RISK PERCEPTION AND TRENDS OF TURKISH CONSTRUCTION COMPANIES

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
THE MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULLFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF CIVIL ENGINEERING

JANUARY 1998

Approval of the Graduate School of Natural and Applied Sciences

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ABSTRACT

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January 1998, 112 pages

This study includes a comprehensive survey conducted for the purpose of providing an insight into the current attitudes of leading Turkish construction companies towards risk and its management. The content of this thesis is based on a structured questionnaire which includes general information about responding companies, their perceptions about the degree of importance and frequency of certain construction related risks, as well as their allocation. After discussion of the current obtained views, the results are compared with a similar survey conducted in the USA, by Roozbeh Kangari. Except for the risks stemming from the country's economical and political situation, both Turkish and US contractors have assigned the same level of importance to risks specific to construction industry. Besides, evidences concerning the applicability of risk management and analysis techniques in Turkish construction sector, their benefits and the reasons for using them or not from a contractor's viewpoint are obtained.

Finally, the suggestions of the contractors about the implementation of risk management techniques in construction projects are discussed. As a result; it has been found out that the contractors rank the risks that originate from the political and economical instability of the country as the most important ones. Furthermore, it has been believed that governmental institutions, having the greatest share in the construction market as a client, allocate such risk on to the contractors without application of appropriate and fair contract strategies. Most of the contractors mentioned that co-operation and co-ordination of governmental agencies, universities and construction companies are necessary for the successful implementation of risk management strategies, in Turkey.

Keywords: Construction Industry, Attitudes, Risk Perception, Risk Allocation, Risk Management and Analysis Techniques and Surveys.

ÖZ

TÜRK MÜTEAHHİT FİRMALARININ RİSK KONUSUNDAKİ GÖRÜŞ VE EĞİLİMLERİ

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Ocak 1998, 112 sayfa

Bu çalışma, önde gelen Türk müteahhit firmalarının risk ve risk yönetimi konusundaki güncel yaklaşımlarını ortaya çıkarmak amacıyla düzenlenen geniş bir araştırmayı kapsamaktadır. Tezin içeriği; ankete katılan firma hakkında genel bilgi, müteahhit firmaların belli başlı risklerin önem dereceleri ve karşılaşılma olasılıkları ile ilgili algılamaları ve bunun yanısıra bu risklerin taraflar arasındaki paylaşımına ilişkin görüşlerin yeraldığı standart bir ankete dayanmaktadır. Firmaların risk konusundaki güncel görüşleri tartışıldıktan sonra, sonuçlar Roozbeh Kangari tarafından Amerika'da düzenlenen benzer bir araştırmanın sonuçları ile karşılaştırılmaktadır. Sonuçlar göstermektedir ki; ülkelerin ekonomik ve politik koşullarından kaynaklanan riskler dışında, gerek Türk ve gerekse Amerikalı müteahhitler inşaat endüstrisine özgü riskleri önemlerine göre aynı şekilde derecelendirmişlerdir. Bütün bunların yanısıra, müteahhitlerin bakış açısından; risk yönetim ve analiz tekniklerinin Türk inşaat sektöründe kullanılabilirliği, bu

tekniklerin faydaları, kullanım veya kullanılmama nedenleri hakkında da bilgiler yer almaktadır.

Son olarak, müteahhitlerin risk yönetim tekniklerinin inşaat projelerinde uygulanması konusundaki önerileri irdelenmektedir. Bu çalışma sonucunda; müteahhitlerin ülkedeki politik ve ekonomik istikrarsızlıklardan kaynaklanan riskleri en önemli riskler olarak gördükleri ve en büyük işveren olan kamu kuruluşlarının uygun ve adil olmayan bir sözleşme stratejisi ile risklerin büyük bir kısmını müteahhitlere yüklediği ortaya çıkmaktadır. Ankete katılan müteahhitlerin hemen hepsi de risk yönetiminin Türkiye'de uygulanabilmesi için kamu teşkilatlarının, üniversitelerin ve inşaat firmalarının işbirliğinin ve koordinasyonunun gerekli olduğunu vurgulamaktadırlar.

Anahtar Kelimeler: İnşaat Endüstrisi, Risk Algılaması, Risk Paylaşımı, Risk Yönetim ve Analiz Teknikleri ve Anketler.

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to my supervisor Assoc.Prof.Dr.Talat Birgönül for his precious comments, guidance and support throughout this research. I also appreciate the assistance coming from Research Assistant İrem (Dikmen) Özdoğan who supplied me the material in preparing this work, as well as her friendship.

I would like to thank my uncles Vecdi Şermet and İsmail Salıcı, as well as Mr.Kamuran Gürakan and Assoc.Prof.Dr.Hasan Tapkın for their arrangement of connections with the companies and most of all, the contractors who have helped patiently by their responses and valuable comments.

With their immeasurable love and encouragement, my parents, Reyhan and Metin, and my sisters İpek and Zeynep deserve the greatest acknowledgement.

And finally, to dear Burak, I would like to thank for his invaluable motivation, patience and understanding throughout my hard working days and nights.

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INTRODUCTION

1.1 The Purpose and the Scope of the Study

The purpose of this study is to demonstrate trends and current attitudes of Turkish contractors towards risk concept, how they tackle the risks and what is done to conduct construction risk management and analysis.

One important aspect of this study is putting forward the degree of importance of risks that can be encountered in construction projects, as well as their probability of occurrence. It will also provide an insight into the Turkish contractors' approach to the construction risk allocation. Besides, it will supply some evidence about the applicability of risk management and analysis techniques (RMAT) in Turkish construction sector, their benefits and the reasons for using them or not from a contractor's viewpoint.

1.2 Introduction to Risk in the Construction Sector

Due to the dynamic, challenging and rewarding nature of the construction industry, the construction companies are nearly all the time subject to risk. The construction business encompasses a wide range of activities and is in close relation with many other sectors. It requires a large number of people with different skills and interests. Moreover, it is affected from external factors such as national economic conjuncture, government acts, political situation, and so on.

The construction companies have different characteristics when compared to those in other sectors, especially in terms of their financial structure. As long as they can realize their projects and are paid by the owner, they can survive. They have a limited budget.

The most important thing for a construction company would be the unrealistic estimate of cost and the completion time of a project since it directly affects the financial decision making process.

Moreover, construction companies are adversely affected from inflation, defective and late design, delayed progress payments, exceptionally inclement weather, changes in material and stock prices, inadequate planning and many other factors. All these factors can affect time, cost, quality, performance and productivity of a construction project. Deviation from any of these components of a project would result in loss, or even in bankruptcy of the construction company. For those reasons, risk management is considered an important part of the decision making process. Through an effective and systematic risk management process, risks can be minimized, transferred or controlled, however, they can not be eliminated totally.

In Turkey, the contractors can any time face the risk of delayed progress payments, severe competition, inflation, and political instability as the results of the survey used in this thesis, and interviews with the contractors clearly show. This study is hoped to be a guideline for improving the contractors' understanding of the major risks and introducing the risk management concept, to help them survive in such a sector and country.

CHAPTER 2

LITERATURE SURVEY:
RISK MANAGEMENT IN THE CONSTRUCTION INDUSTRY

2.1 Introduction

In this chapter of the study, an easily understood overview of the risk management that is applicable to construction industry is going to be provided.

Construction projects, from beginning to end, are exposed to uncertain environments because of such factors as design, materials and equipment availability, contractor ability, climatic environment, the economic and political environment, and statutory regulations. Moreover, uncertainties increase with the size of the project (in terms of its physical size, its manpower requirements, and its financial value), the complexity of the project (which is affected by the number of disciplines involved), the level of involvement of external agencies (e.g. the impact of government regulations), the degree of impact of environmental issues (e.g. weather, local lobbies), the level of impact of international trading conditions and currency fluctuations, unknown levels of inflation for long-term projects and the complexity of financing [1].

Most contractors, however, have developed a series of rules of thumb that they apply when dealing with risk. These rules generally rely on the contractor's experience and judgment. Rarely do contractors quantify uncertainty and systematically assess the risks involved in a project. Furthermore, even if they assess these risks, they even frequently evaluate the consequences (potential impact) associated with these risks [2].

The objective of project management should not be to avoid risks. To avoid risks is to stagnate and ultimately to be overtaken by events and die [3]. Therefore, the risks should be recognized, assessed and managed systematically through risk analysis and management.

2.2 Risk and Uncertainty - Definitions

There is no unique definition of risk in the literature. Some of the common definitions are as follows:

> *Risk* - in its most basic form, is the uncertainty associated with any outcome [4].

According to Raftery, risk is an abstract concept. It is difficult to define and, in most cases, impossible to measure with any precision. In the context of management and economics of construction projects, a definition of risk and uncertainty would be as follows:

> *Risk and uncertainty* characterize situations where the actual outcome for a particular event or activity is likely to deviate from the estimate or forecast value [3].

Considering both internal and external aspects of projects, risk has also been defined as:

> Exposure to the possibility of economic and financial loss or gain, physical damage or injury, or delay as a consequence of the uncertainty associated with pursuing a particular course of action [5].

In the context of project management, Wideman defines project risk as follows:

> *Project Risk* is the cumulative effect of the chances of uncertain occurrences adversely affecting project objectives.

In other words, it is the degree of exposure to negative events, and their probable consequences impacting on project objectives, as expressed in terms of scope, quality, time and cost.

The definition of Wideman can better be explained by the following relationship shown diagrammatically in Figure 2.1. It can be visualized that unknowns about the future may turn out to be either favourable or unfavourable, but lack of knowledge of future events constitutes *uncertainty* so that uncertainty is simply the set of all possible outcomes, both favourable (*opportunity*) and unfavourable (*risk*). Accordingly, the constant goal of project risk management should be to move uncertainty away from risk and towards opportunity [6].

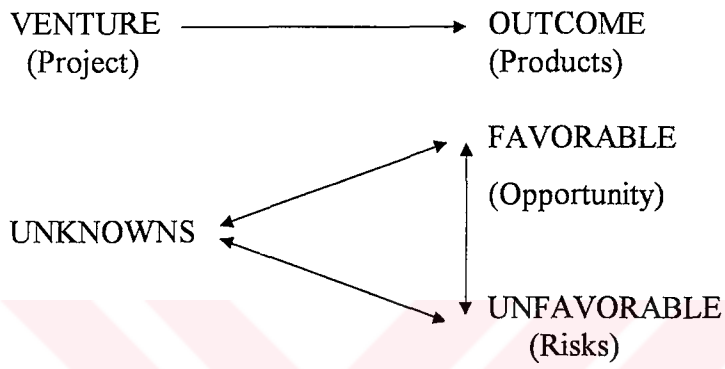

Figure 2.1. The Uncertainty/Opportunity/Risk Relationship [Wideman, 1992]

In the literature, sometimes, a distinction between the definitions of risk and uncertainty is encountered while these two terms are generally considered to be synonymous [7]. The distinction between *risk* and *uncertainty* is usually that risk is taken to have quantifiable attributes, whereas uncertainty does not. In other words, uncertainty is "one of a kind".

Such a distinction serves little useful purpose for the practical purposes of decision making in construction projects as the vast majority of business decisions are made without the benefit of statistical data and statistical calculations. Most decisions depend on subjective judgments [3].

2.3 Risk Management

2.3.1 Risk Management - An Integrative Function

Failure to give proper recognition to risk management on a project can lead to unnecessary and often substantial losses, or even complete project failure. The status of risk on a project varies significantly during the course of its life cycle, and, as with most of the other project functions, the most effective time for achieving the greatest impact on project results is early on in the project development phase. Consequently, risk management should be established as a continuing integrative function throughout the project's life cycle.

Figure 2.2 illustrated schematically how risk management integrates with each of the other project management functions [6].

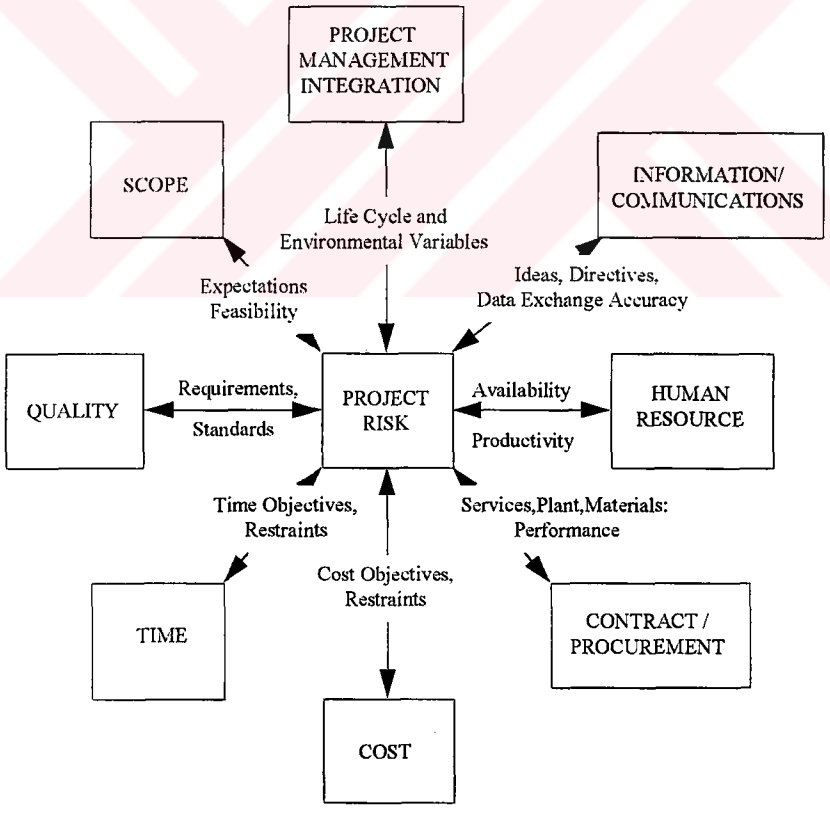

Figure 2.2 Integrating Risk With Other Project Management Functions [Wideman,1992]

2.3.2 Risk Management - Definition and General Approach

Risk management - is the identification, measurement and control at most economic cost of the risks which can threaten life, property and the assets and earnings of an organization [8].

According to Wideman:

Risk management - is the art and science of identifying, assessing and responding to project risk throughout the life of a project and in the best interests of its objectives. [6]

Put simply, risk management is a way of insuring against an upset in future plans [9].

A significant initial part of risk management process is the risk analysis.

Risk analysis - is the identification and assessment of the likelihood of risks occurring and the consequences of occurrence [8].

The aim of risk analysis and management is to ensure that truly worthwhile projects are sanctioned, overruns are avoided to a certain extent [11]. It is a very constructive and creative process in terms of project management [7].

2.3.3 Risk Management System

Risk management system must be practical, realistic, and cost effective. It is a matter of common sense, analysis, judgment, intuition, experience, gut feel, and a willingness to operate a disciplined approach to one of the most critical features of any business or project in which risk is generated.

The process of risk management system is broken down into a number of stages. One approach is a process made up of five stages, namely, risk identification, classification, analysis, attitude and response [7]. Another approach proposes risk

identification, assessment, response and documentation phases [6] while another third approach consists of a simple model of stages consisting of risk analysis and risk management [10]. Apart from terminology, the three approaches are made up of similar steps which cannot be distinguished definitely.

It is better to provide a general description of stages of risk management process. Here, the first approach will be taken as basis.

2.3.3.1 Risk Identification

At this stage, the source and the type of risks are identified [7]. Risk identification is considered as the process requiring the greatest attention because at this stage all the potential risks having a large impact on the final cost and duration of a project are identified. Since the most influential decisions are made early in the life of projects, all the potential risk and uncertainties should be identified as early as possible [10].

There are six steps involved in the risk identification process as shown in Figure 2.3 [2].

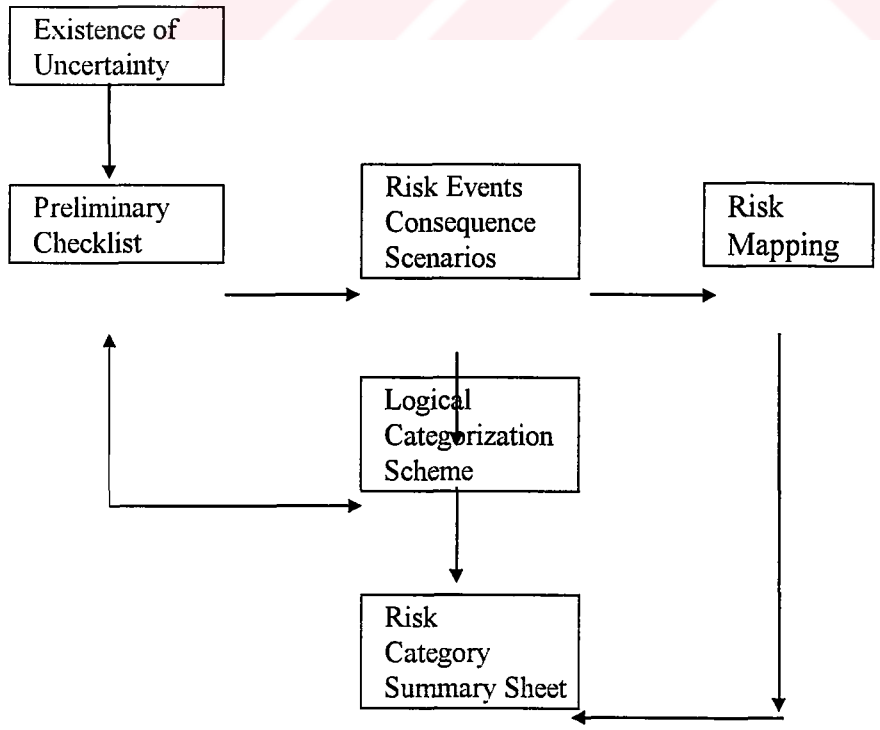

Figure 2.3 Risk Identification Framework [Al-Bahar &Crandall, 1990]

Preliminary Checklist

The preliminary checklist of potential project risks is the starting point for identifying risk. A failure to recognize the existence of one or more potential risks may result in a disaster or foregoing an opportunity for gain for gain resulting proper corrective action. Risks of all types that affect productivity, performance, quality, and economy of construction should be included.

Commercial checklists or survey questionnaires, in addition to the past experience of contractors can be utilized to assist in preparing checklist of potential risks. Despite the fact that substantial effort has been devoted to establishing a systematic identification process, success is heavily dependent upon the experience combined with intuition of the contractor identifying the risk.

Identify Risk Events / Consequence Scenarios

The second step of the risk identification process is the definition of a set of credible risk event/consequence scenarios. This set represents all reasonable possibilities associated with the realization of each primary source of risk included in the preliminary checklist. The consequences can include economic gain/loss, personal injury, physical damage, time and cost savings/overrun. Since most risks that evolve in construction projects are financially related, the emphasis is on the financial consequence criterion as a uniform basis of assessment. Any other criteria can be valued in terms of financial gain or loss.

Risk Mapping

In event risk mapping, a graph of two dimensions or scales is proposed to construct the risk map. In the first dimension, uncertainty will be assessed with regard to the probability of occurrence. In the second dimension, risk will be assessed with regard to its potential severity. Such a two-dimensional graph is considered an important graphical representation, and will enable the project manager to assess the relative importance of an early stage. Risk is a function of the interaction of

uncertainty and potential gain/loss, and the proposed mapping function presents Iso-Risk curves where each curve represents equivalent risk but differences in uncertainty and gain/loss. The further the curve is from the origin the greater the risk. Figure 2.4 shows the risk mapping.

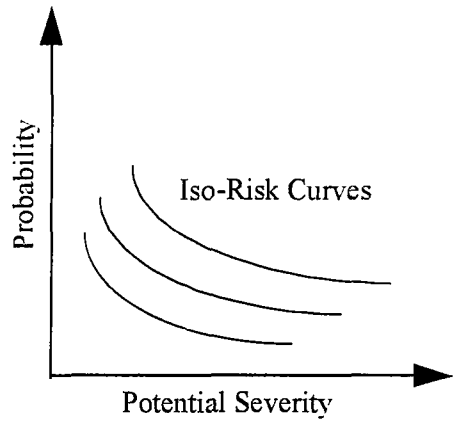

Figure 2.4 Risk Mapping Concept [Al-Bahar &Crandall, 1990]

Risk Classification

The purpose of classification of risks is twofold: First, to expand the contractor's awareness about the risk involved. Second, we need to classify risks because the strategies a contractor adopts to mitigate risks will vary according to their nature [2]. Risks may be classified in a number of different ways. One way is to classify risks according to their impact on the project. For example:

- Scope risks - risks associated with changes of scope.
- Quality risks - failure to complete tasks to the required level of technical and quality performance.
- Schedule risks - failure to complete tasks within the estimated time limits.
- Cost risks - failure to complete tasks within the estimated budget allowances.

This approach has a disadvantage that many identifiable risks will have an impact on two or more of these areas. So this leads to significant overlapping and potential double counting when it comes to making offsetting provisions.

Yet another way of classifying risks is to separate them according to their nature. For example, discrete one-time events such as fire and theft may be distinguished from those that are time-scaled, such as with flooding or earthquake, because in the latter case the probability and magnitude of occurrence varies with the period of time selected [6].

A useful approach to risk identification is to classify the types of project risk according to the primary source (rather than effect). This will also facilitate more effective management. Later, in Table 2.1 a list of primary sources of risk in construction projects together with probable risk management responses and a summary of possible counteractions against risks will be given.

Risk Category Summary Sheet

This is the final step in risk identification process. The summary sheet will integrate the participation of all personnel involved in the project management team. Such participation is considered very important in risk identification process, since judging the significance of any risk cannot be delegated to a single person [2].

2.3.3.2 Risk Analysis

The main purpose of a risk management system is to assist business to take the right risks. An integral part of the system is risk analysis [7]. At his stage, the consequences associated with the type of risk or combination of risks, by using analytical techniques are evaluated [4].

Risk analysis can be qualitative and quantitative, whereas qualitative risk analysis cover risk identification and initial risk assessment stages. The interaction between different stages of risk management system is common. Initial qualitative risk analysis is realized by using the following well-known techniques;

- Check lists of risk compiled from previous experience,
- Interviews with key project participants and,
- Brain-storming with the project team.

It is believed this initial stage is essential and it brings considerable benefits in terms of understanding project and its potential problems [10]. At the end of initial risk analysis, a project may be rejected because it is unacceptably risky. The emphasis in "initial risk analysis" is on an unbiased accept/reject decision, while the emphasis in "additional risk analysis" is on strategic and tactical decisions about managing risk assuming that project will proceed [11].

Quantitative risk analysis is considered as the most formal aspect of the whole process, usually involving sophisticated analysis techniques [10].

There are a number of systematic models used in the quantitative risk analysis stage. Kangari and Riggs classified these methods as classical models (i.e., probability analysis and Monte Carlo Simulation) and conceptual models (i.e., fuzzy set analysis) [12].

Some of the very common techniques which can be used to support risk analysis follow:

- Brain-storming
- Sensitivity analysis
- Probability analysis
- Monte Carlo Simulation
- Delphi Method
- Decision Tree analysis
- Utility Theory
- Decision Theory
- Fuzzy Set Theory

Practical application of the above mentioned techniques may be limited to certain type or size of project. Perhaps more important is management's attitude towards risk analysis itself, especially as it tends to be governed more by their understanding of the mathematics involved in the techniques and consequently, in their confidence in the results produced.

Brain-storming is a simple but effective attempt to help people think creatively in a group and also very effective in finding creative solutions to potential problems.

Sensitivity analysis is the simplest form of risk analysis [6]. It is used to identify the impact on the total of a change in a single risky variable [7]. Some of the advantages of sensitivity analysis include that there is a range of possible outcomes, decision making is more realistic and the relative importance of each variable examined is readily apparent. Some weaknesses are that variables are treated individually, limiting the extent to which combinations of variables can be assessed, and the probabilities of occurrence of risk are not quantified [6,10].

Probability analysis is advantageous over sensitivity analysis since it specifies a probability distribution for each variable and then considers the effects on the risks in combination. However, since every project is unique, defining the probability of occurrence of any specific variable may be quite difficult. The problem of assessing how risks can occur in combination is usually handled by a sampling approach (such as the Monte Carlo Simulation technique) and running the analysis a number of times. Today, many computer programs such as @ Risk, CASPAR and Crystal Ball are available for analyzing and simulating risk.

The basic concept of Delphi Method is to derive a consensus using a panel of experts to arrive at a convergent solution to a particular problem. This is particularly useful, for example, in arriving at probability assessments relating to future events when risk impacts are large and critical [6,13].

Decision Trees are commonly used to study alternative projects and the effects of design and other choices on project costs [10].

None of the techniques discussed so far take into account the attitude towards risk of the decision maker. Utility Theory endeavors to formalize management's attitude towards risk. However, in practical project work Utility Theory tends to be viewed as rather theoretical [6].

Decision Theory is a technique for assisting in reaching decisions under uncertainty and risk. All decisions are based to some extent on uncertain forecasts. Given the criteria selected by the decision maker, Decision Theory, points to the best possible course whether or not the forecasts are accurate [14].

Fuzzy Set Theory assesses qualitative data in quantified terms. Fuzzy data approach provides ways of exploring possible outcomes, but unless they are based on sound results, results can be misleading [15].

Risk analysis techniques help decision makers to utilize subjective judgments in a systematic way and improve the quality of decisions through the combination of both subjective and objective judgments.

2.3.3.3 Risk Response

This is the action phase of the Risk Management System [4]. Following the identification and analysis phases, decision maker is able to formulate suitable risk treatment strategies in advance of the problem occurring [2,3]. The two objectives of these strategies are removing as much as possible the potential impact and increasing control of risk. These two approaches to managing the risk are called risk finance and risk control respectively [2].

The general principle of risk response is that the parties to the project should seek a collaborative and mutually beneficial distribution of risk . The starting point for the distribution of risk is the contract [3]. If at the time of entering into a contract the distribution of risk is not clearly understood, or is patently unfair then disputes are almost inevitable [6].

Responses to identified risk are usually listed as follows: risk avoidance, risk reduction and prevention, risk retention and risk transfer (through contract or insurance).

Risk Avoidance aims to remove risk from the project. The refusal to contract is a simple example of risk avoidance. However, it is more relevant to consider the specific risks which can be avoided [4,7]. Risk elements can be avoided by many methods, which include the following;

By a Contractor:

- Do not bid on the project.
- Tender a very high bid.
- Place conditions on the bid.
- Do not bid on the high-risk portion of the contract.

By an Owner/client:

- Do not proceed with the project.

Most of the above options tend to remove the organization from the business of construction [4].

Risk Reduction and Prevention is directed towards decreasing exposure to potential risks by two ways; reducing the severity of risk if it does occur and reducing the probability of a risk.

Risk reduction and prevention falls into four basic categories:

- Education and training to alert the staff potential risks;
- Physical protection to reduce likelihood of loss;
- Systems to ensure consistency and to make people ask the "what if" questions.
- Physical protection to protect people and property [4,7].

Risk Retention by a party that can control or uncontrol them, in both cases, imposes a residual risk on that party. This risk exposure of any party, that is the amount of risk still not allowed for financially, includes contingency allowances for the serious risks. This "contingency" is often set by simply adding a 10% amount onto the

estimated cost of a project, which is not an adequate way to deal with risks [10]. However, an adequate contingency allowance and good control, even on a tight budget, will reduce the chance of overrun. This requires a positive and systematic approach [6].

Transferring risk does not reduce the criticality of the source of risk, it just removes it to another party [7].

A decision to allocate risk will be implemented either through the Conditions of Contract or through insurance (or bonding) [6,10].

Contract strategy is essentially the primary risk allocation mechanism in the construction industry. The contract strategy basically defines the responsibilities and duties in the construction project. Specific terms and Conditions of the Contract give the details of risk allocation and which party is responsible for which risk under various conditions.

There are three ways of allocating risk in construction projects;

- The owner/client assumes all the risk (i.e., pays the costs)
- The contractor assumes all the risk (i.e., pays the costs)
- The risks are shared [16].

Many construction organizations contract the responsibility for risk as a commodity to be bought and sold. Insurance is the prime example of this allocation strategy in that an insurance company is allocated the responsibility for specific risks under specific condition for a price [4]. Insurance is a mechanism for smoothing the costs of losses, not a loss transfer mechanism. Due to its certain disadvantages, especially being too expensive, insurance should only be used as a last resort. It has been quoted as "a complicated and inefficient method of borrowing money, the essence of which is that you pay back the loan before you get the money!" [8]

Other ways for transferring the financial consequences of risks are; indemnities, sureties, bonds, guarantees and liquidated damages.
While transferring risks, the following two rules are to be considered;

- Transfer the risk to the party that can best control the risk; and
- Transfer the risks to the party that can best afford the risks [4].

A tabular summary of the alternative risk management responses described above, together with primary sources of risk in construction projects, is given in Table 2.1.

A formal risk management process in any organization will generally give positive results only if it is used as a tool that considers all aspects of the project Risk management is only as effective as the managers and staff involved. A project manager must take care to ensure that the level of risk management is consistent with the people involved. A very technical approach may tend to alienate staff; however, a nontechnical approach may not provide sufficient information for decision making.

There is no doubt that a properly working risk management process can be of great benefit to the project by increasing communications between the project functions and reducing the number of unpleasant surprises as the project proceeds.

Table 2.1 Primary Sources of Risk in Projects, Risk Management Responses and Possible Counteractions [2,17]

Primary Sources of Project Risks	Risk Management Responses	Possible Counteractions
Design Inadequate design, Detail, precision, appropriateness of specifications, surveys and investigations, Interaction with method of construction, Likelihood of change.	Transfer, Avoidance.	Condition clauses, Participation in design, Adaptable design/ construction methods, Revisions
Environmental Ecological damages, pollution, waste treatment, Public enquiry.	Insurance, Transfer, Reduction and prevention.	Contractual clauses, Protection and safety programs.
Financial and economic Inflation, Exchange rate fluctuations, Default by sub-contractors and suppliers, Availability of funds, Adequacy of insurance, Adequate provision of cash flow, Taxation.	Retention, Transfer, Avoidance.	Escalation clause, Price contingency in the bid, Project financing by a reputable owner, Owner's purchase of equipment and material, Providing performance bond and prequalification of sub-contractors and suppliers, Forward contracts for hedging exchange rate fluctuations.
Political Changes in laws and regulations, War and civil disorder, Expropriation, Embargoes.	Insurance, Transfer, Reduction and prevention.	Insurance, Contingency planning, Contractual clauses for schedule delays and additional payments, Clear contract clauses.
Legal Direct and indirect liabilities, Local laws, Bureaucratic delays.	Avoidance, Retention.	Contingency planning, Contractual clauses.
Logistics Availability of specialized resources, Access and communications, Damage to equipment and material in transit.	Transfer, Retention, Reduction and prevention, Insurance.	Contractual clauses, Purchase including delivery.
Construction Climate, Industrial relations, Different site conditions, Defective work, Equipment failure and theft, Accidents, Feasibility of construction methods, Extent of change of construction methods.	Retention, Transfer, Reduction and prevention, Insurance.	Physical contingency in the bid, Insurance for liability from accidents, Contract clause for time extensions due to delays, Safety and training programs for employees, Planning procurement activities in advance, Quality control/ assurance programs, Application of versatile methods.

Table 2.1 (continued)

Primary Sources of Project Risks	Risk Management Responses	Possible Counteractions
Physical Flood, Earthquake, Fire, Collapse and landslide.	Insurance, Transfer.	Insurance carried by owner, Contractual clauses for delay and payments for incurred damages, Contingency planning.
Operational Fluctuations in market demand for output, Maintenance needs, Fitness for purpose, Safety of operation.	Reduction and prevention, Retention, Insurance.	Realistic market forecasts, Elasticity of operation, Insurance carried by owner.

2.4 Dealing With Risks In Contracts

2.4.1 Contract Strategy Considerations

Selection of an appropriate procurement strategy will depend upon the type of project, its particular emphasis in terms of scope, quality, time and cost, and the degree of uncertainty associated with each. Careful consideration of these aspects should lead to the right choice of organizational structure, allocation of responsibility, and means of procurement.

The choice of which type of contract is most suited to the project in question is very much the subject of project risk management. The selection of the right form of contract requires:

- The identification of specific risks,
- Determination of how they should be shared between the parties, and
- The insertion of clear legal language in the contract documents to put it into effect.

The most challenging of these tasks is the finding of a cost-effective and equitable degree of risk allocation. Standard contract documents prepared by various levels

of government, organizations or standard model documents prepared for various industry sectors, such as construction, are typically used. Specific allocations of risk are intrinsic to such standard forms, but the principles behind the allocations are rarely stated. Such intrinsic allocation of risk may or may not be appropriate to the project [18].

2.4.2 Suggested Risk Sharing Principles

Various authors have sought to identify principles which should govern the allocation of risk amongst the parties to a project [17,19,20,21,22]. Recommendations are suggested by the answers to these questions:

- Which party can best control the events that may lead to the risk occurring?
- Which party can best manage the risk if it occurs?
- Whether or not it is preferable for the client to retain an involvement in the management of the risk.
- Which party should carry the risk if it cannot be controlled?
- Whether the premium to be charged by the transferee is likely to be reasonable and acceptable.
- Whether the transferee is likely to be able to sustain the consequences if the risk occurs.
- Whether, if the risk is transferred, it leads to the possibility of risks of a different nature being transferred back to the client.

If at the time of entering into a contract the distribution of risk is not clearly understood, or is patently unfair, such as one party being the cause of risks which are then sustained by the other party, then disputes are almost inevitable. The adoption of systematic risk management and analysis may consequently result in departing from the standard contract conditions in particular circumstances, to the overall benefit of the project.

Many descriptions of successful projects reflect on the healthy cooperative team spirit enjoyed on the project. So it is not necessarily the project organizational structure and forms of contract which determine whether or not project objectives are successfully achieved, but rather the attitudes of the parties involved. However, an effective structure and good contract wording can go a long way to establish good relations and avoid the frustrations which otherwise undermine initial enthusiasm and good intentions. Obviously, this includes an equitable distribution of risk, and the means for handling it in the event that it arises [6].

2.4 How Does the Project Manager Know When There is a Project Risk?

Some of the most common general project risk situations encountered:

- The project manager does not recognize that every project is an exercise in risk.
- This project is very different from the last one.
- There is a feeling of uneasiness.
- When the project is in its earliest phase, project risk and opportunity are highest.
- The project scope, objectives and deliverables are not clearly defined or understood.
- A large number of alternatives are perceived as possible.
- Some or all technical data are lacking.
- The technical process (and design) are not mature.
- Standards for performance are unrealistic or absent.
- Costs, schedules and performance are not expressed in ranges.
- The future timing of activities and events are vague.
- Design lacks production engineering input.
- Prototype of a key element is missing.
- There is a higher than usual R&D component.
- Some or all environmental permits are outstanding.
- Other similar projects have been delayed or canceled.
- A wide variation in bids are received.
- No appropriate contingency plans have been developed.

- The project team relies entirely on the contingency allowance.
- Someone starts "hedging their bets" [23].

2.5 Risk Management - The Future?

Because risk has a natural complexity in its variety, scenario combination possibilities and variation in probability impacts unique to each project, there are some ideal opportunities for computer applications. Obvious applications include rapid access to established databases, data storage, repetitive computations ranging from simple to complex, and sensitivity analysis.

However, effective project risk management is also subject to practical experience and sound judgments. Artificial intelligence (AI), expert systems (ES), and human-computer cooperative systems (HCCS) are being developed to incorporate these added dimensions. The intent is to enhance the project manager's risk management ability to arrive at better solutions than would have been arrived at without such support systems, e.g., by reducing the recurrence of similar risks.

The ultimate potential of AI and ES (and HCCS) is in their ability to augment the program manager's reasoning power. But to do this a better understanding of cognition, knowledge representation, information usage, effective decision making and risk assessment is still needed [24].

CHAPTER 3

THE RESEARCH METHODOLOGY AND THE STRUCTURE OF THE QUESTIONNAIRE

3.1 The Research Methodology

In this thesis, the survey was conducted by means of a questionnaire. The framework of the questionnaire used in this survey was based on the survey conducted by Roozbeh Kangari (Journal of Construction Engineering and Management, December,1995). However, details of the questionnaire were specifically designed to suit the purpose of this thesis. It covers additional subjects related to risks in international projects, problems encountered in BOT (Build-Operate-Transfer) projects, risk management and analysis techniques (RMAT), computer programs, the benefits of RMAT, and the reasons for using or not using these techniques, etc.

The survey was restricted to 116 leading Turkish construction companies that were supposed to represent the Turkish construction sector as a reliable sample. The sample population mostly consisted of the members of the "Turkish Contractors Association" and the "Union of International Contractors". Most of the respondents were top managers and/or owners of these companies. The method of administration was generally a face-to-face interview. On the other hand, some of the questionnaires were mailed, and the responded ones were mailed back by the respondents. Interviews were much more appropriate than the mailed self-administered questionnaires. Because during those interviews, it had been possible to obtain detailed comments of contractors on the content of each question.

3.2 The Structure of the Questionnaire

The questionnaire consists of 25 questions most of which are structured and closed-ended. It is made up of mainly three parts;

The first part focuses on general demographic information about type, age and specialization areas of the construction companies.

The second part covers;

- Current attitudes of contractors towards the degree of importance, frequency and allocation of risk categories observed in Turkish construction sector,
- Approach of contractors to the degree of importance and probability of occurrence of risks encountered in international construction projects,
- Ranking of certain project types according to the amount of risk they carry.
- Ranking of contract types according to the amount of risk they carry.
- Contractor's opinions about the problems encountered in BOT projects.

The third part is related with the level of awareness and the usage of risk management and analysis techniques and computer programs, contractors' opinions about the benefits of and reasons for using or not using these techniques.

The last optional part includes an open-ended question allowing the respondents to comment on the applicability of risk management in construction companies. This question is important from two aspects: First of all, it includes very valuable recommendations of the respondents related to what can be done to introduce and then implement the systematic risk management in the sector. Secondly, it puts forward the considerations of the contractors related to major obstacles to the implementation of risk management and the ways of getting rid of them.

CHAPTER 4

SURVEY RESULTS OF THE RISK PERCEPTION AND TRENDS OF TURKISH CONSTRUCTION COMPANIES

4.1 An Overview of the Survey

The conducted survey has been applied to 116 Turkish construction companies most of which are either a member of the Turkish Contractors Association (TCA) or the Union of International Contractors (UIC). The choice of the sample was made on the basis of accessibility, reliability and representativeness of these companies. In this way, a broad picture of the construction sector in terms of risk perception has been obtained. Of the 116 questionnaires sent out (obtained through both face-to-face interviews and mailing), 105 (91%) were completed and returned. However, 2 of these were excluded from the analysis due to erroneous and missing responses. As a result, the overall response rate for the survey is 88%, that is, 103 of the responses are usable and valid. In the analysis; mainly the findings of the returned questionnaires as well as a number of related reports and studies have been utilised.

4.2 Results and Analysis of the Survey

4.2.1 General Demographic Information About the Construction Company

The first part of the questionnaire focuses on general demographic information about the construction company including the type, age and specialisation area(s) of

the company. As stated before, most of the companies (73 of the total number of companies) are either a member of TCA or UIC. Four of these companies are member contractors solely affiliated to UIC. Companies other than the members of TCA and UIC are also experienced and well-known in the construction sector.

The details and the results of the first three questions related to company characteristics are as follows:

Question 1. Type of company:

Table 4.1 Type of the companies being surveyed

Type	No. of Companies	% Response
Sole Proprietorship	0	0
Ordinary Partnership	0	0
Collective Partnership	1	1.0
Limited-Company	20	19.4
Joint-Stock Corporation	81	78.6
Joint-Venture	1	1.0
Total	103	100.0

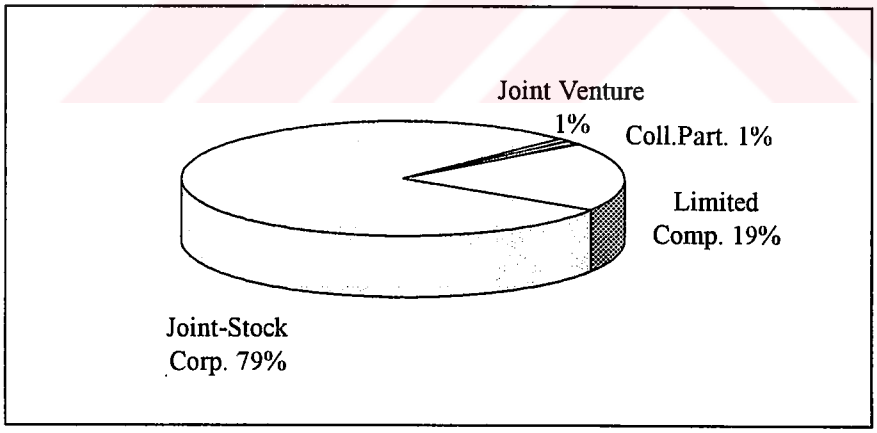

Figure 4.1 Percentage Breakdown of Types of Companies

Nearly 80% of the respondents are joint-stock corporations. This form of organization is preferred by large companies due to ease of capital formation, flexibility and tax benefits. Unlike the partnerships, the joint-stock corporations and limited companies have a continuity that is independent of the stockholders. The single joint-venture company responded the questionnaire is performing

international contracting activities. Each member of the joint-venture shares in the risks and the ultimate rewards of taking on larger and more prestigious construction projects. By entering into the joint-venture, the member companies can overcome the primary limitations such as lack of capital, shortage of expertise, etc.

Question 2. How many years has your company operated in the construction sector?

Table 4.2 Years of Operation

Range (years)	No. of Companies	% Response
Less than 1 year	0	0
1-5 years	5	4.9
6-10 years	16	15.5
11-20 years	27	26.2
More than 20 years	55	53.4
Total	103	100.0

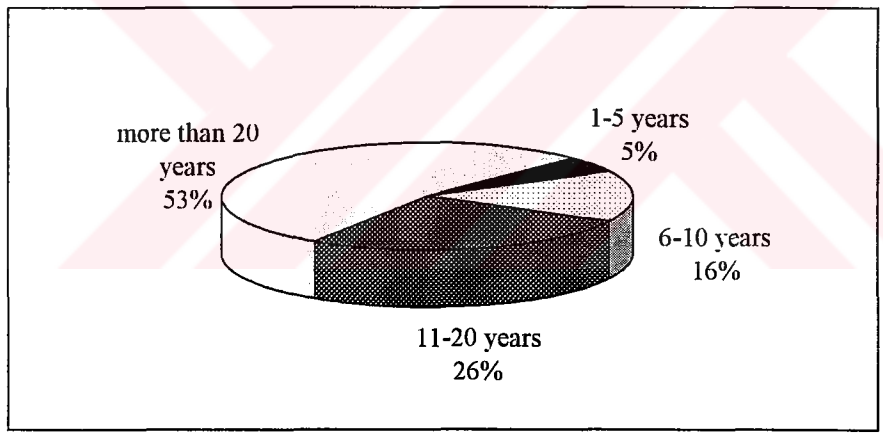

Figure 4.2 Percentage Breakdown of Years of Operation of Companies

Of the 103 companies responded, nearly 80% of the companies had more than 10 years of experience (55% of them are operating more than 20 years) in the construction sector. It is important to mention that, experience of the contractor is an important factor in terms of the reliability and quality of the survey data.

Question 3. Please identify the type(s) of construction work(s) that your company performs: (You can mark more than one choice)

Table 4.3 Type of Construction Work

Type of Construction Work	No.of Companies	% Response
Engineering Structures	81	78.6
Motorways	33	32.0
Energy Transmission and Distribution Lines/Telecommunication Network Construction Operation and Maintenance	8	7.8
Building Construction	88	85.4
Industrial Construction	50	48.5
Other	9	8.7

The distribution of the contractors specialised in any type of construction work(s) in the whole sample is illustrated in Figure 4.3

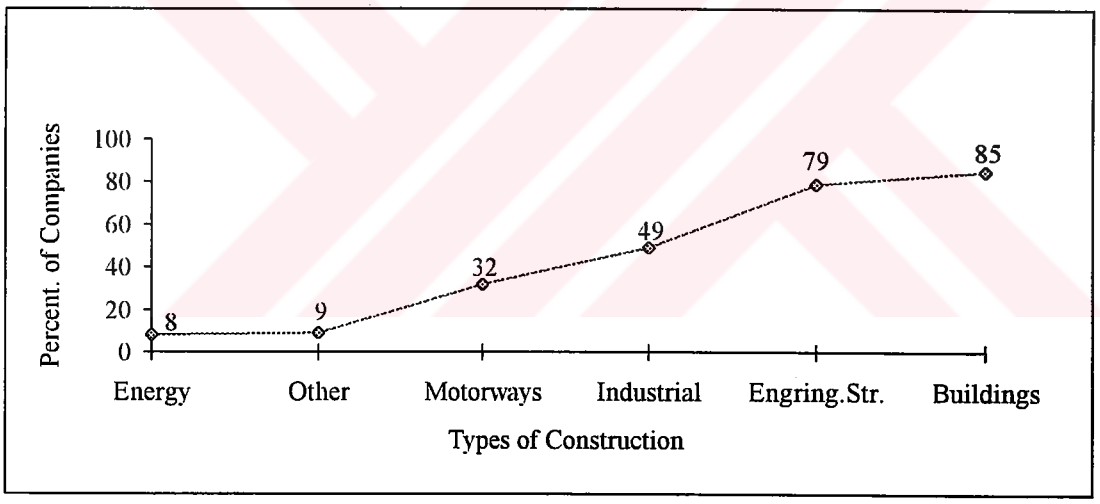

Figure 4.3 Percentage Breakdown of Types of Construction Work

As it could be easily seen from the above given figure; nearly 85% (88 out of 103) of the contractors are specialised in building construction. The percentage of the contractors specialised in engineering structures (including dams, bridges, tunnels, airports, harbours, railways, sewerage-water networks, water cisterns, etc.) is 79%. This is followed by industrial construction type (refineries, reactors, industrial facilities, etc.), the share being about 49%, and then comes the motorways (32%). The least share (8%) belongs to the energy related construction works (energy

transmission and distribution lines, telecommunication network construction, operation and maintenance). The other option (9%) includes; the natural gas distribution conversion system and the operation of the city natural gas networks (2 companies); manufacturing and installation of the steel structure systems (1 company); landscaping (2 companies); design, manufacturing and erection of industrial chimneys, silos (1 company); military facilities (2 companies); and mining excavation works (1 companies).

It is important to note that according to the construction sector reports of several banks [25,26], residential housing market constitutes the major share of building construction and it is speculated that due to the increasing population and the increasing need for houses, it will continue to be the largest share in the sector in the near future.

Starting from 1950's, the share of the types of construction work in Turkish construction sector has changed gradually. The changes recorded from 1950 to 1995 in the construction types also reflect the major changes being observed in the economy. During 1950-1959, for the development of country, infrastructure construction was given priority. By 1960's and 1970's, an increase in the variety of construction works, investments supporting infrastructure construction and industrial construction were observed. During the 1980's; besides infrastructure investments, superstructure investments (including houses) started to increase as well. During the 1990's the building construction has taken the largest share as a result of the suspension of large infrastructure investments due to instabilities and problems encountered in the economy [25].

During the interviews being conducted with the executives of contracting companies, it has been stated by the representatives of these companies (especially holding type of companies) that, they mentioned that they diversify their interested areas to other sectors different from the construction industry in order to minimize risks in the case of sudden recession periods that have been experienced previously. Such sectors that the construction companies are active, as reported by the

respondents are as follows: tourism, insurance, consultancy, banking, marketing, mining, import-export activities land development, health, food, education, radio and television.

4.2.2 Risk Perceptions of Turkish Contracting Companies

4.2.2.1 Importance and Probability of Occurrence of Risks

In this part of the questionnaire (including Questions 4 and 5), it has been aimed to obtain a better understanding of the Turkish contracting companies' attitude on the importance of different risk categories and their probability of occurrence.

Question 4 is designed so as to determine the relative importance of each risk category from a contractor's viewpoint. Although the concept of importance varies from project to project as well as from time to time, this question will still provide a general assessment of the importance of risk perceived by the Turkish contractors. Very low importance (or no importance) is accorded a value of 1 while the greatest importance is accorded a score of 5 on a measurement scale of 1 to 5, where 2 denotes that risk is unimportant; 3 denotes risk that is neither important nor unimportant; 4 denotes important risks, and 5 denotes very important risks.

Question 5 is prepared to investigate the contractors' opinions with regard to the probability of occurrence of the risks as determined in Question 4. Very low level of occurrence (or never occurring) is accorded a value of 1 while the highest probability of occurrence (always occurring) is accorded a score of 5. In this manner, 2 denotes low level of occurrence (or rarely occurring risk); 3 denotes risks that occur sometimes (or can be regarded as an undecided response); 4 denotes high probability of occurrence (risk occurring quite often).

Question 4. Risks that can probably be encountered in the Turkish construction sector are listed in the following table (Table 4.4). Respondents are requested to put a "√ " to the appropriate cell where the selected number indicates the level of risk

importance and most closely approximates their opinion as a contractor. For a given scale of 1 to 5;

5 = Very important

4 = Important

3 = Neither important nor unimportant

2 = Unimportant

1 = Very unimportant

Question 5. Respondents are requested to put a "√" to the suitable cell where the number best determines the probability of occurrence of risk and most closely approximates their opinion as a contractor. For a scale of 1 to 5;

5 = Always

4 = Quite often

3 = Undecided / Neutral

2 = Rarely

1 = Never

Responses to questions 4 and 5 will be analysed in the same table, Table 4.4, in order to facilitate a better understanding of the importance and the probability of occurrence of a certain risk.

Column 2 of Table 4.4 presents 33 different risk descriptions with an additional "other" option to be added if desired by the respondent. These risk categories were identified, based both on the literature and previous experience of contractors and other researchers who were consulted before the questionnaire was prepared. The risk categories in the table are ordered according to their primary sources; Risks between 1-7 (7 included) are categorised as political and legal risks; between 8-14 (8 and 14 included) are financial risks; between 15-24 (15 and 24 inc.) are construction related risks; 25 and 26 are force majeure risks (26. Terrorism can also be classified as a political risk because it causes public disorder); 27 is an environmental risk; 28 through 31 are technical risks; 32 and 33 are commercial (or market) risks.

Table 4.4 Importance and Probability of Occurrence of Risk Categories

No (1)	Risk (2)	Importance average on a scale of 1-5 (3)	Std. dev. (4)	Importance (% response) (5)					Avg. probab. of occurrence on a scale of 1-5 (6)	Std. dev. (7)	Probability of occurrence of risk (8)				
				5	4	3	2	1			5	4	3	2	1
1	Delayed site hand over (delayed expropriation, etc.)	3.61	1.09	16.8	53.5	7.9	17.8	4	3.13	1.12	7.9	42.6	6.9	39.6	3
2	Political instability[3]	4.34	0.88	51.5	37.6	5.9	3	2	3.91	0.94	24.8	55.4	6.9	11.9	1
3	Bureaucracy	3.97	0.91	28.7	49.5	12.9	7.9	1	4.15	0.75	31.7	56.4	6.9	5	0
4	Changes in laws and regulations	3.44	1.25	22.8	33.7	14.9	21.8	6.9	2.82	1.00	5.9	22.8	20.8	48.5	2
5	Inadequate specifications (covering deficient, ambiguous,and contradictory concepts)	3.49	1.27	24.8	36.6	7.9	24.8	5.9	3.27	1.19	17.8	31.7	11.9	36.6	2
6	Inability to evaluate bids on time and by means of an adequate procedure	3.81	1.01	23.8	51.5	7.9	15.8	1	3.38	1.07	9.9	50.5	8.9	28.7	2
7	Delay in resolving disputes	3.89	0.95	24.8	53.5	8.9	11.9	1	3.31	1.08	9.9	46.5	9.9	31.7	2
8	Changes in taxation system	3.17	1.18	14.9	27.7	22.8	28.7	5.9	2.55	0.97	3	17.8	18.8	52.5	7.9
9	Delayed progress payments [1, b]	4.65	0.64	71.3	24.8	3	0	1	4.34	0.91	52.5	37.6	3	4.9	2
10	Difficulties in obtaining credits	3.79	1.05	28.7	38.6	16.8	14.9	1	3.48	1.09	18.8	35.6	21.8	21.8	2
11	Inflation [a]	4.30	0.97	53.5	33.7	4	6.9	2	4.63	0.73	73.3	19.8	2.9	4	0
12	Exchange rate fluctuations	4.06	0.99	36.6	47.5	2	12.9	1	3.65	1.07	20.8	46.5	11.9	18.8	2
13	Interest rate fluctuations	3.82	0.98	23.8	50.5	10.9	13.9	1	3.48	1.05	14.9	44.5	14.9	24.7	1
14	Difficulty stemming from extraordinary project financing models (eg. BOT)	3.37	1.07	18.8	23.8	34.7	20.8	2	3.07	1.01	11.9	16.8	39.6	29.7	2
15	Labour disputes/strikes/lock-out	2.77	1.14	4	32.7	10.9	41.6	10.9	2.08	0.91	1	11.9	4	60.4	22.8
16	Accidents	3.36	1.25	20.8	33.7	11.9	27.7	5.9	2.58	1.12	6.9	19.8	6.9	57.4	8.9
17	Low productivity (equipment,labour)	3.71	1.14	27.7	41.6	5.9	23.8	1	3.11	1.26	16.8	28.7	7.9	41.6	5
18	Difficulties/ delays in availability of materials, equipment, and labour	3.39	1.21	16.8	42.6	8.9	25.7	5.9	2.56	1.07	5.9	18.8	8.9	58.4	7.9
19	Third-party delays	3.39	0.98	5.9	55.4	10.9	26.7	1	3.01	1.03	5	36.6	14.9	41.6	2

Table 4.4 (continued)

No (1)	Risk (2)	Importance average on a scale of 1-5 (3)	Std. dev. (4)	Importance (% response) (5)					Avg.probab. of occurrence on a scale of 1-5 (6)	Std. dev. (7)	Probability of occurrence of risk (8)				
				5	4	3	2	1							
20	Inadequate quality of work and need for correction	3.56	1.19	24.8	37.6	9.9	24.8	3	2.33	0.85	3	8.9	12.9	68.3	6.9
21	Changes in quantity/scope of work	3.33	1.07	9.9	46.5	11.9	29.7	2	3.43	1.06	13.9	44.6	11.9	29.7	0
22	Client delays (unable to get approvals, lack of payment, etc.)	4.22	0.89	43.6	43.6	4	0	8.9	3.98	0.94	30.7	48.5	8.9	11.9	0
23	Unforeseen ground conditions	3.56	1.10	17.8	47.5	10.9	20.8	3	2.62	0.99	4	21.8	9.9	61.4	3
24	Exceptionally inclement weather	3.01	1.19	7.9	38.6	8.9	35.6	8.9	2.38	0.81	0	15.8	10.9	68.3	5
25	Force majeure (earthquake, flood, storm, landslide)	3.62	1.29	31.7	32.7	7.9	21.8	5.9	2.06	0.73	0	6.9	8.9	67.3	16.8
26	Terrorism	3.77	1.28	35.6	33.7	11.9	9.9	8.9	2.19	1.04	3	10.9	13.9	46.5	25.7
27	Restrictions due to precautions against environmental pollution	2.88	1.20	6.9	31.7	17.8	29.7	13.9	2.20	1.00	2	12.9	10.9	51.5	22.8
28	Delays in design	3.70	0.98	15.8	58.4	6.9	17.8	1	2.94	1.03	3	38.6	9.9	46.5	2
29	Defective or incomplete design	3.93	0.97	26.7	54.5	5.9	10.9	2	3.01	1.19	11.9	29.7	11.9	40.6	5.9
30	A construction technique that is used for the first time (lack of experience)	3.36	1.28	20.8	34.7	11.9	24.8	7.9	2.39	0.93	4	8.9	18.8	58.4	9.9
31	Technically complex project	2.69	1.12	5.9	22.8	16.8	43.6	10.9	2.24	0.81	0	10.9	14.9	61.4	12.9
32	Financial failure of any party in the contract	4.25	0.97	49.5	36.6	5	6.9	2	2.86	1.11	5.9	28.7	18.8	38.6	7.9
33	Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence [2, c]	4.48	0.71	56.4	37.6	4	1	1	4.22	0.86	40.6	48.5	4.0	5.9	1

(Note that [1, 2, 3] corresponds to the first, second and third most important risks whereas [a, b, c] denotes the first, second, and third most frequently occurring risks.)

Importance of Risks

As seen from Column (3) of the Table 4.4, it could be concluded that all of the above risks have more or less the equal importance for the contractors in Turkey. This conclusion is reasonable since the construction sector, due to its very nature, is in close interaction with the other sectors in economy and has direct effect on them. Similarly, all the other sectors affect the construction sector in return. Besides general economic conjuncture of Turkey and government policy has great influence on the sector. In a country like Turkey where instabilities both in economy and government policies are continuous, most of the contractors are inevitably pessimistic, especially about the situations that are out of their control.

For a scale of one to five, the standard deviations are relatively low, thus revealing an industry-wide consensus for scaling risk categories.

The five most/least important risks are presented in Table 4.5 which are taken from Table 4.4. As shown in Column (3) of Table 4.4, very important risks are in the range of 4.65 for delayed progress payments to 4.25 for financial failure of any party in the construction. The risks considered very unimportant ranged from 2.69 for technically complex project to 3.17 for changes in taxation system.

Table 4.5 The Most and Least Important Risks

Level of importance	Risk
Most important	• Delayed progress payments • Insufficient demand in the construction sector, risk of not obtaining long term works and high competence • Political instability • Inflation • Financial failure of any party in the contract
Least important	• Technically complex project • Labour disputes/strikes/lock-out • Restrictions due to precautions against environmental pollution • Exceptionally inclement weather • Changes in taxation system

The obtained results show that; for Turkish contractors financial risks (overall average being 3.9), political risks (overall average being 3.8) and market risks (overall average being 4.4), which are beyond the control of Turkish contractors constitute the most important risk categories. It is reasonable that delayed progress payment is considered to be the most important one by contractors, especially when the client is the public institutions. This may even result with the termination of the contract, if the contractor does not have his progress payments on time. On the other hand, technical (overall average being 3.3) and construction related (overall average being 3.4) risks are considered as the least important ones. This is due to the fact that majority of the construction companies that have joined the questionnaire utilise modern technology in their works and also employ experienced, well educated and high quality technical staff who are open to all kinds of innovation and technological advances. For this reason, the companies are optimistic about the technical and construction related risks and believe that they are able to overcome such risks even in a very complex project they might undertake. Since most of the construction companies have insured themselves against force majeure risks with an "all risk" type of insurance, this risk is not considered as an important risk. Terrorism, especially for the companies constructing in Eastern Anatolia, is considered to be a relatively important risk. One other fact that could be derived from Table 4.5 is that, the contractors are not much sensitive about environmental pollution issues (the average being 2.88) and consider this risk as unimportant.

Comparison of Importance of Risks with Kangari's Survey

The first part of the questionnaire, including Question 4 and Question 6, is based on a survey conducted by Roozbeh Kangari [1] [27]. The data collected from these two questions of the questionnaires is compared to data collected by Kangari, covering the perceptions of 49 US contractors. The purpose of this comparison is to project

[1] Member of ASCE and Assoc.Prof., Civ.and Envir. Engr. School, Georgia Inst. of Tech., Atlanta, USA.

trends in risk perceptions of Turkish and US contractors in an attempt that will aid contractors in risk management globally.

In Kangari's questionnaire there were 23 risk descriptions, some of which are not applicable to Turkish conditions. Thus, only the risks that are in common in both of the questionnaires will be compared in Table 4.6, in terms of their degree of importance. For the ease of comparison, following ranges of responses will be used: 1-2.7 is low (very unimportant to unimportant), 2.8-3.7 is mid (neither important nor unimportant), 3.8-5 is high (important to very important).

Table 4.6 Comparison of Risk Importance

Risk	Level of Risk Importance	
	Kangari's survey	Current survey
• Delayed site hand over (site access)	Mid	Mid
• Changes in government regulations and practices	Low	Mid
• Delayed dispute resolution	Mid	High
• Changes in taxation system	Low	Mid
• Delayed progress payments	High	High
• Inflation	Mid	High
• Labour disputes/strikes	Mid	Low
• Accidents/Safety	High	Mid
• Low productivity (labour, equipment)	High	Mid/High
• Difficulties/delays in availability of materials, equipment, and labour	Mid/High	Mid
• Third-party delays	Mid	Mid
• Quality of work	High	Mid/High
• Changes in work	High	Mid
• Unforeseen ground conditions	High	Mid
• Force majeure	Mid	Mid
• Defective or incomplete design	High	High
• Financial failure-any party in the contract	High	High
• Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence (Contractor competence)	High	High

Attitudes toward risks that are characterised by the economic conditions of country, such as inflation rate, taxation system show notable differences between the results of two surveys. This difference is much more remarkable, especially in the case of inflation. Since the inflation rate in the USA is very low as compared to Turkey,

this is not considered as an important risk by the US contractors. Turkish contractors assign a higher value for the changes in taxation system as well (Turkish contractors consider it a mid level risk while the US contractors consider it low), since high taxes on progress payments bring repressive financial burden on Turkish companies.

Changes in governmental regulations and practices is given more importance by Turkish contractors. It stems from the problems related to contractor selection criteria, payments, unit prices, deficiencies in Bidding Law. On the other hand, the US contractors consider the changes in governmental regulations as the least important risk since they possess comparatively more stable and open political systems.

Dispute resolution appears as the main bottleneck in Turkish contracting system which is a very long and tedious process. Most of the construction projects end up in the courts and settlement of the dispute between parties take normally 4-5 years. In a medium of high inflation, this brings huge financial burden for the claimant since the amount to be granted will not be escalated with the real inflation rate but instead a very conservative interest rate which is very below the actual inflation rate is used. However, its importance lies in the mid range for the US contractors where they do experience a more rapid court system thus the rights of the claimants are protected in against inflation and other adverse effects.

Some of the risks shown in Table 4.6 are assigned equal importance levels both by the Turkish and US contractors. These are; delayed site handover/site access (mid-level), delayed progress payment (high-level), third-party delays (mid-level), force majeure (mid-level), defective or incomplete design (high-level), financial failure of any party in the contract (high-level), insufficient demand in the construction sector, risk of not obtaining long term works, and high competence (high-level). These risks are inevitable in the construction sector due to their very nature.

Both the Turkish and US contractors assign a mid-level importance to the risk of delayed site hand over/site access. Owners/clients sometimes fail to provide timely site access causing delays. Such delays are compensable from the point of view of contractors since the owner/client is completely responsible from this risk.

The results of both surveys indicate that, delayed progress payment is a very important risk category. Turkish contractors even consider it as the most important risk among 33 risk descriptions. If the company is not financially strong, in case of a delayed payment the company is unable to continue in business and complete projects in hand. Bank credits are by no means a guarantee of adequate working capital financing since the financial costs are very high due to high and uncertain rates of inflation being experienced in Turkey.

Third-party (excluding owner/client and contractor) delays are given a mid-level importance both by the US and Turkish contractors. According to Kangari, the increased employment of lawyers by the larger contractors reduces the importance of this risk. Third-party delays in Turkey is usually due to misunderstandings and lack of co-ordination with subcontractors, their poor performance, poor workmanship and inadequate timing. Suppliers also cause delays due to poor performance, failure to deliver materials on time or delivering poor quality materials. Delays in approvals by local authorities is another form of this risk. However, contractors can cope with this risk by taking precautions beforehand.

Force majeure risk is determined to be of mid-level importance. Although it is an uncontrollable risk, it can adequately be covered by an insurance system.

Defective or incomplete design is considered as an important risk both by the Turkish and US contractors. When a contractor is performing under a lump-sum contract, a defective design could seriously affect the contractor. It is unbelievable that some of the contractors, during the interviews, said that there were times they have signed the contract even in the absence of any project.

Financial failure of any party involved in the project is a result of the economic conditions and is assigned high degree of importance. The middle and small size companies are more sensitive to the threat of this risk. Turkish contractors with an average of 4.25 over a full scale of 5, rank it as the fifth important risk.

Insufficient demand in the construction sector, discontinuity in the supply of construction projects due to recession and/or inflation and high degree of competitiveness among the contracting companies totally reflects the market risk. This could be listed among important risks of the construction sector. Insufficient demand is the result of an unstable demand-supply balance in the Turkish economy. High competence, actually unfair competence, forces the contractor to bid for very low prices that will not generate a profit for him. As a result of this, he will neither obtain the work nor complete the work even if he gets it. For Turkish contractors, this risk is ranked as the second important risk. In Kangari's survey it is the fifth important risk since such conditions do not exist there.

Accidents/safety, quality of work, labour disputes/strikes, low productivity, difficulties/delays in availability of materials, equipment and labour, unforeseen ground conditions are assigned higher importance by the US contractors when compared to the Turkish contractors. As mentioned before, construction-related risks are given the least importance in the Turkish construction sector. On the other hand, safety and quality are ranked as the first and second important risks, respectively in the USA.

Kangari suggests that, safety comes out to be the most important risk due to the fact that contractors are more concerned about the welfare of workers whose livelihood is construction. It is a mid-level important risk in Turkey. Although it is the contractors' responsibility to provide safety on site, most of the contractors mentioned that, safety and necessary precautions against accidents are usually overlooked in Turkey. For this reason, they have to be educated about this subject and more strict inspections should be made by the related governmental institutions.

The US contractors rank quality of work extremely high in importance, second only to safety. This risk is ranked in the upper mid range by the Turkish contractors. However, there is a positive approach to the concept of quality among Turkish contractors with the introduction of Total Quality Management approach into big companies. Nowadays, many leading construction companies support the involvement of their managers and personnel in quality related training.

As it could be seen from Table 4.4, labour disputes/strikes is ranked as the second least important and rarely occurring risk in Turkey. However, in Kangari's survey it lies in the mid range. In his report, Kangari has mentioned that it is the contractor's responsibility to take action to curtail or prevent the occurrences of such risks.

Low productivity is scored as one of the most important risks in the US construction sector. It is ranked in the upper mid range by the Turkish contractors. Work-force inefficiency is one of the major causes of low productivity. In Turkey, especially at remote sites, any available person, skilled or not, is hired in order to justify the workforce requirements. Another reason for low productivity is the unwillingness of workers to work because of such factors as; fatigue, discomfort, severe weather conditions, lack of motivation, wages not paid on time, absence of trust and respect between the workers and the site engineer. Contractors should develop procedures that will improve workers' morale and co-operation among them. Besides, necessary materials, equipment and tools should be provided to workers on time and in required quantities. Equipment and machinery should be kept in proper conditions so that they can effectively be used.

Difficulties and delays in the availability of materials, equipment, and labour risk takes place in the upper mid range in Kangari's survey while it is in the mid range in present survey. This risk can be controlled through a well-defined procurement strategy.

Unforeseen ground conditions are not considered as an important risk by the Turkish contractors. On the other hand, the US contractors assigned it a high level

of importance. With the application of high technology, a thorough examination of ground conditions will minimise this risk. On the other hand, soil tests will increase the costs. For this reason, cost increases due to unforeseen ground conditions should be well defined in the contract conditions.

Probability of Occurrence of Risks

Table 4.4 Column(6) presents the average probability of occurrence of the risks defined in Column(2). It is interesting that important risks generally occur much more frequently than less important risks if Column (3) and (6) are compared. It may be due to the fact that companies have probably been hindered by these risks more often than the less important ones. Financial risks (with an overall average of 3.9) are the most frequently occurring risks. Then come the market risks (overall average being 3.6) and political risks (overall average being 3.4). It is not surprising that force majeure risks are the rarely occurring risks (overall average being 2.13). If the risks are considered separately; the five most/least frequently occurring risks are illustrated in Table 4.7. As shown in Column (6) of Table 4.4, the risks occurring very frequently ranged from 4.63 for inflation to 3.98 for client delays (unable to get approvals, lack of payment, etc.) The risks occurring rarely ranged from 2.06 for force majeure to 2.24 for technically complex project.

Table 4.7 Most and Least Frequently Occurring Risks

Level of frequency	Risk
Most frequently occurring	• Inflation • Delayed progress payments • Insufficient demand in the construction sector, risk of not obtaining long term works and high competence • Bureaucracy • Client delays
Least frequently occurring	• Force majeure (earthquake, flood, storm, landslide) • Labour disputes/strikes/lock-out • Terrorism • Restrictions due to precautions against environmental pollution • Technically complex project

During the interviews with the contractors, before the survey was completed, most of them predicted inflation to come out the most frequently occurring risk. The survey results support this expectation. It is a fact that high and uncertain inflation rate being experienced in Turkey introduces an important risk with high probability of occurrence into construction industry. It has an overall influence on construction prices. Besides, it affects decisions about long term investment in equipment, machinery , facilities, or the price charged for their services. Moreover, contractors are unable to control this risk element since it can only be controlled through long term macro-economic regulations.

Other Risks

Questions 4 and 5 include an "other" option to find out what the other risks, except the ones that have been asked in the questionnaire, may be encountered in the Turkish construction sector. The obtained results are presented in Table 4.8. It is better to exclude those risks from the data analysis because they reflect a few number of respondents' view (since it was optional to respond).

Table 4.8 Other Risks

No. of Respondents	Risk	Level of Importance	Probability of Occurrence
1	• Inappropriate or lack of organisational structure in the company	5	5
4	• Unqualified technical staff	4	5
1	• Inappropriate contracting strategy (especially when the client is the public institutions)	5	5
1	• Deficiencies in the State Bidding Law (No.2886)	5	5
1	• Limited number of consultancy organizations in Turkey	5	5
1	• Lack of co-ordination between companies and universities	4	2
1	• Low credibility of Turkey	4	4
1	• Increase in material and labour prices are not reflected to unit prices	5	4

As observed from the above presented Table, only a few of the contractors contributed to this option of Question 4 and 5.

4.2.2.2 Allocation of Risks

The results of Question 6 will be discussed in this part. By asking this question, it has been aimed to determine the apportionment of risk between the parties to a contract (including contractor and client) from a contractor's viewpoint. In this questionnaire, the respondents are selected among the contractors that is; the clients are out of the sample population. However, it would be much better to consider the client's perception as well to compare each parties' approach to risk allocation and find out conflicting and/or common points.

The responses to Question 6 are placed into the following categories: allocation of risk to the client, allocation of risk to the contractor, or sharing of the risk.

Question 6. Respondents are requested to put a "√ " to the suitable cell according to whether the risks (defined in Question 4 and 5) are totally accepted by the client (Client), or totally accepted by the contractor (Contractor), or shared equally by both parties (Shared).

Table 4.9 Allocation of Risk

		Risk Allocation		
No (1)	Risk (2)	Client % (3)	Shared % (4)	Contractor % (5)
1	Delayed site hand over (delayed expropriation, etc.)	68.6	25.5	5.9
2	Political instability	33.3	49.0	17.6
3	Bureaucracy	38.2	29.4	32.4
4	Changes in laws and regulations	32.4	38.2	29.4
5	Inadequate specifications (covering deficient, ambiguous, and contradictory concepts)	37.3	32.4	30.4
6	Inability to evaluate bids on time and by means of an adequate procedure	47.1	23.5	29.4
7	Delay in resolving disputes	17.6	57.8	24.5
8	Changes in taxation system	36.6	34.7	28.7
9	Delayed progress payments	50.0	6.9	43.1
10	Difficulties in obtaining credits	11.0	51.0	38.0
11	Inflation	27.5	53.9	18.6
12	Exchange rate fluctuations	29.4	39.2	31.4
13	Interest rate fluctuations	21.8	39.6	38.6
14	Difficulty stemming from extraordinary project financing models (e.g. BOT)	20.6	51.0	28.4
15	Labour disputes/strikes/lock-out	7.0	36.0	57.0
16	Accidents	0	13.9	86.1

Table 4.9 (continued)

No (1)	Risk (2)	Risk Allocation Client % (3)	Shared % (4)	Contractor % (5)
17	Low productivity (equipment, labour)	0	6.9	93.1
18	Difficulties/ delays in availability of materials, equipment, and labour	0	10.8	89.2
19	Third-party delays	2.9	48.0	49.0
20	Inadequate quality of work and need for correction	0	25.5	74.5
21	Changes in quantity/scope of work	35.3	49.0	15.7
22	Client delays (unable to get approvals, lack of payment, etc.)	60.8	14.7	24.5
23	Unforeseen ground conditions	14.7	56.9	28.4
24	Exceptionally inclement weather	6.9	59.4	33.7
25	Force majeure (earthquake, flood, storm, landslide)	14.9	72.3	12.9
26	Terrorism	23.8	60.4	15.8
27	Restrictions due to precautions against environmental pollution	9.8	59.8	30.4
28	Delays in design	30.4	31.4	38.2
29	Defective or incomplete design	26.5	35.3	38.2
30	A construction technique that is used for the first time (lack of experience)	1.0	50.5	48.5
31	Technically complex project	5.9	43.6	50.5
32	Financial failure of any party in the contract	4.9	79.4	15.7
33	Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence	4.9	28.4	66.7

Detailed examination of the Table reveals that, there does not exist a consensus on the allocation of risks by the respondents. A few of the risks were interpreted with reasonable consistency by the respondents.

Table 4.10 summarizes the allocation of risk categories in the order of responses for each risk category. For example, as shown in Table 4.10, low productivity had 93.1% responses in favor of the contractor assuming the risk, while technically complex projects had 50.5%. While arranging the Table 4.10, it is assumed that the risks with a minimum of 50% response rate in favor of any party (contractor, client, or shared) are allocated to that party. This percentage can be higher for more definite risk allocation as Kangari uses in his analysis (e.g. 70%). In the current analysis, due to contractors' conflicting responses, a lower percentage will be taken as a bottom limit for reaching a general idea about risk allocation.

Survey results have revealed that, only three of the risks, ranging from delayed site hand over with a 68.6% to delayed progress payments with 50% response rate are allocated to the client. These are certainly considered as the clients' risks, as the clients are in the most favourable position to undertake the burden of those three risks. A total of seven risks; five of them construction risks, one of them technical and the another one market risk, are allocated to the contractor. Results clearly reveal that; the contractors have agreed that most of the risks are better to be shared. The cost overruns resulting from delays due to unforeseen ground conditions, exceptionally inclement weather, force majeure and terrorism have to be compensated by the client and in that case, the contractor should have the right to demand for the increase in cost. For that reason, contractors have considered those four risks to be shared between the parties. Allocation of ten risks remained undecided. When the risks in this group are examined, it is observed that neither the contractor nor the client can control these risks since the major source of these risks are regulations, laws and macro economic conditions in the country.

Table 4.10 Summary of Risk Allocation

Risk allocation	Risk
Contractor	• Low productivity (equipment, labour) • Difficulties/delays in availability of materials, equipment, and labour • Accidents • Inadequate quality of work and need for correction • Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence • Labour disputes/strikes/lock-out • Technically complex project
Owner/Client	• Delayed site handover (delayed expropriation, etc.) • Client delays (unable to get approvals, lack of payment, etc.) • Delayed progress payments
Shared	• Financial failure of any party in the contract • Force majeure (earthquake, flood, storm, landslide) • Terrorism • Restrictions due to precautions against environmental pollution • Exceptionally inclement weather • Delay in resolving disputes • Unforeseen ground conditions • Inflation • Difficulty stemming from extraordinary project financing models (e.g. BOT)

Table 4.10 (continued)

Risk allocation	Risk
Shared (continued)	• Difficulties in obtaining credits • A construction technique that is used for the first time (lack of experience) • Changes in quantity/scope of work • Political instability
Undecided	• Third-party delays • Interest rate fluctuations • Defective or incomplete design • Delays in design • Bureaucracy • Exchange rate fluctuations • Inadequate specifications (covering deficient, ambiguous, and contradictory concepts) • Changes in laws and regulations • Inability to evaluate bids on time and by means of an adequate procedure • Changes in taxation system

Table 4.10 clearly shows that Turkish contractors are either accepting or sharing the risk. Only three risks are considered as the client's risk, inevitably. During the interviews with the contractors, they mentioned that clients usually do not like to take any risk and would like to place all the risk contractually on their contractors. Contractors, without any argument, have to accept the contract as it has been prepared by the client. Due to this reason, contracts in Turkey are usually one-sided.

Comparison of Risk Allocation with Kangari's Survey

Findings of the Kangari's survey show that, the contractors are willing to accept risk as it is the case in the present survey. For the comparison, the risks in Table 4.6 are considered. Similarities of the responses to risk allocation in both surveys will be discussed first, followed by the differences.

Table 4.11 Comparison of Risk Allocation (K:Kangari's survey, P:Present survey)

Risk	Risk Allocation			
	Client	Shared	Contractor	Undecided
• Delayed site hand over (site access)	K, P			
• Changes in government regulations and practices (laws as well)	K			P
• Delayed dispute resolution		K, P		
• Changes in taxation system	K			P
• Delayed progress payments	K, P			
• Inflation		P	K	
• Labour disputes/strikes			K, P	
• Accidents/Safety			K, P	
• Low productivity (equipment and labour)			K, P	
• Difficulties/delays in availability of materials, equipment, and labour			K, P	
• Third-party delays				K, P
• Quality of work			K, P	
• Changes in work	K	P		
• Unforeseen ground conditions	K	P		
• Force majeure		P		K
• Defective or incomplete design	K			P
• Financial failure-any party in the contract		K, P		
• Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence			K, P	

Responses to both of the surveys show similarities, that is 11 out of 18 risks (61%) are allocated to the same category in both of the surveys.

There is a consensus, especially, on the construction risks that are agreed to be totally under the responsibility of the contractor. The most remarkable agreed upon risk is the low productivity due to labour and equipment. The responses in both surveys recorded more than 90% in favour of the contractor assuming this risk. Difficulties/delays in availability of materials, equipment, and labour; quality of material; accidents; labour disputes are the other construction risks assumed as contractor risks. High competence is conceded industrywide as a risk to be borne by the contractor in both surveys.

At that point, it is meaningful to note that low productivity; difficulties/delays in availability of materials, equipment, and labour and quality of work are three risks that contractors consistently favour assuming. Not only did contractors overwhelmingly designate them as their responsibilities, in both of the surveys and ASCE survey (Kangari's survey is based on that survey, 1979), but current writings of contractors and academics also support this position. No dissenting views were uncovered for any of these risks up to now [28].

The risks that are allocated to the client in both surveys are only delayed site hand over (site access) and delayed progress payments. These two risks are difficult for the contractor to control or protect himself from.

All of the risks discussed thus far have been identified as possessing a trend of consistency in both the US and Turkish construction sectors. Contractors have perceived these risks as belonging to either themselves or clients.

Only two risks are designated as shared by the contractors in both of the surveys. These are delayed dispute resolution, and financial failure of any party. Since dispute resolution is a contractual/legal matter between two parties, it is considered inevitably as a shared risk. Financial failure of any party is mostly related to the recent economic conditions of the country. As a result of recessions, the number of business failures generally increases. Such situations can explain the desire to share this risk. As the probability of failure increases, contractors understandably prefer to share this uncontrollable risk, thereby limiting vulnerability [28].

Third-party delays is somewhere in between shared and contractor's risk in present survey and it is in between shared and client's risk in Kangari's. It totally remains undecided and could not be categorised in both surveys.

Responses to the two surveys show differences regarding changes in government regulations and practices, changes in taxation system, inflation, changes in work, unforeseen ground conditions, force majeure, defective or incomplete design.

In Kangari's survey; the contractors considered changes in government regulations, practices and taxation system, inflation, unforeseen ground conditions, changes in work and defective (or incomplete) design as belonging to the client. When the present survey is considered, changes in government regulations, practices and taxation system are not assigned to any category. Instability in Turkish government is the major cause of this indecision. Another undecided risk is the defective (or incomplete) design. The allocation of this risk is just a mixture of all three options. Turkish contractors prefer to share inflation, unforeseen ground conditions, changes in work and force majeure with the client. US contractors have totally assigned these risks, except force majeure, to the clients. Force majeure risk has remained undecided (somewhere between shared and client responsibility) in the Kangari's survey.

4.2.3 Risk Perceptions of Turkish Contractors In International Construction Projects

In this part of questionnaire (including Questions 7,8, and 9) it is intended to provide current attitudes of Turkish contractors towards the importance of risks encountered in international construction projects and their probability of occurrence.

Question 7. Has your company engaged in international contracts?

Table 4.12 Breakdown of Responses to Question 7

	No. of companies	% Response
Yes	54	52.4
No	49	47.6
Total	103	100.0

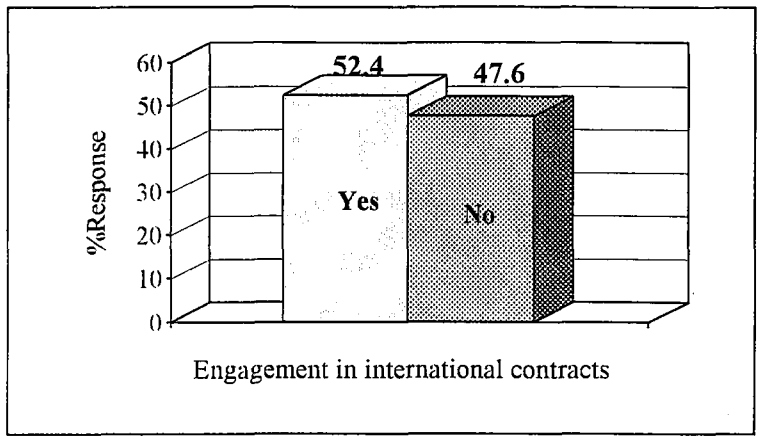

Figure 4.4 Percentage Breakdown of Responses to Engagement of Contractors in International Construction Projects

As the Figure 4.4 illustrates, more than half (52.4%) of the contractors that joined the survey have been experienced in international contracts.

During the interviews, the contractors have mentioned that at the moment they are operating in the Russian Federation, Libya, Kazakhstan, Turkmenistan, Germany, and Kuwait. Most of the projects take place in Russia and they are mostly building, housing and industrial plant type of projects.

4.2.3.1 Importance and Probability of Occurrence of Risks Encountered In International Construction Projects

Question 8. Risks that can probably be encountered in international construction projects are listed in the following table (Table 4.13). Respondents are requested to put a "√ " to the suitable cell where the number determines the level of risk importance and most closely approximates their opinion as a contractor. For a full scale of 1 to 5;

5 = Very important

4 = Important

3 = Neither important nor unimportant

2 = Unimportant

1 = Very unimportant

Question 9. Respondents are requested to put a "√ " to the suitable cell where the number best determines the probability of occurrence of risk and most closely approximates their opinion as a contractor. For a full scale of 1 to 5;

5 = Always

4 = Quite often

3 = Undecided / Neutral

2 = Rarely

1 = Never

Responses to questions 8 and 9 will be analysed in the same table, Table 4.13, that is similar to Table 4.4.

Table 4.13 Importance and Probability of Occurrence of Risks Encountered In International Construction Projects

No (1)	Risk (2)	Importance average on a scale of 1-5 (3)	Std. dev. (4)	Importance (% response) (5)					Avg. probab. of occurrence on a scale of 1-5 (6)	Std. dev. (7)	Probability of occurrence of risk (8)				
				5	4	3	2	1			5	4	3	2	1
1	Convertibility of the currency of the country of operation	4.16	1.21	56.9	22.4	3.4	13.8	3.4	3.53	1.24	28.1	29.8	10.5	29.8	1.8
2	Economic instability in the country of operation (high inflation, etc.)	4.38	0.90	55.2	36.2	1.7	5.2	1.7	3.53	1.12	17.5	45.6	12.3	21.1	3.5
3	Taxation system in the country of opr.	4.16	0.99	43.1	41.4	5.2	8.6	1.7	3.51	1.27	28.1	28.1	15.8	22.8	5.3
4	Unable to repatriate profits totally and/or freely out of the country	4.35	0.89	53.4	34.5	6.9	3.4	1.7	3.26	1.32	17.5	38.6	7.0	26.3	10.5
5	Clients not paying on time (irregularities in cash flows)	4.53	0.78	63.8	31.0	1.7	1.7	1.7	3.68	1.06	17.5	56.1	7.0	15.8	3.5
6	Political instability	4.28	0.93	50.0	36.2	6.9	5.2	1.7	3.39	1.16	17.5	36.8	15.8	26.3	3.5
7	Level of political/ethical corruption	3.86	1.07	31.0	41.4	12.1	13.8	1.7	3.35	1.17	19.3	31.6	15.8	31.6	1.8
8	Political sequestration of machinery, equipment, or other assets	4.12	1.13	50.0	27.6	10.3	8.6	3.4	2.35	0.95	1.8	14.0	15.8	54.4	14.0
9	Delays/ obstacles due to bureaucracy	4.19	0.85	37.9	50.0	6.9	3.4	1.7	3.72	0.88	14.0	57.9	14.0	14.0	0
10	Level of political/economic/cultural relations between two countries	3.97	0.97	32.8	43.1	12.1	12.1	0	3.21	1.13	12.3	33.3	22.8	26.3	5.3
11	Embargoes	4.17	1.16	55.2	24.1	6.9	10.3	3.4	2.46	1.32	10.5	14.0	14.0	33.3	28.1
12	Military interferences	4.14	1.13	50.0	31.0	5.2	10.3	3.4	2.19	1.13	5.3	8.8	15.8	40.4	29.8
13	War	4.33	1.13	65.5	17.2	5.2	8.6	3.4	2.12	1.05	5.3	5.3	14.0	47.4	28.1
14	International competence	3.88	0.98	25.9	50.0	12.1	10.3	1.7	3.81	0.89	15.8	61.4	14.0	5.3	3.5
15	Unaccustomed standards, provisions (quality, health, safety, etc.)	3.79	1.02	27.6	39.7	17.2	15.5	0	3.30	1.13	14.0	36.8	17.5	28.1	3.5

Table 4.13 (continued)

No (1)	Risk (2)	Importance average on a scale of 1-5 (3)	Std. dev. (4)	Importance (% response) (5)					Avg. probab. of occurrence on a scale of 1-5 (6)	Std. dev. (7)	Probability of occurrence of risk (8)				
				5	4	3	2	1			5	4	3	2	1
16	Severe environmental conditions of the country (climate, geography, etc.)	3.47	1.10	15.5	43.1	17.2	20.7	3.4	2.98	1.01	1.8	38.6	21.1	33.3	5.3
17	Difficulties/delays in availability of local labour	3.30	1.10	12.1	43.1	12.1	31.0	1.7	2.74	1.09	3.5	29.8	12.3	45.6	8.8
18	Difficulties/delays in avail.of materials	3.69	1.14	24.1	46.6	6.9	19.0	3.4	3.04	1.12	7.0	38.6	8.8	42.1	3.5
19	Problems due to local subcontractors	3.41	0.99	6.9	55.2	12.1	24.1	1.7	3.00	1.07	3.5	40.4	14.0	36.8	5.3

Importance of Risks Encountered in International Construction Projects

When Column (3) of Table 4.13 is analysed, nearly all the risks are considered as important. This is due to the fact that international construction projects offer to a contractor the prospect of greater profit commensurate with much greater risk. From another viewpoint, contractors believe international contracts to be much risky due to the economic and political conditions of country of operations. Libya constitutes a good example for this situation. As a result of the UN embargo, Libya has been in great economic difficulties. This situation caused many Turkish contractors to quit working in Libya, that was once the greatest employer. Nowadays, Libya is far from justifying any expectation of a promising market for Turkish contractors at least in the near future [29]. Another example is the bureaucracy in Russian Federation. It imposes difficulties for the contractors operating in this country. Besides, all these facts, investment banking for international contracts has not developed in Turkey and the Turkish Eximbank's credit opportunity for financing is not satisfactory. Shortly, it is quite difficult for Turkish international contracting to maintain its markets or to enter into new ones.

For a scale of one to five, the standard deviation, being relatively low is an indication of consensus among contractors.

The five most/least important risks are illustrated in Table 4.14. As shown in Column (3) of Table 4.13, the risks deemed very important ranged from 4.53 for clients not paying on time (irregularities in cash flow) to 4.28 for political instability. The risks deemed unimportant ranged from 3.3 for difficulties/delays in availability of local labour to 3.79 for unaccustomed standards and provisions (quality, health, safety, etc.)

Table 4.14 Most and Least Important Risks In International Contracts

Level of importance	Risk
Most important	• Clients not paying on time (irregularities in cash flow) • Economic instability in the country of operation (high inflation, etc.) • Unable to repatriate profits totally and/or freely out of the country of operations

Table 4.14 (continued)

	• War • Political instability
Least important	• Difficulties/delays in availability of local labour • Problems due to local subcontractors • Severe environmental conditions of the country (climate, geography, etc.) • Difficulties/delays in availability materials • Unaccustomed standards, provisions (quality, health, safety, etc.)

Results show that financial and political risks again constitute the most important risks, as it is in Question 4 (risks encountered in Turkish Construction sector). About 95% of the respondents have assigned either very important (5) or important (4) to risk of clients not paying on time or failing to pay. This causes financial problems and delays in projects. In my opinion, the second important risk that is the economic instability in the country of operation is the major source of client's inability to pay, as well as the political instability of the country that is the fifth important risk.

The state of the national economy of the country of operation clearly has a widespread impact upon a construction project. Economic conditions may change from country to country; it may be internationally creditworthy or already burdened with excessive debt. Since the potential client is the government in most of the international projects and the project is internally government financed, the national economy determines the client's eventual ability to pay. Payments may be tardy if the government runs into economic difficulties. The national economy may also impact the promptness and reliability of payment by a private sector client. In the case of an externally aided project actual payments to the contractor may be insulated from the national economy. However, the state of economy has impacts beyond the issue of contract payments; it will certainly shape the local working environment. For example, there can be a shortage of skills and few manufactured products, although labour, basic food and raw materials may be readily available and inexpensive. The condition of the economy is also a major factor in the motivation of the parties who initiate the project. Projects that will, directly or indirectly,

satisfy an urgent human need for say food or shelter are likely to attract funding from national or international agencies [30].

Other financial risks considered as important (when ranked they are the 8th important risk having the same importance average 4.16) by Turkish contractors worth mentioning; convertibility of the currency and taxation system of the country of operation. For the funding of various aspects of project performance (including purchase and import of materials and equipment; remitting by expatriate staff of any savings from salaries paid locally; and transferring by the contractor from its external earnings of a contribution to home overheads and of its profit) a contractor needs internationally convertible currency. Besides, the stability of the exchange rate, or a controllable currency is another point. The contractors can protect themselves from fluctuating exchange rate through hedging. They usually buy forward, agreeing to pay a predetermined rate, at a foreseen future date, when a particular currency will be required for the purposes of the project.

Local taxation is also a prime concern. Taxes, duties, etc. are charged by the government of many countries of operation. These include;

- charges on any or all of company turnover, profits or offshore remittances.
- charges on the wages, salaries, allowances and benefits paid to local and expatriate employees.
- charges on the import of materials, equipment and spares.
- charges on the extraction of raw materials and on the transfer of materials across regional boundaries within the country.
- charges for a specific social or national purpose. These may be for supporting education, or perhaps a national defence fund contribution [30].

Besides, double taxation is a financial burden for the contractors. They have to pay taxes both at home and in the country of operation. This case is especially valid for contractors operating in Russian Federation.

The third important risk is related with the repatriation of profits; Turkish contractors operated in Libya experienced it. During the interviews, contractors mentioned that they could not repatriate their profits totally/partially out of the country due to military and political reasons. Related to this risk the contractors have also met, in some cases, risk of political sequestration of equipment, or other assets, or detention of staff especially in North African countries. This risk is assigned an importance average of 4.12 meaning that it is relatively an important risk.

War is the fourth important risk for Turkish contractors. Since its occurrence is rare, its importance is relatively low. In fact, in case of a war or civil disorder termination of the contract is unavoidable. The most striking example was the Gulf War. Following this war, economy of the Middle East countries including Iraq, Saudi Arabia and Kuwait, which were once the greatest employers of Turkish contractors, entered into a serious crisis. Afterwards, most of the Turkish contractors quit working in these countries.

Political instability of the country of operation is ranked as the fifth important risk. In much of the international construction, the client is a government and a contractor's relationship with the client or potential client is conditioned by government structure. Since the possibility of existence of a non-government structure or private sector is in turn dependent on government structure, its influence is virtually all-embracing. Influence of the changes in government structures and political pressures on the contractors has been considerable in recent years. A contractor wishing to work in a country has no alternative but to acknowledge the government structure, as well as bureaucracy and administration.

Delays/ obstacles due to bureaucracy is ranked as the sixth important risk. Together with bureaucracy, lengthening channels of communications and delays in decision processes directly affect the completion time and efficiency of construction projects. The overcoming of bureaucratic difficulties can be tedious and time consuming. Where the due processing of a particular document is critical,

contractors have arranged for a representative to accompany it on its path from desk to desk, as each clerk makes his necessary contribution to the process, to ensure that no avoidable delay occurs. The situation in Turkey is similar.

Another important risk is the embargoes, that is ranked as the seventh important risk by the contractors. As mentioned before, Libya constitutes a good example for this situation. As a result of the UN embargo, Libya has been in great economic difficulties. Most of the Turkish contractors had to quit operating in this country. A very striking fall has later been observed in the market share of this country.

Military interferences, after convertibility of currency and taxation system in the country of operation risks (mentioned before), is ranked as the 9th. important risk with an importance average of 4.14. This risk is followed by political sequestration of machinery, equipment, or other assets that was mentioned before.

Level of political/economic/cultural relations between two countries is ranked in the upper mid-range (importance average being 3.98). The degree of such relation is basically dependent on the political relation between two countries. Other two, especially economic relations, are influenced by the former one. Cultural relations may include language, legal system and social environment, etc. Clearly, a known language and general familiarity with the legal system reduce the unknowns facing a contractor. But it does not constitute much problem as the contractors mentioned. The social environment may affect decisions made by the contractor. There may be religious restrictions as it is in Saudi Arabia, Libya. There is also the question of social facilities and amenities, medical care and recreational facilities. These, from the contractor's viewpoint, are some of the features of the social environment that need to be considered in forming a judgement as to how willing the staff and workforce would be to become part of the local community and how successful they would be in doing so.

International competence with the importance average being 3.88 is not considered as an important risk by Turkish contractors. In my opinion, it is due to the well-known success and self-respect of Turkish contractors in international construction

works. But competition from the local industry (where sufficiently developed) may be experienced. The local industry has considerable advantages; it will be familiar with local conditions and is likely to receive preference in the bidding or selection process which may seek to encourage local industry.

Level of political/ethical corruption is ranked as the sixth unimportant risk by the contractors with the importance average 3.86. This is followed by the risk of unaccustomed standards and provisions related with quality, health, safety, etc. It is considered as somewhat not an important risk with a scoring of 3.79. The standards and provisions of country of operation may not match those of Turkey and may be very complicated as some of the contractors have mentioned during the interviews. For example, the standards of Russia have been so complex and outdated that even the Russian people have had difficulties in understanding them. But, as the contractors have gained experience and know-how in this country, this risk has no longer been considered as an important risk.

Difficulties and/or delays in the availability of materials is the fourth least important risk with the importance average being 3.69. In fact, suitability, location as well as the availability of materials are crucial to the project. How the work is to be done and its costs will be influenced by the materials available. Since the contractors can manage this risk, it is not much of importance.

Severe environmental conditions of the country including climate and geography, in today's technology, is not a hindering factor for the progression of the construction work. For this reason its importance average is low, that is 3.47. Both individuals and operations have increasingly effective protection against effects of climate.

Problems due to local subcontractors (importance average is 3.41) and difficulties and/or delays in the availability of local labour (imp.avg. is 3.30) are the least important risks for the contractors. Contractors have explained why they assigned lower values to these risks as bringing their workforce and subcontractors with them. They do not want to employ any local subcontractor or labour. Local

subcontractors in the countries where Turkish contractors operate may not be so much specialised in the areas acquired. Instead contractors prefer their own subcontractors that are much easier to control and communicate.

Probability of Occurrence of Risks Encountered in International Construction Projects

Column (6)of Table 4.13 presents the average probability of occurrence of the risks defined in Column (2). When the average probability of occurrence of risks is examined it is observed that all the scores are gathered in between 3.8 and 2.1, meaning that the contractors are either undecided or neutral (the occurrence is neither very often nor rare). This can be explained by the fact that the occurrence of these risks may change from one country to another and from one project to another project to a great extent. It was also mentioned by the contractors while they respond to this question. For this reason, the validity of responses is open to argument.

The five most/least frequently occurring risks are illustrated in Table 4.15. As shown in Column (6) of Table 4.13, the risks occurring frequently to a degree are ranged from 3.81 for international competence to 3.51 for taxation system in the country of operation. The risks occurring rarely ranged from 2.12 for war to 2.74 for difficulties and/or delays in availability of local labour.

Table 4.15 Most and Least Frequently Occurring Risks Encountered In International Construction Projects

Level of frequency	Risk
Frequently occurring	• International competence • Delays/ obstacles due to bureaucracy • Client not paying on time(irregularities in cash flows) • Economic instability in the country of operation (high inflation, etc.), and Convertibility of the currency of the country of operation (having the same average, 3.53) • Taxation system in the country of operation
Rarely occurring	• War • Military interferences • Political sequestration of machinery, equipment, or other assets • Embargoes • Difficulties/delays in availability of local labour

Other Risks Encountered In International Construction Projects

Other risks that have been mentioned by contractors are presented in Table 4.16. It is better to exclude these risks from analysis because they reflect a few number of respondents' view (it was optional to respond to this part).

Table 4.16 Other Risks

No. of Respondents	Risk	Level of Importance	Probab.of Occurrence
1	• Double taxation	4	4
1	• Difficulties encountered in obtaining credits	5	5
1	• Unable to export and import the materials, machinery, and equipment without delays and difficulties	4	3
2	• Other countries' construction companies have their government's political and financial support while Turkish contractors do not	5	5
1	• Creditworthiness	5	4
1	• There is no insurance system against political risks in other countries	4	3
1	• Turkish Eximbank credits are not satisfactory	4	4

As observed from the above table, the most important risk is the lack of governmental support. Government should provide the necessary financial and political support to the contractors as they are entering an international construction project. Besides, Government (Under-Secretariat of Treasury) should actively take part in finding solutions to the problems of the construction sector related to obtaining credits and insurance against political risks in abroad, as well as exporting and importing materials, machinery, and equipment without delays and difficulties.

Creditworthiness is also considered as an important risk. As long as Turkey has a low credit standing, foreign commercial banks and bond market investors have shied away from dealing with Turkey in terms of providing credit.

Double taxation is another risk mentioned by the contractors. In some cases there is international relief from the effect of this risk. It is known as double taxation relief,

where the Under-Secretariat of Treasury, either by the reciprocal arrangement with the country of operations will offset tax paid in the country of operations against tax otherwise payable at home. Where such taxes are on a comparable basis the contractor pays the higher of the two charges.

4.2.4 Serious Effects of Risks

Question 10. The serious effects of risks are listed below. Respondents are requested to circle the number that most closely approximate their attitude about the effect of risk. For a scale of 1 to 5;

5 = Very important

4 = Important

3 = Neither important nor unimportant

2 = Unimportant

1 = Very unimportant

Table 4.17 Measurement of Contractor Attitude Toward the Serious Effect of Risk

Effect of Risk	Mean	Std.dev.	% Response				
			5	4	3	2	1
• Final cost being higher than the estimated cost	4.52	0.84	67	25	2	5	1
• Failure to achieve the project within the required completion date	4.30	0.71	41	52	3	4	0
• Failure to achieve the required quality	4.12	0.91	37	47	7	8	1
• Injury to workers and other personnel	3.60	1.33	36	22	14	22	6
• Damage to company image	4.40	0.95	63	22	7	7	1

In this question, it can be concluded that all the above effects of risks have more or less the equal importance for a contractor in Turkey. However, the most serious effect of a risk on a construction company is found to be "final cost being higher than the estimated cost". Since most risks in construction projects are financially related, the emphasis is on the financial effect criterion. It is followed by "damage to company image". Adversely effected company image is very critical for the company's status in the market. Failure to achieve the project within the required completion date, as well as quality are also serious from the contractor's point of

view. Adverse effects of risks on workers and other personnel are not given the necessary importance. Relatively low standard deviations, except for "injury to workers and other personnel" indicate a consensus on the importance of effects of risks. On the contrary, contractors are undecided about adverse effects of risks on workers and other personnel.

Question 11. In terms of construction work, what type of projects in Turkey carries more risk relative to others? Respondents are required to circle the number that most closely approximates their attitude. For a scale of 1 to 5;

5 = Very risky

4 = Somewhat risky

3 = Neutral/ No idea

2 = Somewhat not risky

1 = Not risky

Table 4.18 Comparison of Construction Work Types In Terms of Risk They Carry

			% Response				
Type of Construction Work	Mean	Std.dev.	5	4	3	2	1
Engineering Structures	4.13	0.98	43	39	8	9	1
Motorways	3.39	1.02	12	40	25	21	2
Energy Transmission and Distribution Lines/Telecommunication Network Constr. Operation and Maintenance	3.28	0.96	9	34	35	20	2
Building Construction	2.85	1.08	6	27	19	42	6
Industrial Construction	3.92	0.90	27	49	14	10	0

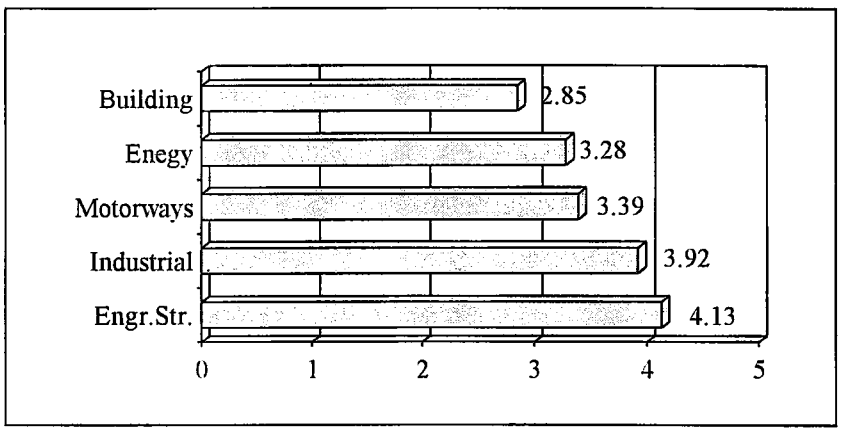

Figure 4.5 Ranking of Construction Works In Terms of Risk They Carry

(5 = Very risky, 4 = Somewhat risky, 3 = Neutral/No idea, 2 = Somewhat not risky, 1 = Not risky)

Turkish contractors consider engineering structure (infrastructure) projects as the most risky type in the construction sector. Then comes industrial construction projects. Contractors are neutral about motorways, energy transmission and distribution lines/telecommunication network construction, operation and maintenance projects. Building construction is somewhat not risky.

The results can only be explained through the economic trends and the Government's investment policy. Building construction projects are relatively not risky when compared with the other types of construction work. Because parallel to increasing population and developing cities, demand for buildings increases day by day. As a result, investment for building construction is supported and given priority by the Government agencies as well as private sector clients. Recently, there has been a considerable increase in mass housing construction. On the other hand, engineering structure projects are considered very risky due to the fact that such projects are regulated through the Government's investment policy to a great degree. Due to instabilities in the general economic condition, considerable delays in existing engineering structure construction has occurred as the result of suspended payments. Especially between years 1994-1995, such problems have been confronted in the most severe form. In recent years, contractors who could not get their money and great differences between defined prices and current market prices due to high inflation result in a dramatic fall in engineering structure project investments [25]. Industrial construction projects can also be considered risky with a scoring of 3.98. The restrictions against environmental pollution and very complicated techniques used for this type of projects make them risky.

Question 12. In your opinion, in Turkey for high-risk projects, is risk allocation defined clearly and appropriately in tender documents?

Table 4.19 Breakdown of Responses to Question 12

	No. of companies	% Response
Yes	15	14.6
No	83	80.6
Missing	5	4.8
Total	103	100.0

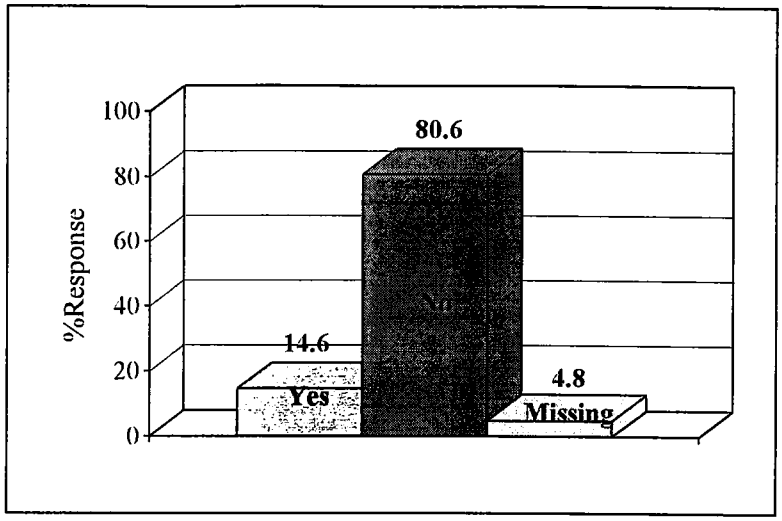

Figure 4.6 Percentage Breakdown of Responses to Definition of Risk Allocation in Tender Documents

As seen from Figure 4.5, five of the respondents have not contributed to this question at all. Only about 15% of the respondents believe that for high-risk projects, risk allocation is clearly and appropriately defined in tender documents. Remaining part of the sample, about 81% of the respondents, do not think that there is such an application in Turkey.

In this question, respondents whose response is "No" are requested to proceed with an explanation. Summary of the contractors' opinions related to why risk allocation is not defined in even high-risk projects are as follows:

1. Deficiencies and inconsistencies of the State Bidding Law No:2886 is the major cause of unfair allocation of risks. The Bidding Law has to be revised and updated by experienced technical staff.
2. A government agency responsible for the evaluation of projects and tenders has to be established.
3. Uncertainties are usually allocated to the contractors for the advantage of the client, that is not fair.
4. Most of the contracts are of one type and include one-sided provisions allocating a large or unclear amount of risk to the contractor.

5. The public sector does not want to take any risk in projects.
6. Both the client and the contractor are not much aware of the concept of risk and risk management
7. The client's budget does not include any allowance to deal with serious risks. (Actually, the contractors cannot even get their payments on time.)
8. Political instability in Turkey is another important factor mentioned by the contractors.
9. Even the client cannot know what risks will be encountered.
10. While tender documents are prepared, the characteristics of the project are not taken into consideration much. Because these documents are usually standardised.

In summary, the contractors believe that the major shortcomings in allocating risks to parties appropriately and fairly stem from the Governmental procedures and regulations.

Question 13. In Turkey, which type of contracts carries more risk? Respondents are required to circle the number that most closely approximates their attitude. For a scale of 1 to 5;

5 = Very risky

4 = Somewhat risky

3 = Neutral/ No idea

2 = Somewhat not risky

1 = Not risky

Table 4.20 Comparison of Contract Types In Terms of Risk They Carry

			% Response				
Type of Contract	Mean	Std.dev.	5	4	3	2	1
Unit Price (Ministry of Public Works)	3.70	1.19	28	41	10	15	6
Offered Unit Price	2.60	1.04	3	22	16	48	11
Lump Sum	3.90	1.07	35	33	16	16	0
Cost+Fee	1.50	0.64	0	1	5	36	58
Turnkey	3.93	1.00	33	40	14	13	0
Build-Operate-Transfer (BOT)	3.55	1.07	21	34	27	15	3
Build-Sell	2.98	1.10	8	28	25	32	7

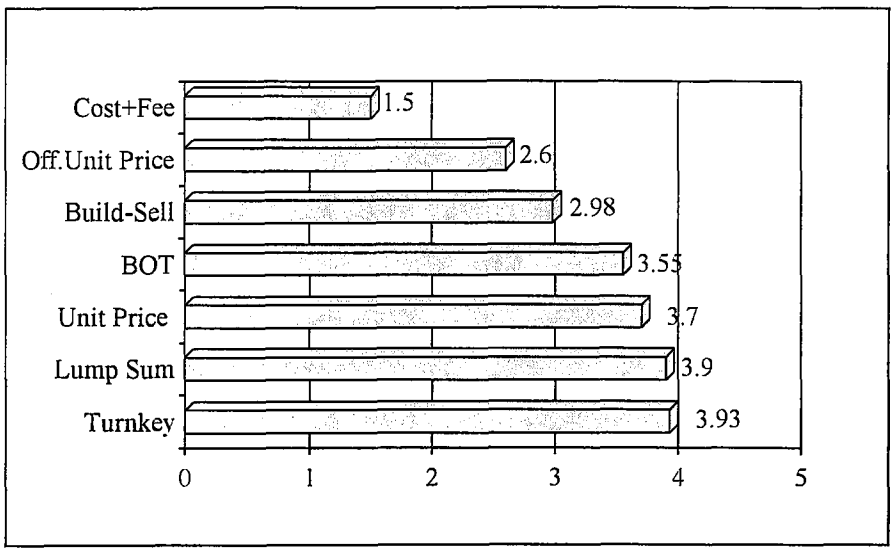

Figure 4.7 Ranking of Contract Types In Terms of Risk They Carry

(5 = Very risky, 4 = Somewhat risky, 3 = Neutral/No idea, 2 = Somewhat not risky, 1 = Not risky)

Turnkey (whereas the contractor has a complete responsibility of the entire construction cycle for a fixed amount of money) and lump sum (the contractor agrees to complete the work for a single, lump sum of money) contracts are considered more risky than the other types of contracts, as shown in Figure 4.7. This is an expected result, as these two contract types involve greater uncertainty than other types. Turnkey and lump sum contracts are almost equally ranked as somewhat risky with a scoring of 3.93 and 3.90, respectively. A failure to recognise future economic changes, in such factors as interest rates and inflation, is one of the important factors making these contract types risky since high and unstable inflation will increase the cost of work.

Unit price (determined by the Ministry of Public Works) contracts are ranked as the second risky type of contract with a scoring of 3.70. Unit price contracts are widely used on projects such as excavation, high-ways, and sewer or water pipe. The major problems in unit price contracts usually stem from the need for determining new unit prices not stated in the contracts due to any unforeseen/not mentioned work types or high inflation. Due to high inflation, the market prices may well exceed the unit prices determined by the Ministry of Public Works unless the contracts are based on foreign currencies such as USD (US Dollars) or DM (Mark).

Contractors seem undecided about BOT type of contracts since it is not very common in Turkey and a small number of contractors who joined the survey mentioned that they have an experience in BOT projects. However, a score of 3.55 shows that BOT type of contracts can be considered somewhat risky. At that point, it should be mentioned that success of a BOT project is strongly related with the country factors (regulatory framework, economic stability, political influences, etc.) as well as the way that these uncertainties are handled. On the other hand, in Turkey, due to unstable economy, lack of experience of both private and public sector, poor legal structure, political interferences, government's unwillingness to provide guarantees, BOT projects are difficult to realise. In Question 15 major problems related to BOT projects will further be discussed

Contractors are also undecided about ranking of Build-Sell type of contracts since most of them have not dealed with this contract type. In Turkey, mostly small size construction companies are engaged in Build-Sell projects whereas the respondents of the survey are large/medium size companies and holdings.

Offered unit price contracts are ranked as somewhat not risky, with a scoring of 2.6. As it was expected, Cost+Fee contracts are considered as the least risky with the consensus of contractors. About 95% of the contractors scored either 1 or 2 on the scale.

Question 14. Have you ever performed in a project realised by Build-Operate-Transfer (BOT) model?

Table 4.21 Breakdown of Responses to Question 14

	No. of companies	% Response
Yes	26	25.2
No	76	73.8
Missing	1	1.0
Total	103	100.0

As seen from Table 4.21, only 25% of the contractors have performed in a BOT project. Actually, it is a good number when the whole construction sector in Turkey is considered. Moreover, BOT is a new concept in Turkey where a considerable number of projects are planned to be realised with this model in the very near future.

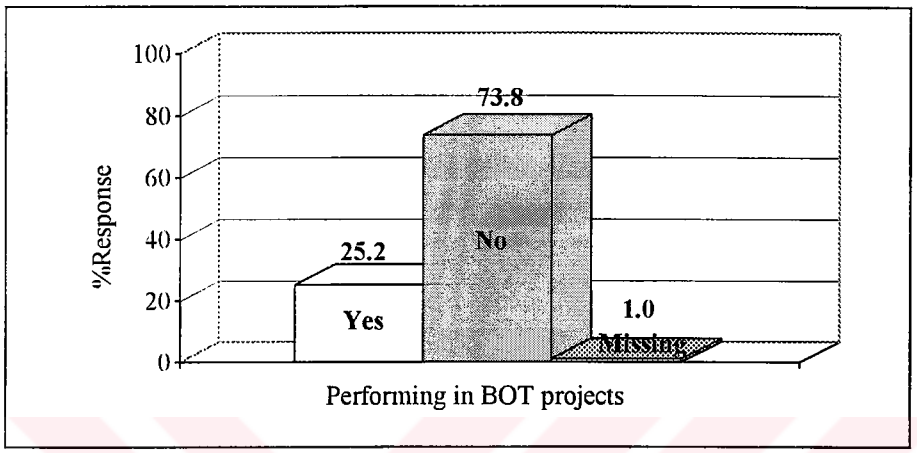

Figure 4.8 Percentage Breakdown of Responses to Question 14.

Question 15. From a project company's point, evaluate the problems that can probably be encountered in a BOT model according to their level of importance. (Respondents are requested to circle the number that most closely approximates their attitude.) For a scale of 1 to 5;

5 = Very important

4 = Important

3 = Neither important nor unimportant

2 = Unimportant

1 = Very unimportant

Table 4.22 Problems that can be encountered in BOT projects

No (1)	Explanation of Problems (2)	Mean (3)	Std.dev (4)	% Response (5)				
				5	4	3	2	1
1	Immature legal basis for BOT model	4.4	0.86	56.7	33.3	3.3	6.7	0
2	Frequent changes in regulations and laws	4.07	0.83	30	53.3	10	6.7	0
3	Lack of tax exemption that makes the model attractive (VAT, investment discount, etc.)	3.7	1.12	26.7	36.7	20	13.3	3.3

Table 4.22 (continued)

4	Too much bureaucracy	4.1	0.96	40	40	10	10	0
5	Prolonged evaluation process	3.87	1.11	33.3	40	6.7	20	0
6	Government's present evaluation criteria being unsuitable for the BOT model	3.87	0.90	26.7	40	26.7	6.7	0
7	Political instability	4.57	0.68	66.7	33.3	33.3	0	0
8	Economic instability	4.50	0.82	66.7	20	10	3.3	0
9	High market risk (except for energy investments)	3.37	1.33	23.3	30	16.7	20	10
10	Financial difficulties	4.33	0.88	53.3	33.3	6.7	6.7	0
11	Government's reluctance to provide guarantees	4.20	0.89	43.3	40	10	6.7	0
12	Lack of experience of public institutions	4.43	0.68	53.3	36.7	10	0	0
13	Lack of credit between public and private sectors	3.57	1.01	16.7	43.3	20	20	0
14	Lack of co-ordination between public and private sectors	3.67	0.92	10	63.3	13.3	10	3.3
15	High premiums demanded by foreign partners for the risks they carry	4.10	1.03	36.7	50	6.7	6.7	0
16	Complexity of the consortium structure due to foreign partners	3.77	1.10	26.7	43.3	13.3	13.3	3.3
17	Lack of experience of private sector about BOT model	3.50	1.17	20	40	13.3	23.3	3.3
18	Unreliable and inadequate feasibility study of selected projects	3.80	1.16	30	43.3	6.7	16.7	3.3
19	Technically complex projects	2.47	1.04	3.3	16.7	16.7	50	13.3
20	Inflexibility for construction delays so as not to decrease operation period	3.43	1.17	20	33.3	20	23.3	3.3
21	Public reaction to BOT model that is within the scope of privatisation	2.70	1.06	3.3	16.7	43.3	20	16.7

When column (3) of Table 4.22 is analysed, political, economical and legal problems are given higher scores of importance. From the contractors' viewpoint, the most important problem encountered in BOT projects stem from political instability with a very high scoring of 4.57. Economic instability follows it and it is assigned an importance average of 4.50 that is very close to that of political instability. The least important risk, as it can be expected, is technically complex project, importance average being very low; 2.47. Public reaction to BOT model is the second least important risk for the contractors, scoring being 2.70.

The five most/least important problems related to BOT model are illustrated in Table 4.23 for better understanding.

Table 4.23 Most and Least Important Problems Related to BOT Model

Level of importance	Risk
Most important	• Political instability • Economic instability • Lack of experience of public institutions • Immature legal basis for BOT model • Financial difficulties
Least important	• Lack of experience of private sector about BOT model • Inflexibility for construction delays so as not to decrease operation period • High market risk (except for energy investments) • Public reaction to BOT model that is within the scope of privatisation • Technically complex projects

About 90% of the respondents have assigned either very important (5) or important (4) to problems of political and economical instability.

At that point, it is worth talking about some literature about political risks in BOT projects since it is the major problem. Political risk can be defined as "government interference through specific acts or events with the conduct of business or in terms of overall government policy towards foreign investors" [31]. Probability of encountering political risk is directly related with the stability of political system in the host country. For a feasible BOT project, political stability in a host country is essential. Suggestions for protection in BOT projects in a potentially unstable country can be as follows:

- Project companies should be given the security that negotiations will not be interrupted /cancelled with the changes in government;
- Government should provide some coverage for outstanding debt and other financial obligations for political instabilities;
- A consortium of international investors and lenders should be formed so that expropriation of the project facility will result in a default of a number of international loans and jeopardize the country's credit rating to an unacceptable degree [32].

Economic instability is another very important problem effecting the success of a BOT project. In an economically unstable country, inevitably, private sector companies may neither participate in a BOT bidding nor require high risk premiums for financing. From another point, economic instability effects the creditworthiness of a country adversely. As long as the country's credibility is low, project is then unfinanciable. For the protection, government should provide guarantees against economical instability, including adverse affects of inflation and foreign exchange rate movements.

The third important problem determined by the contractors is the inexperience of public institutions about BOT model. In my opinion, immature legal basis for BOT model can also be considered as the third important risk since the scoring of these two risks are very close to each other. A well-defined legal framework is compulsory for the realization of BOT projects. Serious problems can be confronted in the initiation of BOT projects due to inadequate regulatory system in developing countries [33]. An inadequate legal structure results in an increase in development and project costs, causes delays in the realization period and discourages the potential BOT participators. As a result of a poor legal structure, a complicated contract regulation which takes a long period of time to finalize is required. Governments should institutionalize the regulatory process to reduce the number of conditions that need to be included in the contractual agreements for private companies [34]. As long as the old-fashioned thinking style of public sector and legal inconsistencies are removed, BOT model may have more successful applications in Turkey.

Financial difficulty is ranked as the fifth important problem relative to others. It is highly correlated with the political and economical stability in the country.

As to the least important problems; technically complex project is ranked as the least important one. The contractors believe that as long as they are experienced in the similar kind of projects and have the necessary equipment, machinery and trained personnel, they can manage any technical problem. Moreover, it is a widely

known fact that an innovative technical solution is even an advantage in winning a BOT tender [35].

Public reaction to BOT model, that is the second least important problem, is generally encountered in energy projects (esp. nuclear power plants) in the form of an environmentalist reaction.

Although high market risk , except for energy investments, is ranked as the third least important problem, its importance average is 3.37. Contractors consider it as neither important nor unimportant. At that point, why energy investments are exceptional is to be clarified; Since they are not demand-oriented, energy program is fixed and produced energy is only saleable to the government. In Turkey, government and treasury guarantees mostly eliminate the market risk of energy investments. However, transportation investments have higher market risk since toll roads are demand-oriented and market-sensitive. If the demand is less than the predicted, enough revenues can not be generated. Another risk is the existence of possible routes. In that case, a "no second-facility guarantee" may be required from government or a guaranteed minimum traffic volume should be fixed regardless of actual demand to provide a minimum cash flow to cover project debt [32].

Other Problems That Can Be Encountered In A BOT Model

Table 4.24 Other Problems Related to a BOT Model

No. of Respondents	Risk	Level of Importance
1	• Lack of a single agency responsible for the realization of BOT projects (so that bureaucratic and organizational problems are minimized)	5
1	• Lack of a well-defined law related to BOT	5
1	• Unfair competition	5
1	• Contractors/Operators are not given any opportunity to make a profit (e.g. stockholder's equity to be paid back)	5

4.2.5 Risk Management And Analysis Techniques

Question 16. Which of the alternative method (or methods) do you use when coping with risks in case you meet uncertain situations?
(You may put a "√" to more than one alternative.)

Since most of the respondents have selected more than one method for coping with risks, possible combinations of alternative methods have to be assessed. For example, there are some companies using only one method, whereas the others are using 8 of them. The following tables, 4.25 and 4.26, illustrate the percentage of respondents using the methods separately from one another and various combination of alternative methods, respectively.

Table 4.25 Percentage of Respondents Using Each Method

Method To Cope With Risk	% Response
1.Obtaining additional information to reduce uncertainties	84.5
2.Appropriate allocation of risk between the parties through an effective contract strategy	73.8
3.Formation of a consortium with experienced companies	46.6
4.Insurance	58.3
5.Adding an appropriate risk contingency onto the tender value	68.0
6.Investing in less risky fields of industry (by means of an appropriate and effective portfolio diversification)	29.0
7.Developing a risk management department where systematic techniques are being used	24.3
8.Making use of hedging instruments (forward, futures, option contracts) for financial risks	21.4

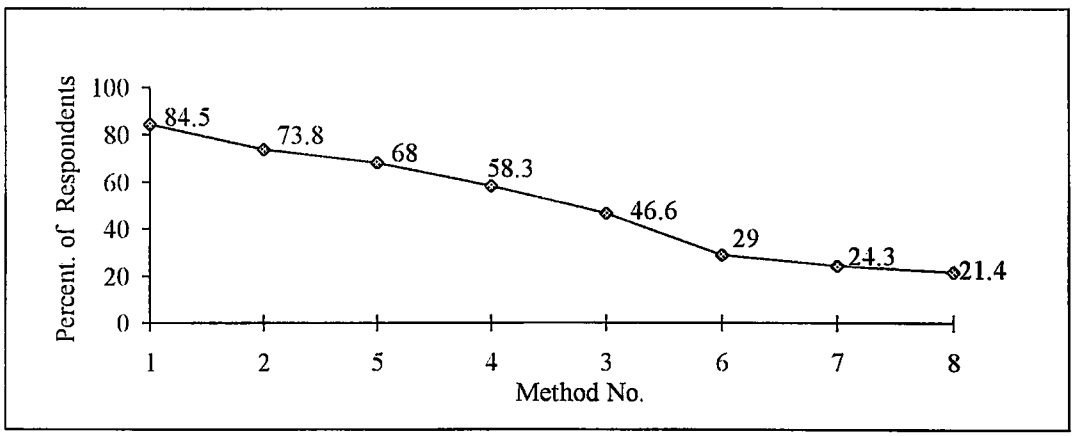

Figure 4.9 Methods Used For Coping With Risks

Table 4.26 Alternative Method Combinations Used for Coping With Risks (Each number in "Method" column corresponds to the methods described in Table 4.25.)

Method	%	Cum. %
Only 2	2	2
Only 5	1	3
1,2	1	4
1,4	1	5
1,5	2	7
1,6	1	8
2,3	1	9
3,4	1	10
3,5	2	12
4,5	1	13
1,2,3	1	14
1,2,4	1	15
1,2,5	3	17
1,2,6	2	19
1,2,7	3	22
1,3,4	1	23
1,3,5	3	26
1,4,5	3	29
1,4,7	1	30
1,5,6	2	32

Method	%	Cum. %
1,5,8	1	33
2,3,5	1	34
2,5,8	1	35
1,2,3,4	2	37
1,2,3,5	4	41
1,2,4,5	7	48
1,2,4,6	2	50
1,2,4,7	1	50
1,24,8	1	51
1,2,5,6	2	53
1,2,5,7	1	54
1,3,4,7	1	55
1,4,5,6	1	56
2,3,4,7	1	57
2,4,5,7	1	58
2,4,7,8	1	59
1,2,3,4,5	6	65
1,2,3,4,8	1	66
1,2,3,5,6	3	69
1,2,3,6,7	1	70

Method	%	Cum. %
1,2,3,6,8	2	72
1,2,4,5,6	2	74
1,2,4,5,7	2	76
1,2,4,5,8	3	79
1,2,4,6,7	1	80
1,2,4,7,8	2	82
1,3,4,5,6	3	84
1,3,4,5,7	1	85
1,3,4,5,8	1	86
2,3,4,5,6	1	87
2,3,5,6,8	1	88
2,4,5,7,8	1	89
1,2,3,4,5,6	3	92
1,2,3,4,5,7	1	93
1,2,3,5,7,8	1	94
1,2,4,5,7,8	1	95
1,2,3,4,5,6,8	1	96
1,2,3,4,5,7,8	3	99
1,2,3,4,6,7,8	1	100

As observed from Table 4.26, most of the contractors use more than one method when coping with risks in case they meet any uncertainty. Only 2 of them use just one method; method 2-appropriate allocation of risk between parties through an effective contract strategy and method 5-adding a risk contingency onto the tender value.

Figure 4.9 shows that contractors (about 85 %) mostly prefer to use method 1-obtaining additional information to reduce uncertainties. About 74% of them use method 2-appropriate allocation of risk between the parties through an effective contract strategy. Adding a risk contingency, which is most probably a fixed percentage figure, to the cost estimate is another method preferred by the contractors (68%). More than half of the contractors (58%) use insurance and about 47% prefer to form a consortium with experienced partners. Method 7-developing a risk management department within the company where systematic risk management techniques are being used (about 24%) and method 8-hedging

instruments against financial risks are not used commonly. In fact, hedging instruments are not recognised much in any other sector in Turkey. Only some financial leasing, factoring companies or banks apply hedging instruments (forward, futures, option contracts) to minimize the risk of unexpected future movements in interest rates, exchange rates or commodities.

The findings reveal that the traditional methods are still adopted by the majority of construction companies when coping with uncertainties.

Question 17. Do you consider insurance as an effective risk management method?

Table 4.27 Perceptions of Contractors Regarding the Effectiveness of Insurance

	No. of companies	% Response
Yes	58	56.3
No	45	43.7
Total	103	100.0

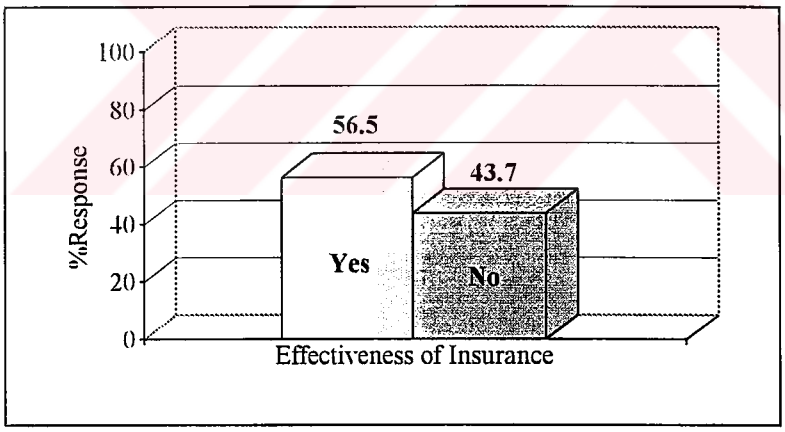

Figure 4.10 Percentage Breakdown of Responses to Question 17.

Figure 4.10 reveals that there is not a distinct difference between the number of contractors considering insurance as an effective risk management method and those considering it as ineffective. 56.3% of the responses are positive, while 43.7% of them are negative about the effectiveness of insurance.

The contractors who responded as "Yes" proceeded with Question 18, while others skipped to Question 19.

Question 18. Please mark the top three important problems, which are encountered during the insurance of risks, in order of their importance. (Start with 1 for the most important)

1. Inadequate risk coverage
2. Insurance companies lacking knowledge and experience about risk management
3. Very high risk premiums charged by insurance companies
4. Need for renegotiation on an annual basis due to frequent variations in cover and premiums charged
5. Inadequacy of service offered by insurance companies
6. Regarding insurance as a complex and ineffective method
7. Charged premiums do not reflect a realistic risk coverage
8. Instalment not paid in full amount and in due time
9. Other;
   - Some important risks (economical, political, etc.) cannot be insured
   - Unwillingness of insurance companies to pay instalments
   - Inadequate insurance policy
   - Insurance system in Turkish construction sector has not developed much.

Table 4.28 Problems Encountered During the Insurance of Risks

Problems	Most Important	Second Important	Third Important
	% Response	% Response	% Response
1.Inadequate risk coverage	***47.3***	9.1	3.7
2.Insurance companies lacking knowledge and experience about risk management	18.2	***23.6***	9.3
3.Very high risk premiums charged by insurance companies	7.3	20.0	13.0
4.Need for renegotiation on an annual basis due to frequent variations in cover and premiums charged	5.5	3.6	1.9
5.Inadequacy of service offered by insurance companies	5.5	5.5	***20.4***
6.Regarding insurance as a complex and ineffective method	9.1	5.5	9.3
7.Charged premiums do not reflect a realistic risk coverage	5.5	12.7	14.8
8.Instalment not paid in full amount and in due time	1.8	16.4	***20.4***
9.Other	0	3.6	7.4

In Table 4.28, what percentage of response corresponds to each problem for the top three importance level is illustrated. The top three important problems are better to be summarized in Table 4.29 :

Table 4.29 Top Three Important Problems Related To Insurance

Rank	Problems
1.	Inadequate risk coverage
2.	Insurance companies lacking knowledge and experience about risk management
3.	Inadequacy of service offered by insurance companies, and Instalment not paid in full amount and in due time

It can be concluded that the most important problem perceived by the contractors is the inadequate risk coverage. Certain risks such as, earthquake, storm, fire, landslide, theft, breakdown of machinery and this kind of sudden and unforeseen events, may be only partly insurable. On the other hand, very important risks including political, commercial risks, etc. are not covered by insurance at all. The second important problem is related with the inexperience of insurance companies about risk management. As the third important problem, contractors think that the service offered by many insurance companies is poor and instalments are not paid in full amount and in due time.

Because of these disadvantages listed, insurance should only be used as a last resort. It has been quoted as "a complicated and inefficient method of borrowing money, the essence of which is that you pay back the loan before you get the money!" [8]

Question 19. Are any systematic risk management techniques used in your company?

Table 4.30 Breakdown of Responses to Question 19

	No. of companies	% Response
Yes	20	19.4
No	83	80.6
Total	103	100.0

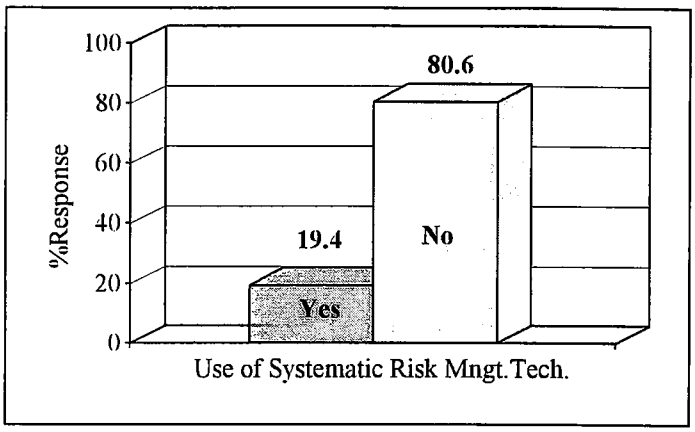

Figure 4.11 Percentage Breakdown of Responses to Question 19

From the Figure 4.11, it can be seen that majority of the contractors, more than 80%, do not use any systematic risk management technique. However, most of the contractors who were interviewed stated that they have generally used their experience, and subjective/intuitive assessment in measuring risks in one way or the other. In nearly all of the Turkish construction companies, risks are not assessed in a formal and systematic way.

The contractors who responded as "Yes" to Question 19, proceeded with Question 20 through Question 24 while others skipped to Question 25.

Question 20. How long have your company been using systematic risk management techniques?

Table 4.31 Breakdown of Responses To Question 20

Range (years)	No. of Companies	(Valid) % Response
Less than 1 year	1	5
1-5 years	10	50
6-10 years	4	20
More than 10 years	5	25
Total	20	100

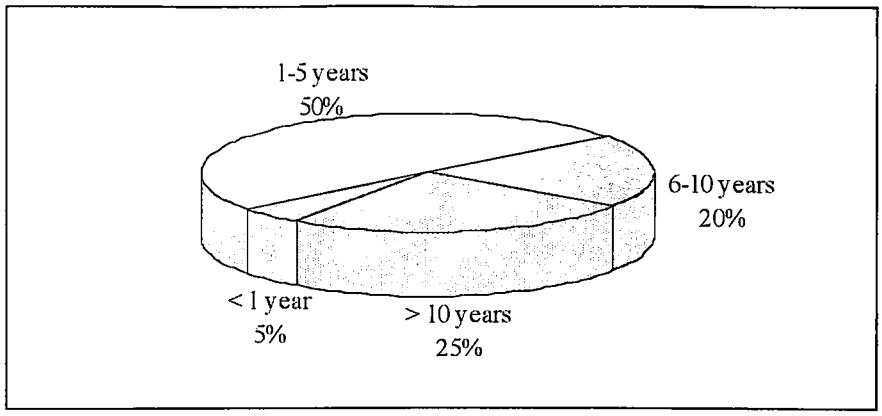

Figure 4.12 Percentage Breakdown of Responses To Question 20

The Figure 4.12 shows the percentage breakdown of the companies with respect to number of years they have been using the risk management techniques. Of the 20 companies who responded to this question, except for one company, 95% of them have been using the techniques more than 1 year.

Question 21. What are the risk analysis techniques used in your company? (Please circle the number that most closely approximates your opinion about the awareness and usage of techniques.)

4 = Using it currently

3 = Have used in the past, but no longer found it as useful/relevant

2 = Aware of technique, but do not use it

1 = Have not heard of it

Table 4.32 Measurement of Respondents' Level of Awareness and Usage of Risk Analysis Techniques

Technique (1)	No.of Respondents (2)				Total (3)
	4	3	2	1	
• Preparation of checklists of risks that can effect a project by a team of experienced people	16	2	2	1	21
• Performing brain-storming sessions to discuss the risks that effect a project	16	-	4	1	21
• Decision Trees	10	1	-	10	21
• Probability Theory	11	1	1	8	21
• Multi-criteria decision making techniques (AHP, SMART, etc.)	-	1	3	17	21
• Fuzzy Set Theory	-	-	2	19	21
• Monte Carlo Simulation	-	-	1	20	21

Table 4.32(continued)

• Influence Diagrams	-	-	5	16	21
• Utility Theory	1	-	3	17	21
• Sensitivity Analysis	5	-	3	13	21
• DELPHI Method	-	-	1	20	21

The techniques that are listed in Table 4.32 were obtained from the literature and described in Chapter 2. The numbers shown in Table 4.32 represents the level of response for each technique, e.g. 16 respondents ("4"-Column2) currently use checklists.

It appeared that only a very few number of Turkish contractors are aware of the risk management techniques. The more traditional techniques, such as checklists, brain-storming are currently used by the majority of the contractors. The respondents who skipped Questions 20-24 mentioned that they were also using these traditional techniques very frequently but they did not follow a systematic procedure. Other techniques, such as decision trees, probability theory, and sensitivity analysis, are used, but not extensively. Only a very few contractors are aware of multi-criteria decision making (AHP:Analytic Hierarchy Process), fuzzy set theory, Monte Carlo simulation, influence diagrams, utility theory, sensitivity analysis, and Delphi method and most of the respondents have even not heard of them.

Question 22. What are the computer programs used for risk analysis in your company?

Table 4.33 Computer Programs Used For Risk Analysis

Computer Programs	No.of Respondents
• @ RISK	-
• PREDICT!	-
• CRYSTAL BALL	-
• MONTE CARLO	-
• CASPAR (Computer Aided Simulation for Project Appraisal and Review)	-
• Other	-

None of the contractors use computer programs for risk analysis. It is due to the fact that the risk management concept is very new to the construction sector in Turkey. There seems to be a need for the introduction of these programs to the

construction companies after the logic of risk management is comprehended by the project managers.

Question 23. Mark the top three benefits of using risk management and analysis techniques (RMAT) to your company. (Please rank in order of importance, starting with 1 for the most beneficial reason.)

Table 4.34 Ranking of Benefits of RMAT

Benefit	Most Important	Second Important	Third Important
	% Resp.	% Resp.	% Resp.
• *Allows the formulation of more realistic cost and time estimates*	***65***	10.5	-
• *Permitting the generation of alternative scenarios, it leads to more objective decision making*	*15*	*15.8*	***31.6***
• Allows the assessment of contingencies that almost actually reflect the risks	-	10.5	5.3
• Allows the determination of the appropriate cost for the risks transferred	10	10.5	5.3
• Leads to the most suitable allocation of risks between the parties	-	10.5	5.3
• *Leads to the determination of the most suitable contract strategy*	*5*	***31.6***	*36.8*
• An indication of contractor responsibility to the client	-	5.3	-
• Builds up statistical database about historical risks that assists in better management of future projects.	5	5.3	15.8

In this question, respondents were requested to rank the (top three) benefits of carrying out RMAT. The benefits are based on those given in Reference [13], with some revisions and simplification of expression being carried out to make ranking easier and more understandable for the respondents. It would have been possible to request respondents to list their own perceived benefits and then rank the replies. But this would have led to fragmentation of information and analysis would be much difficult. In Table 4.34, what percentage of response corresponds to each benefit is illustrated. The first important three benefits are going to be summarized in Table 4.35 :

Table 4.35 Top Three Benefits of RMAT

Rank	Benefits
1.	Allows the formulation of more realistic cost and time estimates
2.	Leads to the determination of the most suitable contract strategy
3.	Permitting the generation of alternative scenarios, it leads to more objective decision making

The findings indicate that contractors perceived the formulation of more realistic time and cost estimates as the major benefit of using RMAT.

Question 24. State your reason(s) for using risk management and analysis techniques (RMAT) in your company. (You may mark more than one reason.)

Since most of the respondents (who said "Yes" to Question 19) have marked more than one reason, possible combinations of various reasons have to be assessed. The following tables, 4.36 and 4.37, illustrate each reason given by the respondents separately and the various combination of reasons of using RMAT, respectively.

Table 4.36 Frequency and Percentage Breakdown of Question 24
(Separate Assessment of Reasons)

Reason for using RMAT	Frequency	Valid %
1. Due to the demand of client	2	10
2. For better quality	9	45
3. As a company policy	9	45
4. For higher profit	11	55
5. For the completion of project within budget and time limits	15	75
6. Other		
• For the application of new techniques and methods with the minimum risk	3	15
• To promote international contracting		
• To attract foreign creditors and investors		

Table 4.37 Combination of reasons of using RMAT (Each number in "Reason" column corresponds to the reason described in Table 3.36.)

Reason	Frequency	Valid %
Only 1	1	5
Only 3	1	5
Only 5	1	5
25	2	10
34	1	5
35	1	5
45	4	20
56	1	5

Reason	Frequency	Valid %
234	2	10
235	1	5
245	1	5
345	1	5
2345	1	5
2456	1	5
12356	1	5

As observed from Table 4.36, most of the contractors (75%) use RMAT to be able to complete the project within budget and time limits. More than 50% of the contractors' reason for using RMAT is for obtaining higher profit. Obtaining a better quality is ranked as the third reason together with the company policy. Only 10% of them use RMAT as a result of their client's demand. Other reasons were given by 15% of the contractors.

Question 25. State your reason(s) why risk management and analysis techniques (RMAT) are not used in your company. (You may mark more than one reason.)

Since the respondents have marked more than one reason as it was in Question 24, possible combinations of various reasons have to be assessed. The following tables, 4.38 and 4.39, illustrate each reason given by the respondents separately and the various combination of reasons of not using RMAT, respectively.

Table 4.38 Frequency and Percentage Breakdown of Question 25 (Separate Assessment of Reasons)

Reason for not using RMAT	Frequency	Valid %
1. Lack of time to carry out the analysis	17	16.5
2. Lack of technical knowledge about the subject	42	40.8
3. Lack of understanding of RMAT by the client and/or top management	46	44.7
4. An additional cost for the project	24	23.3
5. Considering RMAT as useless	12	11.7

Table 4.38 (continued)

6. Other • Volume of work is not large enough • Without using any RMAT, experience and professional judgement of managers are enough to deal with risks • Since there is no trend in Turkish construction sector application of RMAT is impossible • Due to high competition, companies do not use any RMAT for fear of losing the work • As long as the government's (as an client) approach does not change, RMAT is not applicable	9	8.8

Table 4.39 Combination of reasons of not using RMAT (Each number in "Reason" column corresponds to the reason described in Table 3.37)

Reason	Frequency	Valid %
Only 1	4	5.1
Only 2	10	12.8
Only 3	5	6.4
Only 4	3	3.8
Only 5	3	3.8
Only 6	2	2.6
12	1	1.3
13	3	3.8
14	2	2.6
15	1	1.3
23	16	20.5
24	2	2.6
26	1	1.3

Reason	Frequency	Valid %
34	8	10.3
56	1	1.3
123	1	1.3
124	1	1.3
134	1	1.3
146	1	1.3
234	1	1.3
235	4	5.1
236	2	2.6
345	2	2.6
1234	2	2.6
23456	1	1.3

As observed from Table 4.38, the two main reasons for not using RMAT are;

(a) Lack of understanding of RMAT by the client and/or top management, and

(b) Lack of technical knowledge about the subject.

Since risk management and analysis techniques are very new to the Turkish contractors, these two implementation problems are inevitable. As the utilisation of RMAT requires the managers to have some basic knowledge of probability and statistics, the above mentioned problems can easily be overcome. On the other hand, because the assessment of risks is largely based on the experience and judgement of managers, it would not be much difficult to apply risk management at all.

The other reasons for not using RMAT are inherent problems encountered in the construction sector. These are; considering RMAT as an additional cost for the project (23.3%) and lack of time to carry out RMAT (16.5%). Cost justification of RMAT is obviously one of the fundamental considerations for its adoption. Because of high competition, construction companies do not want to use RMAT for the fear of losing work since it will increase the initial cost of project. But for the long term, the cost of implementing RMAT may not be a significant hindrance to its acceptance, unless its usefulness cannot be ascertained. Contractors must be persuaded that it is not an additional cost, but an integral part of the project management process. Lack of time for carrying out RMAT seemed to be another handicap for some of the contractors. It is obviously true since the time required for the application of RMAT is limited when compared with the traditional approach. However, with the aid of a computer and suitable risk management decision support systems, the time involvement of using RMAT would not be as much as it has been expected by some of the respondents.

In my opinion, when risk management and analysis is implemented for some time so that contractors become familiar with it and realize its benefits, they will start using RMAT more frequently and effectively.

Question 26. What has to be done to make aware of the people in construction sector about the implementation of risk management? (Please write your suggestions.)

This question is structured for the purpose of obtaining suggestions of the contractors for guiding the people in this sector about the implementation of risk management and what is to be done to take the advantage of implementing it in construction projects. Among 103 respondents, 66 of them stated their suggestions.

Below is the summary of contractors' suggestions:

- Co-operation and co-ordination of government agencies, universities and construction companies are necessary for the implementation of risk management in Turkey.
- As long as the bidding methods, specifications, contractor selection criteria, controlling mechanism and mentality of those who plan the investments do not change, risk management can not be implemented in Turkey. Risk management should be considered in a macro scale. For example, rational solutions of Ministry of Public Works should integrate all the construction companies about the application of risk management. General specifications should also cover the subject of risk management.
- When risks are encountered during various stages of a project, by means of brainstorming sessions and teamwork, they have to be assessed thoroughly at the moment of their occurrence.
- As an initial step, seminars, conferences, and courses have to be organized by universities, consultants or insurance companies so that top management and/or client is informed about systematic and practical risk management and analysis techniques as well as related computer programs that can be applicable in Turkey.
- Advantages of construction risk management are needed to be explained to the top management and/or client through publications, seminars, conferences, etc.
- Quality of technical staff has to be improved through training.
- Political and economical instability in Turkey is an obstacle to the implementation of risk management since risks are no longer manageable in this environment.
- Most of the Turkish contractors consider risk management a natural and important part of construction work but do not implement it in a systematic and scientific way.
- Civil engineers should certainly have an experience on construction site.

- In civil engineering departments or other related departments of universities, courses about risk management and analysis can be arranged and this would be very helpful.

In summary, contractors are ready to implement systematic risk management and analysis techniques, especially in international projects. Most of them believe that courses, seminars would be very helpful in learning about this very new concept. On the other hand, they consider the political and economical instabilities in Turkey as well as the government acts as an obstacle to the implementation of risk management. Government and its agencies as a client should also be persuaded that risk management has many advantages related to the successful completion of projects.

CHAPTER 5

CONCLUSIONS

5.1 Conclusions

In this thesis, a questionnaire has been designed for the purpose of providing an overall view about the risk perceptions of Turkish contractors. In addition to the questionnaire survey, personal interviews have also been conducted with some of the contractors in order to get detailed comments on this concept.

The thesis starts with a short introduction to risk concept in the construction sector. Then a literature review covering the definitions of risk, uncertainty, and risk management, the risk management system and its major stages, dealing with risks in contracts and the future of risk management takes place.

The following conclusions could be drawn from the results of the survey:

- Most of the construction companies responded to the questionnaire are joint-stock corporation that is a form of organisation preferred by large and corporated companies. More than half of them are older than 20 years, so that they could be considered as experienced in their field of work. They are generally specialized in the construction of buildings and engineering structures. Some of them have investments on other sectors such as tourism, insurance, prefabrication, mining, land development, etc. for the diversification of sector risks and for not to put all eggs in one basket. The findings of the research are consistent with sectoral reports of several banks, as well as annual report of the Turkish Contractors Association.

- In Turkey ; financial, political and market risks that are beyond the control of the contractors constitute the major risk categories. Delayed progress payment is considered as the most important risk with an industrywide consensus of contractors. This is followed by insufficient demand in the construction sector, risk of not obtaining long term works and high degree of competence. This market risk is then followed by risks of political instability, inflation and financial failure of any party being employed in the contract. The uncertainties stemming from the deficiencies in the national economic policy, high inflation and political situation are the biggest and most unavoidable obstacles for the Turkish contractors in making long term investments.

- Technical and construction related risks are considered as the less important risks by most of the contractors. Technically complex project is considered as the least important risk. It is followed by labour disputes/strikes/lockout, restrictions due to the precautions against environmental pollution, exceptionally inclement weather and changes in taxation system. Most of the respondents believe that; they are able to accomplish any kind of project, even the most complex one.

- High and uncertain rates of inflation experienced in Turkey is ranked as the most frequently occurring risk. Since the contractors are unable to control this risk element, they are subject to long term financial uncertainties and can not make any speculation about the future. Other frequently occurring risks are; delayed progress payments, insufficient demand in the construction sector, risk of not obtaining long term works, high degree of competence, bureaucracy and client delays. As the survey results show; risks that are considered as important are occurring very frequently as well. Force majeure risk is considered as the least frequently occurring one. Labour disputes or strikes, terror, restrictions due to precautions against environmental pollution and technically complex projects are the other risks occurring rarely in Turkey.

- In Turkey, contractors are either accepting or sharing the risk. Clients usually allocate the risk contractually on their contractors. Since the contracts in Turkey are one-sided, there is no proper and fair risk allocation. Except for the risks of delayed site hand-over, delays due to the default of the client and delayed progress

payments, most of the risks are either allocated to the contractor or shared. Risks stemming from macro economical and political instabilities, regulations, specifications, laws and design remained undecided and could not be allocated to any party.

- It is surprising to note that when the data related to the degree of importance and the allocation of risks are compared to those of a similar survey conducted by Kangari in the USA, notable similarities are observed. Except for the risks stemming from the country's economical and political situation, both the Turkish and US contractors have assigned the same level of importance to risks specific to construction industry. Delayed progress payments, high degree of competence, financial failure of any party being mentioned in the contract, defective or incomplete design, low productivity are the other risk categories deemed important by the contractors of both Turkey and the USA. On the other hand, remarkable differences between the risks resulting from the country's economic and political situation are observed. Inflation is considered as a very important risk category in Turkey, whereas, it is of minor importance in the USA. The reason is very obvious; inflation rate in the USA is very low and stable when compared to inflation fluctuating daily in Turkey.
- There is again a consensus of both the Turkish and US contractors on the allocation of construction related risks. In both of these surveys; labour disputes and/or strikes, safety, low productivity, difficulties and/or delays in the availability of materials, equipment and labour, quality of work, high competence are allocated to the contractors. Delayed site hand over and delayed progress payments are considered as the client's risk. Risks of delayed dispute resolution and financial failure of any party are better to be shared as the results of both surveys indicate. However, in Kangari's survey, clients are allocated much more risk as compared with the results of the present survey.
- More than half of the contractors joined the survey are experienced in international projects. The state of the national economy and political situation in the country of operation are the major sources of risk for the Turkish contractors. The most important risk considered by the contractors is the risk of clients not paying on

time or failing to pay. The economic instability in the country of operation is ranked as the second important risk. In my opinion, since the national economy determines the client's eventual ability to pay, this risk is better to be considered as the most important one. The third important risk is related with the repatriation of profits; especially the Turkish contractors operated in Libya have experienced it. They could not repatriate their profits totally/partially out of the country due to military and political reasons. Risk of war and political instability in the country of operation come next. No construction company would like to work in a country where there is war or political disturbance. Influence of political instability in the country of operation is all-embracing. In international construction work, client is usually the government and for this reason, the contractor wishing to work in a foreign country should know the government structure, bureaucracy and the political situation.

- Difficulties encountered in the availability of local labour, problems stemming from local subcontractors, severe environmental (including climate and geography) conditions, difficulties encountered in the availability of materials and unaccustomed standards and provisions are the risks considered as unimportant by the contractors. Since Turkish contractors bring their own workforce and subcontractors with them, there is not much problem due to the unavailability of local labour and subcontractors. In today's high technology, severe environmental conditions is not an hindering factor. Since the Turkish contractors can manage the availability of materials, it is not an important risk. As long as the contractors have gained experience in international contracts, they do not consider the risk of unaccustomed standards and provisions as important.

- The contractors' responses to the probability of occurrence of risks in international construction projects are not as clear as their responses to the risks encountered in Turkey. They are either undecided or neutral on this subject. It can be explained by the fact that the occurrence of the risks may change from one country to another. However, international competence, delays and/or obstacles due to bureaucracy, clients not paying on time are the frequently occurring risks in international contracts.

- For the contractors, the most serious effect of a risk on a construction company is the "final cost being higher than the estimated cost". As the survey results show, the important risks in construction projects are financially related. For this reason, the emphasis is on the financial effect criterion. It is followed by "damage to the company image". Adversely affected company image can never be healed if it is heard in the market.

- Turkish contractors consider engineering structure (infrastructure) projects as the most risky type in the construction sector. Then comes the industrial construction projects. The building construction is found somewhat as not risky. Engineering structure type of projects are considered very risky due to the fact that such projects are regulated through the Government's investment policy to a great extend. Due to instabilities in the general economic condition, considerable delays in existing engineering structure construction has occurred as the result of suspended and/or reduced payment schemes. Building construction projects are relatively not risky when compared with the other types of construction work due to the increasing demand for such projects and the Government's support for mass housing projects. The Government's investment policy, as well as the macro economic condition of the country is a determining factor in the risk level of a certain type of construction project.

- Most of the contractors believe that risk allocation process is not clearly and appropriately defined in tender documents. The major shortcoming stems from the deficiencies in governmental procedures and regulations. As an initial step, the State Bidding Law needs updating and revision with the contribution of experts in this field.

- Contractors consider turnkey and lump sum contracts more risky than any other type of contract. A failure to recognise future economic changes, in such factors as interest rates and inflation rate, increases the uncertainty in such contracts. In Turkey, there is no guarantee of contractors against inflation and interest rate. One way to control uncertainty would be the use forward contracts. A forward contract is an agreement to buy (or sell) an asset (major currencies or interest rates) at a preset price on a future date. However, such contracts are valid for

short term and not common in the construction sector. Unit price contracts are also risky. Due to high inflation, the market prices may well exceed the unit prices determined by the Ministry of Public Works and Settlements unless the contracts are based on foreign currencies such as USD (US Dollar) or DM (Deutschmark).

- From the contractors' viewpoint, the most important problem encountered in BOT projects stem from political and economic instability. For the successful realization of a BOT project, political and economic stability is a must. Another important problem is the inexperience of public institutions. Immature legal basis for a BOT model can result in a disaster. A well-defined legal framework is compulsory for the realization of BOT projects. As long as the public sector is educated, legal inconsistencies are removed and the Government provides the necessary support and guarantees, BOT model may have more successful applications in Turkey.
- Most of the contractors prefer to use traditional methods to cope with uncertainties. To reduce the uncertainty, most of them find it beneficial to obtain additional information. They also believe that an effective contract strategy and an appropriate risk contingency added to the tender value would be used to cope with the risk. Insurance is another alternative method used by the contractors.
- More than half of the respondents consider insurance an effective risk management method. On the other hand, the number of respondents who find it ineffective is also significant. Inadequate risk coverage, insurance companies' lacking knowledge and experience about risk management, inadequacy of service offered by insurance companies, and instalment not paid in full amount and in due time are the major disadvantages encountered by the respondents. Due to these above mentioned disadvantages, insurance should only be used as a last resort.
- Most of the contractors in Turkey do not use any systematic risk management techniques. Instead, they solely rely on their experience and know-how. The traditional techniques; such as checklists, brainstorming sessions are being adopted in construction companies. Only a few number of the contractors are aware of the risk management techniques, but they still do not use them. It is apparent that a systematic and rational risk management process is needed to provide a logical and

consistent framework for identifying and assessing potential risk factors and determining the correct action for coping with these risks.

- None of the contractors who responded the questionnaire use a computer program for risk analysis. As long as the project managers take an initial step towards the application of a systematic risk management process in construction companies, related computer programs will soon be required for a rapid and reliable risk analysis.
- The results of the survey indicate that the contractors perceived the formulation of more realistic time and cost estimates as the major benefit of using risk management and analysis techniques. Most of the contractors use it for the purpose of being able to complete the project within budget and time limits. On the other hand, reasons given for not using it, is that the client and/or the top management do not know much about this very new concept and people in the sector do not have adequate technical knowledge. However, it is not much difficult to overcome these problems since the assessment of risks is largely based on the experience and judgement of managers and they only need to know the systematic of risk management process.

5.2 Recommendations

The results of the survey show that contractors are ready to implement systematic risk management and analysis techniques, especially in international projects. As an initial step; seminars, conferences, and courses can be organized by universities, consultants or insurance companies so that top management and/or client is informed about this very new concept in the construction sector.

On the other hand, contractors consider the political and economical instabilities in Turkey as well as the government acts as an obstacle to the implementation of risk management. Government and its associated agencies as a client should also be persuaded that risk management has many advantages related to the successful completion of projects and it is not an additional cost, but an important part of the project management process.

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APPENDIX

ORTA DOĞU TEKNİK ÜNİVERSİTESİ - MIDDLE EAST TECHNICAL UNIVERSITY
İNŞAAT MÜHENDİSLİĞİ BÖLÜMÜ - CIVIL ENGINEERING DEPARTMENT
06531 Ankara, Türkiye • Tel: 90(312) 210 5496 • Fax: 90(312) 210 1262 • Email: cedep@trcoqucl.cc.metu.edu.tr

Ankara, 5 Haziran 1997

Sayın Firma Yetkilisi,

Bölümümüz, Yüksek Lisans programı öğrencilerinden Ayşegül Petek Yener'in sürdürdüğü "Türk Müteahhit Firmalarının Risk Konusundaki Görüş ve Eğilimleri" (Risk Perception and Trends of Turkish Construction Companies) konulu tez çalışmasında veri tabanı olarak kullanılacak anket formu ilişikte sunulmaktadır.

Bahis konusu bu anketin, firmamızın üst düzey bir yetkilisi tarafından yanıtlanarak tarafımıza iade edilmesi Türk Müteahhit Firmalarının risk konusundaki görüş ve eğilimlerinin belirlenmesi açısından çok faydalı olacaktır.

Firmalarca verilecek tüm yanıtlar ve elde edilecek bulgular, gizlilik kuralları içersinde değerlendirilecek olup sadece akademik amaçlar için kullanılacaktır. Bu kapsamda, firma adları herhangi bir anlam ifade etmeyeceğinden sorulmasına gerek dahi duyulmamıştır.

Yoğun çalışma temponuz içersinde, anketimize zaman ayırarak vereceğiniz yanıt ve değerli yorumlarınıza ve bizden esirgemeyeceğinizi umduğum ilgi ve yardımınıza şimdiden içten teşekkürlerimi sunarım.

Saygılarımla

Doç.Dr. Talat BİRGÖNÜL
Tez Yöneticisi
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Öğretim Üyesi

Anket Formlarının iade edileceği adres :

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İnşaat Mühendisliği Bölümü
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Bilgi için gerekli olabilecek telefon numaraları :

Doç.Dr. Talat BİRGÖNÜL : (312) 210 24 27

Arş.Gör. A.Petek YENER : (312) 210 24 66

I. GENERAL INFORMATION ABOUT THE CONSTRUCTION COMPANY

1. Type of company:

- ❑ Sole Proprietorship
- ❑ Ordinary Partnership
- ❑ Collective Partnership
- ❑ Limited-Company
- ❑ Joint-Stock Corporation
- ❑ Joint-Venture

2. How many years has your company operated in the construction sector?

- ❑ Less than 1 year
- ❑ 1-5 years
- ❑ 6-10 years
- ❑ 11-20 years
- ❑ More than 20 years

3. Please mark the types of construction work your company performs: (You can mark more than one item.)

- ❑ Engineering structures (dams, bridges, tunnels, airports, harbors, railways, sewerage-water networks, water cisterns, etc.)
- ❑ Motorways
- ❑ Energy transmission and distribution lines/telecommunication network construction, operation and maintenance
- ❑ Building construction (house, school, office, theater, mosque, hotel, government building, market, hospital, shopping center, university, etc.)
- ❑ Industrial construction (refineries, reactors, industrial facilities, etc.)
- ❑ Other (Please specify.) _____

☞

II. INFORMATION ABOUT RISK MANAGEMENT AND ANALYSIS

RISK MANAGEMENT

(Please answer the Questions 4 and 5 on the same table.)

4. Risks that can probably be encountered in the Turkish construction sector are listed in the following table. Please put a "✓" to the suitable cell where the number determines the level of risk importance and most closely approximates your opinion as a contractor.

5 = Very important

4 = Important

3 = Neither important nor unimportant/Undecided

2 = Unimportant

1 = Very unimportant

5. Please put a "✓" to the suitable cell where the number determines the probability of occurrence of risk and most closely approximates your opinion.

5 = Always

4 = Quite often

3 = Undecided/Neutral

2 = Rarely

1 = Never

		QUESTION 4					QUESTION 5				
No.	Risk	Level of risk Importance					Probability of occurrence of risk				
		5	4	3	2	1	5	4	3	2	1
1	Delayed site handover (delayed expropriation,etc.)										
2	Political instability										
3	Bureaucracy										
4	Changes in laws and regulations										
5	Inadequate specifications (covering deficient, ambiguous, and contradictory concepts)										
6	Inability to evaluate bids on time and by means of an adequate procedure										
7	Delay in resolving disputes										
8	Changes in taxation system										
9	Delayed progress payments										
10	Difficulties in obtaining credits										
11	Inflation										
12	Exchange rate fluctuations										☞

No.	Risk	QUESTION 4 Level of risk Importance					QUESTION 5 Probability of occurrence of risk				
		5	4	3	2	1	5	4	3	2	1
13	Interest rate fluctuations										
14	Difficulty stemming from extraordinary project financing models (e.g., Build-Operate-Transfer)										
15	Labor disputes/strikes/lock-out										
16	Accidents										
17	Low productivity (equipment, labour)										
18	Difficulties/delays in availability of materials, equipment, and labour										
19	Third-party delays (except for the contractor and the client)										
20	Inadequate quality of work and need for correction										
21	Changes in quantity/scope of work										
22	Client delays (unable to get approvals, lack of payment, etc.)										
23	Unforeseen ground conditions										
24	Exceptionally inclement weather										
25	Force majeure (earthquake, flood, fire, storm, landslide)										
26	Terror										
27	Restrictions due to precautions against environmental pollution										
28	Delays in design										
29	Defective or incomplete design										
30	A construction technique that is used for the first time (lack of experience about the technique)										
31	Financial failure of any party in the contract										
32	Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence)										
33	Other (please specify.)										

6. Please put a "✓" to the suitable cell according to whether the risks below are totally accepted by the owner/client (owner), or totally accepted by the contractor (contractor), or shared equally by both parties (Shared).

		QUESTION 6		
No.	Risk	12. Risk allocation		
		Owner	Shared	Contractor
1	Delayed site handover (delayed expropriation, etc.)			
2	Political instability			
3	Bureaucracy			
4	Changes in laws and regulations			
5	Inadequate specifications (covering deficient, ambiguous, and contradictory concepts)			
6	Inability to evaluate bids on time and by means of an adequate procedure			
7	Delay in resolving disputes			
8	Changes in taxation system			
9	Delayed progress payments			
10	Difficulties in obtaining credits			
11	Inflation			
12	Exchange rate fluctuations			
13	Interest rate fluctuations			
14	Difficulty stemming from extraordinary project financing models (e.g., Build-Operate-Transfer)			
15	Labor disputes/strikes/lock-out			
16	Accidents			
17	Low productivity (equipment, labour)			
18	Difficulties/delays in availability of materials, equipment, and labour			
19	Third-party delays (except for the contractor and the client)			
20	Inadequate quality of work and need for correction			
21	Changes in quantity/scope of work			
22	Client delays (unable to get approvals, lack of payment, etc.)			
23	Unforeseen ground conditions			
24	Exceptionally inclement weather			
25	Force majeure (earthquake, flood, fire, storm, landslide)			
26	Terror			
27	Restrictions due to precautions against environmental pollution			
28	Delays in design			
29	Defective or incomplete design			☞

		QUESTION 6		
No.	Risk	12. Risk allocation		
		Owner	Shared	Contractor
30	A construction technique that is used for the first time (lack of experience about the technique)			
31	Financial failure of any party in the contract			
32	Insufficient demand in the construction sector, risk of not obtaining long term works, and high competence)			
33	Other (please specify.)			

7. Has your company engaged in international contracts?

- ❑ Yes
- ❑ No (Please proceed to Question 10.)

8. Risks that can probably be encountered in international construction projects are listed in the following table. Please put a "✓" to the suitable cell where the number determines the level of risk importance and most closely approximates your opinion as a contractor.

5 = Very important

4 = Important

3 = Neither important nor unimportant/ Undecided

2 = Unimportant

1 = Very unimportant

9. Please put a "✓" to the suitable cell where the number determines probability of occurrence of risk and most closely approximates your opinion.

5 = Always

4 = Quite often

3 = Undecided/Neutral

2 = Rarely

1 = Never

☞

No.	Risk	QUESTION 8 Level of risk Importance					QUESTION 9 Probability of occurrence of risk				
		5	4	3	2	1	5	4	3	2	1
1	Convertibility of the currency of the country of operation										
2	Economic instability in the country of operation (high inflation rate, etc.)										
3	Taxation system in the country of operation										
4	Unable to repatriate profits totally and/or freely out of the country										
5	Clients not paying on time										
6	Political instability										
7	Level of political/ethical corruption										
8	Political sequestration of machinery, equipment, or other assets										
9	Delays/obstacles due to bureaucracy										
10	Level of political/economic/cultural relations between two countries										
11	Embargoes										
12	Military interferences										
13	War										
14	International competence										
15	Unaccustomed standards and provisions of the country of operation (quality, health, safety, etc.)										
16	Severe environmental conditions of the country of operation (climate, geographic conditions, etc.)										
17	Difficulties/delays in availability of local labour										
18	Difficulties/delays in availability of materials										
19	Problems due to local subcontractors										
20	Other (please specify.)										

10. The serious effects of risks are listed below. Please circle the number that most closely approximates your attitude about the effect of risk.

	Very Important		Neutral/ Undecided		Very Unimportant
❑ Final cost being higher than the estimated cost	5	4	3	2	1
❑ Failure to achieve the project within the required completion date	5	4	3	2	1
❑ Failure to achieve the required quality	5	4	3	2	1
❑ Injury to workers and other personnel	5	4	3	2	1
❑ Damage to company image	5	4	3	2	1

☞

11. In terms of construction work, what type of projects in Turkey carries more risk relative to others? Please circle the number that most closely approximates your attitude.

	Very Risky		No idea/ Neutral		Not Risky
❑ Engineering structures (dam, bridge, tunnel, harbor, etc.)	5	4	3	2	1
❑ Motorways	5	4	3	2	1
❑ Energy transmission and distribution lines/ telecommunication operation and network construction and maintenance	5	4	3	2	1
❑ Building construction (house, hospital)	5	4	3	2	1
❑ Industrial construction (refineries, etc.)	5	4	3	2	1
❑ Other (please specify.)					
❑ _____	5	4	3	2	1
❑ _____	5	4	3	2	1

12. In your opinion, in Turkey, for high-risk projects, is risk allocation defined clearly and appropriately in tender documents?

❑ Yes

❑ No (Please state your reason.) _____

13. In Turkey, which type of contracts carry more risk? Please circle the number that most closely approximates your attitude.

	Very Risky		No idea/ Neutral		Not Risky
❑ Unit price (Ministry of Public Works)	5	4	3	2	1
❑ Offered unit price	5	4	3	2	1
❑ Lump sum	5	4	3	2	1
❑ Cost+fee	5	4	3	2	1
❑ Turnkey	5	4	3	2	1
❑ Build-Operate-Transfer (BOT)	5	4	3	2	1
❑ Build-Sell	5	4	3	2	1 ☞

14. Have you ever performed in a project realised by Build-Operate-Transfer (BOT) model?

- ❑ Yes
- ❑ No (Please proceed to question 16.)

15. From a project company's point, evaluate the problems that can be encountered in a BOT model according to their level of importance. (Please circle the number that most closely approximates your attitude.)

	Very Important		Neutral/ Undecided		Very Unimportant
(1) Immature legal basis for BOT model	5	4	3	2	1
(2) Frequent changes in regulations and laws	5	4	3	2	1
(3) Lack of tax exemption that makes the model attractive (VAT, investment discount, etc.)	5	4	3	2	1
(4) Too much bureaucracy	5	4	3	2	1
(5) Prolonged evaluation process	5	4	3	2	1
(6) Government's present evaluation criteria being unsuitable for the BOT model	5	4	3	2	1
(7) Political instability	5	4	3	2	1
(8) Economic instability	5	4	3	2	1
(9) High market risk (except for energy investments)	5	4	3	2	1
(10) Financial difficulties	5	4	3	2	1
(11) Government's reluctance to provide guarantees (procurement, not making alternative investments, minimum demand guarantees)	5	4	3	2	1
(12) Lack of experience of public institutions	5	4	3	2	1
(13) Lack of credit between public and private sector	5	4	3	2	1
(14) Lack of co-ordination between public and private sector	5	4	3	2	1
(15) High premiums demanded by foreign partners for the risks they carry	5	4	3	2	1
(16) Complexity of consortium structure due to foreign partners	5	4	3	2	1

☞

(17) Lack of experience of private sector about BOT model)	5	4	3	2	1
(18) Unreliable and inadequate feasibility study of selected projects	5	4	3	2	1
(19) Technically complex projects	5	4	3	2	1
(20) Inflexibility for construction delays so as not to decrease operation period	5	4	3	2	1
(21) Public reaction to BOT model that is within the scope of privatisation	5	4	3	2	1

RISK MANAGEMENT AND ANALYSIS TECHNIQUES

16. Which of the alternative method (or methods) do you prefer to use when coping with uncertainties in case you meet uncertain situations?

(You may put a "✓" to more than one alternative.)

- ❑ Obtaining additional information to reduce uncertainties
- ❑ Appropriate allocation of risk between the parties through an effective contract strategy
- ❑ Formation of a consortium with experienced companies
- ❑ Insurance
- ❑ Adding an appropriate contingency onto the tender value
- ❑ Investing in less risky fields of industry (by means of an appropriate and effective portfolio diversification)
- ❑ Developing a risk management department where systematic techniques are being used
- ❑ Making use of hedging instruments (forward, futures, option contracts) for financial risks
- ❑ Other (Please specify.)
- ❑ _____
- ❑ _____

☞

17. Do you consider insurance an effective risk management method?

- ❑ Yes
- ❑ No (Please proceed to question 19.)

18. Please mark the top three important problems, which are encountered during the insurance of risks, in order of their importance. (Start with 1 for the most important.)

- – Inadequate risk coverage
- – Insurance companies lacking knowledge and experience about risk management
- – Very high risk premiums charged by insurance companies
- – Need for renegotiation on an annual basis due to frequent variations in cover and premiums charged
- – Inadequacy of service offered by insurance companies
- – Regarding insurance as a complex and ineffective method
- – Charged premiums do not reflect a realistic risk coverage
- – Instalment not paid in full amount
- – Other (1) _____
- – Other (2) _____

19. Are any systematic risk management techniques used in your company?

- ❑ Yes
- ❑ No (Please proceed to question 25.)

20. How long has a systematic risk management and analysis technique been used in your company?

- ❑ Less than 1 year
- ❑ 1-5 years
- ❑ 6-10 years
- ❑ More than 10 years

☞

21. What are the risk analysis techniques used in your company? (Please circle the number that most closely approximates your opinion about the awareness and usage these techniques)

4 = Using it currently

3 = Have used in the past, but no longer found it as useful/relevant

2 = Aware of technique, but do not use it

1 = Have not heard of it

- ☐ Preparation of checklists of risks that can effect a project by a team of experienced people 4 3 2 1
- ☐ Performing brain-storming sessions to discuss the risks that can effect a project 4 3 2 1
- ☐ Decision trees 4 3 2 1
- ☐ Probability theory 4 3 2 1
- ☐ Multiple-criteria decision making techniques (Analytic Hierarchy Process (AHP), Simple Multi-Attribute Ranking Technique (SMART)) 4 3 2 1
- ☐ Fuzzy Set Theory 4 3 2 1
- ☐ Monte Carlo simulation 4 3 2 1
- ☐ Influence Diagrams 4 3 2 1
- ☐ Utility Theory 4 3 2 1
- ☐ Sensitivity Analysis 4 3 2 1
- ☐ DELPHI method 4 3 2 1
- ☐ Other (Please specify.)
- ☐ _____ 4 3 2 1
- ☐ _____ 4 3 2 1

22. What are the computer programs used for risk analysis in your company?

- ☐ @ RISK
- ☐ PREDICT!
- ☐ CRYSTAL BALL
- ☐ MONTE CARLO
- ☐ CASPAR (Computer Aided Simulation for Project Appraisal and Review) ☞

❑ Other (Please specify.) _____

❑ No computer program is used.

23. Please mark the top three benefits of using risk management and analysis techniques (RMAT) to your company. (Please rank in order of importance, starting with 1 for the most beneficial reason.)

- Allows the formulation of more realistic cost and time estimates.
- Permitting the generation of alternative scenarios, that it leads to more objective decision making.
- Allows the assessment of contingencies that almost actually reflect the risks.
- Allows the determination of the appropriate cost for the risks transferred.
- Leads to the most suitable allocation of risks between the parties.
- Leads to the determination of the most suitable contract strategy.
- An indication of contractor responsibility to the owner.
- Improves corporate experience and communication.
- Builds up statistical database about historical risks that assists in better management of future projects.

24. State your reason(s) for using risk management and analysis techniques in your company. (You may mark more than one reason.)

❑ Due to the demand of client

❑ For better quality

❑ As a company policy

❑ For higher profit

❑ For the completion of project within budget and time limits

❑ Other (Please specify.)

❑ _____

❑ _____

☞

25. State your reason(s) why risk management and analysis techniques are <u>not</u> used in your company. (You may mark more than one reason.)

- ❑ Lack of time to carry out the analysis.
- ❑ Lack of technical knowledge about the subject.
- ❑ Lack of understanding of risk management and analysis techniques by the client and/or top management.
- ❑ An additional cost for the project.
- ❑ Regarding risk management (analysis) as useless.
- ❑ Other (Please specify.)
- ❑ _____
- ❑ _____

26. What has to be done to make aware of the people in construction sector about the implementation of risk management? (Please write your suggestions.)

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