

Evaluating Risk Management Practices in the Pakistani Construction Industry: The Current State of Play

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Abstract

The construction industry of Pakistan has experienced rapid growth in recent years due largely to stronger investment in infrastructure development. Mega projects, of a scale never experienced by Pakistani construction practitioners, require higher levels of planning and management to ensure effective procurement delivery. Moreover, construction managers need to be more meticulous when addressing construction risks, necessitating the implementation of structured risk management procedures. However, the concept of a formal and prescribed risk management process is somewhat new to these managers and they are still chiefly assessing risks through intuition, judgment and experience. While such long-established informal approaches may have been acceptable in the past, they will undoubtedly gain poor outcomes on large scale projects. This research attempts to reveal the current state of utilization of formal risk management practices in Pakistan. Specifically, a questionnaire survey instrument was adopted to ascertain current processes and procedures used to identify, analyze and mitigate risks on construction projects. The research uncovered a total of forty (40) risks which are frequently encountered in the Pakistani construction industry as well as a range of unstructured, partially structured and structured approaches for quantifying and addressing risks. In general, this study confirmed that the large majority of Pakistani construction firms still tend to approach risk management in an *ad hoc* manner. Further research aims to develop a road map for improving rates of adoption of formalized risk management approaches in the Pakistani construction industry. Such a road map may have value for other developing and newly industrialized nations.

Keywords

Construction Industry, Risk, Risk Management, Pakistan

1. Introduction

No construction projects are risk free. Every construction project, large or small, involves risks, varying in impact. Risks may hinder the successful completion of a project by causing time and budget over-run, and/or quality default. The construction industry in developing countries has a very poor reputation for coping with risks. Risk analysis is either ignored or done subjectively by simply adding a contingency. As a result, many major projects fail to meet schedule deadlines and cost targets with an attendant loss to both contractors and owners. As stated by Ofori (1993), the structural problems of the construction industry in developing countries are more fundamental, more serious, more complex, and overall, much

more pressing than those confronting their counterparts elsewhere. Common problems affecting the construction industry in developing countries include lack of management skills, shortage of skilled labor, low productivity, shortage of supplies, bad quality of supplies and lack of equipment. Apart from technical issues, management-related problems are one of the most important aspects facing construction contractors since they have to deal with substantial constraints such as incomplete information, unpredictable client behavior and uncertain project circumstances. Innovation never ceases in the field of construction, which also contributes its fair share in uncovering so many technical and other risks

Keeping in view the current economic boom, a number of large construction projects are being deployed in Pakistan. Mega projects, of a scale never experienced by Pakistani construction practitioners, require higher levels of planning and management to ensure effective procurement delivery. However, the lack of management skills, especially risk management, has been a major concern in local construction industry, which has clearly shown its negative results. Time and budget overruns, poor quality and inadequate safety practices are usual byproducts of local construction projects. Though it was observed that many of the risks are being routinely identified and mitigated on the basis of the managers' own intuition, experience and judgment, but due to the lack of familiarity with proper risk management, it was observed that the Pakistani managers are not properly employing risk management processes.

2. Risk and Risk Management

The Oxford Advanced Learner's Dictionary (1995 ed.) defines risk as the "chance of failure or the possibility of meeting danger or of suffering harm or loss". In construction projects, a risk may be defined as the likelihood of a detrimental event occurring to the project. Since the objectives of construction projects are usually stated as targets established for function, cost, time and quality, the most important risk in construction is the failure to meet these targets.

Within the scope of management and decision theory, research in construction and project risk management began in 1960's (Guilin *et al*, 2004). Risk management is defined as a set of methods and activities designed to reduce the disturbances occurring during project delivery (Skorupka, 2003). It can also be defined as the structured set of processes aimed at identifying, analyzing and responding to project risks. It includes maximizing the results of positive events and minimizing the consequences of negative events (PMBOK Guide, 2000). According to Gray (2000), risk management is a proactive approach rather than reactive. It is a preventive process designed to ensure that surprises are reduced and negative consequences associated with the undesirable events are minimized. Successful management of project risk gives the project manager better control over the future and can significantly improve chances of reaching project objectives on time, within budget and meeting required technical (functional) performance. The major components of risk management process are risk identification, risk assessment, risk response development and risk response control.

2.1 Risk Identification

This step seeks to identify the risks to be managed. Comprehensive identification using a well-structured systematic process is critical, because a risk not identified at this stage may be excluded from further analysis. Identification should include risks whether or not they are under the control of the organization (Australian/New Zealand Standard 4360:2004). An effective tool for identifying specific risks is the work breakdown structure (WBS). Use of WBS reduces the chance of risk event which may be missed. Turner (1999) suggests expert judgment, plan decomposition, assumption analysis, decision drives and brainstorming for identification of risk effectively in a project. Perry and Hayes (1985) suggest a checklist of risk that may occur throughout the life span of any project. The Delphi technique was used by Dey (1999) for the identification of risks.

As a result of risk identification, we get a list of risks which may occur in the project or risk symptoms, sometimes called triggers which are indirect manifestation of actual risk events; for example, poor morale may be an early warning signal of an impending schedule delay or cost overruns on early activities may be indicative of poor estimation.

2.2 Risk Assessment

Risk assessment is about developing and understanding the risk. It provides an input to decision on whether risks need to be treated and the most appropriate and cost affected risk treatment strategies. Risk assessment involves consideration of the sources of risk, their positive and negative consequences, likelihood that those consequences may occur. Factors that affect consequences and the likelihood may be identified. Risk is analyzed by combining consequences and their likelihood. In most circumstances existing controls are taken into account (Australian/New Zealand Standard AS/NZS 4360:2004).

Risk analysis techniques are grouped into two parts: quantitative and qualitative. They both benefit from the data produced by risk identification but the qualitative approach consumes the gathered information through direct judgment, ranking options, comparing options and descriptive analysis. In contrast, some of the quantitative risk analysis techniques, such as Decision Tree method and Monte Carlo simulation, are used in performing statistical analyses and simulations in order to reach numerical results that show the effects of risks. While most tools and techniques used in analyzing the risks provide quantitative solutions, they all constitute some subjectivity (Ahmet, 2003).

2.3 Risk Response Development

The risk response-planning phase exists to develop responses to identified risks, which are appropriate, achievable and affordable. Owners are also allocated to each risk response to be responsible for its implementation and for monitoring its effectiveness. Risk response is the most important stage of risk management because the above stages of risk management do not actually remove the risk in the project.

Gray (2000) suggests that there are basically two strategies for risk response. These strategies are: (1) reduce the likelihood that the event will occur; and (2) reduce the impact that adverse event would have on the project. Responses to risk can be classified as mitigating, avoiding, transferring, sharing, retaining or any combination of the above.

2.4 Risk Response Control

The last step in the risk management process is risk control that involves executing risk response strategy, monitoring triggering events, initiating contingency plans and watching for new risks. Establishing a change management system to deal with events that require formal changes in the scope, budget and/or schedule of the project is an essential element of risk control (Vaughan, 1997).

3. Objectives of Research

The research aims to identify risks in the Pakistani construction industry. The research took the assessment of those identified risks, working out the numerical operations on the identified risks. The respective significance and probability of identified risks were calculated, and some statistical models were applied to mathematically determine and analyze risks. The research also investigated the most effective approaches towards preventing or minimizing construction risks (i.e. mitigating losses). Above all, the main objective of this research was to present a viewpoint of risk management in the Pakistani construction industry.

4. Research Methodology

The first phase of research was risk identification, for which a comprehensive study of literature was carried out to compile and collect the risks identified by different researchers in different parts of the world. Literature review for risk identification yielded a detailed list of one hundred and thirteen (113) risks identified by different researchers in their studies. The risks identified in literature review, being very diverse in nature, presented a global risk scenario. The scope of the research, which was limited to the Pakistani construction industry, posed the restriction to analyze risks faced by local construction professional and experts. Therefore, a pilot study was conducted with industry experts to short-list the identified risks from literature review according to conditions in the Pakistani construction industry. The panel of respondents was made up of personnel from the construction industry having in-depth knowledge of current construction practices and understanding of the risks faced by today's construction industry. Hence, a modified list was generated of forty (40) risks faced by the Pakistani construction industry.

The second phase of research was risk analysis, which required the observations and perceptions of different industry experts and construction practitioners with respect to the severity and probability of identified risks. Considering the nature of work and constraints of time and resources, the questionnaire survey was adopted as a method for data collection. The questionnaire used in the survey consisted of three main parts as follows:

- (a) Background Information - collecting the personal data of respondents, their experience in the construction industry.
- (b) General Perception of Risk Management - collecting the respondents' familiarity with the concept of risk management and its current practices in the Pakistani construction industry. This part of the questionnaire also explored the respondents' level of knowledge of risk response.
- (c) Risk allocation and Significance - collecting the level of impact and likelihood of identified risks. The allocation of identified risks to respective stakeholder(s) was also obtained through this part of the questionnaire. The information collected from this part of the questionnaire was required to perform statistical calculations for the severity and probability of risks.

The third phase of the research was risk mitigation. During this phase, a comprehensive literature review was carried out to collect the suitable preventive and mitigative actions to respond to the risks. The work of Kartam and Kartam (1997) was adopted for risk mitigation.

To indicate the relative effectiveness of preventive and mitigative actions, structured interview were held with industry experts. Based on their experience, knowledge of industry and local working conditions, the interviewees responded to the risk response options. The respondents were required to indicate the relative effectiveness of each of these methods by giving scores based on the scale ranging from most effective, effective, indifferent, ineffective, most ineffective and inapplicable.

5. Data Collection and Analysis

For data collection, the local construction industry was selected, and a random selection of professionals was undertaken. A total number of 70 questionnaires were sent out. Out of 70, forty-two (42) questionnaires were returned. Two incomplete questionnaires were rejected. Thus, the survey response rate achieved was 60%.

Based on collected information in the first part of the questionnaire, the average age of respondents was 43.5 years. The average years of experience in the construction industry was 19. In the second part of the

questionnaire, information collected was related to the general perception of risk management, its application to the Pakistani construction industry and the state of risk response. Regarding the familiarity with the concept of risk management, out of 40 respondents, 10% were very familiar, 44% were familiar, 38% were partially familiar and 8% were not familiar. With regards to the frequency of risk management implementation in the Pakistani construction industry, 18% considered it as very often, 67% as often and 15% as not at all. For the level of risk control by the application of efficient risk management, 28% of the respondents believed that risks involved in construction could be fully controlled, 59% thought that they would be partially controlled and 13% perceived that they would not be controlled at all.

The last part of the questionnaire was related to the significance and allocation of each risk. To determine the significance (risk factor) of each risk, severity and probability of each risk were obtained from the questionnaire survey. Figure 1 shows the rating of the top ten significant risks in the Pakistani construction industry.

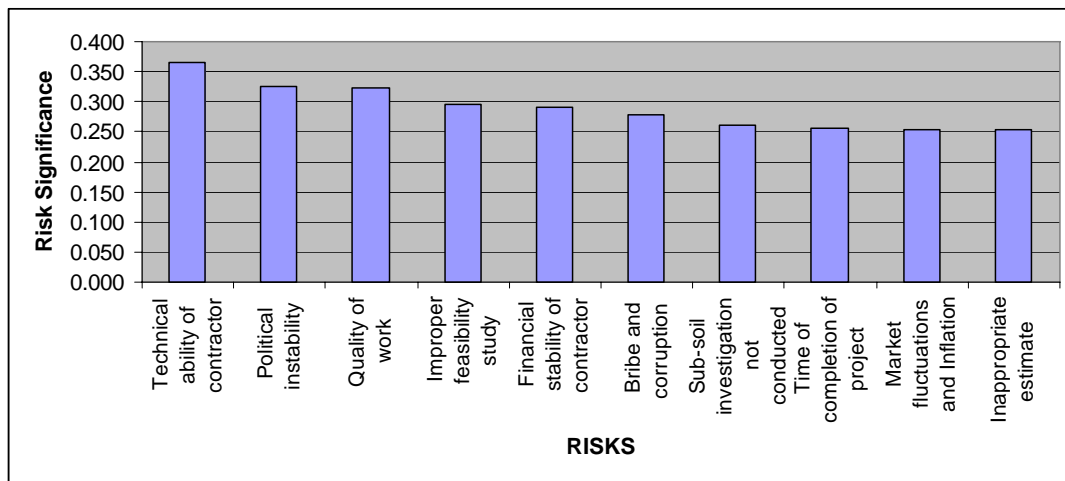


Figure 1: Top Ten Significant Risks in the Pakistani Construction Industry

6. Findings

6.1 Risk Significance

The survey shows that the technical ability of the contractor was the most significant risk of the construction industry, and this risk was allocated to contractors. Experts suggest that the best preventive measure is proper prequalification of the contractor, which should be emphasized by governments to the stakeholders of the construction industry.

Quality of work was the second most significant risk to the construction industry, and this risk is allocated to contractors, since the contractors are in a better position to control this risk. Close supervision of subordinates and better coordination with subcontractors and stakeholders are effective mitigative measures for this risk

Improper feasibility study was the third major identified risk in the construction industry, and its allocation is undecided. The preventive measures for this risk suggested by experts are to transfer or share risk to/with other parties or to use subjective judgment to produce a proper program.

The fourth most undesirable risk to local construction industry was not conducting sub-soil investigation, and allocation of this risk is undecided. Experts suggested this risk should be shared or transferred to other parties and experience and judgment should be used to prepare a proper marginal program.

Political instability, which can cause delays to projects, was the fifth major risk seen by the local construction industry. This risk is a shared risk since all the parties involved in the construction industry tend to suffer the instable and insecure political environment. The most effective preventive measures for these risks are to refer to the previous and ongoing similar projects for an accurate program or to utilize quantitative risk analysis technique for accurate time estimation.

Bribe and corruption were the sixth most important risk in the industry. The allocation of this risk is shared, and all parties will have to bear the negative consequences of such a risk. The preventive measures for this risk suggested by experts is to transfer or share risk to/with other parties

Inappropriate estimate was the seventh most significant risk faced by the construction industry and generally causes cost over-runs of projects. The allocation of this risk is undecided. Referring to previous and ongoing similar projects for an accurate program was the most effective preventive measure for this risk.

The eighth most significant risk in the industry was financial stability of contractor. This risk is allocated to the contractor. Other parties do not assume the responsibility of this risk. During a recession period, the significance increases, and the contractor desires a risk sharing approach. Moreover, clients have been forced to pay in excess of their contractual obligations in order to secure delivery of the contract object when the contractor's financial stability is jeopardised. Preventive measures for this risk include planning alternative methods/options as a stand-by for the project or transferring or sharing risk to/with other parties.

Funding of risk was the last major risk faced by the construction industry, especially of developing countries. Transferring or sharing risk to/with other parties is a suitable preventive measure for this risk. The survey findings also indicated other risks such as time of completion of project, market fluctuation and inflation, delay in obtaining planning approval, strikes and influence of power groups, availability and productivity of labor, cost of project, scope of project, etc.

6.2 Risk Mitigations

6.2.1 Preventive measures

Preventive actions are used to avoid and reduce risks at an early stage of project construction. Thompson and Pery (1992) conclude that risk management is most valuable at any early stage in a project. In order to quantitatively demonstrate the relative degree of effectiveness between the methods, structured interview were conducted with industry experts.

The survey results indicate that “*Produce a proper schedule by getting updated project information*” and “*Plan alternative methods/ options as stand by*” were considered as the two most effective risk prevention actions. The interview results indicate that before preparing a schedule of the project, there must be full information in all relevant aspects considered, and there must be an alternative in any mishap. The interview results further show that since there is limited time and information available when preparing the project program, practitioners' experience and subjective judgement become the most valuable information source for use and principal method at this stage. Therefore, “*Depend on subjective judgment to produce a proper program*” was considered an effective preventive measure. However, as construction projects are subject to a dynamic environment, reliance only on experience and subjective judgement may be incorrect, and updated information should be obtained and applied.

An important finding from the results is that “*the method of making time estimation through quantitative risk analysis techniques*” was not considered to be an effective preventive method. This was due to the practitioners' insufficient knowledge and experience of these analysis techniques and the difficulty of finding the true probability distribution for risk in the practice. The survey also indicates that the method “*transfer share/ risk*” was considered ineffective for preventing risks. Substantial losses could occur if risks are transferred to those subcontractors who do not have such financial or technical ability and may leave if they are in trouble. While this argument is true in the local industry, it shows the practitioners' limited awareness of the full potential benefits from risk transfer/share, in the contract arrangement not only with the subcontractors, but also with the client. “*Refer to previous and ongoing similar projects for accurate program*” was also an ineffective preventive measure because it is difficult to find similar projects. Changes with respect to the environment, culture or scope of work always occur. Adding a “*risk premium to time estimation*” was not recommended by the practitioners as an effective preventive method. Risk premium in construction projects takes the form of contingencies or added margins to an estimate to cover unforeseen eventualities. Yet, this result was expected since taking into consideration such risk premiums would increase the bid and would consequently decrease the probability of gaining the bid due to the highly competitive local construction industry.

6.2.2 Mitigative measures

While some project risks can be reduced through various preventive actions at early stages, the project progress still suffers due to risks in many projects during the construction process. When progress suffers, stakeholders will have to adopt various remedial actions to minimize the effects of the risk.

The most effective risk mitigative method recommended by experts was to “*coordinate closely with subcontractors*”. The subcontracting approach has been widely used and developed into a very sophisticated system in the Pakistani construction industry. Close coordination both technically and socially with subcontractors becomes an important and effective method to reduce the impacts of delayed progress. “*Close supervision of subordinates for minimizing abortive work*” was ranked as a second most effective mitigative method to be followed for minimizing losses. However, most local subcontractors lack the technical ability to fulfill contracted works.

A significant finding from the survey results is that “*increase of manpower and/or equipment*” was considered an effective remedial method to minimize the effects from delayed progress, and that “*changing the construction methods*” has been rarely used. The interview results suggest that the fluctuation in labour force on site does affect project progress in the local industry. In fact, as pointed out before, shortage of manpower in the subcontractors' firms is one of the most serious risks to project delays. Therefore, increasing the work force will normally speed up progress effectively. “*Changing the sequence of work by overlapping activities*” was considered an ineffective mitigative method. “*Increasing the working hours*” and “*changing the construction methods*” were not recommended as effective methods to minimize the effects of risks on the project.

7. Conclusion

Risk management is a demanding and challenging field of construction management due to its dynamic nature and involvement of human factors. The lack of management in the construction industry has been a negative factor in underdeveloped and developing countries. Wastage of resources, under-quality results and ultimate delays are reckoned to be the integral parts of projects in the developing world.

Risk management, being a new field of construction management, is in its early stages in the Pakistani construction industry. Although a formal and prescribed risk management seems to be lacking, traditional risk management depending upon intuition, judgment and experience is carried out. Poor construction

management practices, resulting in accidents at construction sites, delays in meeting deadlines, overruns in project budget and low construction quality are customary in Pakistani construction industry. Contractors' financial and technical abilities are major risks faced by local industry due to lack of proper procurement methods. Quality of work, political instability and bribe and corruption are the risks which affect the productivity of projects.

The survey on risk management action shows the varying degrees of effectiveness of various preventive and remedial methods in the local industry. Significantly, it reveals that methods where practitioners' experience and subjective judgement are used are the most effective and important risk management action, and that methods using quantitative analytical techniques have been rarely used due to limited understanding and experience. The findings suggest a need to promote the application and awareness of various analytical techniques for risk management in a proper context in the Pakistan construction industry. Also, the findings indicate that coordination with sub-contractors, close supervision of subordinates as well as increase of manpower and equipment are considered to be the most effective risk mitigative methods utilized in the Pakistani construction industry market. This result has highlighted the fact that subcontracting work agreements hold the key to mitigate losses of delay impacts that a general contractor has to bear in Pakistan.

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