

Risk Assessment Process for Construction Projects in Afghanistan

Mohammad Numan Aloko

Department of Civil Engineering, Kandahar University, Afghanistan
Email: numanaloko@kdru.edu.af

Abstract— *The construction industry in Afghanistan faces challenges such as cost overruns and delays. To overcome these problems, nowadays, implementing risk management in construction field has shown improvements in the mitigation of risks which have adverse impacts on project objects such as time, cost and quality. Risk assessment process is executed as part of risk management for uncertainties that construction sector confronts in Afghanistan. 21 most significant risks were identified, analyzed and evaluated using 5x5 probability matrix method. It was found that 20 out of 21 risks fell into the unacceptable and unwanted category. These risks require mitigation measures by executing risk treatment policy and need be to registered, monitored and reviewed before and during the construction phase. The findings call for necessary awareness in developing the Afghanistan construction industry's capability and performance to execute risk management for mitigating against further project failure.*

Keywords— *Risk Management, Qualitative Risk Assessment, Risk Analysis, Probability matrix*

I. INTRODUCTION

Afghanistan is a developing country where the construction sector has a significant influence on the country's development and infrastructure. According to the Afghanistan Investment Support Agency (AISA) [1], in the recent years, the statistics show that the construction sector has a share of 7-10% in GDP of the country. The construction sector has been rated third in the county's economic development after agriculture and mining [2]. Although the construction industry represents a significant share of Afghanistan economy, over the past years the efficiency and enhancement of the construction industry have been undervalued. In the delivery of essential infrastructure projects such as power plants and roads, there are unnecessary cost overruns, delays, and less productivity [3].

Nowadays, implementing risk management in construction has gained more attention globally. Risk management overcomes many risks which have adverse effects on project objects such as time, cost and quality

[4]. ISO 31000 [5] defines risk management as “coordinated activities to direct and control an organization with regard to risk”. For the sustainability of an organization, the risk management framework, policy and plan is an essential requirement to deal with uncertain events in the changing world. Risk management process encompasses activities of communicating, consulting, establishing the context, and identifying, analyzing, evaluating, treating, monitoring and reviewing risk [5]. Among these activities, the risk assessment is a vital part of the risk management process. Risk assessment comprises risk identification, risk analysis, and risk evaluation [6]. Risk identification is the first stage of risk assessment by which potential risks are recognized by surveys, expert advice, brainstorming, previous data analyzing, etc. Next, these identified risks are assessed by different techniques that can be qualitative, semi-qualitative or quantitative [7]. Finally, the risks are categorized based on their severity and impacts.

Despite the vital role of risk management in the improvement of quality in the construction projects, limited researches have been conducted in Afghanistan, and rarely addressed in academia. In order to prevent the cost overruns and delays of projects in Afghanistan, a risk assessment will be carried out as part of the risk management process for the risks that construction industry faces.

II. RESEARCH METHODOLOGY

In this study, the risk assessment is performed for the risks that construction industry confronts in Afghanistan. Risk management process is summarized in Figure 1. As can be seen in the figure risk assessment has three stages, namely, identification, analysis, and evaluation.

2.1. Risk Identification

To identify the risks that cause cost overruns and delays in the construction project in Afghanistan, a literature survey is conducted with particular emphasis on the standards, guidelines, codes of practices, published articles and other documents issued by accredited institutions and national legislation related to the subject.

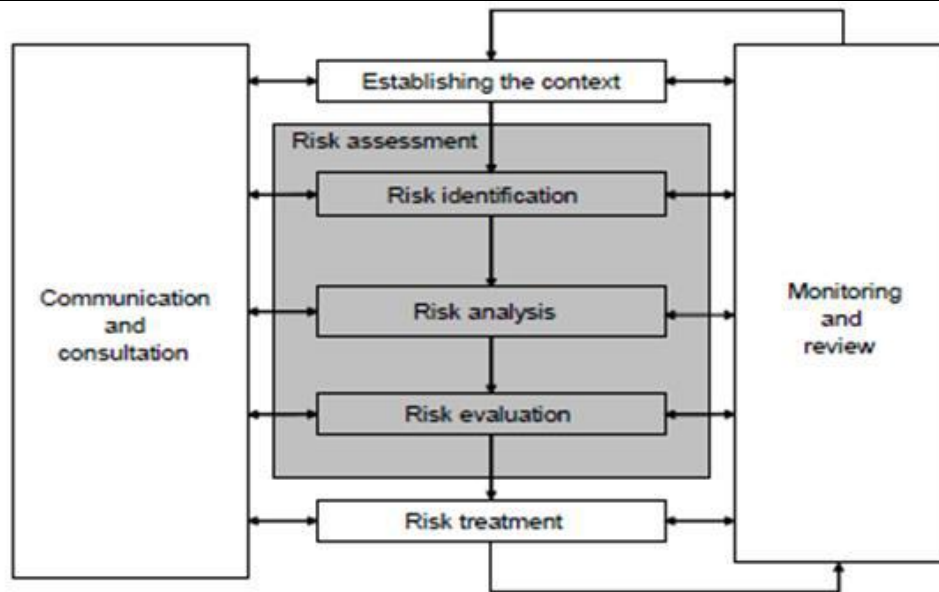


Fig. 1: The contribution of risk assessment to the risk management process [6].

As the result of the literature survey, three relevant published articles have been selected for the risk identification process. Niazi and Painting [8] with Ahady et al. [9] searched for the factors that cause cost overruns in the construction industry in Afghanistan. Also, Niazi and Gidado [10] explored the circumstances of project delays. The mentioned researchers have sorted the most influential factors for cost overruns and delays in the construction sector. In this study, these factors were identified as potential risks that should be analyzed and evaluated.

2.2. Risk Analysis

5x5 risk matrix methodology was developed in the risk analysis stage. After identification of risks, the

Very likely	(quantitative value	: 5)
Likely	(“ “	: 4)
Occasional	(“ “	: 3)
Unlikely	(“ “	: 2)
Very unlikely	(“ “	: 1)

frequency (likelihood) of the uncertain event, and its severity of consequence were estimated in the five categories defined by 5x5 risk matrix methodology, and identical quantitative values have been designated [6]. The value of risk was estimated by multiplication of likelihood and severity of the risk. The risk value can be formulated as:

$$R = P \times S$$

Where: P = Likelihood of occurrence and
 S = Potential severity of risk.

2.2.1. Categories for likelihood of risks (Frequency classification)

Five categories described by risk matrix methodology are:

- Very Unlikely: Infrequent risks, with about no probability of happening.
- Unlikely: Risks that are comparatively rare, but have a little chance of exposing.
- Occasional: Risks that are more common, with approximately a 50/50 probability of taking place.
- Likely: Risks that are extremely likely to happen.
- Very likely: Risks that are almost certain to reveal. Address these risks first.

2.2.2. Categories for severity of risks (Consequence classification)

Defined five harm categories are:

Disastrous	(quantitative value	: 5)
Severe	(“ “	: 4)
Serious	(“ “	: 3)
Considerable	(“ “	: 2)
Insignificant	(“ “	: 1)

- Insignificant: Risks that make no substantial negative consequences, or pose no notable threat to the organization or project.
- Minor: Risks that hold a little potential for adverse outcomes, but will not significantly influence overall success.
- Moderate: Risks that could induce negative consequences, posing a consistent threat to the project or organization.
- Critical: Risks with substantial unfavorable effects that will severely impact the accomplishment of the organization or project.

- Disastrous: Risks with extremely negative results that could make the entire project to fail or severely affect the daily operations of the organization.

2.3. Categories of risk on the basis of risk level

Risk categories were established by building a risk matrix using levels for likelihood of risk and classes for severity of risk as its variables shown in Table 1. In this matrix risks are grouped as:

Table.2.1: Risk matrix and risk categories on the basis of risk level [11; 12].

Probability of Occurrence (P)		Severity of Consequence (S)				
		Disastrous	Severe	Serious	Considerable	Insignificant
		5	4	3	2	1
Very likely	5	25 Very high	20 Very high	15 Very high	10 High	5 Low
Likely	4	20 Very high	16 Very high	12 High	8 Medium	4 Very low
Occasional	3	15 Very high	12 High	9 Medium	6 Low	3 Very low
Unlikely	2	10 High	8 Medium	6 Low	4 Very low	2 Very low
Very unlikely	1	5 Low	4 Very low	3 Very low	2 Very low	1 Very low

2.4. Risk Evaluation

At this stage, the results of risk analysis have been compared with risk criteria to decide whether the risk or its magnitude is acceptable or tolerable. The actions to be taken for each risk depend on whether the relevant risk is categorized as:

Unacceptable	(quantitative value)	: 15, 16, 20, 25)
Unwanted	(“ “	: 9, 10,12)
Acceptable	(“ “	: 3,4)
Negligible	(“ “	: 1,2)

Table 3.1 shows the risk category and acceptance level after estimating the risk value (R = P X S) in risk analysis process.

Table 3: Risk Categorization [12].

Category of risk	Evaluation of tolerability
Very low (Level 1, 2, 3, 4)	Acceptable (or Negligible)
Low (Level 5, 6)	Risks that should be reduced so that they are tolerable or acceptable (Unwanted)
Medium (Level 8, 9)	
High (Level 10, 12)	
Very high (Level 15, 16, 20, 25)	Unacceptable

III. RESULTS AND DISCUSSION

3.1: Identified Risks in Construction projects in Afghanistan

Table 4.1 shows the result of a literature survey of the potential risks that are most influence the cost overruns and delays of projects. These risks were addressed by clients, contractors and consultants [8; 9; 10].

Table 4: Most significant risks faced by construction industry in Afghanistan

NO	Risk	Description
1	Corruption	Corruption creates a severe threat to the Afghanistan Construction Industry being able to improve because it has a critical influence on construction cost growth. This is because of low commitments of Afghan leaders against corruption, lack of technical staff, a weak legal and regulatory regime and poor overseeing mechanism.

2	Security	Security is a significant threat that has limited most projects from being delivered on planned funds in Afghanistan. The bad security condition is a great dare that construction stakeholders face with, thus, most of the projects are delayed which drives to cost rises.
3	Delay in progress payments by client	Delays in progress payments by clients are a crucial factor which makes construction cost overruns not only in Afghanistan but can be one of the common main causes of delays in most countries.
4	Financial difficulties by contractor	Some contractor companies go on bankruptcy due to some political and economic challenges in Afghanistan.
5	Frequent change orders during construction by client	Deficiency of communication between client and contractor during the design stage of the project causes that the customer changes his mind during the construction phase to modify the scope of the project.
6	Market inflation	Raising the prices of goods and services due to the high demand in the market.
7	Mistakes and discrepancies in design documents	Lack of well-documented engineering design and construction standards and qualified design engineers in Afghanistan.
8	Inappropriate type of project bidding and award	The process of project bidding is complicated in Afghanistan and sometimes the project is awarded to an unqualified company.
9	Lengthy bureaucracy in government entities	The inadequate management system in government such that still there are no active online systems to facilitate communication problems and the existence of parallel government institutions that require the same documents repeatedly.
10	Late in approving design documents	Decision-making problems in the top management.
11	Shortage of supply of construction material required	Some essential construction materials are imported from outside of the country, and due to some political and security concerns, the materials cannot arrive on time.
12	Fluctuations in the cost of building and other materials	Fluctuation in prices of raw materials increases the cost of building and construction materials.
13	Delay in sub-contractors work	Financial difficulties and disqualifications of sub-contractors' companies result in project delay.
14	Lack of pre-contract project coordination	The terms and conditions of a project is not clear. While implementing the plan, the contractors recognize some undiscussed points that were not reviewed with the client before the sign of the contract.
15	Lack of skilled labor	Most of the skilled labor in Afghanistan are from Pakistan and India, so there is the inadequacy of local skilled labor.
16	Improvements to standard drawings during construction phase	Lack of communication and interaction in the decision-making process between stakeholders.
17	Poor qualification of the contractor's technical staff	The contracting companies are facing the nonexistence of experienced technical staff to execute complex projects such as applying HVAC systems in buildings.
18	Poor site management and supervision by contractor	Construction management process is not implemented in some of projects.
19	Ineffective planning and scheduling of project by contractor	Poor construction management
20	Poor communication and coordination by contractor with other parties	Proceeding the project without giving a construction progress report to the stakeholders.
21	Frequent change of sub-contractors because of their inefficient work	The disability of sub-contractors to complete the project and meet the needs of main contractors.

The above risks can be classified for further main risk categories as external, project management, organizational, technical, quality and performance [13]. Risk types vary for each country. For example, in the case of Afghanistan, corruption and security are two dominant risk types that can generate other kinds of risk as well. Due to these two risks, construction projects cannot be delivered on time with the estimated budget. However, in Pakistan, as a result of a questionnaire survey, the principal risks in construction projects were payment delays, project funding problems, accidents/safety during construction, defective design, etc. [4].

3.2: Risk Analysis and Evaluation of Identified Risks

The 5x5 risk matrix methodology has been applied to the risk analysis. For each type of risk, the category of likelihood and severity were assigned. As it has been

shown in Table 5, out of 21 potential risks, just one of them fell into the acceptable category. Other ones have been ranked as the unacceptable and unwanted risks. This shows that the risks can cause severe losses to the quality and scheme of the construction projects in Afghanistan. For the risks that are in the category of unacceptable and unwanted requires a risk mitigation or treatment plan to minimize the probability of occurrence. Risk treatment can include; withdrawing the risk by determining not to begin or proceed with the activity that gives rise to the risk, eliminating the risk origin, changing the probability, changing the consequences, assigning the risk with another party, and retaining the risk by informed decision [5].

Table 5: Analysis and Evaluation of Identified Risks

No	Risk	Frequency of Occurrence		Consequence		Risk Class	
		Description	Frequency	Severity		Rating	Accept
1	Corruption	Very likely	5	Critical	4	20	Unacceptable
2	Security	Likely	4	Critical	4	16	Unacceptable
3	Delay in progress payments by client	Occasional	3	Critical	4	12	Unwanted
4	Financial difficulties by contractor	Occasional	3	Moderate	3	9	Unwanted
5	Frequent change orders during construction by client	Occasional	3	Moderate	3	9	Unwanted
6	Market inflation	Occasional	3	Moderate	3	9	Unwanted
7	Mistakes and discrepancies in design documents	Occasional	3	Moderate	3	9	Unwanted
8	Inappropriate type of project bidding and award	Likely	4	Critical	4	16	Unacceptable
9	Lengthy bureaucracy in government entities	Likely	4	Moderate	3	12	Unwanted
10	Late in approving design documents	Occasional	3	Critical	4	12	Unwanted
11	Shortage of supply of construction material required	Likely	4	Moderate	3	12	Unwanted
12	Fluctuations in the cost of building and other materials	Occasional	3	Moderate	3	9	Unwanted
13	Delay in sub-contractors work	Occasional	3	Moderate	3	9	Unwanted
14	Lack of pre-contract project coordination	Unlikely	2	Minor	2	4	Acceptable

15	Lack of skilled labor	Likely	4	Moderate	3	12	Unwanted
16	Improvements to standard drawings during construction phase	Occasional	3	Minor	2	6	Unwanted
17	Poor qualification of the contractor's technical staff	Occasional	3	Critical	4	12	Unwanted
18	Poor site management and supervision by contractor	Occasional	3	Moderate	3	9	Unwanted
19	Ineffective planning and scheduling of project by contractor	Occasional	3	Critical	4	12	Unwanted
20	Poor communication and coordination by contractor with other parties	Occasional	3	Moderate	3	9	Unwanted
21	Frequent change of sub-contractors because of their inefficient work	Occasional	3	Moderate	3	9	Unwanted

IV. CONCLUSION

In this study, the risk assessment process has been implemented for the potential risks that the construction industry confronts. The probable uncertainties of cost overrun and delays in building construction in Afghanistan were reviewed through the literature assessment in which 21 most critical risks were identified. After the analysis and evaluation of identified risks using probability matrix method, it was found that 20 risks fell into the unacceptable and unwanted category. These risks need mitigation measures by executing risk treatment policy to register, monitor and review the uncertain events. The conclusions call for necessary awareness in developing the Afghanistan construction industry's capability and performance to execute risk management in their projects for mitigating against further project failure.

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