

Risk Factors Occurring in Construction Works

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Abstract:

Background: Managing risk is very essential parameter for successful construction projects. It plays a key role in decision making. Identification of the risk factors relevant to construction works of Pakistan will help the researchers and practitioners for preparing strategy to control risks and achieve success.

Materials and Methods: Investigation was done through interviewing seven senior practitioners working at managerial level from client, consultant and contractor organizations. Structured interviews were conducted with a form prepared based on 52 risk factors identified from literature. Frequency analysis of the data revealed that all the identified factors have relevancy with construction works of Pakistan.

Results: From statistical analysis of the data, it is found that 21 factors are high risk factors while 31 factors are medium factors. High risk factors are changing demands, quality of work, payment delays, lack of experience of contractor, material supply chain management, bureaucratic delay, lack of coordination between project participants/stakeholders, design completion, occurrence of dispute/ labor strikes, inadequate soil testing and survey, material management, project funding problems, delay in contractor's claims settlements, material availability, slow decision making, equipment failure, human resource management, contract breaching by client/contractor, poor equipment and technology management, slow response by the consultant engineer regarding testing and inspection and inadequate risk management plan.

Conclusion: Results of this study will be helpful for practitioners in understanding the risk behavior of the projects. It will trigger the practitioners in choosing the critical factors for taking effective measures to manage risk.

Key Word: Construction Industry, Risk, Risk factors, Construction Works, Pakistan, Sindh.

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I. Introduction

Construction sector is a major role player in accomplishing of essential infrastructural needs of any society¹. Since, new research trends focus on sustainable developments². Hence, controlling risk is very promising parameter for success. In management of any project, risk management is a sensitive parameter which needs careful attention. Several researchers have highlighted risk issues in construction project but in Pakistan very less attention is paid on this very critical dimension of a project success. Risks can affect adversely on project performance which may cause delay and cost overruns³. Hence, it is very imperative that proper management of risk be focused. Process of risk management is a systematic procedure of determining and analyzing risk to make necessary arrangements for exploiting the chance of occurrence and minimizing negative effects⁴. Risk management plays key role in decision making⁵. Hence this study is carried out to identify the risk factors relevant to construction works of Pakistan. This will help the researchers and practitioners for preparing strategy to control risks and achieve success.

II. Review of Previous Works

Project risk is an uncertain event or condition that, if occurs, has a positive or negative effect on a project's objectives. Components of risk are an event that may or may not happen, the probability of the occurrence of that event and the impact of the occurrence of that event. There are various risk factors which occur during construction of any project and must be controlled efficiently for successful completion of projects⁴. An investigation conducted in UAE construction projects indicated that inflation and sudden changes in prices, shortage in material and labor supply are significant risk⁶. Survey amongst the contractors in Kuwaiti's construction industry revealed that financial failure is major risk in construction⁵. Through review of literature a total of 52 factors were identified and summarized in table 1.

Table no 1: Literature Mapping for Risk Factors.

S#	Risk Factors	Reference
1	Changing demands	[7], [8], [9], [10], [4], [11], [13], [14], [6],[5],
2	Quality of work	[7], [3], [10], [4], [11], [13], [14], [6], [5]
3	Payment delays	[3], [8], [9], [10], [4], [11], [6], [5], [16], [17]
4	Lack of experience of contractor	[3], [8], [10], [4], [11], [13], [6], [5], [16], [17]
5	Material supply chain management	[3],[8], [10], [4], [11], [13],[14], [15], [6], [16]
6	Bureaucratic Delay	[3], [8], [9], [10],[11], [12], [5], [16]
7	Changes to laws/regulatory changes	[3],[10], [4],[11],[13], [6], [5], [17]
8	Unrealistic project schedule	[3], [8], [10], [12], [13], [14], [5], [16], [17]
9	Lack of coordination between project participants/stakeholders	[7], [8], [9], [4], [11], [13], [17]
10	General safety accident occurrence	[3], [10], [4], [11], [12], [13], [6], [5]
11	Severe weather conditions	[8], [9], [4], [13], [6], [5], [16], [17]
12	Design completion	[7], [9], [11], [13], [14], [15]
13	Occurrence of dispute/ labor strikes	[3], [10], [4], [11], [13], [6], [5]
14	Inadequate soil testing and survey	[8], [4], [11], [6], [5], [16], [17]
15	Material management	[9], [10],[4],[11], [13],[6], [17]
16	Project funding problems	[7],[3],[15], [6], [16]
17	Site access delays	[8],[10],[11],[13], [16]
18	Labor productivity	[7],[9],[10],[11], [12], [13]
19	Slow delivery of materials	[3], [10],[4],[11], [12], [13]
20	Labor Supply	[3],[8], [9],[10], [4], [11]
21	Unsuitable construction program planning	[3], [9], [4], [14], [15], [5]
22	Lack of experience of client	[8], [9],[4], [11],[13],[16]
23	Delay in contractor's claims settlements	[9],[4], [11], [6], [5]
24	Inadequate scope	[3],[8], [10],[6], [16]
25	Material availability	[3],[4], [12], [6], [5]
26	Poor site conditions	[3], [10], [11],[15], [6]
27	Earthquakes, fire, floods/Unforeseen site conditions	[3], [8],[4],[11], [16]
28	Slow decision making	[3], [4],[11], [12],[6]
29	Site management	[3], [8], [4], [11], [16]
30	Slow delivery of equipment	[8], [10], [11], [16], [17]
31	Errors during construction	[8], [13], [6], [5], [16]
32	Currency fluctuation	[9], [4], [11], [12], [13]
33	Equipment Failure	[13], [6], [5]
34	Human resource management	[3], [8], [4], [16]
35	Inappropriate construction methods	[3], [8], [6], [16]
36	Design variations	[3], [9], [13], [6]
37	Incomplete approval and other documents	[8], [4], [16], [17]
38	Incomplete or inaccurate cost estimate	[9], [4], [11], [13]
39	Inadequate program scheduling/delay in completion	[9], [10], [16], [17]
40	Variations of construction programs	[6], [5], [16], [17]
41	Contract breaching by client/contractor	[7], [9]
42	Client financial failure	[8], [11]
43	Incomplete design	[7], [11]
44	Poor subcontractor work productivity	[7], [15]
45	Threat of war	[10], [15]
46	Corruption	[8], [11]

47	Inappropriate overall organizational structure linking to the project	[13]
48	Poor Equipment and technology management	[3],[8], [6]
49	Preparation and approval of shop drawings	[3], [6], [5]
50	Slow response by the consultant engineer regarding testing and	[3], [11], [14]
51	Difficulties in obtaining work permits	[3], [4], [6]
52	Inadequate risk management plan	[3], [13], [6]

III. Data Collection and Results

Data collection was performed qualitatively by interviewing experienced personnel involved in handling construction projects. 7 senior engineers working at managerial level were interviewed having working experience of more than 15 years. Cumulative experience of all the respondents was 135 years. The respondents were required to confirm the relevancy of occurrence for each risk factor with respect to construction works in Pakistan. Data was analyzed with statistical methods and summarized to draw the conclusion. Interviewee represented major stakeholder i.e. consultant, contractor and client as summarized in table 3 below.

Table no 2: Type of Organization.

Organization Type	Frequency	Percent	Cumulative Percent
Consultant	2	28.6	28.6
Contractor	3	42.8	71.4
Client	2	28.6	100.0
Total	7	100.0	

Table 2 highlights that majority of respondents are representing contractors who are actually the personnel involved in converting design from paper to physical state. Among the respondents 3 respondents have obtained bachelor degree in civil engineering while 4 respondents are master degree holders. The data was analyzed with frequency analysis method and the results are presented in table 4 below.

Table no 2: Risk Level of the Factors

S#	Risk Factors	Relevancy	Risk Level
1	Changing demands	Relevant	High
2	Quality of work	Relevant	High
3	Payment delays	Relevant	High
4	Lack of experience of contractor	Relevant	High
5	Material supply chain management	Relevant	High
6	Bureaucratic Delay	Relevant	High
7	Changes to laws/regulatory changes	Relevant	Medium
8	Unrealistic project schedule	Relevant	Medium
9	Lack of coordination between project participants/stakeholders	Relevant	High
10	General safety accident occurrence	Relevant	Medium
11	Severe weather conditions	Relevant	Medium
12	Design completion	Relevant	High
13	Occurrence of dispute/ labor strikes	Relevant	High
14	Inadequate soil testing and survey	Relevant	High
15	Material management	Relevant	High
16	Project funding problems	Relevant	High
17	Site access delays	Relevant	Medium
18	Labor productivity	Relevant	Medium
19	Slow delivery of materials	Relevant	Medium
20	Labor Supply	Relevant	Medium
21	Unsuitable construction program planning	Relevant	Medium
22	Lack of experience of client	Relevant	Medium

23	Delay in contractor's claims settlements	Relevant	High
24	Inadequate scope	Relevant	Medium
25	Material availability	Relevant	High
26	Poor site conditions	Relevant	Medium
27	Earthquakes, fire, floods/Unforeseen site conditions	Relevant	Medium
28	Slow decision making	Relevant	High
29	Site management	Relevant	Medium
30	Slow delivery of equipment	Relevant	Medium
31	Errors during construction	Relevant	Medium
32	Currency fluctuation	Relevant	Medium
33	Equipment Failure	Relevant	High
34	Human resource management	Relevant	High
35	Inappropriate construction methods	Relevant	Medium
36	Design variations	Relevant	Medium
37	Incomplete approval and other documents	Relevant	Medium
38	Incomplete or inaccurate cost estimate	Relevant	Medium
39	Inadequate program scheduling/delay in completion	Relevant	Medium
40	Variations of construction programs	Relevant	Medium
41	Contract breaching by client/contractor	Relevant	High
42	Client financial failure	Relevant	Medium
43	Incomplete design	Relevant	Medium
44	Poor subcontractor work productivity	Relevant	Medium
45	Threat of war	Relevant	Medium
46	Corruption	Relevant	Medium
47	Inappropriate overall organizational structure linking to the project	Relevant	Medium
48	Poor Equipment and technology management	Relevant	High
49	Preparation and approval of shop drawings	Relevant	Medium
50	Slow response by the consultant engineer regarding testing and inspection	Relevant	High
51	Difficulties in obtaining work permits	Relevant	Medium
52	Inadequate risk management plan	Relevant	High

Table 4 above shows that all the respondents agreed that all the risk factors identified from literature are relevant to construction works of Pakistan. Further analysis highlighted that 21 of 52 factors are high risk factors while other all factors medium risk. The factors having high risk are changing demands, quality of work, payment delays, lack of experience of contractor, material supply chain management, bureaucratic delay, lack of coordination between project participants/stakeholders, design completion, occurrence of dispute/ labor strikes, inadequate soil testing and survey, material management, project funding problems, delay in contractor's claims settlements, material availability, slow decision making, equipment failure, human resource management, contract breaching by client/contractor, poor equipment and technology management, slow response by the consultant engineer regarding testing and inspection and inadequate risk management plan.

IV. Conclusion

This paper studies risk factors occurring in construction works of Pakistan. Investigation was done through interview of 7 experience professionals working at managerial level in contractor, client and consultant organizations. Study involved structured interview based on a form prepared using fifty two common risk factors identified based on literature review. Analysis of the data revealed that all the factors from literature have relevancy with construction works of Pakistan also. Among the factors 21 factors are high risk factors while remaining 31 factors are medium risk factors.

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