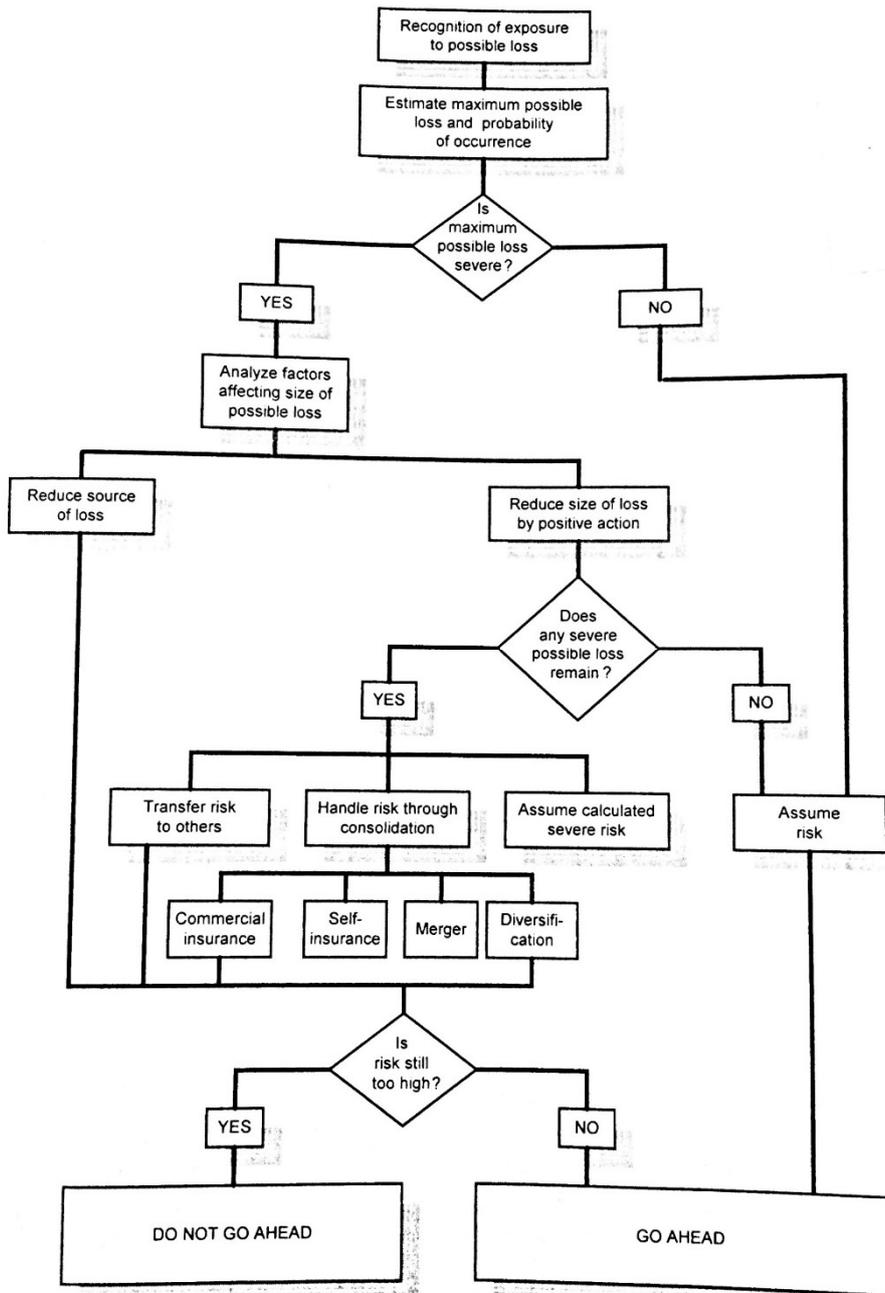


Figure 3: Risk Decisions Flow Chart

Source: (Fisk, 2010)

2.5.1 Risk Sharing and Allocation

Risk sharing and allocation is, as the term implies, the distribution of risk among the different involved parties. The laws that govern construction contracts, distribute risks by default among the involved parties. This is the case in the US. However, in other countries there might be differences in the percentage of risk allocation by the law. Whatever the accuracy or the percentage of risk that is allocated by the legal system, risk might be reallocated or shared upon agreements between the owner, the designer and the contractor. That is what is really meant by risk allocation, to reallocate risk in a better distribution (Fisk, 2010). Risk is most alleviated when distributed reasonably over the parties. According to El Sayegh (2008): “Risk allocation is an important issue, it refers to the proper allocation of risks to the contracting parties, mainly the owner or the contractor”. The previous statement implies that risk allocation requires fair and proper distribution of risks among the project participants. Proper allocation of risk results in a better work and bidding environment which is reflected in prices of bids. Improper allocation usually results in an increase of bid prices.

2.5.2 Distribution of Risk

Risk Allocation has been studied by many researchers in order to find a method or guidelines at which risk can be allocated. As found by Charoenngam and Yeh (1999): “Risks should be allocated to the party best able to control them, and if they are beyond both parties control, they should be assigned to the owner”. Thus, the general rule is to transfer each risk to the

party that can handle it best, and that have the best means to deal with this risk (Charoenngam, 1999). General guidelines have been given by Fisk (2010) to be applied in allocating risk. These are:

1. The party that carries and manages a certain risk properly should be rewarded (compensated).
2. Risk must be allocated to the party with the best means to handle it.
3. Risk is allocated to the party with the most efficient system is favorable.
4. Risk is allocated to the party with the ability to undertake it financially.
5. Risk allocation must be done through steps that assures that risk is allocated as intended.

In addition, there might be risks that cannot be allocated to a single participant. In such case, risk is carried by both involved parties (Charoenngam, 1999). Risks are usually allocated prior to contract awarding by the owner's administration (Fisk, 2010).

2.5.3 Risk Allocation by Contract Clauses

Contract clauses are conditions that delineate the responsibilities of the contracting parties. Risk and liability are usually allocated through these clauses and the contracting parties are obligated to abide by these conditions throughout the project duration. More details on contract clauses are provided in the upcoming sections. Although, it is favored that the contract conditions be balanced fairly, some contracts use what is called "Exculpatory Clauses". These are clauses that transfers risk from one project participant to another as stated by Fisk (2010): "An exculpatory clause is one that attempts, by specific language, to shift a risk or burden of risk from one party to another". As found

by Wang and Chou (2003), Risk allocation through contract clauses come in seven types:

1. Type A: Contract clauses clearly state that the owner should take certain risks.
2. Type B-1a: Contract clauses clearly state that the contractor should take certain risks, and the contractor is accepting this risk allocation.
3. Type B-1b: Contract clauses clearly state that the contractor should take certain risks, and the contractor is not accepting such risk allocation.
4. Type B-2: The contract clauses are vague about allocation of certain risks, and risk allocation remains undecided.
5. Type C-1: The contract does not allocate risks, but the contracting parties arrived to an agreement that the risks should be taken by the owner.
6. Type C-2: The contract does not allocate risks, but the contracting parties arrived to an agreement that the risks should be taken by the owner.
7. Type D: The contract does not allocate risks, and the contracting parties, does not arrive to an agreement on risk allocation.

It was found that most of the risks are allocated by contract clauses. The remaining risks are allocated upon agreement (Wang, 2003).

2.5.4 Misallocation of Risk

Even though it has been advised by many researchers and experts to allocate risks equitably or fairly over the owner and the contractor, this is not the case.

In the general practice, most of the risks are allocated to the contractor, and the

contractor himself transfers a major portion of these risks on subcontractors (Charoenngam, 1999). This practice usually results in improper allocation of risks leaving project participants with the least control and power, with the highest portions of risk (Hanna, 2013). Such practice usually results in two consequences (Fisk, 2010):

1. An increase in the bid prices to compensate for losses due to possible risks.
2. Conflicts and Litigation of claims and disputes.

Further discussion on the effects of risk misallocation on project performance is provided in the upcoming section.

2.6 Risk Sharing in the Construction Industry of the Arabian Gulf

Ruqyah Al Sabah conducted a study in 2014 to investigate the relationship between construction risks and project success in the Arabian Gulf region. The objective of the study was to identify, assess and classify the influence of pure risks on project performance. The study was focused on 122 multinational firms working in the Arabian Gulf region and a total of 74 risks were under consideration. The results were that 30 risks, 18 internal risks and 12 external risks, were found to have significance on project performance. Table 1 presents these significant risks and Figure 4 and Figure 5 illustrate the significance of each risk on schedule overrun and cost overrun.

Another study, conducted by El-Sayegh (2008) included a questionnaire that is answered by experts in the field of construction in UAE. One of the questions asked in the questionnaire is related to the proper allocation of risks. It was found that most risks are allocated to the contractor and only two risks are directly allocated to the owner (El-Sayegh, 2008). It was found that owners in the UAE tend to transfer most

of the risk to the contractors and do not have the incentive of risk sharing (El-Sayegh, 2008).

Table 1: Significant Risks on Project Performance

Cost Overrun	External Risks	Internal Risks
	L1: Nationalism and Local Protectionism	D1: Defective/Late Design Documents
	L6: Permits and Licenses	C4: Long Lead Material/Equipment
	N2: Inclement Climate	D3: Inaccurate Supplemental Design Information
	E5: Resources Availability and Quality	MG1: Insufficient Scope Definition
	P1: War Threat	C8: Equipment and Labor Productivity
		C12: Inadequate Schedule
		F1: Error in Bids/Quotation
	C11: Differing and Unforeseen Site Conditions	
	F4: Constructive Changes	
Schedule Overrun	External Risks	Internal Risks
	L6: Permits and Licenses	D1: Defective/Late Design Documents
	N2: Inclement Climate	C4: Long Lead Material/Equipment
	P1: War Threat	MG1: Insufficient Scope Definition
	L3 : Import and Export Restrictions	C12: Inadequate Schedule
	MG6: Coordination Between Subcontractors	

Source: (Al-Sabah, 2014)

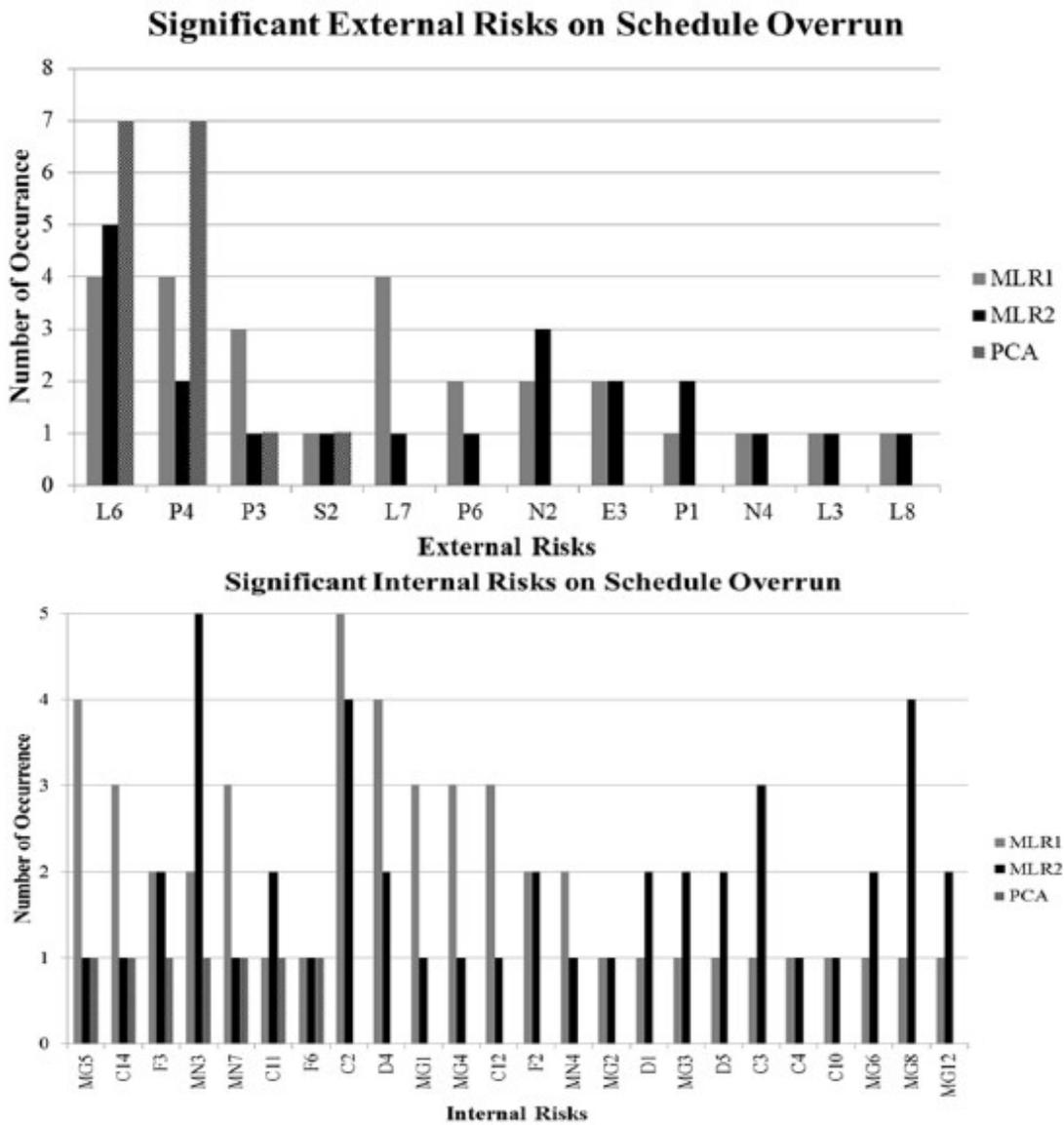


Figure 4: Risk Significance on Schedule Overrun

Source: (Al-Sabah, 2014)

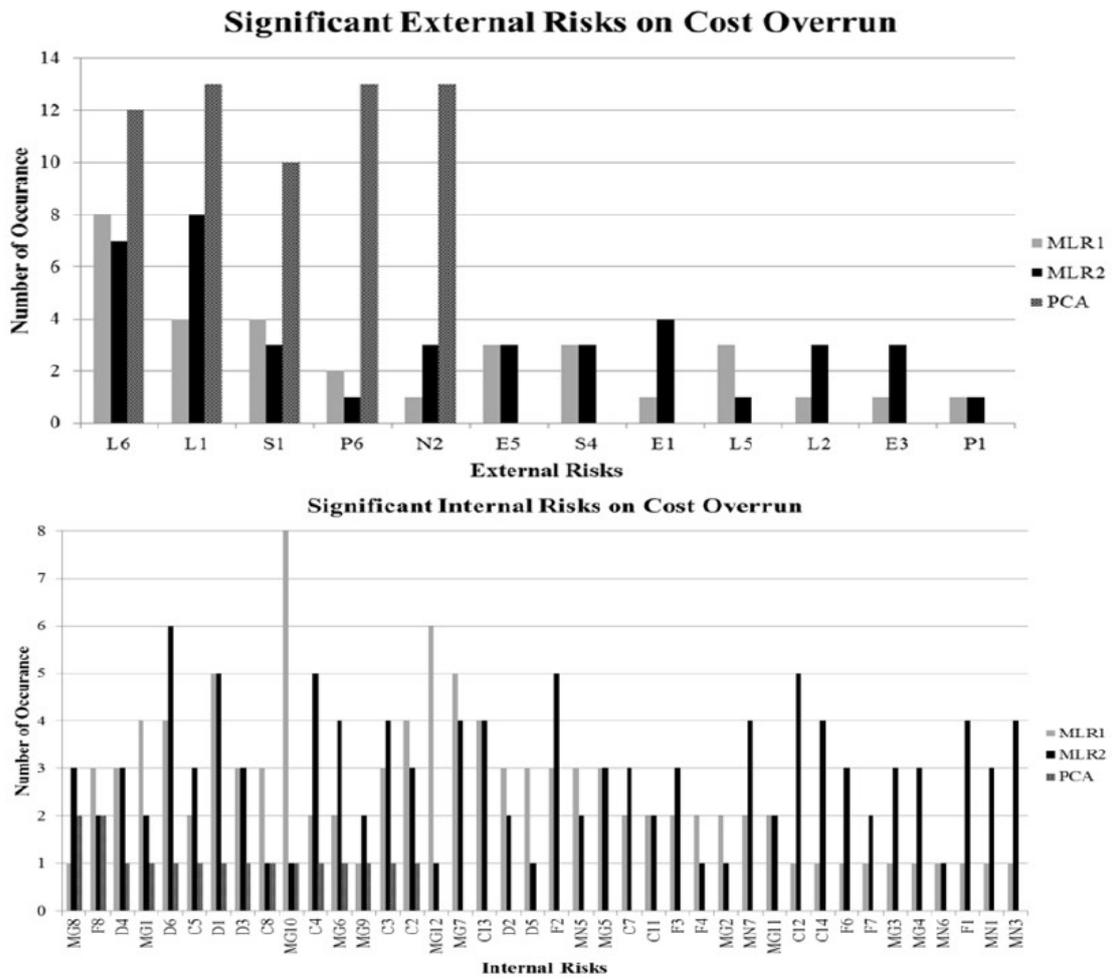


Figure 5: Risks Significance on Cost Overrun

Source: (Al-Sabah, 2014)

2.7 Risk Allocation in the Saudi Construction Industry

The issue of risk allocation in Saudi Arabia has been the subject of many researchers in the last two decades.

Al Bargouthi (1994) studied liability sharing in both, design and construction contracts, and he found that there were many disagreed upon clauses. He also found that owners in Saudi Arabia use exculpatory language to escape responsibility or shift it to the other party. He also found that many clauses that grants the contractor important rights were missing, such as: compensation for loss of opportunity and progress payment guaranteed bonds.

Al Salman (2004) looked at risk sharing in the Saudi construction industry and took the opinions of contractors and owners on 25 risk categories. He found that the perceived allocation of risk differs from what is really practiced, where contractors bear most of the risks. The most important risk was found to be quality of work and the least important was adverse weather conditions. He also found that contractors favor risk sharing because some risks are beyond their control and to compensate for the high competition when the market is slow. The findings of Al-Salman are presented in Table 2.

Khaliluddin (2010) took the same approach of Al Salman but considered 36 risks instead of 25. He arrived at the same conclusions of Al Salman, except for the least significant risk, which turned out to be bribes and corruption and poor quality of work remained the most significant risk. The findings of Khaliluddin are presented in Table 2 and Table 3.

Table 2: Risk Allocation in 2004

Risk Description	Risk Allocation (Practice)	Risk Allocation (Perception)	Risk Rank of Importance	Risk Effects
Permits & regulation	Undecided	Undecided	18	Schedule
Site access	Contractor	Undecided	10	Schedule, safety
Scope limitation & work definition	Undecided	Owner	4	Budget, schedule
Labor, material & Equip. availability	Contractor	Contractor	4	Schedule, budget
Labor & equipment Productivity	Contractor	Contractor	17	Schedule, Budget
Defective design	Undecided	Undecided	12	Budget, Schedule
Changes in work	Undecided	Owner	13	Schedule, budget
Differing site condition	Contractor	Undecided	13	Schedule, budget
Adverse weather conditions	Contractor	Shared	Least important	Schedule, budget
Acts of God	Shared	Shared	23	Budget, schedule
Defective materials	Contractor	Contractor	10	Quality, budget & schedule
Changes in government regulations	Contractor	Undecided	21	Budget, schedule
Labor disputes	Contractor	Contractor	23	Schedule
Safety/ Accidents	Contractor	Contractor	6	Safety
Inflation	Contractor	Undecided	13	Budget

Table 2: Continued

Risk Description	Risk Allocation (Practice)	Risk Allocation (Perception)	Risk Rank of Importance	Risk Effects
Contractor competence	Contractor	Undecided	6	Budget, schedule & quality
Change order negotiations	Undecided	Shared	6	Budget, schedule
Third party delays	Contractor	Undecided	18	Schedule, budget
Coordination with subcontractors	Contractor	Contractor	22	Schedule
Delayed dispute resolutions	Contractor	Shared	13	Schedule, budget
Delayed payment on contract	Undecided	Owner	2	Budget, schedule
Quality of work	Contractor	Undecided	Most important	Quality, budget
Financial failure	Shared	Undecided	2	Budget, schedule
Actual quantities of work	Contractor	Undecided	18	Budget, schedule
Accuracy of project program	Contractor	Undecided	6	Schedule, budget

Source: (Al Salman, 2004)

Table 3: Top 10 Most Significant Risks in the Saudi Construction Industry (2010)

RISK	RANK	RII
Poor quality of work	1	89.77
Owners' unreasonably imposed tight schedule	2	84.09
Change of design required by owners	3	83.7
Quality problems of supplier material	4	83.33
Low productivity of labor and equipment	5	82.61
Delay of material supply by suppliers	7	82.5
Defective design	8	82.14
Deficiencies in drawings and specifications	9	80.68
Lack of scope of work definition by owner	10	79.34

Source: (Khaliluddin, 2010)

2.8 General Conditions of Contracts

Contract conditions represent the provisions that regulate the relationship between the contracting parties and allocates responsibilities among them. According to Rosen (2010): "The conditions of the contract are an inherent part of the owner-contractor agreement and are considered to be the general clauses of the agreement". Contract conditions come in two types:

- a) General Contract conditions
- b) Supplementary Contract Conditions

“The general conditions, sometimes called the General Provisions, specify the manner and the procedures for implementing the provisions of the construction contract according to the accepted practices within the construction industry” (Fisk, 2010).

The general conditions mainly state the rights and define the relationships of the contracting parties as the owner and the contractor. However, the general conditions are not limited to the owner and the contractor. They may also include parties such as subcontractors and consultants, but any other parties are only mentioned as needed (Rosen, 2010). The general conditions is of importance because it defines relationships between contracting parties, their responsibilities and rights (Bubshait and Mohawis, 1994).

The supplementary conditions on the other hand, as the name implies, supplement the general conditions with items that apply exclusively for the project. The supplementary conditions may contain very similar items that are already included in the general conditions or even duplicate the titles of these items, but they may include different implementation or add specific requirements that apply for this unique project (Fisk, 2010). According to Rosen (2010), modifying the general conditions of a contract to solely suit a specific project, forming the set of supplementary conditions, is necessary for the owner.

Due to the importance of the general conditions and due to the major role they play in the smooth delivery of the project, several agencies took it upon itself to standardize these conditions and produce them in a well-established and a well-written form. The following section presents few of the available standard conditions and discusses their formation and implementation.

2.8.1 Available Standards

There are different available contracting standards that are followed in the international construction industry. However, there are a few that are most famous and widely used around the world. In Saudi Arabia, a local standard is followed for public projects that is originally formulated on the basis of an international standard, as will be presented shortly. In the following, three of the widely used available standards are presented and a brief background on each is given.

2.8.2 The FEDIC Standard

The word FEDIC is the abbreviation of “International Federation of Consulting Engineers”. The FEDIC federation was established on 22 July, 1913. Several European countries in addition to the United States and the United Kingdom found and maintained the federation (‘About FIDIC’, 2015). The FIDIC contract comes in four collections (books), categorized based on type of project:

- Red Book: Conditions of Contract for Construction.
- Yellow Book: Conditions of Contract for Plant & Design Build.
- Silver Book: Conditions of Contract for EPC Turnkey Projects.
- Green Book: Short Form of Contracts.

Source: Bunni, N. (2005). The FIDIC Forms of Contract (3rd ed.). Oxford: John Wiley & Sons.

2.8.3 The AIA Standard:

The word AIA is the abbreviation of “The American Institute of Architects”. An institute that was formed in 23, February 1857 (‘About AIA’, 2015). “In the absence of a unified voice for the owners, the AIA offered prospective owners of construction a set of contract conditions as early as 1888, then called the “Uniform Contract”. In 1911, the Uniform Contract was divided into two parts that are familiar to us today:

AIA A101: Standard Form of Agreement between Owner and Contractor.

AIA A201: General Conditions of the Contract for Construction.”
(Rosen, 2010)

2.8.4 The EJCDC Standard:

The word EJCDC is the abbreviation of “The Engineers Joint Contract Documents Committee”. “The committee is a joint venture of four major organizations of professional engineers & contractors formed in 1975” (‘About EJCDC’, 2015). “EJCDC is responsible for preparing engineering related construction contract documents similar to those AIA produces for architectural documents. EJCDC contract documents are available from the member associates”. The general conditions of the construction contract are covered in EJCDC C-700. (Rosen, 2010)

2.8.5 The Unified Contract for Public Works (Saudi Arabia)

The Unified Contract for Public Works is the standard that is followed in public projects in Saudi Arabia. The UCPW has been formed by the ministry of commerce on the basis of the FEDIC standard. The UCPW is composed of two parts. Part one is the agreement. Part two are the conditions of the contract. However, the UCPW is still under major review and requires improvements. (Mohawis, 2010).

2.9 Implications on Project Success

The quality of the general conditions of a contract has a major role in the total success of a project. According to Bubshait and Al-Mohawis: “The pivotal role of the general conditions has important ramifications for the likelihood and degree of project success in terms of cost, time, quality and satisfaction of the contracting parties”. The general conditions of the contract must be viewed by the contracting parties as a potential source of risk that must be considered (Bubshait and Al-Mohawis, 1994). In a study presented by Ibbs and Ashley, it was emphasized the importance of a well written and thought contract clauses on the success of the project. The study aimed to assess the impacts of contract clauses on the project success. The study was conducted by a task force from the University of Illinois and the University of Texas. In the study, a survey was distributed and responded to by 36 companies. The study found that nine clauses were the major source of disputes or confusion (80% of the problems originate from these clauses) (Ibbs and Ashely, 1987). These clauses are:

- | | |
|--------------------------------------|-----------------------------------|
| a) Construction changes | e) Workmanship variations |
| b) Design changes | f) Work scope definition |
| c) Design rework | g) Definition of costs |
| d) Supporting and included documents | h) Cost reporting and control |
| | i) Schedule reporting and control |

Source: William, I., & Ashley, D. (1987). Impact of Various Construction Contract Clauses.

Journal of Construction Engineering and Management, 501-501.

2.10 Components of the General Contract Conditions

As presented earlier, there are several standard forms of the general conditions that are prepared by international agencies such as the FIDIC or the AIA. However, it has been noticed by several researchers and experts in the construction industry that there are variations in the contents of these conditions. Hinze and Tada from the University of Washington have conducted a study to find how consistent the general conditions are among 150 projects. According to the study: “from a review of the general conditions provisions used by various utilities, it is apparent that little consistency exists between documents. While the general intent of some provisions may be similar, different phraseology is employed” (Hinze and Tada, 1993). Issues such as the most important clauses, quality and writing of the conditions are discussed in the following sections.

2.11 Most Important Clauses of the General Conditions

Despite the vast number of contract clauses that might exist in a single project, certain provisions are of higher importance among other provisions in every project. Fischer (2005) have presented a discussion titled “Top Ten Most Important Clauses of a Construction Contract”. The paper addresses in details what the authors consider most

important clauses and discusses what must be given attention within these clauses (Fischer, 2005). According to Fischer (2005): “We believe that focusing on these on these clauses prior to commencing a construction project will reduce the likelihood of disputes during and after the work”. These top ten clauses are listed in the following:

- | | |
|---|---------------------------------|
| a) Payment | e) Dispute clauses |
| b) Pay-when-paid clauses | f) Liquidated damages |
| c) Project delivery systems &
contractor’s design
responsibilities. | g) Delay and extensions of time |
| d) Differing site conditions | h) Identification and insurance |
| | i) Notice-of-claim requirements |
| | j) Termination clauses |

Source: Top Ten Most Important Clauses of a Construction Contract Defense Counsel Journal; Jul 2005; 72, 3; ProQuest Central

The study presented earlier, done by Hinze and Tada on the subject of the contents of the general conditions, also revealed that inconsistency exists among contracts of similar projects. The study emphasizes the need to implement standardized conditions to reduce disputes and litigations (Hinze and Tada, 1993).

2.12 Writing of Contract Conditions

Both the owner and the contractor should consider the general conditions of construction contracts as a potential source of disputes and litigations. Contract conditions should be carefully written by the owner and carefully read by the contractors to avoid such complications. During this research, efforts has been put to find out about writing and phrasing of the contract conditions. However, there is a lack of resources on such subject. Rosen in his book, Construction Specification

Writing, presented a sample of the contents of the AIA and the EJCDC standards. Then he advised that any special clauses, or any modification to the pre-printed conditions, be included in the supplementary conditions. He provides the most important items that comprise the supplementary conditions, but does not discuss issues such phrasing of clauses. He also stated that there are general guidelines for writing the supplementary condition provided by the same agencies such as the AIA or the EJCDC. Despite the lack of resources, Bubshait and Al Mohawis came up with a tool to evaluate the general conditions of a contract, where the quality of the general conditions can be defined in 11 attributes. This tool and the identified attributes might be worthy when writing the conditions. These attributes are:

- **Clarity:** “the ease with which the language of the general conditions can be understood, and the absence of ambiguities”.
- **Conciseness:** “the degree to which the general conditions are free from unnecessary (superfluous) information”.
- **Completeness:** “the degree to which the general conditions cover all contractual aspects”.
- **Internal consistency:** “the level of conflict (if any) between clauses of the general conditions”.
- **External consistency:** “the level of conflict (if any) between a clause in the general conditions and other related regulations”.
- **Practicality:** “the feasibility of implementing the requirements of the general conditions”.
- **Fairness:** “the degree to which the general conditions are fair to the contracting parties”.

- **Effect on quality:** “the degree to which the general conditions promote the meeting of the project’s established requirements of materials and workmanship”.
- **Effect on cost:** “the degree to which the general conditions promote the completion of a project within the estimated budget”.
- **Effect on schedule:** “the degree to which the general conditions promote the completion of a project within the allocated time duration”.
- **Effect on safety:** “the degree to which the general conditions promote the completion of a project without major accidents or injuries”.

Source: Bubshait, A., & Al Mohawis, S. (1993.). Evaluating the general conditions of a construction contract. International Journal of Project Management, 133-136.

2.13 The Current Situation in Saudi Arabia

A study by Aiman Hawari was done in Saudi Arabia on the FIDIC general conditions. In the words of the author: “The aim of the study was to understand the Saudi private owner’s perception about the most ambiguous clauses of construction conditions which may be the source of contractual disputes between the contract parties” (Hawari, 2012). The perception of the Saudi private owner’s on 17 clauses were studied through a survey that was distributed over the owners. Most of the respondents believe that the FIDIC contract is not a suitable form of contract for the Saudi private projects. The study concluded that respondents are familiar with 60% of the selected clauses and unfamiliar with the 40% remaining clauses (Hawari, 2012). The study have revealed that the Saudi private owners are reluctant to use the FIDIC conditions. The reason behind this fact is that these owners are still unfamiliar with some conditions of the FIDIC.

2.14 Improvement of the current situation

As established earlier, there is a need for improvement on the current situation in Saudi Arabia in order to improve the overall status of the construction industry. Chui and Bai, from China, compared the contract general conditions between the United States and China to investigate the differences between the two systems and help the United States companies to conduct business in China. The study found that differences exist between the two systems and these differences may be due to differences in geography, history, culture, policy and language (Chui, 2010). Such differences most probably exist between Saudi Arabia and other countries and might be reflected in the formation of the local standard conditions (UCPW) on the basis of another foreign standard. These differences must be taken into account in order to improve the current system. Moreover, the study referred to earlier, sets an example on how to facilitate the business of foreign companies in Saudi Arabia. Investments should be put to research in such subjects that foster the construction industry in the Kingdom.

2.15 Summary

Risk and liability are two terms that are used interchangeably in the literature to describe responsibility. These two terms are related in that when risk materializes, it becomes a liability. Risk in construction projects is inevitable, it cannot be entirely eliminated or escaped, but it can be managed. Risk sharing is an approach of risk management, where risks are distributed fairly among project participants and some of these risks are shared. A proper risk allocation places risks on the parties that can handle them best. Risks are usually allocated through the general and supplementary

conditions of contracts. The general conditions are the most important documents of contracts and many internationally accepted forms of conditions are available. The quality of the general conditions weights on project success as a whole. The Saudi Ministry of Finance has introduced the UCPW on the basis of the FIDIC red book. However, the Saudi contract is still new and needs major review as claimed by experts in the industry. Attributes that influence the quality of the general conditions and vital clauses of these conditions have been identified.

CHAPTER 3

Research Methodology

3.1 General

This chapter describes the means at which this research has been carried out. The general scheme of the adopted methodology is described in the following:

1. Reviewing the literature related to the subject to benefit from previous research.
2. Studying the Saudi Contraction Contract (UCPW) articles and extracting the necessary clauses for this research.
3. Developing a questionnaire survey using the selected conditions.
4. Distributing the survey on the targeted population.
5. Collecting and analyzing results using statistical tools.
6. Drawing conclusion and providing recommendations based on the research results.

3.2 Data Collection

The data collection tool utilized in this research is a survey questionnaire. The population of the study was identified to be the two participants of any public project as owners and contractors. The following sections provide a description of

the data collection tool, the population and the sample size, and the method of collection.

3.2.1 Data Collection Tool

The data required to complete this research was collected through a survey questionnaire. The questionnaire content was developed and used in a previous study conducted by Maher Al Bargouthi in 1994. However, its use in Al-Bargouthi's study was secondary and very limited, and the results were not exposed to any statistical analysis.

Al-Bargouthi's questionnaire was redesigned to match the requirement of this study. The new survey questionnaire is composed of an official cover letter, general questions about the respondent and his firm, a page of instructions, and a matrix of liabilities. The purpose of the letter is to invite the participant to take part in the study. The letter is issued by the Construction Engineering and Management department to give a formal impression and grant confidentiality of information and anonymity. The letter and the full survey questionnaire are shown in the appendix.

3.2.2 Survey Questionnaire

The survey used to collect data is composed of two parts. Part one aims to collect data about the respondents and their firms. Part 2 aims to evaluate risk sharing between the contractual parties (owner, contractor and consultant). In part 1 the respondent is required to define the entity that he represents, his job title and the total years of experience that he has. In part 2, a total of 70 risks are listed for the

respondent to distribute them on the project participants as shown in Table 4. The respondent has to allocate each risk to the most suitable bearer/bearers two times. The first time he allocates the risks based on his perception. The second time the respondent proposes a better allocation of these risks to their most efficient bearer. The probabilities of the respondents' allocation under each category (Perceived or Proposed) are as follow:

1. The owner bears/should bear this risk.
2. The contractor bears/should bear this risk.
3. The risk is shared/should be shared.

However, for the sake of simplification, the respondents are only required to put tick marks under the responsible parties as shown in Table 4. A space is left empty at the end of the survey for the respondents to add any comments they might have and provide their e-mail addresses in case they would like to be briefed with the results of the study.

Table 4: Survey Questionnaire Part 2

#	Risk Description	Perceived			Proposed		
		O	C	S	O	C	S
1	Answer clarifications during bidding period						
2	Stipulate payment method						
3	Stipulate definitions and contractual responsibilities						
4	Stipulate methods for claims and dispute settlement						
5	Confidentiality of bid details						
6	Bid mistakes						
7	Obtain necessary guarantees, insurances and bonds						
8	Obtain necessary licenses and permits						
9	Third party and liability						
10	Pay Zakat, taxes and duties						
11	Sufficient quantity and skill of labour						
12	Labour housing transportation and medical treatment						
13	Maintaining labour roster at work						
14	Availability of resources to execute work						
15	Adequacy and suitability of equipment						
16	Provide and maintain temporary structures						
17	Provide site superintendence during execution						
18	Site housekeeping and sanitary conditions						
19	Site first aid trained personnel and supplies						
20	Site security (including material yard)						
21	Site safety						
22	Pollution control caused by work						
23	Noise control and undue disturbance of public						
24	Unnecessary or improper interference with public convenience						
25	Mobilization and demobilization						
26	Dumping debris in an approved location						

#	Risk	Perceived			Proposed		
		O	C	S	O	C	S
27	Prepare schedules (bar charts, CPM, ...) for owner's approval						
28	Maintain progress and overcome schedule slippage						
29	Notify owner of actual or anticipated delay						
30	Promotion of local manufacturers and suppliers						
31	Utilize Saudi airline and maritime carriers						
32	Maintaining procurement records						
33	Preservation of existing structures, facilities and utilities						
34	Preserve vegetation (other than marked for removal) on or near site						
35	Subcontractors' and suppliers' acts and omissions						
36	Obtain approval before subcontracting						
37	Guarantee no further subcontracting						
38	Obtaining SASO approval on imported material and equipment						
39	Adherence to laws and customs of Saudi Arabia						
40	Adherence to import and customs laws						
41	Perform government relations activities						
42	Giving notices and paying fines to public authorities applicable to work						
43	Prepare as-built drawings						
44	Prepare shop and work drawings						
45	Documenting by photographs						
46	Delayed progress payments						
47	Infringement of patents, copyrights and trade secrets						
48	Allow owner access to all aspects of work						
49	Cooperation to facilitate inspection of work						
50	QA/QC (inspection and testing of work)						
51	Preserving articles of value, archaeological or geological interest						
52	Site conditions including surface and subsurface						
53	Safeguarding title to design, confidential information and patents						

#	Risk	Perceived			Proposed		
		O	C	S	O	C	S
54	Obtain owner's approval before issuing publicity releases						
55	Criminal misappropriation and misapplication						
56	Issue and document change						
57	Working on undocumented change						
58	Liquidated damages for delay (up to 10% of contract value)						
59	Liquidated damages (consequential damages)						
60	Conflict of interest						
61	Force majeure						
62	Special risks (limited to outbreak of war)						
63	Standby time controlled by owner						
64	Standby time controlled by contractor						
65	Maintenance period						
66	Cost of contractor's search for defects controlled by owner (implied)						
67	Cost of contractor's search for defects controlled by contractor						
68	Cooperation with other contractors working for owner in the area						
69	Warranty of work						
70	Guarantee for 10 years						

3.3 Population and Sampling

The targeted population of this study has been determined to be all of the contractors of class 1, class 2 and class 3, based in the Eastern Province, 11 Saudi Universities to represent the owner along with 155 consultants (owner representatives) in al Khobar area. To determine the effective sample size, Kish's formula for calculating the sample size has been used as follow (Al Shaar, 2015):

Equation 1: Initial Estimate of the Sample Size

$$n_0 = \frac{pq}{SEM^2}$$

Equation 2: Final Estimate of The Sample

$$n = \frac{n_0}{1 + \frac{n_0}{N}}$$

Where:

n_0 = the first estimate of the sample size

P = the proportion of the characteristics being measured

$q = 1 - p$

n = the final estimate of the sample size

N = the target population size

SEM = the maximum percentage of the standards error allowed

for the sample mean.

Substituting 0.5 for p, q becomes 0.5. And substituting 0.1 for SEM gives a value of 25 as the first estimate of the sample size (n_0). Plugging this number into the second equation and substituting the population (N) of the owners, contractors and consultants, we find the sample size for contractors to be 20 and for consultants to be 22. For owners, the population is very small, calculating the sample size using this formula gives a minimum of 8 responses. However, since this number is very small, the whole population will be considered as the sample. Table 5 summarizes the populations and the calculated sample sizes respectively.

Table 5: Population and Sample Sizes

Sample	Population	Final Estimate of the sample
Owners and Consultants	155	21.72 = 22
Contractors	93	19.7 = 20
Total	259	42

3.4 Collection Method

The primary method of collection was ought to be e-mail. The names and addresses of the contractors and the engineers were obtained from the websites of the Ministry of Municipal and Rural Affairs (MOMRA) and the Saudi Counsel of Engineers (SCE). An invitation was sent through e-mail to the whole population of contractors and consultants.

The e-mail contained a scan of the approved invitation letter along with the survey questionnaire, all in both languages, Arabic and English. In addition, a web-based survey questionnaire was developed and a link was provided in the e-mail. Surprisingly, no correspondence whatsoever was found from anyone. Another reminder e-mail was sent after a week in a trial to motivate respondents to take the questionnaire, but with no use.

Since the e-mail approach have failed, another approach had to be taken. Contractors, consultants and owners were phone called and visited in their offices or sites, and been asked to help and participate in the study. While some of the interviewed population were repellent and did not show any immediate cooperation, others were very welcoming, cooperative and enthusiastic about the study.

After a long period of making calls and taking appointments and interviewing people, a good amount of data piled up and was enough to start the analysis. Referring to Table 6, none have responded to e-mails, 13 responses where collected through phone call and the remaining 33 was collected upon interview.

Table 6: Number of Responses by Method of Collection

METHOD	TOTAL	RESPONDED
E-MAIL	160	None
PHONE CALL	20	13
INTERVIEW	55	33

3.5 Statistical Tools

The collected data from the survey will be used to measure the following:

1. The extent into which the allocated risks in the general conditions of the Saudi Public Contract match the reality.
2. The extent of agreement on the allocated risks between the contracting parties.
3. The extent of agreement on the reallocation of risks between the contracting parties.

These three goals were achieved by analyzing the gathered data using the following statistical tools:

1. Evaluating the quality of data using general statistical measures such as: the mean, the standard deviation and the variance.
2. Allocating risks based on majority of choice (50% or more).
3. Test of hypothesis to measure the extent of conformity between the perceived and the proposed allocation of risks using the Chi-square test of independence.

Further elaboration will be given on each statistical tool and its implementation in the analysis in Chapter 5.

CHAPTER 4

Conditions of the Saudi Public Contract

4.1 General

The Saudi Public Contract (UCPW), was written on the basis of the FIDIC contract. The contract is comprised of the following two main documents:

- A. The Agreement
- B. The General Conditions

Where the full version of the contract might be extended to include the items shown in Figure 6.

The Agreement is the basic document of the contract that defines the contracting parties, the owner and the contractor, day, date and the city where the contract was signed, a description of the project to be executed and the signature of both parties. The agreement also includes the contract value, the purpose of the contract and six other articles that govern the contract in general.

The general conditions of UCPW is composed of 61 articles that elaborate on the six articles of the agreement. The articles of the UCPW conditions can be grouped under six categories as shown in Figure 6. It should be noted that the numbering system of articles in the English version is different from the Arabic version. A whole article is missing in

the English version as well, the article related to force majeure. Anyhow, the English version is unofficial version and is nothing but mere translation from Arabic to English.

The UCPW clearly states that, the contract should be written in Arabic and it may be translated to English. However, if a conflict arises, the Arabic version shall prevail. The six categories of conditions and the articles of these conditions are briefly explained in the following sections and a closer look at some certain conditions is given at the end of the chapter.

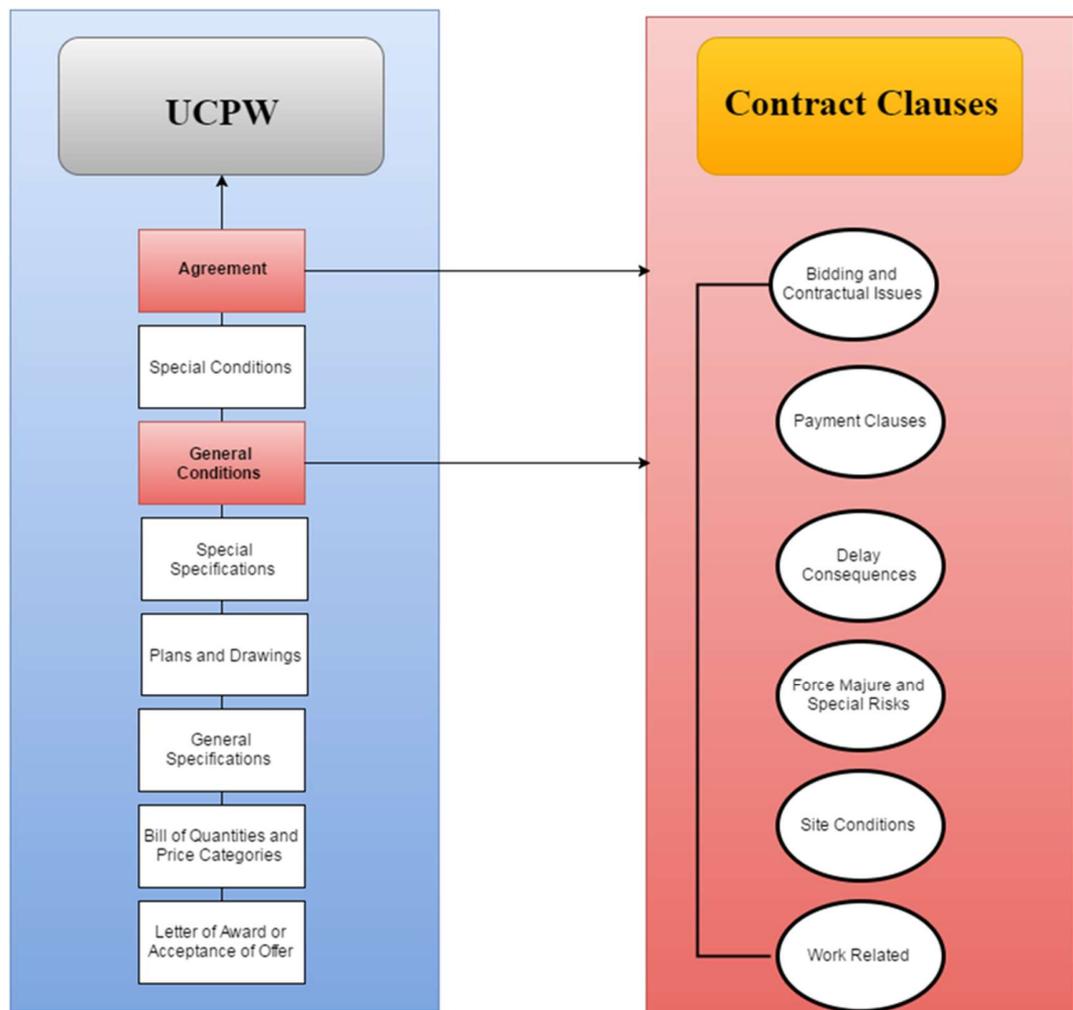


Figure 6: UCPW Contract Clauses

4.2 Bidding and Contractual Issues

This group of clauses generally cover preconstruction and bidding activities. Articles of this category provide definitions and interpretations of the contract wordings, delineates responsibilities of the contracting parties and the powers of the Engineer (Consultant).

The articles also cover subcontracting issues, claims and disputes and language of contract requirements. The following articles can be categorized under bidding and contractual issues:

- Article (1.1): Purpose of the Contract
- Article (1.2): Contract Documents
- Article (1.3): Contract Term
- Article (1.4): Term for Warranty of Works
- Article (1.7): Bid Integrity
- Article (1.8): Governing Laws
- Article (2.1): Definitions and Interpretations
- Article (2.2): Powers of the Engineer
- Article (2.3): Assignment to Others
- Article (2.4): Subcontracting
- Article (2.5): The Scope of the Contract
- Article (2.6): The Language of the Contract
- Article (2.7): Retention of Plans
- Article (2.8): Addendum to Article (2.2)
- Article (2.43): Amendments, Additions and Cancellation

- Article (2.44): Claims
- Article (2.41): Warranty period
- Article (2.53): Withdrawing the Work From the Contractor
- Article (2.57): Settlement of Disputes
- Article (2.58): Notification

4.3 Payment Clauses

Payment clauses addresses items such as method of payment, bonds and guarantees, zakat, taxes and duties and progress payments.

- Article (1.5): Contract Value
- Article (1.6): Payment
- Article (2.9): Performance Bond
- Article (2.11): Tender Sufficiency
- Article (2.60): Taxes and Fees
- Article (2.19): Sending of Notices and Payment of Charges and Fines
- Article (2.46): Quantities
- Article (2.47): Measurement of Works
- Article (2.48): Method of Measurement
- Article (2.50): Preliminary and Final Handover Payment, and Guarantee Period
- Article (2.59): The Work Owner's Default

4.4 Time Related and Delay Consequences

This group of conditions tackles time related and delay issues, and their consequences.

- Article (2.33): Work Commencement
- Article (2.34): Site Handover and Possession
- Article (2.35): Work Completion Period
- Article (2.36): Extension of Work Completion Period
- Article (2.39): Delay Fine
- Article (2.40): Supervision Costs Due to Delay
- Article (2.51): Preliminary Handover
- Article (2.52): Final Handover
- Article (2.53): Withdrawing the Work from the Contractor
- Article (2.54): Effects of Work Withdrawal

4.5 Force Majeure, Special Risks and Accidents

- Article (2.55): Special Risks and Force Majeure
- Article (2.56): Contract Termination due to Special Risks or Force Majeure
- Article (2.18): Injuries to persons and properties

4.6 Site conditions

- Article (2.10): Site Viewing

- Article (2.16): Designation of Work Site
- Article (2.17): Guarding and Lightning
- Article (2.25): Evacuation of Work Site Upon Completion
- Article (2.29): Site Access

4.7 Work Related Clauses

- Article (2.12): Works Performance
- Article (2.13): Work Program
- Article (2.15): The contractor's employees
- Article (2.20): Relics and Other Items of Value
- Article (2.21): Patent rights and ownership
- Article (2.22): Blocking Traffic and Causing Damage to Adjacent Properties
- Article (2.23): Abnormal Traffic
- Article (2.24): Cooperation with Other Contractors
- Article (2.26): Employment of Workers
- Article (2.27): Statement of Workers
- Article (2.28): Materials and Workmanship
- Article (2.30): Work test before covering
- Article (2.31): Removing Works and Materials in Violation of the Contract
- Article (2.32): Suspension of Work
- Article (2.37): Prohibition of Work at Night and During Official Holidays
- Article (2.38): Rate of Work Progress

- Article (2.42): The Contractor's Obligation to Search for The Reasons of Defect, Error, or Flaw.
- Article (2.45): Equipment, Temporary Works and Materials
- Article (2.49): Use of Explosives

4.8 Clauses of the UCPW: A Closer Look

The UCPW has a total of 70 clauses, 8 of those are found in the agreement and the remaining 62 are in the general conditions. All of which are considered vital part of the contract. However, some articles are surrounded by ambiguity and cannot be understood clearly from the headline. It would be sufficient here to explain the most ambiguous and most important clauses of the contract only. For further knowledge, the reader may refer to the original contract available online in both languages. The selection of these contract clauses was based on the literature review and the most relevant problems that is found in the local industry nowadays.

4.8.1 Definitions and Interpretations

Definitions and interpretations of the contract wording are provided in article one of the general conditions. Their function is to eliminate any misunderstanding and ambiguity in the interpretation of the remaining articles. The article is comprised of three statements, where the first statement implies a list of words and their definitions, the second statement addresses that singular and plural forms bear the same meaning in any context and the third statement excludes the headings and the margins from the contract.

Although the article lists the meaning and interpretation of ten words, only three of them are found necessary to be mentioned here. The contract defines the contracting parties as the work owner (party 1) and the contractor (party2), both represented in the administrative body or person authorized to sign the contract, where the first party is the body that solicits for tender and the second party is the body whose tender is accepted.

The Engineer is the supervising entity appointed by the first party to supervise the work of the second party. The terms Engineer, Architect and Consultant are all found to be used interchangeably in the literature to refer to the supervisor of the work appointed by the owner, and shall all be used to refer to this body hereafter.

4.8.2 Powers of the Engineer

The second article of the contract elaborates on the power and the authority limits of the engineer. The engineer is not authorized to release the contract from any obligation or commitment, nor is allowed to order the execution of any work that might come at the expense of the work owner. The engineer may mandate a representative to supervise the work and exercise the powers of the engineer himself on the contractor and the owner in writing. A copy of the written authorization shall be provided to the contractor as well. The engineer has the power to accept or reject an order later on if his representative fails to do so. Upon dissatisfaction with the engineer's representative, the contractor may refer the matter to the engineer who may approve, cancel or amend the decision of his representative.

4.8.3 Subcontracting

The contract stipulates that the contractor might not hire a subcontractor to execute the whole work agreed upon in the contract. The contractor may not hire a subcontractor to execute parts of the work without the written consent of the owner. In addition, the contract holds the main contractor entirely responsible for the acts and errors of his subcontractors and their staff.

4.8.4 Site Conditions

The contractor might view the site, investigate the topographic and soil conditions of the site, its accessibility and carry out any required tests, prior to tender, at his own cost. The contractor is also responsible for checking and reviewing the design in detail and inform the engineer and the owner of any error during work execution. In case site conditions differ materially from what is in the contract, the contractor should notify the engineer within a period of 10 days. There is no general rule in the literature for who shall incur extra costs associated with differing site conditions, it is all dependent on the contract wording. The UCPW does not argue this matter clearly and it is possibly supported in the supplementary conditions.

4.8.5 Taxes and Fees

The contractor shall pay taxes and fees on time according to the laws and rules of the Kingdom of Saudi Arabia. In case of changes in the rates of taxes and custom duties, the contractor has to provide evidence of the incurred costs to be able to claim compensations from the work owner. It is preferred that an agreement is

made in the contract on rates of taxes, fees of labor and costs of material. However, if no such rule has been established, the contractor and the owner may settle this issue at a fair price for both parties. The contractor shall also provide the owner with a performance bond that is equal to 5 percent of the contract value to ensure contract execution within 10 days from receiving the notice to proceed. The contractor may be given 10 extra days as a grace in addition to the original 10 days.

4.8.6 Payment

Article 50 focuses on payment and elaborates on the rights of the contractor and the method at which progress payments are remunerated. The contract stipulates that the contractor is paid based on the actual completed work at least once a month.

The last progress payment, which is not less than 10% of the contract value is not paid until the preliminary handover of the project and submission of Zakat and Income Taxes certificates. The contract addresses as well that the owner may pay the contractor and advance payment that does not exceed 10% of the contract value given that the contractor provides a bank guarantee of the same amount to be deducted from the final payment. All payments should be in the Saudi Currency unless stated otherwise in the supplementary conditions. The reader may refer to the text of the UCPW for detailed and specific stipulations of on payment method.

In addition to article 50, the issue of payment is referred to in various locations in the UCPW clauses. Such clauses discuss that the work owner shall abide to the payment method and times stipulated in the agreed upon contract when the contractor delivers the work. The contractor shall claim compensations for delay in

payment within thirty days from the incident and shall not claim compensation for delayed payment stemming from his faults. Failure of meeting the thirty days period exempts the owner from any claimed compensation thereafter.

4.8.7 Delay Penalty and Supervision Costs (Liquidated and Consequential Damages)

The terms “Delay Penalty” and “Supervision Costs” in the literature are usually referred to as “Liquidated Damages” and “Consequential Damages”, where the former is a previously agreed upon penalty for delay in delivery and the latter is incurred costs of supervision resulting from this delay. According to Crowley (2008): “Liquidated damages are contractually specified damages that provide restitution for additional owner costs incurred from contractor delayed completion. Established legal precedence requires owners to specify rates that are a good faith pre-estimate of actual anticipated damages”.

However, liquidated damages being viewed as a penalty rather than a compensation for delay costs incurred by the work owner is debatable. According to Thomas (1995): “Liquidated damages are generally deemed to be in lieu of actual delay damages. When using a liquidated-damages clause, the owner is limited to the delay damages stipulated and cannot seek actual damages resulting from the delay. But, the liquidated-damages clause does not prevent the owner from seeking compensation for damages resulting from negligence, poor workmanship, willful misconduct, or numerous other defaults by the contractor. Courts generally enforce

the liquidated-damages clause so long as: (1) The daily amount bears some resemblance to the damages that could be foreseen at the time the contract was written, that is, the amount specified as liquidated damages is not perceived as a penalty; and (2) the damage amount is difficult or impossible to estimate.”

Article 39 of the general conditions of the UCPW states that: “If the Contractor delays the work completion and fails to fully hand it over at the specified dates, and if the Work Owner sees no reasons to withdraw the work from it, the Contractor shall pay a fine for the delay period for the completion of work after the date specified for the handover. This delay fine shall be computed on the basis of the average daily cost of the project, by dividing the contract price by its period...”, the article then details the computation of this penalty on the basis of the daily cost of the contract. However, the article then adds that such penalty shall not exceed 10% of total contract value. The contractor being in acquaintance of this penalty limit urges him to include it somehow in the bid.

The following article to the delay penalty, the 40th article of the general conditions argues consequential damages, or damages resulting from supervision costs. Article 40 states that: “In addition to the fine stated in the previous article, the Contractor shall bear the fees of the project supervisor during the period for which the Contractor is subject to the fine. Such fees shall be computed according to the supervisor's contract stipulation, whether it is a periodical amount or a percentage

of the contract value”. In case the contract was a fixed-price lump sum contract, the UCPW provides a formula to calculate consequential damages as follows:

$$\text{Contract Price} \times \frac{1}{100} \times \frac{\text{Delay Period Per Day}}{\text{Contract Value Per Day}}$$

Although the contractor might be able to predict such delay, there is a certain degree of uncertainty surrounding such matter. The contractor might front-load his bid to account for such risk, as in liquidated damages, but still, there is no upper bound for the cost. On the other hand, front loading the bids with liquidated damages and consequential damages might have a positive effect. The contractor will probably have the incentive to meet the deadline of the project in order for him to increase his return on investment, by actually not having to compensate the owner for delay and still have the preloaded bid fees of supervisory and costs of delay for himself.

4.8.8 Third Party Liability

Third party liability is defined in the Meriam Webster Dictionary (2016) as:

“Someone who is not one of the two main people involved in a legal agreement but who is still affected by it in some way”. However, it has different interpretations when looked at from different perspectives. In investment for example, “A third party is an individual or entity that is involved in a transaction but is not one of the principals. The third party often has a lesser interest in the transaction than the principals” (Investopedia, 2016). In business, on the other hand, “Someone who may be indirectly involved but is not a principal party to an arrangement, contract, deal, lawsuit, or transaction” (Business Dictionary, 2016).

Projecting the previous definitions on construction contracts, a third party is a party who is not one of the two contracting parties, the owner and the contractor, but still might be affected by the actions of the two contracting parties or acts associate with work implied by such contract. The phrase “Third Party” only mentioned once under the special risks in article 55. The article spares the contractor from a third party liability in case this party is affected by special risks such war or military coupe. Although the contract (UCPW) holds the contractor responsible for accidents and damages happening in the site under his command, no clear allocation of such risk is provided. In despite of that, contractors usually escape such risk through insurance, where the insurance company takes the burden of the third party liability. However, this is applicable for big contractors handling relatively large size projects.

4.8.9 Force Majeure and Special Risks

Force majeure is the French synonym to “superior force”. Force majeure is also referred to as “Acts of God” or “Acts of Nature”. Examples are hurricanes, earth quakes, storms and floods. According to the Contracts Standards Library (2016): “Force Majeure clause (French for superior force) is a contract provision that allows a party to suspend or terminate the performance of its obligations when certain circumstances beyond their control arise, making performance inadvisable, commercially impracticable, illegal, or impossible. The provision may state that the contract is temporarily suspended, or that it is terminated if the event of force majeure continues for a prescribed period of time”

In general, all standard forms of contracts release the contractor from force majeure liability, but what is considered as a “Force Majeure” is debatable. The FIDIC for instance, includes special risks such as war and military coupe under force majeure clause. In contrast, the UCPW has force majeure and special risks under two different clauses. The FIDIC Red Book (1999) defines what is included in a force majeure clause as “In this Clause, Force Majeure means an exceptional event or circumstance:

- a) Which is beyond a Party’s control,
- b) Which such Party could not reasonably have provided against before entering into the Contract,
- c) Which, having arisen, such Party could not reasonably have avoided or overcome, and
- d) Which is not substantially attributable to the other Party.

Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

(i) War, hostilities (whether war be declared or not), invasion, act of foreign enemies,

(ii) Rebellion, terrorism, sabotage by persons other than the Contractor’s

Personnel, revolution, insurrection, military or usurped power, or civil war,

(iii) Riot, commotion, disorder, strike or lockout by persons other than the munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and

(v) Natural catastrophes such as earthquake, hurricane, typhoon or volcanic Activity.”

The UCPW defines Force Majeure in the 51st article of the general conditions in the Arabic version as: any unexpected event that occurs after sealing the contract and before its completion that might makes contract performance, entirely or partially, impossible. An event is still not considered a force majeure until:

- A. Impossibility of contract performance is stemming from an event that occurs after agreeing to the contract and during its execution, without having any control of the two parties on such event.
- B. The contractor cannot expect such event prior to sealing the contract.
- C. The event is inevitable by the two parties in anyway.
- D. No contractor has made a mistake or an error in assessing the possibility of contract performance.

Although that special risks and force majeure are defined differently in the UCPW, their consequences and liabilities are included under one clause. Article 52 of the Arabic version of the UCPW stipulates that, in occurrence of a special risk or a force majeure event and in case performance of the contract became impossible for any of the two parties, this party has to notify the other party within a period of 45

days from the occurrence of that event. Upon confirmation of the impossibility of contract performance, the contract is terminated after 90 days from the notification date. Based on the status of the project, the contractor is either exempted of the whole contract or part of it, and is compensated for all the delivered work in accordance with article 54 (Contract Termination). If, later on, completion of work became possible, the contractor has to resume work after notifying the engineer and take all necessary actions, such as fixing what needs to be fixed, to complete the work. The contractor shall be compensated for extra costs of material, work and delay upon evidence.

4.8.10 Change Orders

The fact that a project encounters several changes from what was planned is inevitable. The contracting parties should always expect changes to happen on the original plan and bare that in the writing and agreement to the contract conditions. There are two types of changes that might occur to a construction contract. These two types are:

- A. Addenda: changes happening between tender solicitation and bid opening
- B. Change orders: changes happening after signature of the agreement

Changes by addenda does not possess as much risk as changes by change order. This is due to the nature of change by addenda being in the early stages of the project, which can somehow be either avoided or alleviated. Change order on the other hand bear some risk for both party, for the contractor to accept that change and for the owner to expect that such change is doable and to be accepted by the

contractor. According to Fisk (2010), change in construction come in three types: cardinal, constructive and directed. Al Mohawis (2014) explains these changes as follow: “Cardinal changes are major changes that alter the identity of the contract. Such change can be considered a breach of contract. Constructive changes are a change claimed by the contractor resulting from the owner’s action or lack of action that necessitates an adjustment to the contracting price and or time. Directed changes are changes explicitly directed by the owner or his representative” Then he adds: “In general, change orders should be within the scope of the contract and should be clear, specific and detailed. Individual authorized to initiate and approve change orders should be known to parties of contract. Change orders should not be implemented unless documented and authorized in writing”.

Change orders are covered in articles 8 and 43 of the general conditions of the UCPW. Article 8 authorizes the engineer with full power to order and initiate change on behalf of the owner and preserve the rights of the contractor to be compensated for extra costs. Article 43 restates that the contractor has to conform to the changes ordered by the engineer and adds that the owner might alter the scope of work by what results in not more than 10% increase or 20% decrease of the bid price. The article also emphasizes that the contractor shall not perform any change order unless authorized in writing by the engineer. Changes claimed by the contractor are covered in the 43rd article of the general conditions and will be discussed in section 4.8.11.

4.8.11 Claims

Article 43 addresses that the contractor may report claims to the engineer on a monthly basis through the stipulated method in the contract, including all details and information to support this claim within thirty days from the incident. The engineer shall assess claims and changes of work and thereafter validate the claim and its value based on the rates in the contract. The contractor and the work owner might decide on a fair price for rates that are not included in the contract. The owner shall not compensate the contractor for claims older than 30 days which was reported to the engineer within that monthly claim statement.

4.8.12 Warranty and Guarantee

Warranty and guarantee are covered in articles 41 and 50 of the general conditions and the two terms has different meanings. A guarantee is a pledge by the contractor to deliver the work in the promised or agreed upon standard. A warranty is a pledge by the contractor to carry out any required repairs to defects differing from what has been agreed upon in the contract (Foster, 2013).

The UCPW stipulates that a warranty period starts from the date of the preliminary handover to the date of the final handover, where the contractor bears the responsibility of repairing any deficient parts of the work that are not a results of natural tear and wear, and that are not the results of a fault in maintenance or performance, at his own expense after. Any other repairs not associated with the contractor negligence or fault shall be compensated for. In case the contractor

defaults, the work owner may hire another contractor to carry out the repairs at the expense of the primary contractor by deduction from the final payment. The contractor is obliged to guarantee the work against partial or whole collapse for 10 years unless stated otherwise in the contract conditions.

4.8.13 Contract Termination

In any legal system, a contract is terminated by breaching any of its conditions. In the UCPW, there is no specific clause on contract termination, however, contract termination is mentioned in other clauses. Article 7 of the agreement document states that the owner has the complete right to terminate the contract in case any form of bribery to win the contract has been found. The UCPW puts article 7 as follows “Without prejudice to provisions of other laws, the Contractor acknowledges that it has not paid money or offered any other benefits or promised the same in order to secure this contract. If proven otherwise payments made or promised shall be deducted from the Contractor's dues, in addition to the Work Owner's right to terminate the contract without compensation and the liability of the contractor and its personnel for such acts”

Article 55 of the general conditions discusses contract termination due to eruption of war and force majeure as follows: “In the event a war erupts during the effective period of this contract the Contractor shall take all possible measures and make efforts to complete the works. It shall always take into consideration the Work Owner's right to terminate the contract by written notice addressed to the Contractor at any time after eruption of war. By giving such notice, the contract

becomes terminated except for the rights of the two parties stipulated in this Article and Article (56), and without prejudice to the rights of either of the two parties related to any violation prior to the contract termination.”

Then article 56 comments on the rights of the contractor in case of termination of contract due to eruption of war: “ In the event the contract is terminated due to eruption of war as stated above, the Work Owner shall pay the Contractor all its dues for the works carried out, plus the price of the materials and goods supplied to the site, after deducting the amounts due to him from the Contractor from the balance of the advanced payments made to the Contractor or any other amount paid to the Contractor against the work performance”.

Article 57 states that any unresolved disputed between the two parties shall be brought to the Board of Grievances for final settlement. Followed by article 59, the contract states that in case the work owner’s default from payment, the contractor has the right to claim compensations. However, that does not entitle him to suspend work as follows: “The Work Owner shall execute the contract conditions in good faith, and pay to the Contractor its due instalments without delay. If the Work Owner breaches any of the contract conditions or fails to pay in due date, the Contractor shall be entitled to claim compensation for losses resulting from this default or breach. However, the Contractor may not suspend the work for any delay of payment on the Work Owner’s part because of any fault attributable to the Contractor. The Contractor shall be deemed as waiving any compensation not claimed within thirty days from the incidence for which it claims compensation”.

CHAPTER 5

Data Analysis and Results

5.1 General

Upon gathering the data from the different collection sources, the data has been sorted and classified into three main categories:

- A. Owners and Engineers
- B. Contractors
- C. Composite of the two

Where two subcategories span under each of the four main categories. These two subcategories are: Perceived Allocation of Risks and Proposed Allocation of Risks. Categorizing of data is necessary to compare the different responses of each group of respondents. The following sections present a description of the collected data, the adopted analysis methods and the results of the analysis.

5.2 Statistical Methods

5.2.1 Standard Deviation and Variance

The standard deviation and the variance are measures of dispersion of values around their mean. The standard deviation and the mean are related as shown in

Equation 3 and Equation 4. Where the variance is the square of the average of the squared means, the standard deviation is calculated by taking the square root of the variance.

Equation 3: Variance

$$Var (X) = \sum_{i=1}^n p_i x_i^2 - \mu^2$$

Equation 4: Standard Deviation

$$\sigma = \sqrt{VAR}$$

5.2.2 Tabulation and Cross Tabulation

Cross tabulation is a method that presents the data in a two-way tabular form to compare relations between different sets of data. The method is adopted in the analysis to describe the demography of the surveyed population and to summarize the findings of this research.

5.2.3 Chai-Square Test of Independence

Hypothesis testing is needed in this research to determine if the responses depend on the type of respondent or not. Statistics offers a wide range of hypotheses tests for different types of data. Examples are: the variations of the ANOVA test, the variations of the T-Test and the Z-Test. However, these tests are only applicable for continuous data, which is not the case in this study. The data in hand is both, discrete and binary, which contradicts with the conditions of the aforementioned tests.

The Chi-Square test for independence was found to be most applicable to the collected data and the purpose of the analysis in the first place. The test is used to find out if a set of samples is independent from the variables or not. In this case, to test if the responses (allocation of risks) is dependent on the type of the respondent or not. The Chi-Square test of independence assumes two hypothesis as follows:

- H_0 : The two categorical variables are independent
- H_a : The two categorical variables are related.

Using contingency tables, another table of observed and expected values is generated and used to calculate a value called “Chi-Square”. The formulas that govern the calculations of the expected values and the Chi-square are shown in Equation 5 and Equation 6, respectively. Then, using the degrees of freedom (Equation 7) and the significance level, the obtained Chi-Square value is compared to the respective value in the Chi-Square distribution table. If the obtained value from the data is larger than the tabulated value, the null hypothesis is rejected and the alternative hypothesis is assumed to be true. Otherwise, the null hypothesis prevails.

Equation 5: Expected Value

$$E_{i,j} = \frac{\sum_{k=1} O_{i,k} \sum_{j=1} O_{k,j}}{N}$$

Where:

$E_{i,j}$ = Expected Value

$$\sum_{k=1} O_{i,j} = \text{Sum of the } i\text{th column}$$

$$\sum_{k=1} O_{k,j} = \text{Sum of the } k\text{th column}$$

$N = \text{Total Number}$

Equation 6: Chi-Square

$$\chi^2 = \sum_{i=1} \sum_{j=1} \frac{(O_{i,j} - E_{i,j})^2}{E_{i,j}}$$

Where:

$\chi^2 = \text{Chi square test of independence}$

$O_{i,j} = \text{Observed value of the two nominal variables}$

$E_{i,j} = \text{Expected value of the two nominal variables}$

Equation 7: Degrees of Freedom Formula

$$DF = (r - 1)(c - 1)$$

Where:

$DF = \text{Degrees of Freedom}$

$r = \text{number of rows}$

$c = \text{number of columns}$

5.2.4 Computer Software

Due to the large amount of data, it is more convenient to use a statistical analysis software to carry out the analysis. Utilizing software analysis saves time and effort, and produces more accurate results. The employed software in this research is mainly Minitab 17. The software was found handy and capable of performing all statistical calculations and analysis. In addition, Excel was used to sort and categorize the data, to produce contingency tables and perform manual calculations.

5.3 Demography Analysis: General Information

The first part of the survey was intended to collect information about the nature of respondents. This includes the entity that they represent, the activity of this entity, their job title and their total years of experience. Responses to these questions are summarized in the following subsections.

5.3.1 Surveyed Population

Referring to Table 7, contractors represent approximately half of the surveyed population with a percentage of 52.2%. Owners on the other hand were the least surveyed population with a percentage of 13%. This is due to the difficulty of reach and communication. Architects were in between with a percentage of 34.8%.

Table 7: Surveyed Population

TYPE	NUMBER	PERCENTILE
OWNER	6	13.0%
CONSULTANT/ARCHITECT/ENGINEER	16	34.8%
CONTRACTOR	24	52.2%
TOTAL	46	100.0%

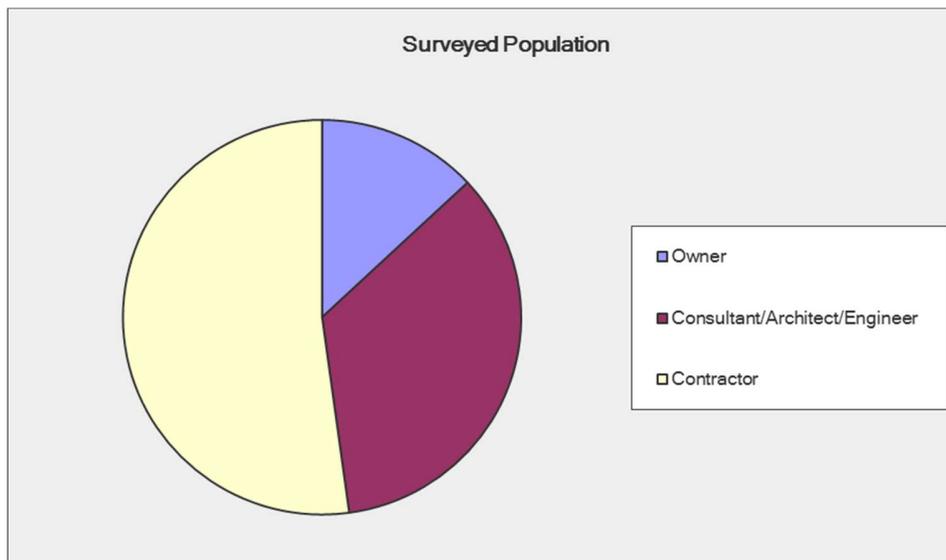


Figure 7: Surveyed Population Pie Chart

5.3.2 Job titles

Respondents had different job titles based on the organization they work in.

However, most of the surveyed respondents had job titles like Tendering Manager, Contracts Administrator or Procurement Manager. Table 8 shows job title frequencies for each group.

Table 8: Job Titles by Type of Respondent

Job Title	Owner	Contractor	Consultant	Total
Tendering Manager	4	5		9
Contracts Administrator		7	10	17
Procurement Manager	2	4		6
Project/Construction Manager		2		2
Other		6	6	12
Total	6	24	16	46

5.3.3 Years of Experience

Most of the respondents had more than 10 years of experience. Some of them had more than 30 years and others had less than 5. The exact number of people and the range of years of experience they belong to are detailed in Table 9.

Table 9: Years of Experience

YEARS	OWNER	CONTRACTOR	CONSULTANT	TOTAL
20 OR MORE	1	12	7	20
15 TO 20	1	4	3	8
10 TO 15	2	7	4	13
5 TO 10	2	1	1	4
5 OR LESS			1	1
TOTAL	6	24	16	46

5.3.4 Response Rate

The major challenge in completing this research was data collection. Very little corporation has been received from the respondents due to the sensitivity of the required data. However, the total number of responses was 46, which satisfies the minimum number of responses of 42 as calculated with Kish formula for sampling. Details on the collection method was provided earlier in 3.4 of this report. Where it's only necessary to present composite responses here, categorical responses are left to be included in the appendix. Table 10 and Table 11 shows the resulting composite perceived and proposed percentages of allocation by all respondents.

Table 10: Perceived Allocation (Composite)

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	96%	0%	4%
Stipulate payment method	96%	0%	4%
Stipulate definitions and contractual responsibilities	96%	0%	4%
Stipulate methods for claims and dispute settlement	89%	0%	11%
Confidentiality of bid details	43%	17%	39%
Bid mistakes	39%	37%	24%
Obtain necessary guarantees, insurances and bonds	4%	83%	13%
Obtain necessary licenses and permits	26%	59%	15%
Third party and liability	13%	78%	9%
Pay Zakat, taxes and duties	9%	83%	9%
Sufficient quantity and skill of labour	0%	85%	15%
Labour housing transportation and medical treatment	0%	91%	9%
Maintaining labour roaster at work	0%	93%	7%
Availability of resources to execute work	0%	100%	0%
Adequacy and suitability of equipment	0%	85%	15%
Provide and maintain temporary structures	0%	80%	20%
Provide site superintendence during execution	22%	63%	15%
Site housekeeping and sanitary conditions	0%	89%	11%
Site first aid trained personnel and supplies	0%	96%	4%
Site security (including material yard)	4%	91%	4%
Site safety	4%	72%	24%
Pollution control caused by work	0%	85%	15%
Noise control and undue disturbance of public	0%	96%	4%
Unnecessary or improper interference with public convenience	0%	78%	22%
Mobilization and demobilization	4%	91%	4%
Dumping debris in an approved location	5%	84%	11%
Prepare schedules (bar charts, CPM, ...) for owner's approval	9%	76%	15%
Maintain progress and overcome schedule slippage	0%	76%	24%
Notify owner of actual or anticipated delay	13%	61%	26%
Promotion of local manufacturers and suppliers	26%	43%	30%
Utilize Saudi airline and maritime carriers	28%	50%	22%
Maintaining procurement records	0%	82%	18%
Preservation of existing structures, facilities and utilities	9%	76%	15%
Preserve vegetarian (other than marked for removal) on or near site	9%	76%	15%
Subcontractors' and suppliers' acts and omissions	4%	78%	17%
Obtain approval before subcontracting	9%	78%	13%
Guarantee no further subcontracting	26%	74%	0%
Obtaining SASO approval on imported material and equipment	4%	74%	22%
Adherence to laws and customs of Saudi Arabia	13%	52%	35%
Adherence to import and customs laws	13%	57%	30%
Perform government relations activities	22%	63%	15%
Giving notices and paying fines to public authorities applicable to work	26%	39%	35%

Risk	Owner	Contractor	Shared
Prepare as-built drawings	9%	70%	22%
Prepare shop and work drawings	9%	65%	26%
Documenting by photographs	13%	59%	28%
Delayed progress payments	54%	26%	20%
Infringement of patents, copyrights and trade secrets	30%	46%	24%
Allow owner access to all aspects of work	9%	59%	33%
Cooperation to facilitate inspection of work	9%	59%	33%
QA/QC (inspection and testing of work)	9%	43%	48%
Preserving articles of value, archaeological or geological interest	9%	61%	30%
Site conditions including surface and subsurface	4%	76%	20%
Safeguarding title to design, confidential information and patents	26%	35%	39%
Obtain owner's approval before issuing publicity releases	9%	72%	20%
Criminal misappropriation and misapplication	4%	63%	33%
Issue and document change	63%	22%	15%
Working on undocumented change	13%	74%	13%
Liquidated damages for delay (up to 10% of contract value)	14%	70%	16%
Liquidated damages (consequential damages)	17%	67%	15%
Conflict of interest	17%	48%	35%
Force majeure	48%	22%	30%
Special risks (limited to outbreak of war)	52%	28%	20%
Standby time controlled by owner	72%	9%	20%
Standby time controlled by contractor	9%	76%	15%
Maintenance period	13%	78%	9%
Cost of contractor's search for defects controlled by owner (implied)	57%	39%	4%
Cost of contractor's search for defects controlled by contractor	13%	83%	4%
Cooperation with other contractors working for owner in the area	9%	67%	24%
Warranty of work	0%	85%	15%
Guarantee for 10 years	4%	96%	0%

Table 11: Proposed Allocation (Composite)

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	96%	0%	4%
Stipulate payment method	96%	0%	4%
Stipulate definitions and contractual responsibilities	96%	0%	4%
Stipulate methods for claims and dispute settlement	89%	0%	11%
Confidentiality of bid details	41%	9%	50%
Bid mistakes	30%	26%	43%
Obtain necessary guarantees, insurances and bonds	13%	63%	24%
Obtain necessary licenses and permits	37%	35%	28%
Third party and liability	13%	57%	30%
Pay Zakat, taxes and duties	13%	78%	9%
Sufficient quantity and skill of labor	0%	76%	24%
Labor housing transportation and medical treatment	0%	87%	13%
Maintaining labor roster at work	0%	89%	11%
Availability of resources to execute work	0%	91%	9%
Adequacy and suitability of equipment	0%	91%	9%
Provide and maintain temporary structures	0%	80%	20%
Provide site superintendence during execution	17%	43%	39%
Site housekeeping and sanitary conditions	0%	85%	15%
Site first aid trained personnel and supplies	0%	96%	4%
Site security (including material yard)	0%	83%	17%
Site safety	4%	46%	50%
Pollution control caused by work	0%	80%	20%
Noise control and undue disturbance of public	0%	78%	22%
Unnecessary or improper interference with public convenience	4%	57%	39%
Mobilization and demobilization	0%	96%	4%
Dumping debris in an approved location	4%	72%	24%
Prepare schedules (bar charts, CPM, ...) for owner's approval	4%	69%	27%
Maintain progress and overcome schedule slippage	4%	48%	48%
Notify owner of actual or anticipated delay	26%	35%	39%
Promotion of local manufacturers and suppliers	29%	29%	42%
Utilize Saudi airline and maritime carriers	24%	41%	35%
Maintaining procurement records	9%	67%	24%
Preservation of existing structures, facilities and utilities	13%	72%	15%
Preserve vegetation (other than marked for removal) on or near site	9%	76%	15%
Subcontractors' and suppliers' acts and omissions	13%	70%	17%
Obtain approval before subcontracting	9%	78%	13%
Guarantee no further subcontracting	23%	58%	19%
Obtaining SASO approval on imported material and equipment	9%	57%	35%
Adherence to laws and customs of Saudi Arabia	4%	35%	61%
Adherence to import and customs laws	4%	43%	52%
Perform government relations activities	39%	37%	24%
Giving notices and paying fines to public authorities applicable to work	17%	39%	43%

Risk Description	Owner	Contractor	Shared
Prepare as-built drawings	0%	70%	30%
Prepare shop and work drawings	0%	65%	35%
Documenting by photographs	9%	50%	41%
Delayed progress payments	72%	13%	15%
Infringement of patents, copyrights and trade secrets	22%	41%	37%
Allow owner access to all aspects of work	4%	54%	41%
Cooperation to facilitate inspection of work	11%	54%	35%
QA/QC (inspection and testing of work)	20%	26%	54%
Preserving articles of value, archaeological or geological interest	20%	43%	37%
Site conditions including surface and subsurface	13%	67%	20%
Safeguarding title to design, confidential information and patents	37%	22%	41%
Obtain owner's approval before issuing publicity releases	9%	63%	28%
Criminal misappropriation and misapplication	4%	63%	33%
Issue and document change	72%	0%	28%
Working on undocumented change	26%	48%	26%
Liquidated damages for delay (up to 10% of contract value)	17%	67%	15%
Liquidated damages (consequential damages)	17%	63%	20%
Conflict of interest	17%	22%	61%
Force majeure	61%	4%	35%
Special risks (limited to outbreak of war)	48%	24%	28%
Standby time controlled by owner	72%	9%	20%
Standby time controlled by contractor	13%	67%	20%
Maintenance period	9%	74%	17%
Cost of contractor's search for defects controlled by owner (implied)	67%	13%	20%
Cost of contractor's search for defects controlled by contractor	17%	74%	9%
Cooperation with other contractors working for owner in the area	13%	59%	28%
Warranty of work	4%	80%	15%
Guarantee for 10 years	4%	87%	9%

5.4 Results

Statistical analysis on the gathered data was carried out using the aforementioned computer software. In the following sections, only summary of the results is shown and detailed reports and graphics are attached in the appendix.

5.4.1 Descriptive Statistics

Descriptive statistics is a group of values or coefficients that present a brief about the collected data. Their values can give a clue on the quality of the data sets. Table 12 and Table 13 presents the mean, the standard deviation and the variance for the two groups of data, the perceived and the proposed allocations. The mean, the standard deviation and the variance were generated on the basis of number of times a risk has been allocated to each party, using the different responses from each party.

The statistics of the two samples turned out to be similar. Both had high standard deviation and fair variance. The high standard deviation is expected since the range of the values spans from 0% to 100%. The fairness of the variance indicates that most of the data points were close to the mean, which indicates somehow a convergence of the opinions.

Table 12: Descriptive Statistics for Perceived Allocation

Variable	Mean	Standard Deviation	Variance
Owner	19%	25%	6%
Contractor	63%	26%	7%
Shared	18%	11%	1%

Table 13: Descriptive Statistics for Proposed Allocation

Variable	Mean	Standard Deviation	Variance
Owner	21%	26%	6%
Contractor	53%	27%	7%
Shared	26%	14%	2%

5.4.2 Perceived and Proposed Allocation of Risks

The main objective of this research was to assess the unified public contract for the level of risk sharing among the involved parties and to determine the perceived and proposed risk bearer. The approach taken to determine a risk bearer is by taking the opinion of the majority of population on each risk. That is, if the majority allocated a risk to a certain party, that party is the risk bearer by consensus. The definition of majority used to make a decision here is 50% of population. Such criteria have been chosen after examining the data and its spread. The criteria were found fair and practical since the allocation percentages vary greatly. Risks with close percentages to 50% but are not exactly 50% are considered undecided upon, since the remaining percentages allocated to another party makes them almost equal. The results of risk distribution for the composite perceived and proposed allocations (owners' and contractors' responses together) are presented in Table 14 and Table 15. Further, Table 16 to Table 19 in the following presents the perception and the proposal of the owners and the contractors each aside.

Table 14: Perceived Allocation of Risks

Risk Description	Allocation
Answer clarifications during bidding period	Owner
Cost of contractor's search for defects controlled by owner (implied)	
Delayed progress payments	
Issue and document change	
Special risks (limited to outbreak of war)	
Standby time controlled by owner	
Stipulate definitions and contractual responsibilities	
Stipulate methods for claims and dispute settlement	
Stipulate payment method	
Adequacy and suitability of equipment	Contractor
Adherence to import and customs laws	
Adherence to laws and customs of Saudi Arabia	
Allow owner access to all aspects of work	
Availability of resources to execute work	
Cooperation to facilitate inspection of work	
Cooperation with other contractors working for owner in the area	
Cost of contractor's search for defects controlled by contractor	
Criminal misappropriation and misapplication	
Documenting by photographs	
Dumping debris in an approved location	
Guarantee for 10 years	
Guarantee no further subcontracting	
Labor housing transportation and medical treatment	
Liquidated damages (consequential damages)	
Liquidated damages for delay (up to 10% of contract value)	
Maintain progress and overcome schedule slippage	
Maintaining labor roster at work	
Maintaining procurement records	
Maintenance period	
Mobilization and demobilization	
Noise control and undue disturbance of public	
Notify owner of actual or anticipated delay	
Obtain approval before subcontracting	
Obtain necessary guarantees, insurances and bonds	
Obtain necessary licenses and permits	
Obtain owner's approval before issuing publicity releases	
Obtaining SASO approval on imported material and equipment	
Pay Zakat, taxes and duties	
Perform government relations activities	
Pollution control caused by work	
Prepare as-built drawings	
Prepare schedules (bar charts, CPM, ...) for owner's approval	
Prepare shop and work drawings	
Preservation of existing structures, facilities and utilities	

Risk Description	Allocation
Preserve vegetation (other than marked for removal) on or near site	Contractor
Preserving articles of value, archaeological or geological interest	
Provide and maintain temporary structures	
Provide site superintendence during execution	
Site conditions including surface and subsurface	
Site first aid trained personnel and supplies	
Site housekeeping and sanitary conditions	
Site safety	
Site security (including material yard)	
Standby time controlled by contractor	
Subcontractors' and suppliers' acts and omissions	
Sufficient quantity and skill of labor	
Third party and liability	
Unnecessary or improper interference with public convenience	
Utilize Saudi airline and maritime carriers	
Warranty of work	
Working on undocumented change	
Bid mistakes	
Confidentiality of bid details	
Conflict of interest	
Force majeure	
Giving notices and paying fines to public authorities applicable to work	
Infringement of patents, copyrights and trade secrets	
Promotion of local manufacturers and suppliers	
QA/QC (inspection and testing of work)	
Safeguarding title to design, confidential information and patents	

Table 15: Proposed Allocation of Risks

Risk Description	Allocation
Answer clarifications during bidding period	Owner
Cost of contractor's search for defects controlled by owner (implied)	
Delayed progress payments	
Force majeure	
Issue and document change	
Standby time controlled by owner	
Stipulate definitions and contractual responsibilities	
Stipulate methods for claims and dispute settlement	
Stipulate payment method	
Adequacy and suitability of equipment	Contractor
Allow owner access to all aspects of work	
Availability of resources to execute work	
Cooperation to facilitate inspection of work	
Cooperation with other contractors working for owner in the area	
Cost of contractor's search for defects controlled by contractor	
Criminal misappropriation and misapplication	
Documenting by photographs	
Dumping debris in an approved location	
Guarantee for 10 years	
Guarantee no further subcontracting	
Labour housing transportation and medical treatment	
Liquidated damages (consequential damages)	
Liquidated damages for delay (up to 10% of contract value)	
Maintaining labour roaster at work	
Maintaining procurement records	
Maintenance period	
Mobilization and demobilization	
Noise control and undue disturbance of public	
Obtain approval before subcontracting	
Obtain necessary guarantees, insurances and bonds	
Obtain owner's approval before issuing publicity releases	
Obtaining SASO approval on imported material and equipment	
Pay Zakat, taxes and duties	
Pollution control caused by work	
Prepare as-built drawings	
Prepare schedules (bar charts, CPM, ...) for owner's approval	
Prepare shop and work drawings	
Preservation of existing structures, facilities and utilities	
Preserve vegetarian (other than marked for removal) on or near site	
Provide and maintain temporary structures	
Site conditions including surface and subsurface	
Site first aid trained personnel and supplies	
Site housekeeping and sanitary conditions	
Site security (including material yard)	
Standby time controlled by contractor	

Risk Description	Allocation
Subcontractors' and suppliers' acts and omissions	Contractor
Sufficient quantity and skill of labour	
Third party and liability	
Unnecessary or improper interference with public convenience	
Warranty of work	
Adherence to import and customs laws	Shared
Adherence to laws and customs of Saudi Arabia	
Confidentiality of bid details	
Conflict of interest	
QA/QC (inspection and testing of work)	
Site safety	Undecided
Bid mistakes	
Giving notices and paying fines to public authorities applicable to work	
Infringement of patents, copyrights and trade secrets	
Maintain progress and overcome schedule slippage	
Notify owner of actual or anticipated delay	
Obtain necessary licenses and permits	
Perform government relations activities	
Preserving articles of value, archaeological or geological interest	
Promotion of local manufacturers and suppliers	
Provide site superintendence during execution	
Safeguarding title to design, confidential information and patents	
Special risks (limited to outbreak of war)	
Utilize Saudi airline and maritime carriers	
Working on undocumented change	

Table 16: Owner's Perception

Risk Description	Allocation
Answer clarifications during bidding period	Owner
Cost of contractor's search for defects controlled by owner (implied)	
Delayed progress payments	
Issue and document change	
Standby time controlled by owner	
Stipulate definitions and contractual responsibilities	
Stipulate methods for claims and dispute settlement	
Stipulate payment method	
Utilize Saudi airline and maritime carriers	
Adequacy and suitability of equipment	Contractor
Allow owner access to all aspects of work	
Availability of resources to execute work	
Bid mistakes	
Cooperation to facilitate inspection of work	
Cooperation with other contractors working for owner in the area	
Cost of contractor's search for defects controlled by contractor	
Criminal misappropriation and misapplication	
Documenting by photographs	
Dumping debris in an approved location	
Guarantee for 10 years	
Guarantee no further subcontracting	
Labor housing transportation and medical treatment	
Liquidated damages (consequential damages)	
Liquidated damages for delay (up to 10% of contract value)	
Maintain progress and overcome schedule slippage	
Maintaining labor roaster at work	
Maintaining procurement records	
Maintenance period	
Mobilization and demobilization	
Noise control and undue disturbance of public	
Notify owner of actual or anticipated delay	
Obtain approval before subcontracting	
Obtain necessary guarantees, insurances and bonds	
Obtain necessary licenses and permits	
Obtain owner's approval before issuing publicity releases	
Obtaining SASO approval on imported material and equipment	
Pay Zakat, taxes and duties	
Perform government relations activities	
Pollution control caused by work	
Prepare as-built drawings	
Prepare schedules (bar charts, CPM, ...) for owner's approval	
Prepare shop and work drawings	
Preservation of existing structures, facilities and utilities	
Preserve vegetarian (other than marked for removal) on or near site	
Preserving articles of value, archaeological or geological interest	

Risk Description	Allocation
Provide and maintain temporary structures	Contractor
Provide site superintendence during execution	
Site conditions including surface and subsurface	
Site first aid trained personnel and supplies	
Site housekeeping and sanitary conditions	
Site safety	
Site security (including material yard)	
Standby time controlled by contractor	
Subcontractors' and suppliers' acts and omissions	
Sufficient quantity and skill of labor	
Third party and liability	
Unnecessary or improper interference with public convenience	
Warranty of work	
Working on undocumented change	
Confidentiality of bid details	Shared
Adherence to import and customs laws	Undecided
Adherence to laws and customs of Saudi Arabia	
Conflict of interest	
Force majeure	
Giving notices and paying fines to public authorities applicable to work	
Infringement of patents, copyrights and trade secrets	
Promotion of local manufacturers and suppliers	
QA/QC (inspection and testing of work)	
Safeguarding title to design, confidential information and patents	
Special risks (limited to outbreak of war)	

Table 17: Owner's Proposal

Risk Description	Allocation
Answer clarifications during bidding period	Owner
Confidentiality of bid details	
Cost of contractor's search for defects controlled by owner (implied)	
Delayed progress payments	
Force majeure	
Issue and document change	
Standby time controlled by owner	
Stipulate definitions and contractual responsibilities	
Stipulate methods for claims and dispute settlement	
Stipulate payment method	
Adequacy and suitability of equipment	
Allow owner access to all aspects of work	
Availability of resources to execute work	
Cooperation to facilitate inspection of work	
Cooperation with other contractors working for owner in the area	
Cost of contractor's search for defects controlled by contractor	
Criminal misappropriation and misapplication	
Documenting by photographs	
Dumping debris in an approved location	
Guarantee for 10 years	
Guarantee no further subcontracting	
Labor housing transportation and medical treatment	
Liquidated damages (consequential damages)	
Liquidated damages for delay (up to 10% of contract value)	
Maintaining labor roaster at work	
Maintaining procurement records	
Maintenance period	
Mobilization and demobilization	
Noise control and undue disturbance of public	
Notify owner of actual or anticipated delay	
Obtain approval before subcontracting	
Obtain necessary guarantees, insurances and bonds	
Obtain owner's approval before issuing publicity releases	
Obtaining SASO approval on imported material and equipment	
Pay Zakat, taxes and duties	
Pollution control caused by work	
Prepare as-built drawings	
Prepare schedules (bar charts, CPM, ...) for owner's approval	
Prepare shop and work drawings	
Preservation of existing structures, facilities and utilities	
Preserve vegetarian (other than marked for removal) on or near site	
Provide and maintain temporary structures	
Site conditions including surface and subsurface	
Site first aid trained personnel and supplies	
Site housekeeping and sanitary conditions	

Risk Description	Allocation
Site security (including material yard)	Contractor
Standby time controlled by contractor	
Subcontractors' and suppliers' acts and omissions	
Sufficient quantity and skill of labor	
Third party and liability	
Warranty of work	
Working on undocumented change	
Adherence to import and customs laws	Shared
Adherence to laws and customs of Saudi Arabia	
Bid mistakes	
Conflict of interest	
Maintain progress and overcome schedule slippage	
Preserving articles of value, archaeological or geological interest	
Promotion of local manufacturers and suppliers	
Provide site superintendence during execution	
QA/QC (inspection and testing of work)	
Site safety	
Unnecessary or improper interference with public convenience	Undecided
Giving notices and paying fines to public authorities applicable to work	
Infringement of patents, copyrights and trade secrets	
Obtain necessary licenses and permits	
Perform government relations activities	
Safeguarding title to design, confidential information and patents	
Special risks (limited to outbreak of war)	
Utilize Saudi airline and maritime carriers	

Table 18: Contractor's Perception

Risk Description	Allocation
Answer clarifications during bidding period	Owner
Bid mistakes	
Delayed progress payments	
Force majeure	
Issue and document change	
Special risks (limited to outbreak of war)	
Standby time controlled by owner	
Stipulate definitions and contractual responsibilities	
Stipulate methods for claims and dispute settlement	
Stipulate payment method	
Adequacy and suitability of equipment	
Adherence to import and customs laws	
Adherence to laws and customs of Saudi Arabia	
Allow owner access to all aspects of work	
Availability of resources to execute work	
Conflict of interest	
Cooperation to facilitate inspection of work	
Cooperation with other contractors working for owner in the area	
Cost of contractor's search for defects controlled by contractor	
Cost of contractor's search for defects controlled by owner (implied)	
Criminal misappropriation and misapplication	
Documenting by photographs	
Dumping debris in an approved location	
Guarantee for 10 years	
Guarantee no further subcontracting	
Infringement of patents, copyrights and trade secrets	
Labor housing transportation and medical treatment	
Liquidated damages (consequential damages)	
Liquidated damages for delay (up to 10% of contract value)	
Maintain progress and overcome schedule slippage	
Maintaining labor roster at work	
Maintaining procurement records	
Maintenance period	
Mobilization and demobilization	
Noise control and undue disturbance of public	
Notify owner of actual or anticipated delay	
Obtain approval before subcontracting	
Obtain necessary guarantees, insurances and bonds	
Obtain necessary licenses and permits	
Obtain owner's approval before issuing publicity releases	
Obtaining SASO approval on imported material and equipment	
Pay Zakat, taxes and duties	
Perform government relations activities	

Risk Description	Allocation
Pollution control caused by work	
Prepare as-built drawings	
Prepare schedules (bar charts, CPM, ...) for owner's approval	
Prepare shop and work drawings	
Preservation of existing structures, facilities and utilities	
Preserve vegetation (other than marked for removal) on or near site	
Preserving articles of value, archaeological or geological interest	
Provide and maintain temporary structures	
Provide site superintendence during execution	
Site conditions including surface and subsurface	
Site first aid trained personnel and supplies	
Site housekeeping and sanitary conditions	
Site safety	
Site security (including material yard)	
Standby time controlled by contractor	
Subcontractors' and suppliers' acts and omissions	
Sufficient quantity and skill of labor	
Third party and liability	
Unnecessary or improper interference with public convenience	
Utilize Saudi airline and maritime carriers	
Warranty of work	
Working on undocumented change	
QA/QC (inspection and testing of work)	
Confidentiality of bid details	Undecided
Giving notices and paying fines to public authorities applicable to work	
Promotion of local manufacturers and suppliers	
Safeguarding title to design, confidential information and patents	

Table 19: Contractor's Proposal

Risk Description	Allocation
Answer clarifications during bidding period	Owner
Bid mistakes	
Cost of contractor's search for defects controlled by owner (implied)	
Delayed progress payments	
Force majeure	
Issue and document change	
Perform government relations activities	
Promotion of local manufacturers and suppliers	
Special risks (limited to outbreak of war)	
Standby time controlled by owner	
Stipulate definitions and contractual responsibilities	
Stipulate methods for claims and dispute settlement	
Stipulate payment method	
Adequacy and suitability of equipment	
Adherence to import and customs laws	
Allow owner access to all aspects of work	
Availability of resources to execute work	
Cooperation to facilitate inspection of work	
Cooperation with other contractors working for owner in the area	
Cost of contractor's search for defects controlled by contractor	
Criminal misappropriation and misapplication	
Dumping debris in an approved location	
Guarantee for 10 years	
Guarantee no further subcontracting	
Infringement of patents, copyrights and trade secrets	
Labor housing transportation and medical treatment	
Liquidated damages for delay (up to 10% of contract value)	
Maintain progress and overcome schedule slippage	
Maintaining labor roster at work	
Maintaining procurement records	
Maintenance period	
Mobilization and demobilization	
Noise control and undue disturbance of public	
Obtain approval before subcontracting	
Obtain necessary guarantees, insurances and bonds	
Obtain necessary licenses and permits	
Obtain owner's approval before issuing publicity releases	
Obtaining SASO approval on imported material and equipment	
Pay Zakat, taxes and duties	
Pollution control caused by work	
Prepare as-built drawings	
Prepare schedules (bar charts, CPM, ...) for owner's approval	
Prepare shop and work drawings	
Preservation of existing structures, facilities and utilities	
Preserve vegetarian (other than marked for removal) on or near site	

Risk Description	Allocation
Preserving articles of value, archaeological or geological interest	Contractor
Provide and maintain temporary structures	
Provide site superintendence during execution	
Site conditions including surface and subsurface	
Site first aid trained personnel and supplies	
Site housekeeping and sanitary conditions	
Site safety	
Site security (including material yard)	
Standby time controlled by contractor	
Subcontractors' and suppliers' acts and omissions	
Sufficient quantity and skill of labor	
Third party and liability	
Unnecessary or improper interference with public convenience	
Utilize Saudi airline and maritime carriers	
Warranty of work	
Adherence to laws and customs of Saudi Arabia	Shared
Confidentiality of bid details	
Conflict of interest	
Documenting by photographs	
Giving notices and paying fines to public authorities applicable to work	
Notify owner of actual or anticipated delay	
QA/QC (inspection and testing of work)	Undecided
Liquidated damages (consequential damages)	
Safeguarding title to design, confidential information and patents	
Working on undocumented change	

Table 20: Risk Allocation Totals by All

Allocation	Perceived	Proposed
Owner/Engineer	9	9
Contractor	52	41
Shared	0	6
Undecided	9	14
Total	70	70

5.4.3 Test of Independence

Using the resulting data from the survey, contingency tables for the number of risks allocated to each party has been obtained and used to generate the expected value tables as illustrated through Table 21 to Table 24. The expected value tables have been used then to calculate the chai-square value and was found to be 2.862 for the perceived allocation and 3.161 for the proposed allocation.

Entering the chai-square probability table with 3 degrees of freedom and 0.05 significance level, the calculated chai-square value for both perceived and proposed allocations was found to be less than the table value of 7.815.

The null hypothesis is then assumed to be true and the risk allocation was found to be independent from the nature of the respondent i.e. owner or contractor.

Table 21: Contingency Table for Perceived Allocation

	Owner	Contractor	Shared	Undecided	Total
Owner	9	50	1	10	70
Contractor	10	55	1	4	70
Total	19	105	2	14	140

Table 22: Contingency Table for Perceived Expected Data

Observed	Expected	O-E	(O-E)^2	Chai-square/E
9	9.5	0.5	0.25	0.026
50	52.5	2.5	6.25	0.119
1	1	0	0	0.000
10	7	3	9	1.286
10	9.5	0.5	0.25	0.026
55	52.5	2.5	6.25	0.119
1	1	0	0	0.000
4	7	3	9	1.286
Chi-square				2.862

Table 23: Contingency Table for Proposed Allocation

	Owner	Contractor	Shared	Undecided	Total
Owner	10	42	11	7	70
Contractor	13	47	7	3	70
Total	23	89	18	10	140

Table 24: Contingency Table for Proposed Expected Allocation

Observed	Expected	O-E	(O-E) ²	Chai-square/E
10	11.5	1.5	2.25	0.196
42	44.5	2.5	6.25	0.140
11	9	2	4	0.444
7	5	2	4	0.800
13	11.5	1.5	2.25	0.196
47	44.5	2.5	6.25	0.140
7	9	2	4	0.444
3	5	2	4	0.800
Chi-square				3.161

5.5 Findings

1. Analysis of the perceived allocation of risks has shown that there is no risk sharing whatsoever in the Saudi public contract. While 9 risks were found to be borne by the owner, the contractor is held liable for 52 risks and another 9 risks remained undecided. The percentages of risk allocation as perceived were found to be:
 - a. 13% by the owner
 - b. 74% by the contractor
 - c. 0 % shared
 - d. 13% undecided
2. Reallocation of risks as proposed by the respondents resulted in 11 less risks allocated to the contractor (41), the number of risks allocated to the owner

remained the same (9). Six risks were proposed to be shared and 14 risks are still undecided upon. The percentages of risk allocations as proposed were found to be:

- a. 13% by the owner
- b. 59% by the contractor
- c. 9% shared
- d. 20% undecided

3. Risks borne by the contractor and proposed to be shared are:

- a. Adherence to import and customs laws
- b. Adherence to laws and customs of Saudi Arabia
- c. Confidentiality of bid details
- d. Conflict of interest
- e. QA/QC (inspection and testing of work)
- f. Site safety

4. The only risk removed from the owner was “Special Risks”, and is still undecided upon. The risk was replaced by the “Force Majeure” risk in the proposed allocation. That is the owner is responsible in the event of a Force Majeure (Act of God).

5. The resulting proposed allocation led to the settlement of undecided risks bearers and emphasized new areas of disagreement. All of the disagreed upon risks were borne by the contractor, except for the special risks, which was with the owner.

These risks are:

- a. Maintain progress and overcome schedule slippage

- b. Notify owner of actual or anticipated delay
 - c. Obtain necessary licenses and permits
 - d. Perform government relations activities
 - e. Preserving articles of value, archaeological or geological interest
 - f. Promotion of local manufacturers and suppliers
 - g. Provide site superintendence during execution
 - h. Safeguarding title to design, confidential information and patents
 - i. Special risks (limited to outbreak of war)
 - j. Utilize Saudi airline and maritime carriers
 - k. Working on undocumented change
6. The following undecided upon risks remained unsettled even after the proposal of the respondents:
- a. Bid mistakes
 - b. Giving notices and paying fines to public authorities applicable to work
 - c. Infringement of patents, copyrights and trade secrets
7. The level of risk sharing was found to be “Statistically” independent from the nature of the respondents, however, differences were found in the allocation of risks by the two parties (Owners and contractors). That is the number or risks borne by each party may remain the same or differs slightly, but the setup is much different. For example, one party swaps a risk between him and the other party.

5.6 Discussion

Upon reviewing the literature, it was found by researchers such as Charoenngam (1999), Fisk (2010), El- Sayegh (2008), and others, that risk must be allocated to the party that has the most control over it. Projecting this key rule on the resulting perceived and proposed allocations, a behavior of shifting and swapping risks between parties on the basis of control can be spotted. Such behavior might be viewed as a verification that parties tend to accept risks that they can handle and control, and reject risks that they have no power or control over. In the following, a discussion is presented that elaborates on the results. Further elaboration is also presented on selected risks and areas of disagreement.

5.6.1 Owner Controlled Risks

All of the risks allocated to the owner in the perceived allocation remained the same in the proposed allocation, except for the special risks, which was slotted in the undecided category to be replaced by the “Force Majeure” risk. Looking at the risks allocated to the owner, it can be seen that these risks are entirely under his control. Examples are: stand-by time controlled by owner and cost of contractor’s search for defects controlled by owner. This result conforms with the results found in the literature, except for the “issue and document change” risk, where 72% of the respondents have proposed that it should be allocated to the owner only. The remaining 28% have proposed that it should be shared. Such allocation is logical since the UCPW obligates the contractor to inform the owner or his representative

of any proposed change in design before implementing that change, which in turn, upon the consent of the owner, shifts the responsibility away from the contractor.

5.6.2 Contractor Controlled Risks

Most of the change happening between the perceived allocation and the proposed allocation is on risks allocated to the contractor. That is, all of the risks proposed to be shared or are still undecided upon, except for one, were originally allocated to the contractor in perception. The resulting proposed allocation of risks to the contractor alone conforms with the literature. Risks that have not changed from perception to proposal are found to be under the control of the contractor and are mostly related to the construction process itself. For instance: adequacy of equipment, availability of resources, skill of labor, standby time controlled by contractor, subcontractors and suppliers hired by the contractor. On the other hand, risks that have been shifted away from the contractor, are either out of his control, or the owner may also have some control over it, mostly the latter. Confidentiality of bid details, for example, was proposed to be shared, since it can be breached from both sides, the owner's side and the contractor's side. More examples are: working on undocumented change, obtain necessary licenses and permits, and performing government relations activities.

5.6.3 Shared and Undecided Upon Risks

Risks that might be under the control of the two parties, or beyond the control of one party, and the other party has little control over, were either proposed to be shared or are still undecided upon. Examples on risks that were proposed to be shared are: adherence to import and customs laws, adherence to laws and customs of Saudi Arabia and conflict of interest. All of which, the two parties may take role in control. The owner might request a certain brand or quality of materials that can only be provided by a certain source that is banned or boycotted by the government. Conversely, the contractor might have alternatives to that source, yet, chooses to import the materials from that source. Inspection and testing of work, site safety and confidentiality of bid details are more examples on risks proposed to be shared.

Moving on, risks that are still undecided upon share the same characteristics of risks proposed to be shared, but, one party might have greater control over them, yet refuses to accept them. Such behavior might be explained in that such risk might not be severe, but it is too much of a burden to be taken. For instance: obtaining necessary licenses and permits, giving notices and paying fines to public authorities. Dealing with the government and public agencies might sometimes need leverage. While both parties might have this leverage, they might tend to save it for other uses or one party might have further reach than the other. Anyhow, such risks might be perceived and managed differently for different contracts, where an agreement might be reached and is appended to the supplementary conditions.

5.6.4 Differences in perception and proposals of each party

Looking at the perception and proposal of owners and contractor, one can easily notice that variations exist between the views of the two parties. For example, owners have the perception that confidentiality of bid details is the only shared risk, and contractors have the perception that quality assurance and control is the only shared risk. Furthermore, compared to owners, contractors have proposed to shift more risks away from them towards the owner or to be shared. Contractors are also less indecisive on the allocation of risks than owners, and owners proposed the sharing of more risks compared to contractors. Finding the total number of risks borne by each party and testing the data for dependence on the type of respondent (owner or contractor), we find that the amount of risks allocated to each party does not vary greatly with the type of respondent. That is, the percentages of risks carried by each party in perception and proposal is independent from the party allocating these risks. Having this in mind, and comparing to the different views of each party, it can be detected that there is a relative agreement between the parties on the number of risks allocated to each party, but the disagreement is on which risks allocated to which party. Areas of disagreement are then found by compiling the responses of both parties and categorizing them based on frequency of agreement. This approach is considered to be applicable since the number of owner respondents and contractor respondents is almost the same giving both samples an equal weight.

5.7 Further Discussion on Selected Risks

Previous studies encountered in this research studied risks in general. That is, the considered risks in these studies were not unique to the UCPW and very little similarity between the two exists. In despite of that, in the following, a comparison is made whenever found possible between the findings of this research and previous researches done by Al-Bargouthi (1994), Al-Salman (2004), Khaliluddin (2010) and Al Sabah (2014). The behavior of the owners and the contractors towards these risks is described as well.

5.7.1 Bidding and Contractual Related Issues: Scope,

Confidentiality of Bid Details, Bid Mistakes, Claims and Changes

Bidding and contractual related issues are generally controlled by the owner as per the literature. Looking at the perceived and proposed risk allocations resulting from this study shows that all of the risks related to project scope and the delivery system of that project were allocated to the owner. Examples: answering clarifications during bidding period, stipulate definitions and contractual responsibilities, stipulate methods for claims and dispute settlement and stipulate payment method. All of these examples had more than 90% agreement that it should be borne by the owner in perception and proposal. The owner has also been found to be responsible for issuing and documenting change with an increasing agreement from perception

to proposal of 63% to 72% respectively. This result differs from what was found by Al-Bargouthi in 1994, where the responsibility for issuing change has been proposed to be shared by both parties instead of being borne by the owner alone.

Looking at bids, the responsibility for the confidentiality of bid details and bid mistakes was disagreed upon in perception. While it is still undecided on who should be responsible for bid mistakes, confidentiality of bid details has been proposed to be shared, but with a very small percentage of 50%. The indecision on responsibilities related to bid mistakes might have occurred from the vagueness of the statement in survey questionnaire. Anyhow, bid mistakes has been studied in the literature and found to have different interpretations and established rules regarding this issue are used to allocate responsibility within certain limits. Compared to Al Bargouthi's study in 1994, confidentiality of bid details was allocated to the owner in perception then proposed to be shared by both parties. Bid mistakes on the other hand was allocated entirely to contractor in perception and proposal. The issue of bidding has not been considered in the remaining studies by the remaining researchers.

5.7.2 Construction Process Related Risks: Subcontracting,

Suppliers, Labor and Equipment.

It was found that an agreement between the surveyed populations exists on the responsibility for risks related to the construction process itself. As all of the risks related to construction process, in despite of respondents' types, were allocated to

the contractor in perception and proposal. This result also conforms with the literature as found by Al-Salman (2004), Khaliluddin (2010), Al bargouthi (1994) and Al-Sabah (2014). The trend also matches the findings of other researchers such as Kangari (1995) and Erickson (1978). Basically the contractor is responsible for the site, anything within that site and the methods and resources he finds necessary to complete the work, as soon as he is handed the site from the owner. This fact can be considered to be the reason behind the results of the perceived and proposed allocations of risks found in this research. Owners realize that work related risks are out of their control and contractors understand that these risks are under their control and accept them.

5.7.3 Construction Site Related Risks: Site Conditions, Safety and

Third Party Liability

It was established in the previous section that site responsibility is transformed to the contractor upon hand out from the owner as per the conditions of the contract. On this basis, risks associated with the construction site are under the responsibility of the contractor in general. This statement has been proved by the findings of this study, where all risks associated with the site and its contents has been allocated to the contractor with varying agreement levels, mostly more than 65% in both cases. For instance: site security, site housekeeping and sanitary conditions and site conditions (surface and subsurface). The allocation of the previous examples is found to conform with the previous studies mentioned earlier in this chapter. Site safety is the only site related risk that has been proposed to be shared because

safety is the responsibility of everyone, where it should be maintained and abided to by the contactors and should be insured by the owners through the contract.

Third party liability was allocated to the contractor in perception and was not proposed to be shared. The result is found to be different from what was found in 1994 where it was proposed to be shared. Other sources have not addressed third party liability anywhere in their research.

5.7.4 Government Related Activities: Paying Taxes and Fees,

Licenses and Permits

Risks associated with government related activities was found to be an area of disagreement. No decision has been reached yet on most of the listed risks. The undecided upon risks related to government activities are: giving notices and paying fines to public authorities applicable to work, obtain necessary licenses and permits, and performing government relations activities. However, an agreement was found that paying Zakat, taxes and duties belongs to the contractor by 83% of the respondents. Anyhow, according to Al-Salman's study, risks associated with permits and regulations were ranked very low in importance, which might indicate that such risks are agreed upon differently for each project, since some party might have the leverage needed to perform these activities and the other party does not. Moreover, these risks were found to be usually shared in the literature.

5.7.5 Delay Consequences: Liquidated and Consequential

Damages

Liquidated and consequential damages are delay consequences occurring from loss of operation of the intended facility and costs of supervision incurred by the owner. In this research, 67% of the respondents have agreed that the contractor is responsible for delay consequences. This result also matches the findings of other studies. The UCPW have established rules that govern delay, where it stipulates on a delay fine as a representation of liquidated damages, and supervision costs as a representation of consequential damages. The reader may refer to section 4.8.7 of Chapter 4 for further explanation on liquidated damages and consequential damages.

5.7.6 Force Majeure (Acts of God) and Special Risks

Both force majeure and special risks are beyond the control of both parties. It has been addressed in this research that the UCPW provides definitions of what is considered to be a force majeure or a special risk and what is not. The UCPW also delineates a general procedure to deal with such risks. Force majeure was disagreed upon in perception then was proposed to be shared by 61% of the respondents. Conversely, special risks were allocated to the owner in perception and was disagreed upon in proposal (still undecided). Different views were found in the literature regarding special risks and force majeure. Where in Al-Bargouthi's study in 1994, both risks were proposed to be shared, in Al-Salman's study in 2004, the

risk was allocated to the contractor. This divergence in opinions might be due to the nature of the risk, as the probability of occurrence of such risk and its magnitude is surrounded by ambiguity and vagueness, it is still undecided upon until such risk materializes.

5.7.7 Payment Related Issues: Payment Method and Progress

Payments

Two statements governed payment related issues. These are: Stipulation of payment methods and delay in progress payments. Both risks were found to be under the control of the owner and an agreement of over 90% of the respondents has been reached. The same result was arrived at by Al-Bargouthi (1994) but not by the remaining researchers where no decisions were made.

CHAPTER 6

Conclusion and Recommendations

The results of data analysis have unveiled a number of issues besides the resulting alternative allocation of liabilities. In addition, interviewing respondents has led to discussions on the current status of the Saudi contract and pointed out problematic spots. Conclusions and recommendations drawn from interviews and data analysis are reported in this chapter.

6.1 Conclusion

The outcomes of this research can be concluded in the following statements:

1. The intended purpose of this research was to assess the level of risk sharing and to point out areas of disagreement in the Saudi public contract. Upon completion of the study, it was found that there are no risks shared in the Saudi contract.
2. Upon consultation of owners and contractors, an agreement has been reached on the proposal of sharing of the following risks:
 - Adherence to import and customs laws
 - Adherence to laws and customs of Saudi Arabia
 - Confidentiality of bid details
 - Conflict of interest
 - QA/QC (inspection and testing of work)
 - Site safety

3. This research has revealed that owners and contractors have different perceptions of the conditions of the UCPW. This difference in perception manifests in the form of disagreement on certain risks. Most of the areas of disagreement in the different perceptions of the listed risks were resolved when the respondents proposed a better allocation of risks, excluding the following risks, which have not changed from perception to proposal (Still undecided upon):
- Bid mistakes
 - Giving notices and paying fines to public authorities applicable to work
 - Infringement of patents, copyrights and trade secrets
4. In addition to the undecided upon risks mentioned in the previous list, new areas of disagreement emerged in the proposals of the owners and contractors. These new areas of disagreement are:
- Maintain progress and overcome schedule slippage
 - Notify owner of actual or anticipated delay
 - Obtain necessary licenses and permits
 - Perform government relations activities
 - Preserving articles of value, archaeological or geological interest
 - Promotion of local manufacturers and suppliers
 - Provide site superintendence during execution
 - Safeguarding title to design, confidential information and patents
 - Special risks (limited to outbreak of war)
 - Utilize Saudi airline and maritime carriers
 - Working on undocumented change

5. In exception of special risks and force majeure, all of the changes on risks allocation happened to risks belonging to the contractor. Special risks were removed from the owner and were replaced with force majeure.
6. It was found that the number of risks allocated to each party is independent from the type of respondent, but the allocation of these risks depends on the type of respondent. That is, there is an agreement on the amount of risks borne by each party, but the disagreement is on what risks should be borne by each party.

6.2 Recommendations

1. Considering the results of this study, it is recommended for both, the contractor and the owner, to seek a proper allocation of risks through effective communication and partnership.
2. It is recommended that risks are allocated on the basis of control as has been proven through literature review and the findings of this study.
3. It is recommended that the findings of this study and other similar studies be considered in the review of the current version of the UCPW, and be considered by owners and contractors in the preparation of bids.

6.3 Suggestions for future Research

1. The low level of risk sharing in the UCPW is an indicator that there is a reluctance towards risk sharing by the contracting parties. The barriers and obstacles discouraging risk sharing, and, solutions and enablers that might encourage risk sharing, should all be investigated in future research.
2. During this research, it was found that the disagreement lies only in the risks allocated to the contractor by the Saudi contract. This result narrates the scope of the problem to the clauses associated with the contractor only.
3. The disagreement was on 14 risks that are still undecided upon. It is recommended that the same study is repeated focusing on these 14 risks to settle this issue.
4. It is suggested that inclusive comparative studies are done in future between the UCPW and the other internationally accepted standards. Such research would be a valuable addition to the current contract enriching it with the best from every other standard.
5. The success of a project should always be sought in cooperation between project participants, the success of a party is the success of everyone after all. Research should be done to assess the readiness of public project participants to implement risk sharing.

References

1. About EJCDC - EJCDC - Engineers Joint Contract Documents Committee. (n.d.). Retrieved April 7, 2015, from <https://www.ejcdc.org/ejcdc/>
2. About FIDIC. (n.d.). Retrieved April 7, 2015, from <http://fidic.org/about-fidic>
3. About The AIA. (n.d.). Retrieved April 7, 2015, from <http://www.aia.org/about/index.htm>
4. Al Bargouthi, M. (1994). *Liability Allocation Among the Parties to Fixed-Price Construction Contracts in Saudi Arabia*. Dhahran: King Fahd University of Petroleum and Minerals.
5. Al Mohawis, S. (2014). *Construction Project Administration: Changes in Construction* (Rep.).
6. Al Sabah, R. (2014). *Evaluating the Impact of Construction Risks on Project Success in the Arabian Gulf Region (AGR) Construction Industry from the Perspective of Multinational Firms*. MADISON: UNIVERSITY OF WISCONSIN.
7. Al Salman, A. A. (2004). *Assessment of Construction Risk Perception and Practices in Saudi Arabia*. Dhahran: King Fahd University of Petroleum and Minerals.
8. Assaf, S. A. (1982). *A systematic approach to the selection of a risk retention level for construction insurance* (PhD. Thesis). University of Illinois at Urbana-Champaign.

9. Bubshait, A., & Almohawis, S. (1993). Evaluating the general conditions of a construction contract. *International Journal of Project Management*, 133-136.
10. Bunni, N. (2005). *The FIDIC Forms of Contract* (3rd ed.). Oxford: John Wiley & Sons.
11. Charoenngam, C., & Yeh, C. (1999). Contractual risk and liability sharing in hydropower construction. *International Journal of Project Management*, 29-37.
12. Chui, K., & Bai, Y. (2010). Comparison of Contract General Conditions between United States and China. *Journal of Architectural Engineering*, 119-119.
13. *Conditions of contract for construction: For building and engineering works designed by the employer: General conditions: Guidance for the preparation of particular conditions: Forms of letter of tender, contract agreement and dispute adjudication agreement*. (1999). Lausanne: Fédération internationale des ingénieurs-conseils.
14. Crowley, L. G., Zech, W. C., Bailey, C., & Gujar, P. (2008). Liquidated Damages: Review of Current State of the Practice. *J. Prof. Issues Eng. Educ. Pract. Journal of Professional Issues in Engineering Education and Practice*, 134(4), 383-390. doi:10.1061/(ASCE)1052-3928(2008)134:4(383)
15. El-Sayegh, S. (2008). Risk assessment and allocation in the UAE construction industry. *International Journal of Project Management*, 431-438.
16. Erikson, C. A. (1979). RISK SHARING IN CONSTRUCTION CONTRACTS (Order No. 7915344). Available from ProQuest Dissertations & Theses Global. (302921083). Retrieved from <http://search.proquest.com/docview/302921083?accountid=27795>

17. Fisher, Timothy S; Kirk, Francis; DeDonato, James; Fornaciari, Salvatore; Welch, Jason. Top Ten Most Important Clauses of a Construction Contract Defense Counsel Journal; Jul 2005; 72, 3; ProQuest Central.
18. Fisk, E., & Reynolds, W. (2010). Using the Specifications in Contract Administration. In *Construction Project Administration* (9th ed.). Upper Saddle River, N.J.: Pearson Prentice Hall.
19. Force Majeure. (n.d.). Retrieved May 20, 2016, from <http://www.contractstandards.com/clauses/force-majeure>
20. Foster, S. T. (2013). *Managing quality: Integrating the supply chain*. Boston: Pearson.
21. Hanna, A., Thomas, G., & Swanson, J. (2013). Construction Risk Identification and Allocation: Cooperative Approach. *Journal of Construction Engineering and Management*, 1098-1107.
22. Hinze, J., & Tada, J. (1993). General conditions provisions critical to construction contracts (Part1). *Power Engineering*, 38-42.
23. Hinze, J., & Tada, J. (1993). General conditions provisions critical to construction contracts (Part 2). *Power Engineering* 35-39.
24. Kangari, R. (1982). *Construction project selection under risk: Market model approach* (PhD. Thesis). University of Illinois at Urbana-Champaign.
25. Kangari, R. (1995). Risk Management Perceptions and Trends of U.S. Construction. *Journal of Construction Engineering and Management* 422-429.

26. Khaliluddin, M. (2010). *Contract Risk Allocation in the Saudi Arabian Construction Projects*. Dhahran: King Fahd University of Petroleum and Minerals.
27. Montgomery, D. C., & Runger, G. C. (2014). *Applied statistics and probability for engineers*. Hoboken, NJ: Wiley.
28. Rosen, H. (2010). General Conditions of the Contract. In *Construction Specifications writing: principles and procedures* (6th ed., pp. 77-85). New York: Wiley.
29. *The Unified Contract for Public Works*. (2013). Riyadh: Ministry of Finance.
30. Third Party Definition. (n.d.). Retrieved May 20, 2016, from <http://www.investopedia.com/terms/t/third-party.asp>
31. Third Party Definition. (n.d.). Retrieved May 20, 2016, from <http://www.businessdictionary.com/definition/third-party.html>
32. Third Party. (n.d.). Retrieved May 20, 2016, from <http://www.merriam-webster.com/>
33. Thomas, R. H., Smith, G. R., & Cummings, D. J. (1995). ENFORCEMENT OF LIQUIDATED DAMAGES. *Journal of Construction Engineering and Management*, 121, 459-463. Retrieved May 20, 2016.
34. Wang, M., & Chou, H. (2003). Risk Allocation and Risk Handling of Highway Projects in Taiwan. *Journal of Management in Engineering*, 60-60.
35. William, I., & Ashley, D. (1987). Impact of Various Construction Contract Clauses. *Journal of Construction Engineering and Management*, 501-501.

Appendix A:

English Survey Questionnaire

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Ministry of Higher Education

King Fahd University of Petroleum & Minerals

COLLEGE OF ENVIRONMENTAL DESIGN

Dept. of Construction Engineering & Management



وزارة التعليم العالي

جامعة الملك فهد للبترول والمعادن

كلية تصاميم البيئة

قسم هندسة وإدارة التشييد

Questionnaire

Dear participant,

I am a master's student at King Fahd University of Petroleum and Minerals in the department of Construction Engineering and Management under the College of Environmental Design. I am conducting a research under the supervision of Prof. Sadi Assaf as part of my master's thesis. The study title is "Assessment of Risk Sharing in the Saudi Public Contract". The study looks into the Saudi Contract from the aspect of risk sharing between the contractual parties and aims to investigate the current situation and find a better allocation of risks among the contracting parties.

In order to achieve the intended objectives by this study, we are consulting experts in the respective fields to insure accurate results and conclusions. The purpose of this letter is to invite you to participate in this study by providing the requested information via the attached questionnaire. The questionnaire is short and should not take more than 15 minutes of your valuable time.

Your participation in this study is highly appreciated. In case you would like to be briefed with the results of this study, kindly provide your contact information in the allocated area at the end of the survey questionnaire.

Khalid Ashmawi,

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In case there is a need for further information or elaboration, please do not hesitate contacting me at any time on my mobile/e-mail.

Yours sincerely,

Khalid Ashmawi
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Minerals
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5/11/2016

Professor Sadi Assaf
CEM Department
King Fahd University of Petroleum and Minerals



Assaf@kfupm.edu.sa

Dear Respondent,

Thank you for taking the time to fill this questionnaire, your contributions to the improvement of the industry are highly appreciated. Kindly answer the following question then read the instructions below to help you complete this survey.

1. Define your entity:
 - a. Owner
 - b. Engineer /Consultant
 - c. Contractor Class 1 Class 2 Class 3
2. Your company name (Optional):
_____.
3. Your job title is:
_____.
4. Total years of experience:
_____.
5. If you are a contractor, please specify your speciality (i.e. Buildings, Infrastructure ... etc.):
_____.
6. The survey is composed of a matrix that has six columns in front of each row.
7. Please put a tick mark in front of each risk to indicate whom this risk is allocated to in reality.
8. Then in the same row, allocate the given risk, by putting a tick mark in the fourth or fifth or sixth column, to whom you believe is responsible for.
9. The letters O, C, S refer to Owner, Contractor, Shared, respectively.
10. Each row has to have two tick marks.
11. For any clarifications or inquires you can always reach me on my contact details provided in the letter.

We understand that your time is valuable and we have designed the survey accordingly. The questionnaire is short and should not take more than 15 - 20 minutes of your precious time.

#	Risk Description	Perceived			Proposed		
		O	C	S	O	C	S
1	Answer clarifications during bidding period						
2	Stipulate payment method						
3	Stipulate definitions and contractual responsibilities						
4	Stipulate methods for claims and dispute settlement						
5	Confidentiality of bid details						
6	Bid mistakes						
7	Obtain necessary guarantees, insurances and bonds						
8	Obtain necessary licenses and permits						
9	Third party and liability						
10	Pay Zakat, taxes and duties						
11	Sufficient quantity and skill of labor						
12	Labor housing transportation and medical treatment						
13	Maintaining labor roaster at work						
14	Availability of resources to execute work						
15	Adequacy and suitability of equipment						
16	Provide and maintain temporary structures						
17	Provide site superintendence during execution						
18	Site housekeeping and sanitary conditions						
19	Site first aid trained personnel and supplies						
20	Site security (including material yard)						
21	Site safety						
22	Pollution control caused by work						
23	Noise control and undue disturbance of public						
24	Unnecessary or improper interference with public convenience						
25	Mobilization and demobilization						
26	Dumping debris in an approved location						
27	Prepare schedules (bar charts, CPM, ...) for owner's approval						
28	Maintain progress and overcome schedule slippage						
29	Notify owner of actual or anticipated delay						
30	Promotion of local manufacturers and suppliers						

#	Risk Description	Perceived			Proposed		
		O	C	S	O	C	S
31	Utilize Saudi airline and maritime carriers						
32	Maintaining procurement records						
33	Preservation of existing structures, facilities and utilities						
34	Preserve vegetation (other than marked for removal) on or near site						
35	Subcontractors' and suppliers' acts and omissions						
36	Obtain approval before subcontracting						
37	Guarantee no further subcontracting						
38	Obtaining SASO approval on imported material and equipment						
39	Adherence to laws and customs of Saudi Arabia						
40	Adherence to import and customs laws						
41	Perform government relations activities						
42	Giving notices and paying fines to public authorities applicable to work						
43	Prepare as-built drawings						
44	Prepare shop and work drawings						
45	Documenting by photographs						
46	Delayed progress payments						
47	Infringement of patents, copyrights and trade secrets						
48	Allow owner access to all aspects of work						
49	Cooperation to facilitate inspection of work						
50	QA/QC (inspection and testing of work)						
51	Preserving articles of value, archaeological or geological interest						
52	Site conditions including surface and subsurface						
53	Safeguarding title to design, confidential information and patents						
54	Obtain owner's approval before issuing publicity releases						

#	Risk Description	Perceived			Proposed		
		O	C	S	O	C	S
55	Criminal misappropriation and misapplication						
56	Issue and document change						
57	Working on undocumented change						
58	Liquidated damages for delay (up to 10% of contract value)						
59	Liquidated damages (consequential damages)						
60	Conflict of interest						
61	Force majeure						
62	Special risks (limited to outbreak of war)						
63	Standby time controlled by owner						
64	Standby time controlled by contractor						
65	Maintenance period						
66	Cost of contractor's search for defects controlled by owner (implied)						
67	Cost of contractor's search for defects controlled by contractor						
68	Cooperation with other contractors working for owner in the area						
69	Warranty of work						
70	Guarantee for 10 years						

Kindly write down any comments that you would like to add in the area below and include your e-mail address in case you would like to be briefed with the results of the study:

Appendix B:

Arabic Survey Questionnaire

إستبيان

عزيزي المشترك،

هذا الإستبيان عبارة عن جزء من دراسة بعنوان "تقييم لمشاركة المخاطر في العقد الحكومي السعودي". هذه الدراسة عبارة عن متطلب من متطلبات درجة الماجستير في إدارة و هندسة الإنشاء في جامعة الملك فهد للبترول و المعادن، و يتم إجراء هذا البحث تحت إشراف الأستاذ سعدي عساف.

في سبيل تحصيل الأهداف المرجوة من هذا البحث، نقوم بإستشارة الخبراء في هذا المجال و أخذ آرائهم للتأكد من الحصول على نتائج دقيقة. الهدف من هذه الرسالة هو دعوتك لتشارك في هذه الدراسة عن طريق ملء الإستبيان المرفق. الإستبيان قصير و صمم بحيث لا يأخذ أكثر من 15 إلى 20 دقيقة من وقتك.

نحن نقدر مشاركتك في هذه الدراسة وفي حال أحببت أن تستلم مختصرا عن نتائج هذا البحث، زودنا بعنوان بريدك الإلكتروني في المكان المخصص في نهاية الإستبيان.

شكرا مقدما،

خالد عشاوي.

باحث

قسم هندسة و إدارة التشييد

جامعة الملك فهد للبترول و المعادن

عزيزي المشارك

شكرا لك لأخذك الوقت لملئ هذا الإستبيان، إسهاماتك في تحسين صناعة البناء ذات قيمة معتبرة. رجاء أجب الأسئلة التالية ثم إقرأ التعليمات لتساعدك في استكمال هذا الإستبيان.

1. أنت تمثل:

أ. مالك

ب. إستشاري

ت. مقاول تصنيف 1 تصنيف 2 تصنيف 3.

2. إسم الجهة التي تمثلها (اختياري):

3. مسماك الوظيفي هو:

4. عدد سنوات خبرتك:

5. إذا كنت مقاولا، رجاء حدد مجال عمل شركتك (مثال: المباني، الطرق، البنى التحتية...):

6. هذا الإستبان عبارة عن مصفوفة مكونة من 6 أعمدة مقابل كل صف.

7. رجاء، تحت العمود 1 أو 2 أو 3، ضع علامة (أو أكثر) أمام كل مسؤولية لتوضح الطرف الذي يتحملها في الواقع.

8. ثم في نفس الصف، وزع المسؤولية ذاتها للطرف الذي، برأيك، تراه مناسباً بوضع علامة (أو أكثر) تحت الأعمدة 4 أو 5 أو 6.

9. كل صف يجب أن يحتوي على علامتين على الأقل.

10. لإجابة أي تساؤلات أو لطلب شرح أو توضيح، بإمكانك التواصل معي باستخدام بيانات الإتصال المعطاة في الخطاب.

نحن ننفهم أن وقتك ثمين، و عليه تم تصميم هذا الإستبيان و عرضه بشكل مختصر. الوقت المتوقع لملء هذا الإستبيان هو 15-20 دقيقة.

#	وصف الخطورة	المفهوم			المقترح		
		مالك	مقاوم	مشترك	مالك	مقاوم	مشترك
1	الإجابة على الإستفسارات خلال مرحلة المناقصة						
2	تحديد آلية الدفع						
3	تحديد و تعريف المسؤوليات في العقد						
4	المطالبات و المنازعات						
5	سرية العطاءات						
6	الأخطاء في كراسات العطاءات						
7	استخراج الضمانات و التأمينات و السندات المطلوبة						
8	استخراج الرخص و التصاريح اللازمة						
9	مسؤولية الطرف الثالث (أي طرف خارج العقد)						
10	دفع الزكاة و الضرائب						
11	كفاية و مهارة العمالة						
12	سكن العمال و العناية الطبية						
13	الإحتفاظ بقائمة العمالة						
14	توفر المصادر اللازمة لاتمام العمل						
15	كفاية و ملائمة المعدات						
16	توفير المباني المؤقتة و الحفاظ عليها						
17	توفير مراقب في الموقع أثناء التنفيذ العمل						
18	المحافظة على نظافة و ترتيب الموقع و توفير الخدمات الصحية						
19	توفير مسعفين مدربين و لوازمهم						
20	حراسة الموقع						
21	سلامة الموقع						
22	مكافحة التلوث الناجم عن العمل						
23	التحكم في الضوضاء و إزعاج العامة						

#	وصف الخطورة	المفهوم			المقترح		
		مالك	مقاول	مشترك	مالك	مقاول	مشترك
24	التدخلات الغير ضرورية أو الغير لائقة في شؤون العامة						
25	حشد و تسريح القوى العاملة						
26	التخلص من الأنقاض في الاماكن المخصصة لها						
27	تحضير الجداول و المخططات						
28	المحافظة على الجدول و عدم التأخر عنه						
29	إخطار صاحب العمل بأي تأخير حاصل أو متوقع						
30	ترشيح المصنعين و الموردين المحليين						
31	تسخير الطيران و السعودي و النقل البحري السعودي						
32	الإحتفاظ بسجلات المشتريات						
33	المحافظة على المنشآت و المرافق القائمة في الموقع						
34	المحافظة على النباتات في الموقع						
35	أخطاء و تصرفات مقاولين الباطن و الموردين						
36	الحصول على الموافقة قبل التعاقد بالباطن						
37	ضمان عدم التعاقد في الباطن						
38	الحصول على موافقة الهيئة على المواد و المعدات المستوردة						
39	الإلتزام بقوانين و أعراف المملكة						
40	الإلتزام بقوانين الإستيراد و الجمارك						

#	وصف الخطورة	المفهوم			المقترح		
		مالك	مقاول	مشترك	مالك	مقاول	مشترك
43	أداء العلاقات الحكومية للأنشطة						
42	إعطاء الإشعارات و دفع الغرامات لأي جهة متعلقة بالعمل						
43	إعداد الرسومات و المخططات كما تم تنفيذه						
44	إعداد الرسومات و المخططات قبل التنفيذ						
45	التوثيق بالصور						
46	تأخير الدفع (المرحلي)						
47	التعدي على براءات الإختراع و حقوق الطبع و الأسرار التجارية						
48	السماح للمالك بالوصول لجميع نواحي العمل						
49	التعاون في في تسهيل التفتيش في الموقع						
50	اختبارات و ضمان الجودة						
51	المحافظة على مخطوطات أو الأحافير أو الموجودات الأثرية القيمة						
52	ظروف الموقع السطحية و الجوفية						
53	المحافظة على المعلومات السرية و التصاميم و براءات الإختراع						
54	الحصول على موافقة المالك قبل نشر المعلومات للعامة						
55	الأعمال الإجرامية (بما فيها الإختلاس)						
56	اصدار و توثيق التغييرات في المشروع						
57	العمل على تغييرات غير موثقة						
58	التعويضات عن التأخير (إلى 10% من قيمة العقد)						
59	التعويضات عن الأضرار						

#	وصف الخطورة	المفهوم			المقترح		
		مالك	مقاول	مشارك	مالك	مقاول	مشارك
60	تضارب المصلحة						
61	الظروف القاهرة						
62	المخاطر الخاصة (يستثنى منها الحروب)						
63	زمن الإنتظار بسبب المالك						
64	زمن الإنتظار بسبب المقاول						
65	فترة الصيانة						
66	تكلفة البحث عن الأخطاء الحاصلة من طرف المالك						
67	تكلفة الأخطاء الحاصلة من طرف المقاول						
68	التعاون مع المقاولين الآخرين في الموقع						
69	كفالة العمل						
70	الضمان لعشر سنوات						

رجاء أضيف أي تعليق لديك في المساحة المخصصة أدنا. في حال تود استلام مختصر عن نتائج هذه

الدراسة، أضيف عنوان بريدك الإلكتروني في المكان المخصص:

Appendix C:

Owners/Engineers Responses

Perceived Allocation by Owners and Owners Representatives

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	22.00	0.00	0.00
Stipulate payment method	22.00	0.00	0.00
Stipulate definitions and contractual responsibilities	22.00	0.00	0.00
Stipulate methods for claims and dispute settlement	19.00	0.00	3.00
Confidentiality of bid details	10.00	0.00	12.00
Bid mistakes	4.00	13.00	5.00
Obtain necessary guarantees, insurances and bonds	0.00	20.00	2.00
Obtain necessary licenses and permits	4.00	13.00	5.00
Third party and liability	2.00	18.00	2.00
Pay Zakat, taxes and duties	2.00	20.00	0.00
Sufficient quantity and skill of labor	0.00	17.00	5.00
Labor housing transportation and medical treatment	0.00	20.00	2.00
Maintaining labor roaster at work	0.00	19.00	3.00
Availability of resources to execute work	0.00	22.00	0.00
Adequacy and suitability of equipment	0.00	17.00	5.00
Provide and maintain temporary structures	0.00	19.00	3.00
Provide site superintendence during execution	4.00	15.00	3.00
Site housekeeping and sanitary conditions	0.00	19.00	3.00
Site first aid trained personnel and supplies	0.00	22.00	0.00
Site security (including material yard)	0.00	22.00	0.00
Site safety	0.00	13.00	9.00
Pollution control caused by work	0.00	19.00	3.00
Noise control and undue disturbance of public	0.00	22.00	0.00
Unnecessary or improper interference with public convenience	0.00	16.00	6.00
Mobilization and demobilization	0.00	22.00	0.00
Dumping debris in an approved location	0.00	17.00	3.00
Prepare schedules (bar charts, CPM, ...) for owner's approval	2.00	17.00	3.00
Maintain progress and overcome schedule slippage	0.00	15.00	7.00
Notify owner of actual or anticipated delay	6.00	16.00	0.00
Promotion of local manufacturers and suppliers	4.00	10.00	8.00
Utilize Saudi airline and maritime carriers	11.00	9.00	2.00
Maintaining procurement records	0.00	21.00	1.00
Preservation of existing structures, facilities and utilities	2.00	17.00	3.00
Preserve vegetarian (other than marked for removal) on or near site	2.00	15.00	5.00
Subcontractors' and suppliers' acts and omissions	2.00	18.00	2.00
Obtain approval before subcontracting	2.00	16.00	4.00
Guarantee no further subcontracting	2.00	20.00	0.00

Continued

Risk Description	Owner	Contractor	Shared
Obtaining SASO approval on imported material and equipment	0.00	16.00	6.00
Adherence to laws and customs of Saudi Arabia	4.00	10.00	8.00
Adherence to import and customs laws	4.00	10.00	8.00
Perform government relations activities	4.00	15.00	3.00
Giving notices and paying fines to public authorities applicable to work	4.00	10.00	8.00
Prepare as-built drawings	2.00	12.00	8.00
Prepare shop and work drawings	2.00	12.00	8.00
Documenting by photographs	4.00	15.00	3.00
Delayed progress payments	11.00	6.00	5.00
Infringement of patents, copyrights and trade secrets	10.00	9.00	3.00
Allow owner access to all aspects of work	2.00	15.00	5.00
Cooperation to facilitate inspection of work	2.00	13.00	7.00
QA/QC (inspection and testing of work)	2.00	10.00	10.00
Preserving articles of value, archaeological or geological interest	2.00	12.00	8.00
Site conditions including surface and subsurface	2.00	17.00	3.00
Safeguarding title to design, confidential information and patents	6.00	6.00	10.00
Obtain owner's approval before issuing publicity releases	0.00	17.00	5.00
Criminal misappropriation and misapplication	2.00	15.00	5.00
Issue and document change	13.00	4.00	5.00
Working on undocumented change	6.00	16.00	0.00
Liquidated damages for delay (up to 10% of contract value)	2.00	17.00	3.00
Liquidated damages (consequential damages)	0.00	19.00	3.00
Conflict of interest	6.00	8.00	8.00
Force majeure	8.00	6.00	8.00
Special risks (limited to outbreak of war)	10.00	7.00	5.00
Standby time controlled by owner	17.00	2.00	3.00
Standby time controlled by contractor	4.00	15.00	3.00
Maintenance period	2.00	18.00	2.00
Cost of contractor's search for defects controlled by owner (implied)	16.00	6.00	0.00
Cost of contractor's search for defects controlled by contractor	4.00	18.00	0.00
Cooperation with other contractors working for owner in the area	2.00	17.00	3.00
Warranty of work	0.00	17.00	5.00
Guarantee for 10 years	0.00	22.00	0.00

Proposed Allocation by Owners and Owners Representatives

Answer Options for OE Perceived	Owner	Contractor	Shared
Answer clarifications during bidding period	22.00	0.00	0.00
Stipulate payment method	22.00	0.00	0.00
Stipulate definitions and contractual responsibilities	22.00	0.00	0.00
Stipulate methods for claims and dispute settlement	19.00	0.00	3.00
Confidentiality of bid details	11.00	0.00	11.00
Bid mistakes	2.00	8.00	12.00
Obtain necessary guarantees, insurances and bonds	2.00	15.00	5.00
Obtain necessary licenses and permits	9.00	4.00	9.00
Third party and liability	0.00	14.00	8.00
Pay Zakat, taxes and duties	2.00	20.00	0.00
Sufficient quantity and skill of labor	0.00	17.00	5.00
Labor housing transportation and medical treatment	0.00	20.00	2.00
Maintaining labor roaster at work	0.00	17.00	5.00
Availability of resources to execute work	0.00	20.00	2.00
Adequacy and suitability of equipment	0.00	20.00	2.00
Provide and maintain temporary structures	0.00	19.00	3.00
Provide site superintendence during execution	2.00	8.00	12.00
Site housekeeping and sanitary conditions	0.00	17.00	5.00
Site first aid trained personnel and supplies	0.00	22.00	0.00
Site security (including material yard)	0.00	22.00	0.00
Site safety	0.00	9.00	13.00
Pollution control caused by work	0.00	17.00	5.00
Noise control and undue disturbance of public	0.00	18.00	4.00
Unnecessary or improper interference with public convenience	0.00	10.00	12.00
Mobilization and demobilization	0.00	22.00	0.00
Dumping debris in an approved location	0.00	17.00	5.00
Prepare schedules (bar charts, CPM, ...) for owner's approval	2.00	17.00	5.00
Maintain progress and overcome schedule slippage	0.00	10.00	12.00
Notify owner of actual or anticipated delay	8.00	12.00	2.00
Promotion of local manufacturers and suppliers	2.00	8.00	14.00
Utilize Saudi airline and maritime carriers	7.00	7.00	8.00
Maintaining procurement records	4.00	13.00	5.00
Preservation of existing structures, facilities and utilities	2.00	17.00	3.00
Preserve vegetarian (other than marked for removal) on or near site	0.00	19.00	3.00
Subcontractors' and suppliers' acts and omissions	2.00	18.00	2.00
Obtain approval before subcontracting	0.00	18.00	4.00

Continued

Risk Description	Owner	Contractor	Shared
Guarantee no further subcontracting	2.00	11.00	6.00
Obtaining SASO approval on imported material and equipment	0.00	14.00	8.00
Adherence to laws and customs of Saudi Arabia	2.00	6.00	14.00
Adherence to import and customs laws	2.00	8.00	12.00
Perform government relations activities	6.00	9.00	7.00
Giving notices and paying fines to public authorities applicable to work	4.00	10.00	8.00
Prepare as-built drawings	0.00	12.00	10.00
Prepare shop and work drawings	0.00	12.00	10.00
Documenting by photographs	2.00	13.00	7.00
Delayed progress payments	13.00	6.00	3.00
Infringement of patents, copyrights and trade secrets	6.00	7.00	9.00
Allow owner access to all aspects of work	2.00	13.00	7.00
Cooperation to facilitate inspection of work	3.00	13.00	6.00
QA/QC (inspection and testing of work)	5.00	6.00	11.00
Preserving articles of value, archaeological or geological interest	3.00	8.00	11.00
Site conditions including surface and subsurface	2.00	17.00	3.00
Safeguarding title to design, confidential information and patents	7.00	6.00	9.00
Obtain owner's approval before issuing publicity releases	0.00	15.00	7.00
Criminal misappropriation and misapplication	0.00	15.00	7.00
Issue and document change	13.00	0.00	9.00
Working on undocumented change	4.00	12.00	6.00
Liquidated damages for delay (up to 10% of contract value)	2.00	17.00	3.00
Liquidated damages (consequential damages)	0.00	19.00	3.00
Conflict of interest	2.00	4.00	16.00
Force majeure	12.00	0.00	10.00
Special risks (limited to outbreak of war)	6.00	7.00	9.00
Standby time controlled by owner	17.00	0.00	5.00
Standby time controlled by contractor	2.00	15.00	5.00
Maintenance period	2.00	16.00	4.00
Cost of contractor's search for defects controlled by owner (implied)	13.00	4.00	5.00
Cost of contractor's search for defects controlled by contractor	2.00	20.00	0.00
Cooperation with other contractors working for owner in the area	2.00	15.00	5.00
Warranty of work	0.00	17.00	5.00
Guarantee for 10 years	0.00	20.00	2.00

Appendix D:
Contractors Responses

Perceived Allocation by Contractors

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	22.00	0.00	2.00
Stipulate payment method	22.00	0.00	2.00
Stipulate definitions and contractual responsibilities	22.00	0.00	2.00
Stipulate methods for claims and dispute settlement	22.00	0.00	2.00
Confidentiality of bid details	10.00	8.00	6.00
Bid mistakes	14.00	4.00	6.00
Obtain necessary guarantees, insurances and bonds	2.00	18.00	4.00
Obtain necessary licenses and permits	8.00	14.00	2.00
Third party and liability	4.00	18.00	2.00
Pay Zakat, taxes and duties	2.00	18.00	4.00
Sufficient quantity and skill of labor	0.00	22.00	2.00
Labor housing transportation and medical treatment	0.00	22.00	2.00
Maintaining labor roaster at work	0.00	24.00	0.00
Availability of resources to execute work	0.00	24.00	0.00
Adequacy and suitability of equipment	0.00	22.00	2.00
Provide and maintain temporary structures	0.00	18.00	6.00
Provide site superintendence during execution	6.00	14.00	4.00
Site housekeeping and sanitary conditions	0.00	22.00	2.00
Site first aid trained personnel and supplies	0.00	22.00	2.00
Site security (including material yard)	2.00	20.00	2.00
Site safety	2.00	20.00	2.00
Pollution control caused by work	0.00	20.00	4.00
Noise control and undue disturbance of public	0.00	22.00	2.00
Unnecessary or improper interference with public convenience	0.00	20.00	4.00
Mobilization and demobilization	2.00	20.00	2.00
Dumping debris in an approved location	2.00	20.00	2.00
Prepare schedules (bar charts, CPM, ...) for owner's approval	2.00	18.00	4.00
Maintain progress and overcome schedule slippage	0.00	20.00	4.00
Notify owner of actual or anticipated delay	0.00	12.00	12.00
Promotion of local manufacturers and suppliers	8.00	10.00	6.00
Utilize Saudi airline and maritime carriers	2.00	14.00	8.00
Maintaining procurement records	0.00	18.00	6.00
Preservation of existing structures, facilities and utilities	2.00	18.00	4.00
Preserve vegetarian (other than marked for removal) on or near site	2.00	20.00	2.00
Subcontractors' and suppliers' acts and omissions	0.00	18.00	6.00
Obtain approval before subcontracting	2.00	20.00	2.00
Guarantee no further subcontracting	10.00	14.00	0.00

Continued

Risk Description	Owner	Contractor	Shared
Obtaining SASO approval on imported material and equipment	2.00	18.00	4.00
Adherence to laws and customs of Saudi Arabia	2.00	14.00	8.00
Adherence to import and customs laws	2.00	16.00	6.00
Perform government relations activities	6.00	14.00	4.00
Giving notices and paying fines to public authorities applicable to work	8.00	8.00	8.00
Prepare as-built drawings	2.00	20.00	2.00
Prepare shop and work drawings	2.00	18.00	4.00
Documenting by photographs	2.00	12.00	10.00
Delayed progress payments	14.00	6.00	4.00
Infringement of patents, copyrights and trade secrets	4.00	12.00	8.00
Allow owner access to all aspects of work	2.00	12.00	10.00
Cooperation to facilitate inspection of work	2.00	14.00	8.00
QA/QC (inspection and testing of work)	2.00	10.00	12.00
Preserving articles of value, archaeological or geological interest	2.00	16.00	6.00
Site conditions including surface and subsurface	0.00	18.00	6.00
Safeguarding title to design, confidential information and patents	6.00	10.00	8.00
Obtain owner's approval before issuing publicity releases	4.00	16.00	4.00
Criminal misappropriation and misapplication	0.00	14.00	10.00
Issue and document change	16.00	6.00	2.00
Working on undocumented change	0.00	18.00	6.00
Liquidated damages for delay (up to 10% of contract value)	4.00	14.00	4.00
Liquidated damages (consequential damages)	8.00	12.00	4.00
Conflict of interest	2.00	14.00	8.00
Force majeure	14.00	4.00	6.00
Special risks (limited to outbreak of war)	14.00	6.00	4.00
Standby time controlled by owner	16.00	2.00	6.00
Standby time controlled by contractor	0.00	20.00	4.00
Maintenance period	4.00	18.00	2.00
Cost of contractor's search for defects controlled by owner (implied)	10.00	12.00	2.00
Cost of contractor's search for defects controlled by contractor	2.00	20.00	2.00
Cooperation with other contractors working for owner in the area	2.00	14.00	8.00
Warranty of work	0.00	22.00	2.00
Guarantee for 10 years	2.00	22.00	0.00

Proposed Allocation by Contractors

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	22.00	0.00	2.00
Stipulate payment method	22.00	0.00	2.00
Stipulate definitions and contractual responsibilities	22.00	0.00	2.00
Stipulate methods for claims and dispute settlement	22.00	0.00	2.00
Confidentiality of bid details	8.00	4.00	12.00
Bid mistakes	12.00	4.00	8.00
Obtain necessary guarantees, insurances and bonds	4.00	14.00	6.00
Obtain necessary licenses and permits	8.00	12.00	4.00
Third party and liability	6.00	12.00	6.00
Pay Zakat, taxes and duties	4.00	16.00	4.00
Sufficient quantity and skill of labor	0.00	18.00	6.00
Labor housing transportation and medical treatment	0.00	20.00	4.00
Maintaining labor roaster at work	0.00	24.00	0.00
Availability of resources to execute work	0.00	22.00	2.00
Adequacy and suitability of equipment	0.00	22.00	2.00
Provide and maintain temporary structures	0.00	18.00	6.00
Provide site superintendence during execution	6.00	12.00	6.00
Site housekeeping and sanitary conditions	0.00	22.00	2.00
Site first aid trained personnel and supplies	0.00	22.00	2.00
Site security (including material yard)	0.00	16.00	8.00
Site safety	2.00	12.00	10.00
Pollution control caused by work	0.00	20.00	4.00
Noise control and undue disturbance of public	0.00	18.00	6.00
Unnecessary or improper interference with public convenience	2.00	16.00	6.00
Mobilization and demobilization	0.00	22.00	2.00
Dumping debris in an approved location	2.00	16.00	6.00
Prepare schedules (bar charts, CPM, ...) for owner's approval	0.00	16.00	8.00
Maintain progress and overcome schedule slippage	2.00	12.00	10.00
Notify owner of actual or anticipated delay	4.00	4.00	16.00
Promotion of local manufacturers and suppliers	12.00	6.00	6.00
Utilize Saudi airline and maritime carriers	4.00	12.00	8.00
Maintaining procurement records	0.00	18.00	6.00
Preservation of existing structures, facilities and utilities	4.00	16.00	4.00
Preserve vegetarian (other than marked for removal) on or near site	4.00	16.00	4.00
Subcontractors' and suppliers' acts and omissions	4.00	14.00	6.00
Obtain approval before subcontracting	4.00	18.00	2.00
Guarantee no further subcontracting	8.00	14.00	2.00

Continued

Risk Description	Owner	Contractor	Shared
Obtaining SASO approval on imported material and equipment	4.00	12.00	8.00
Adherence to laws and customs of Saudi Arabia	0.00	10.00	14.00
Adherence to import and customs laws	0.00	12.00	12.00
Perform government relations activities	12.00	8.00	4.00
Giving notices and paying fines to public authorities applicable to work	4.00	8.00	12.00
Prepare as-built drawings	0.00	20.00	4.00
Prepare shop and work drawings	0.00	18.00	6.00
Documenting by photographs	2.00	10.00	12.00
Delayed progress payments	20.00	0.00	4.00
Infringement of patents, copyrights and trade secrets	4.00	12.00	8.00
Allow owner access to all aspects of work	0.00	12.00	12.00
Cooperation to facilitate inspection of work	2.00	12.00	10.00
QA/QC (inspection and testing of work)	4.00	6.00	14.00
Preserving articles of value, archaeological or geological interest	6.00	12.00	6.00
Site conditions including surface and subsurface	4.00	14.00	6.00
Safeguarding title to design, confidential information and patents	10.00	4.00	10.00
Obtain owner's approval before issuing publicity releases	4.00	14.00	6.00
Criminal misappropriation and misapplication	2.00	14.00	8.00
Issue and document change	20.00	0.00	4.00
Working on undocumented change	8.00	10.00	6.00
Liquidated damages for delay (up to 10% of contract value)	6.00	14.00	4.00
Liquidated damages (consequential damages)	8.00	10.00	6.00
Conflict of interest	6.00	6.00	12.00
Force majeure	16.00	2.00	6.00
Special risks (limited to outbreak of war)	16.00	4.00	4.00
Standby time controlled by owner	16.00	4.00	4.00
Standby time controlled by contractor	4.00	16.00	4.00
Maintenance period	2.00	18.00	4.00
Cost of contractor's search for defects controlled by owner (implied)	18.00	2.00	4.00
Cost of contractor's search for defects controlled by contractor	6.00	14.00	4.00
Cooperation with other contractors working for owner in the area	4.00	12.00	8.00
Warranty of work	2.00	20.00	2.00
Guarantee for 10 years	2.00	20.00	2.00

Appendix F:
Composite Responses

Composite Perceived Allocation of Risks

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	44.00	0.00	2.00
Stipulate payment method	44.00	0.00	2.00
Stipulate definitions and contractual responsibilities	44.00	0.00	2.00
Stipulate methods for claims and dispute settlement	41.00	0.00	5.00
Confidentiality of bid details	20.00	8.00	18.00
Bid mistakes	18.00	17.00	11.00
Obtain necessary guarantees, insurances and bonds	2.00	38.00	6.00
Obtain necessary licenses and permits	12.00	27.00	7.00
Third party and liability	6.00	36.00	4.00
Pay Zakat, taxes and duties	4.00	38.00	4.00
Sufficient quantity and skill of labor	0.00	39.00	7.00
Labor housing transportation and medical treatment	0.00	42.00	4.00
Maintaining labor roaster at work	0.00	43.00	3.00
Availability of resources to execute work	0.00	46.00	0.00
Adequacy and suitability of equipment	0.00	39.00	7.00
Provide and maintain temporary structures	0.00	37.00	9.00
Provide site superintendence during execution	10.00	29.00	7.00
Site housekeeping and sanitary conditions	0.00	41.00	5.00
Site first aid trained personnel and supplies	0.00	44.00	2.00
Site security (including material yard)	2.00	42.00	2.00
Site safety	2.00	33.00	11.00
Pollution control caused by work	0.00	39.00	7.00
Noise control and undue disturbance of public	0.00	44.00	2.00
Unnecessary or improper interference with public convenience	0.00	36.00	10.00
Mobilization and demobilization	2.00	42.00	2.00
Dumping debris in an approved location	2.00	37.00	5.00
Prepare schedules (bar charts, CPM, ...) for owner's approval	4.00	35.00	7.00
Maintain progress and overcome schedule slippage	0.00	35.00	11.00
Notify owner of actual or anticipated delay	6.00	28.00	12.00
Promotion of local manufacturers and suppliers	12.00	20.00	14.00
Utilize Saudi airline and maritime carriers	13.00	23.00	10.00
Maintaining procurement records	0.00	40.00	9.00
Preservation of existing structures, facilities and utilities	4.00	35.00	7.00
Preserve vegetarian (other than marked for removal) on or near site	4.00	35.00	7.00
Subcontractors' and suppliers' acts and omissions	2.00	36.00	8.00
Obtain approval before subcontracting	4.00	36.00	6.00
Guarantee no further subcontracting	12.00	34.00	0.00

Continued

Risk Description	Owner	Contractor	Shared
Obtaining SASO approval on imported material and equipment	2.00	34.00	10.00
Adherence to laws and customs of Saudi Arabia	6.00	24.00	16.00
Adherence to import and customs laws	6.00	26.00	14.00
Perform government relations activities	10.00	29.00	7.00
Giving notices and paying fines to public authorities applicable to work	12.00	18.00	16.00
Prepare as-built drawings	4.00	32.00	10.00
Prepare shop and work drawings	4.00	30.00	12.00
Documenting by photographs	6.00	27.00	13.00
Delayed progress payments	25.00	12.00	9.00
Infringement of patents, copyrights and trade secrets	14.00	21.00	11.00
Allow owner access to all aspects of work	4.00	27.00	15.00
Cooperation to facilitate inspection of work	4.00	27.00	15.00
QA/QC (inspection and testing of work)	4.00	20.00	22.00
Preserving articles of value, archaeological or geological interest	4.00	28.00	14.00
Site conditions including surface and subsurface	2.00	35.00	9.00
Safeguarding title to design, confidential information and patents	12.00	16.00	18.00
Obtain owner's approval before issuing publicity releases	4.00	33.00	9.00
Criminal misappropriation and misapplication	2.00	29.00	15.00
Issue and document change	29.00	10.00	7.00
Working on undocumented change	6.00	34.00	6.00
Liquidated damages for delay (up to 10% of contract value)	6.00	31.00	7.00
Liquidated damages (consequential damages)	8.00	31.00	7.00
Conflict of interest	8.00	22.00	16.00
Force majeure	22.00	10.00	14.00
Special risks (limited to outbreak of war)	24.00	13.00	9.00
Standby time controlled by owner	33.00	4.00	9.00
Standby time controlled by contractor	4.00	35.00	7.00
Maintenance period	6.00	36.00	4.00
Cost of contractor's search for defects controlled by owner (implied)	26.00	18.00	2.00
Cost of contractor's search for defects controlled by contractor	6.00	38.00	2.00
Cooperation with other contractors working for owner in the area	4.00	31.00	11.00
Warranty of work	0.00	39.00	7.00
Guarantee for 10 years	2.00	44.00	0.00

Composite Proposed Allocation of Risks

Risk Description	Owner	Contractor	Shared
Answer clarifications during bidding period	44.00	0.00	2.00
Stipulate payment method	44.00	0.00	2.00
Stipulate definitions and contractual responsibilities	44.00	0.00	2.00
Stipulate methods for claims and dispute settlement	41.00	0.00	5.00
Confidentiality of bid details	19.00	4.00	23.00
Bid mistakes	14.00	12.00	20.00
Obtain necessary guarantees, insurances and bonds	6.00	29.00	11.00
Obtain necessary licenses and permits	17.00	16.00	13.00
Third party and liability	6.00	26.00	14.00
Pay Zakat, taxes and duties	6.00	36.00	4.00
Sufficient quantity and skill of labor	0.00	35.00	11.00
Labor housing transportation and medical treatment	0.00	40.00	6.00
Maintaining labor roaster at work	0.00	41.00	5.00
Availability of resources to execute work	0.00	42.00	4.00
Adequacy and suitability of equipment	0.00	42.00	4.00
Provide and maintain temporary structures	0.00	37.00	9.00
Provide site superintendence during execution	8.00	20.00	18.00
Site housekeeping and sanitary conditions	0.00	39.00	7.00
Site first aid trained personnel and supplies	0.00	44.00	2.00
Site security (including material yard)	0.00	38.00	8.00
Site safety	2.00	21.00	23.00
Pollution control caused by work	0.00	37.00	9.00
Noise control and undue disturbance of public	0.00	36.00	10.00
Unnecessary or improper interference with public convenience	2.00	26.00	18.00
Mobilization and demobilization	0.00	44.00	2.00
Dumping debris in an approved location	2.00	33.00	11.00
Prepare schedules (bar charts, CPM, ...) for owner's approval	2.00	33.00	13.00
Maintain progress and overcome schedule slippage	2.00	22.00	22.00
Notify owner of actual or anticipated delay	12.00	16.00	18.00
Promotion of local manufacturers and suppliers	14.00	14.00	20.00
Utilize Saudi airline and maritime carriers	11.00	19.00	16.00
Maintaining procurement records	4.00	31.00	11.00
Preservation of existing structures, facilities and utilities	6.00	33.00	7.00
Preserve vegetarian (other than marked for removal) on or near site	4.00	35.00	7.00
Subcontractors' and suppliers' acts and omissions	6.00	32.00	8.00
Obtain approval before subcontracting	4.00	36.00	6.00
Guarantee no further subcontracting	10.00	25.00	8.00

Continued

Risk Description	Owner	Contractor	Shared
Obtaining SASO approval on imported material and equipment	4.00	26.00	16.00
Adherence to laws and customs of Saudi Arabia	2.00	16.00	28.00
Adherence to import and customs laws	2.00	20.00	24.00
Perform government relations activities	18.00	17.00	11.00
Giving notices and paying fines to public authorities applicable to work	8.00	18.00	20.00
Prepare as-built drawings	0.00	32.00	14.00
Prepare shop and work drawings	0.00	30.00	16.00
Documenting by photographs	4.00	23.00	19.00
Delayed progress payments	33.00	6.00	7.00
Infringement of patents, copyrights and trade secrets	10.00	19.00	17.00
Allow owner access to all aspects of work	2.00	25.00	19.00
Cooperation to facilitate inspection of work	5.00	25.00	16.00
QA/QC (inspection and testing of work)	9.00	12.00	25.00
Preserving articles of value, archaeological or geological interest	9.00	20.00	17.00
Site conditions including surface and subsurface	6.00	31.00	9.00
Safeguarding title to design, confidential information and patents	17.00	10.00	19.00
Obtain owner's approval before issuing publicity releases	4.00	29.00	13.00
Criminal misappropriation and misapplication	2.00	29.00	15.00
Issue and document change	33.00	0.00	13.00
Working on undocumented change	12.00	22.00	12.00
Liquidated damages for delay (up to 10% of contract value)	8.00	31.00	7.00
Liquidated damages (consequential damages)	8.00	29.00	9.00
Conflict of interest	8.00	10.00	28.00
Force majeure	28.00	2.00	16.00
Special risks (limited to outbreak of war)	22.00	11.00	13.00
Standby time controlled by owner	33.00	4.00	9.00
Standby time controlled by contractor	6.00	31.00	9.00
Maintenance period	4.00	34.00	8.00
Cost of contractor's search for defects controlled by owner (implied)	31.00	6.00	9.00
Cost of contractor's search for defects controlled by contractor	8.00	34.00	4.00
Cooperation with other contractors working for owner in the area	6.00	27.00	13.00
Warranty of work	2.00	37.00	7.00
Guarantee for 10 years	2.00	40.00	4.00

Appendix G:

Chi-Square Probability Table

Percentage Points of the Chi-Square Distribution

Degrees of Freedom	Probability of a larger value of χ^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21

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