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Research Article

The Contractors' Perception of Risk Management in Pakistan

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Abstract: Risks in construction projects are due to the uncertainty involved at decision making of management, manipulation of resources, tackling of constraints, implementation of quality etc. Therefore, construction projects are always a risky undertaking for all involved stakeholders (client, consultant, and contractor). The contractor as one of the stakeholder has to face maximum challenges to overcome the risk associated uncertainties. The management is essential in dealing with the potential risk exposures to the contractors. In response to these ever increasing uncertainties, in developed countries risk management was introduced as a separate new field in construction industry to manage risks effectively. However, construction industry in developing countries like Pakistan has a deprived reputation for coping with risks. With rapid advancements in the construction industry of Pakistan, many uncertainties are bound to occur. This paper highlights the major risks faced by the contractors in Pakistan. It has been observed that most of the risks faced by stakeholders in Pakistan are universal with few exceptions like political instability and price escalations. Unlike in developed countries, most of the contractor organizations in Pakistan are not adopting the risk management procedures in their organizational structure as well as during project execution. This paper also describes the effect of identified risks on schedule, scope and budget of the project through quantitative and qualitative analysis using database of two actual construction projects. These risks have been causing scope out of control, cost over budget, time over run or quality default. This research has proved that construction projects associated with un-managed risks must face obstacles in their successful completion. Hence, the construction stakeholders in Pakistan need literacy about benefits associated with effective risk management.

Keywords: Construction, contractor, industry, management, projects, Pakistan, risk

1. INTRODUCTION

None of the construction projects in the globe is risk free. Every construction project either it is small, medium or large involves risks, varying in impact. Risk management is a systematic process of identifying, analyzing and responding to project risks [1]. Risk management involves maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to the project objectives [2]. Construction is a highly risk-prone industry with a relatively poor track record of coping with the risks [3].

The risk management in construction is normally carried out through the processes of identifications, analysis and control [4]. Client (Financer of the project), consultant (designer of the project) and contractor (constructor of the project) are the three key stakeholders involve in any construction project. As the job natures of each stakeholder vary therefore the type and nature of risks taken by them also vary.

After identification of the risks, these are required to be analyzed. The risk analysis can be carried out by either qualitative or quantitative method. The qualitative risk analysis involves the conditions to prioritize their effects on the project scope/schedule, while the quantitative risk analysis measures the probability and consequences of risks and estimating their implications for the project scope/schedule [5].

The parties of the construction projects normally have been facing following challenges due to inappropriate risk management during

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projects execution; delays in project completion, cost overruns and failing to meet quality standards along with operational requirements [6]. An effective analysis and management of construction associated risks remain a big challenge to the industry practitioners [7]. There are number of local and foreign stakeholders in various capacities and disciplines, who have been serving the construction industry of Pakistan. The role of these stakeholders becomes more critical and challengeable since the implementation of treaty by World Trade Organization (WTO) in the construction industry of Pakistan [8]. Research has also proved that risks taken by construction stakeholders are country specific as well as worldwide [9, 10]. The major parameters that affect the type and nature of risks include cost effectiveness, quality compromises, geographical influence, cross culture environment, local or international joint ventures etc [11].

Contractor is one of the lead stakeholders in construction project. Contractor has to implement the scope and to utilize maximum budget of the project. Moreover, the schedule of the construction project is also dictated by the contractor. So among the stakeholders the contractor is the organization which has been subjected to face maximum number of risks during lifecycle of a construction project.

Unlike in other developed countries, there is very less research work that has been done in past regarding construction risk management in Pakistan. Hence, there is no significant research literature available about construction risk management topic in Pakistan. Therefore, there was a need to literate the construction community about the limitations as well as opportunities belonging to risk management. The scope of research was kept limited only to contractors as among all the stakeholders of a construction project, the role of contractors is more vital than others in terms of allocation, analysis, and management of construction associated risks. An attempt has been made in this research to introduce risk management in perspective of contractors in Pakistan through investigating:

- Risks faced by various stakeholders in construction projects,
- Analysis of the approach of Pakistan's contractor organizations towards risk management,
- Methodologies of risk management and analysis adopted by Pakistan's contractors in different construction projects
- Proposing risk factors to evaluate the impact of risks on scope, schedule and budget of the projects.

2. MATERIALS AND METHODS

The objectives of the research were achieved by adopting following methodology.

The selection of potential contractors recognize by Pakistan Engineering Council (PEC) for the survey. The contractors were selected based on their organizational structure and key qualification of top hierarchy. The information and details of the surveyed contractors with their PEC categories and cost limit of carrying out any construction project are shown in Table 1.

A survey was conducted among the contractors listed in Table 1 using questionnaire shown in Table 2. The questionnaire was developed on the concept of information gathering techniques discussed in tools and techniques for risk identification in Project Management Institute (PMI) of United States of America publication "Project Management Book of Knowledge" [2].

Minimum three professionals belonging to the top or middle management of selected contractors involved directly in resource / project management with risk management background were interviewed by using questionnaire (Table 2) for listing out the major risks faced by the stakeholders working in construction projects.

Based on the analysis of database obtained from questionnaire, major risks faced by different stakeholders working on various construction projects were listed (Table 3). The respective allocation of each major risk with respect to their intensity of occurrence was also summarized (Table 3). The risks were also ranked based on their intensity of occurrence (Fig. 1) using procedure of probability [12].

Risk management practices in the organizational structure of various contractors were also evaluated through another survey. Following risk management

Table 1. Category-wise PEC approved surveyed contractors' list.

PEC Category	Enlisted Companies in PEC	Construction Cost Limit (Million Rs.)	Contractor Company
C-A	110	No Limit	1. DESCON Engineering (Pvt.) Ltd. 2. SKB Engineering and Construction 3. Habib Rafique (Pvt.) Ltd. 4. IZHAR Construction 5. Imperial Construction Company
C-B	93	Up to 1000	1. Potential Engineers (Pvt.) Ltd. 2. Rising Sun Construction 3. Hassan Zaman (Pvt.) Ltd. 4. KNK (Pvt.) Ltd. 5. SKAFS International
C-1	296	Up to 500	1. Zee Khan Associates (Pvt.) Ltd. 2. Rehman Brothers (Pvt.) Ltd. 3. Shafiq Construction Co. 4. Zoraiz Engineers (Pvt.) Ltd. 5. Shalimar Construction Co. (Pvt.) Ltd.
C-2	433	Up to 200	1. A.J. Corporation 2. Marry Gold Engineers (Pvt.) Ltd. 3. National Industrial Engineers (Pvt.) Ltd. 4. Rockwell Construction (Pvt.) Ltd. 5. DEL Private Ltd.
C-3	970	Up to 100	1. Geo-Tech Services 2. Waqas (Pvt.) Ltd. 3. Naseem & Company 4. Fabcon (Pvt.) Ltd. 5. BEMSOL (Pvt.) Ltd.
C-4	1416	Up to 50	1. Malik Mumtaz and Company 2. Farooq Sandhu & Co (Pvt.) Ltd. 3. Rose Enterprises 4. Murad Technical Services 5. United Engineers

considerations (A-F) were assessed from each contractor:

A. If your organization has a documented risk management policy.

B. The organization polices support the taking of risks for the achievement of objectives.

C. In achieving the objectives of the project, your organization view risks as opportunity

D. If your organization has a risk analysis system.

E. If your organization has risks monitoring system.

F. Your organization evaluate the impact of risks on scope, schedule and budget of the project

The criteria of survey were based on the guidelines of carrying out statistical surveys [13]. The results of this evaluation are presented in Table 4.

After identification of major risks faced by stakeholders and management of risks by contractor organizational structure the risk management practices on two practical projects was investigated. The details of projects are as under:

1. Piling works at Fauji cement plant District Attock (Main Contractor; Descon Pvt. Limited (PEC Category C-A), Subcontractor BEMSOL Pvt. Limited (PEC Category C-4)).

2. Piling works for underpass construction at Lahore Canal Crossing (Contractor; SKB Engineering and Construction (PEC Category C-A)).

Table 2. Questionnaire of risk management.

Risk Management Questionnaire*			
Name of organization			
Construction specialization of organization			
Your name and position in the organization			
How long is your total working experience in Pakistan construction after your engineering graduation?			
How long is your experience of working in the present organization?			
Has your organization has Risk Management Department – If yes, then please provide a copy of its organizational structure. Also please specify:	**Yes / No**		
	Primary functions of your Risk Management Department		
	Secondary functions of your Risk Management Department		
Has your organization Quality management system (QMS) or ISO certification. If yes, how risk management documentation and record keeping is carried out?	**Yes / No**		
Has your organization computer-aided project management environment (Primavera Project Planner, MS Project) for planning, scheduling and monitoring? If yes, how risk management is planned, scheduled and monitored through this environment?	**Yes / No**		
Can you enlist and allocate major risks faced by Clients, Consultants and Contractors during your experience in different projects in the present organization? Kindly also rank intensity of risks: 1. Less critical 2. Moderate critical 3. Critical 4. Very critical	**Major Risks**		
	Clients	Consultants	Contractors
Can you enlist and allocate major risks faced by Clients, Consultants and Contractors during your experience in different projects in your past working organizations? Kindly also rank intensity of risks: 1 Less critical 2. ModeratecCritical 3. Critical 4. Very critical	**Major Risks**		
	Client	Consultants	Contractors
*For research purposes only			

The major risks identified (courtesy of the actual project database provided by the contractors) on both the projects were summarized and analyzed quantitatively and qualitatively. The quantitative effects of risks on scope, schedule and budget were analyzed through cash flow diagram [3, 4]. The qualitative effects of risks on scope, schedule and budget were analyzed through a statistical factor called as Risk Factor [14].

The risk factors were determined using following procedures:

Risk effects the three major components of the project i.e. scope, schedule and budget. Therefore, risk factors are determined using following relationship:

$$RF = n\,S + m\,C + q\,B$$

Where; S= Schedule of the project, C = Scope of the project, B = Budget of the project, n,m,q = Variables

Risk factors are equally affected by S, C and B [14]. Therefore, in qualitative risk analysis S, C and B parameters should be taken as constant. Following minimum and maximum limits of variables for risk factors allocation are proposed; n = 0-2, m = 0-4 and q =0-8 based on the findings of the research work [14]. The risk factor for any particular activity can be between 0 – 14. For the assessment of risk factor impact on any particular activity, the range is further distributed in to four sub factors as following:

0-4	Low risk factor
5-7	Medium risk factor
8-11	High risk factor
11-14	Very high risk factor

3. RESULTS AND DISCUSSION

Based on the analysis of database obtained from questionnaire survey (Table 2), list of the major risks faced by the stakeholders in Pakistan along with risk allocation among stakeholders in contractor's perspective are shown in Table 3.

Table 3. Major risks faced by stakeholders in Pakistan, with risk allocation in contractor's perspective.

Major Risks	Risks Allocation Among the Construction Project Stakeholders (Contractor's Point of View)					
	A*	B	C	D	E	F
Political constraints					■	
Technical capability	■					
Financial capability	■					
Procurement			■			
Litigation			■			
Project scheduling			■			
Financial decisions			■			
Production strategies						
Design alternatives		■				
Facilities planning			■			
Personnel decisions	■					
Interdepartmental corruption			■			
Intradepartmental bribery	■	■		■	■	
Environmental hazards						■
Health and safety			■			
Loss prevention			■			
Quality assurance			■			
Quality control				■		
Price changes					■	
Resources productivity			■			
Tender documents		■				
Project specifications		■				
Conditions of contract	■	■				
Inventory			■			

*A: Client, B: Design Consultant, C: Contractor, D: Supervision Consultant, E: Government Policies & Byelaws, F: Force Majeure

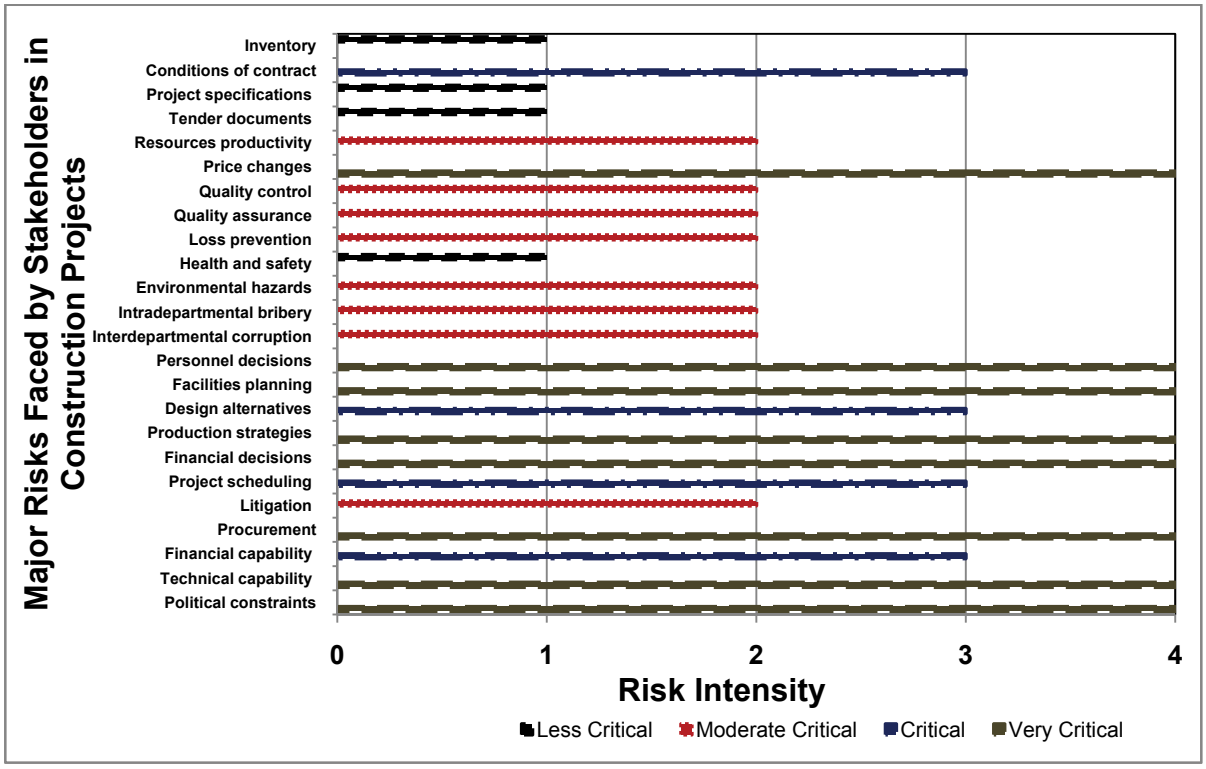

Fig. 1. Comparison of intensity of major risks faced by construction project stakeholders.

Based on the contractor's perspective there were twenty four different types of risks those were identified. Most of these risks can be attributed to specific stakeholder like five to client, five to design consultant, eleven to contractor, two to supervision consultants, two to government policies and one to force majeure. The few identified risks like interdepartmental bribery and conditions of contract were attributed to more than one stakeholder of the projects. The findings also confirm the point of view of existing international research [1, 15, 16, 17] that contractor as a stakeholder is involved in maximum number of risks during project execution.

The risk intensity of each major risks found through this survey (Table 2) was also evaluated and results are plotted in Fig. 1. In determination of risk intensity the factor 4 was designated as very critical, 3 as critical, 2 as moderate critical and 1 as less critical.

Based on the findings of the risk intensity results price changes, personal decisions, facilities planning, production strategies, financial decisions, procurement, technical capability and political constraints are categorized as very critical risks. Conditions of contract, design alternatives, project scheduling and financial capability are found as critical risks. The moderate critical risks include resources productivity, quality control, quality assurance, loss prevention, environmental hazards, interdepartmental bribery, interdepartmental corruption and litigation. Inventory, project specifications, tender documents and health and safety are recognized as less critical risks. The findings also confirm that most of the major risks faced by construction project stakeholder are worldwide [17] and few are country specific [9].

One of the key findings of the survey (Table 2) was that in Pakistan construction industry, most of the Clients deleted contract clauses associated with risks during preparation of their tender documents. Therefore, the allocation of risks among the stakeholders of the project remains un-clear during project execution thus arising different conflicts. These conflicts among various stakeholders put negative impacts on the project because each stakeholder tries to minimize its own risk. As a

result, the identification of major risks along with their allocation among the stakeholders of the constructions projects in Pakistan is necessary.

Risk management practices in the organizational structure of various contractors listed in Table 1 were also evaluated through another survey. The objective was to assess that either the contractor organizations structures have documented risk management policies or system. The results of this survey are presented in Table 4.

It can be seen from Table 4 that sixteen out of thirty organizations surveyed do not have documented risk management policy. Most of the organizations in high PEC category have documented risk management policies. The other organizations which have top management belonging to engineering background also have basic risk management policies. Rest of the organizations is relatively less versed about the risk management policies. As forty seven percent organizations do not have proper risk management

Table 4. Summary of risk management handling by organizational structure of contractors.

PEC Category	Name of Contractor	A	B	C	D	E	F
C-A	DESCON Engineering (Pvt.) Limited	3*	3	3	3	3	3
	SKB Engineering and Construction	3	3	1	3	3	1
	Habib Rafique (Pvt.) Limited	3	3	1	3	3	1
	IZHAR Construction	3	3	1	3	3	1
	Imperial Construction Company	3	3	3	3	3	3
C-B	Potential Engineers (Pvt.) Ltd.	3	2	2	1	2	2
	Rising Sun Construction	3	2	2	1	2	2
	Hassan Zaman (Pvt.) Ltd.	2	1	1	1	1	1
	KNK (Pvt.) Ltd.	2	1	1	1	1	1
	SKAFS International	3	2	2	1	2	2
C-1	Zee Khan Associates (Pvt.) Ltd.	1	1	1	1	1	1
	Rehman Brothers (Pvt.) Ltd.	1	1	1	1	1	1
	Shafiq Construction Co.	1	1	1	1	1	1
	Zoraiz Engineers (Pvt.) Ltd.	1	1	1	1	1	1
	Shalimar Construction Co (Pvt.) Ltd.	3	2	2	2	2	2
C-2	A.J. Corporation	3	2	2	2	2	2
	Marry Gold Engineers (Pvt.) Limited.	3	2	2	2	2	2
	National Industrial Engrs (Pvt.) Limited.	3	2	2	2	2	2
	Rockwell Construction (Pvt.) Ltd.	2	1	1	1	1	1
	DEL Private Ltd.	1	1	1	1	1	1
C-3	Geo-Tech Services	2	1	1	1	1	1
	Waqas (Pvt.) Ltd.	3	2	2	2	2	2
	Naseem & Company	3	2	1	2	2	1
	Fabcon (Pvt.) Limited	3	2	2	2	2	2
	BEMSOL (Pvt.) Ltd.	1	1	1	1	1	1
C-4	Malik Mumtaz and Company	3	2	2	2	3	3
	Farooq Sandhu & Co (Pvt.) Ltd	2	1	2	1	1	2
	Rose Enterprises	1	1	1	1	1	1
	Murad Technical Services	1	1	1	1	1	1
	United Engineers	1	1	1	1	1	1

*Key:

Disagree	Neutral	Agree
1	**2**	**3**

policy therefore their point of view about other risk management options investigated through B, C, D, E and F are neutral or in disagreement. Except the contractor organizations of C-A category, most of the organizations even having risk management policy are less versed about the role of these policies (B, C, D, E and F) in the organizational structure and in project execution and monitoring. Therefore, there point of view does not assist to portray any clear picture. Overall, it can be depicted from the findings of the survey that all class of contractor organizations need literacy about risk management role in organizational structure benefit through the development of risk policies, analysis and monitoring techniques.

Most of the risks identified in Table 3 are generalized. However, in construction profession there are multiple specific areas like geotechnical engineering, structure engineering, transportation engineering, hydraulic engineering, architectural engineering, project management, quality management, contract management, financial management etc [6]. The nature and type of risks in these specific areas should need to be explored. Therefore, risk management practices on two specific practical projects (geotechnical engineering, structure engineering, contract management, financial management) were investigated to evaluate the identification of actual risks in the project as well as to assess the criteria of risks management adopted during project execution. Further the stakeholders responsible for taking those risks were also identified. A summary of major risks identified on both projects with its responsibility of allocation to respective stakeholders are shown in Table 5.

Fig. 2 shows few glimpses of the risks taken on the projects like lack of health, safety, environment, quality assurance, quality control, technical staff employed, factor of safety in design etc. The risks identified on both the projects are generic having direct or indirect dependency on major risks identified by different contractors listed in Table 3. Thus the type of risks also validates the risks summarized in Table 3.

Table 5. Summary of few identified risk areas during execution of construction projects.

Sr. No.	Phase		Risk Allocation to Stakeholder
1	**Design**	Technical Specifications Breaching	Consultant
		Lack of Skilled Staff	Consultant
		Deficient Geotechnical Exploration	Consultant
		Factors of Safety in Geotechnical Design Parameters	Consultant / Client
		Factor of Safety in Structure Design Parameters	Consultant / Client
		Insufficient Dedication	Consultant / Client
		Lack of Reliability & Integrity	Consultant / Client
2	**Construction**	Inexperience/Over Experience Skilled Staff	Contractor/ Consultant / Client
		Lagging Skills in Quality Assurance and Quality Control	Contractor/ Consultant / Client
		Lack of Control of Loss Prevention	Contractor/ Consultant / Client
		No Health, Safety and Environment (HSE) Regulations	Contractor/ Consultant / Client
		Financial Constraints	Contractor/ Consultant / Client

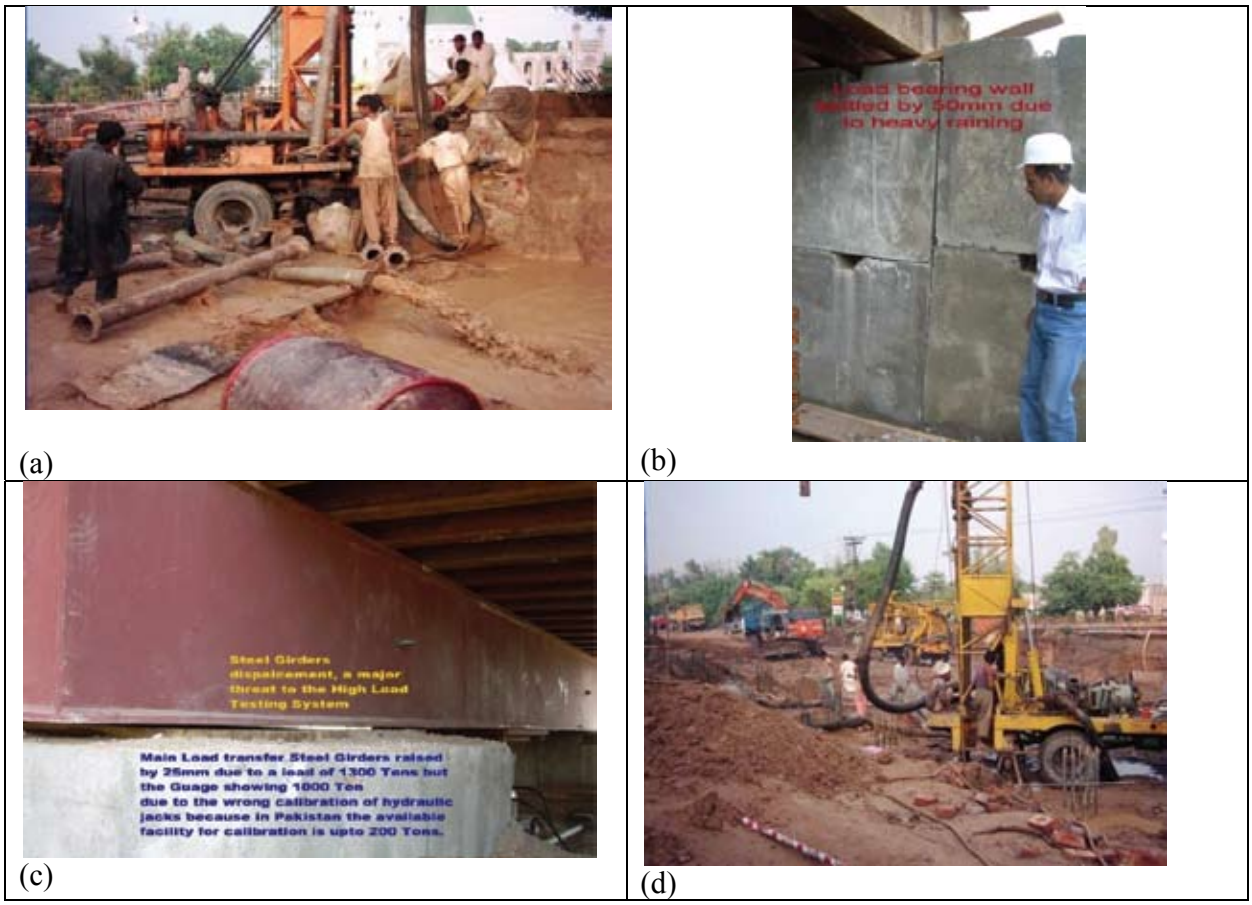

Fig. 2. Photographs depicting the identified risks on both projects.

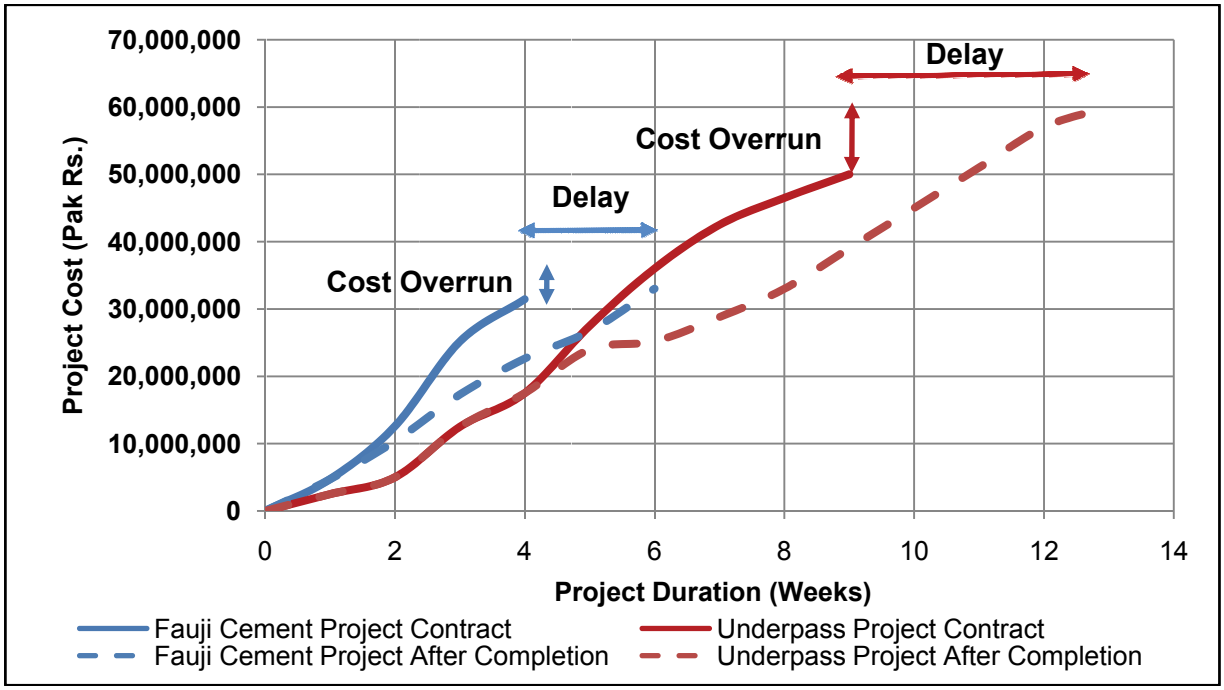

Fig. 3. Comparison of the contractual and after completion cash flow of the projects.

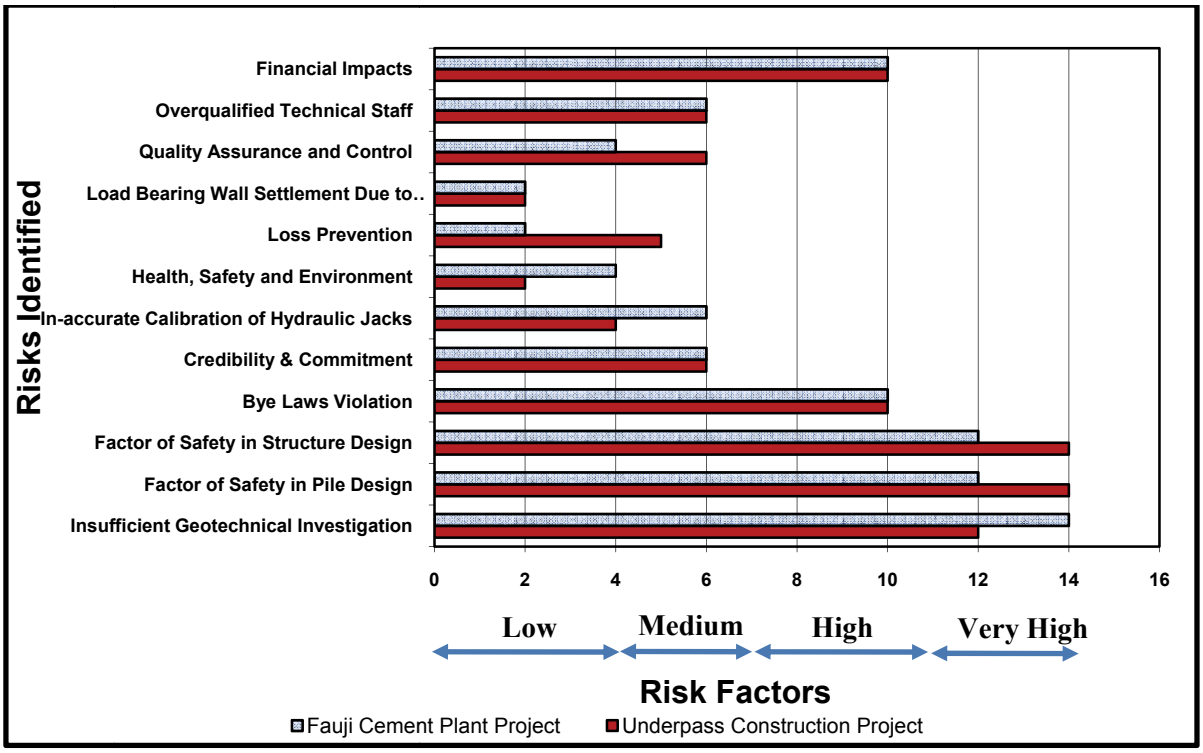

Fig. 4. Risk factors in construction projects of Pakistan: contractors' perspective.

The quantitative analysis of the risks and its effect on cost and schedule of both projects were carried out. The outcome is presented in a cash flow diagram shown in Fig. 3.

The cash flow diagram shows that both projects exhibit cost overrun as well as delay due to inappropriate risk management. The cost overrun and delay indicates the inappropriate risk management during the projects execution [13].

The qualitative analysis of different risks encountered in both projects was also carried out to determine the effect of these risks on scope, schedule and budget of the projects through Risk Factor. Fig. 4 presents risk factor determined for different risks identified from two projects.

The risks like insufficient geotechnical investigation, factor of safety in pile design and factor of safety in structure design can be rated as very high on both the projects. Byelaws violation and financial impacts can be ranked as high risks based on risk factor classification on both projects. Overqualified technical staff, credibility and commitment possessed medium risks on both the projects. Inaccurate calibration of hydraulic jacks, loss prevention, quality assurance and control can be ranked as medium risks based on database of one project and same risks can be ranked as low based on database of other project. Load bearing wall settlement, health safety and environment can be designated as low risks on both projects. Most of the risks identified in the construction projects are comparable with the risks reported in literature [7, 11, 15, 18, 19, 20].

4. CONCLUSIONS

Risk management is one of the most demanding fields for the contractors in Pakistan. Most of the risks encountered by the construction industry stakeholders of Pakistan are universal with some exceptions like political instability and price changes. The concerns associated with risks can be minimized through proper documentation and implementation of management strategies. The contractors in Pakistan are required to recognize the importance of risk management. Most of the current contractor's organizational structures in Pakistan

are not familiar with the detailed benefits of risk management and analysis. Therefore, they are not treating risk management as an opportunity. Hence, the potential benefits from risk management during achievement of construction project schedule and budget are not achieved resulting in cost overrun and delays.

The first basic requirement for the implementation of risk management is that the contractor's organizational culture should realize its importance. The implementation of risk management and its outcomes should not be expected over a short period of time. Nevertheless, the process of educating contractors in Pakistan has already been initiated. The two case histories presented above depict that the contractors are facing and/or taking risks in design and construction phases of their projects. The risks significance analyzed by qualitative methods has shown the relative impact of each risk on the scope, schedule, and budget of the project. The most of the featured risks reflect common directions. However, the impact does vary in its significance from project to project and contractor to contractor. This paper is a step towards the recognition of risk management in the construction industry of Pakistan particularly amongst the contractors.

5. RECOMMENDATIONS

The various construction stakeholders in Pakistan are required to recognize the importance of risk management. The risk management is going to assist the stakeholders in management of scope, schedule and budget of the project. The stakeholders can also get the valuable assistance in controlling the quality, human resource, equipment and plant, procurement and finance of the construction projects through effective risk management.

The outcome of this study supports to inject the concept of risk management through training and educating in the professionals working as stakeholders in the construction industry of Pakistan. The courses at various engineering universities should also include the articles of risk management in their syllabus so that the youngsters get its effectiveness orientation before entering into practical profession.

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