Identification of Risk Factors associated with Pakistan's Construction Industry- Project Manager Perspective

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Abstract

Construction industry operates in very uncertain situations subject to various kinds of risks arise during the execution of a project. During the planning, management and execution of any undertaking project, preparation of actions for identifying & managing the risks is essential. The process of taking a project in hand is very complex from early appraisal stage to close. Construction industry is distressing from misinterpretation of risk management including identification, risk analysis and risk assessment. This research is based on quantitative descriptive approach conducted to identify key risks factors involved during execution of a project and risk categories in contracting companies working in Pakistan and ranking them according to their importance/ usage. A questionnaire survey was conducted and a total of eighty eight critical risk factors were identified and categorized into eleven groups. This research is conducted in Pakistan and major emphasize on contracting companies engaged in construction projects of various nature. This research covers the risk management trends of contracting companies according to project manager perspective. Data are analyzed through MS EXCEL as statistical tool in order to find actual facts and figures.

Keywords: Risk Management, Risks in Construction Projects, Risk factors

1. Introduction

All over the world, development of the country relies on construction sector which is considered as a vital industry. The development and growth of a country depends upon the excellency of construction companies and their qualification (Lodi, 2015).Construction industry is a risky business because construction project contains series of activities which requires diversified coordination. Every project is specific and complex in the construction industry because it operates on uncertain environment (Mohammad Ali Rezvani Befrouei, 2015).

Construction industry is greatly susceptible to risk, with dynamic and complex project atmospheres which form an environment of high risk and uncertainty. The construction industry is exposed to different business, socio-political and technical risks. The track record is not good with dealing these risks in construction industry. The outcome of this will lead people associated with this industry to bear various failures, such as operational and quality requirements failure, more financial requirement and completion of project with uncertain delays. The process which involves risks identification, quantitatively and qualitatively assessment, handling risks with suitable method for responses and monitoring for controlling the risks is termed as risk management (Krantikumar Mhetre, 2016).

It is necessary for the construction industry to follow appropriate submission of business practices. A lot of different variables are observed during the execution of a construction project and for the enforcement of sound business practices and decision, complex relationship exists (Shahid Iqbal, 2015).When the contract is won by the tender, risk should be taken into account in the beginning stage for the investment process. The decision for accepting the contract is largely dependent on risk levels which are identical for similar construction contract.

Contract risks should be clearly identified which served as key issue. Risk analysis should be taken into account for risk factors which have large impact on project success. In construction industry the verification of these factors will be largely depending on the company profile and experience to deal with these risks (Agnieszka Dziadosz, 2015).

Cost, time, safety, quality and environmental sustainability which are termed as goals can only be accomplished by risk management in the construction industry. Project delivery always takes place in a complicated and complex network in construction industry which is a good example of a project with numerous parties. The result of risk management will provide profits and savings to the construction project if properly managed. This is the reason why real estate developers and project managers take risk management in a serious and consideration manner. Project progress in all areas and functions in construction industry must be oriented by implementation of system of risk management (Divya Gupta, 2015).

The degree of project's complexity & uncertainty depends on managing risk for which the reputation of construction industry of Pakistan is bad (Shahid Iqbal, 2015). In order to cover unforeseen, simply contingency are added in the contract for which risk analysis is either overlooked or done. As a result of which the failure of project takes place which will not be able to deliver on quality standards, targeted deadlines and cost targets leading towards contractor loss. The fundamental part of project success is to deliver a project well in time, within quality standards and budgeted cost (Lodi, 2015).

2. Literature Review

2.1 Risk

Unnecessary and unfavorable outcome is often considered as risk. It is difficult to predict about future project in advance so circumstances will be favorable or unfavorable. Risks can happen or not i.e. it's an on-off nature, which depends on conditions at the time of expected incident the impact of risk varies significantly (Wards, 2003) (Turner, 2014). The new unbiased term "uncertainty" is a substitute for risk considered by many researchers (Wards, 2003).Whether positive opportunity or negative threat, uncertainty of outcome is an action and events (David Laws, 2013). Suffering loss or harm depends on the chances of failure or possibility of meeting a risk (Jennifer Bradbery, 2014)

2.2 Risk Management

In any industry, the strategic management has a fundamental element which is considered as risk management. To ensure that the project should be completed successfully, it is considered as most important practice of project management. Risk impact or its occurring in a project can be reduced by risk management (IMCA, 2006). Identification of risks, accessing them and getting a respond is the practice of risk management (David Laws, 2013).

The tasks of establishing the context, identifying, analyzing, assessing, treating, monitoring and communicating is the systematic application of management procedure, policies and practices (ISO, Risk Management, Australian/ New Zealand Standard (AS/ NZS), 2009)Identification and treatment of risk relies on the high quality risk management. To all the operations of an organization, addition of maximum sustainable value is the purpose of risk management. Factors which can affect the organization performance in every aspect can be organized by the understanding of risk management. It lowers the chances of failure and increases likelihood of success. Whole strategy of organization & its implementation depends on the upward and permanent process of risk management. Past, present and future (specifically) risks can only be deal with proper risk management. Chances for benefits/ losses are present in all types of undertakings.

The top level management should have an efficient policy for incorporation into the organization's culture regarding risk management. Responsibility throughout the organization should be conveyed by the strategy of tactical and operational objectives interpreted by risk management as a part of job description of their employees. At all levels, encouraging operational efficiency is the result of risk management supporting responsibility, performance measurement and reward (RIMAP, 2015)In construction field, quality, time and cost which are referred as project objectives may hamper by the risks. It is very important for the contractor to be alert and prepare for risks that arises by identifying it (Reddy, 2015) Construction project should be adjusted to the co-operative environment by the process of risk management.

But this is very unfortunate as far the condition for Pakistan is concerned. Risk management largely depends on contracts in the Pakistan construction industry. The ultimate cost of the project increased when contracts are awarded to other parties (Hameed, 2007).

From the literature point of view, practical experience, best guess and human judgment are been applied for the identification and handling of construction risks. Expert judgment is considered to be very useful for managing risks as risks are highly dependent upon specific conditions. When practical experiments, lesson learned and expert judgement are not properly secured then the problem will take place while other risks relate to possible biased decision making (Farrukh A., 2015).

Risk management consumes resources which are considered as a perception as the biggest barrier for implementation of effective risk management is lack of resources. In term of money, it is difficult to measure the benefits of good management of risks (ISO, A Risk Management – Principles and guidelines, 2009)

2.3 Risk Factors & their classification

Project threats which are systematized by their source is termed as risk categorization. Risk breakdown structure or work breakdown structure can be used as a tool for risk categorization. The role of these tools is basically to develop risk response effectively (PMI, 2013).

Enshassi & Mayer (2015) conducted a research and concluded the risks factors in construction projects into six (6) categories which are Act of God, Physical, Economical and Financial, Environmental and Political, Design and Site Construction

Mojtahedi, Mousavi and Makui (2010) classified risk factors in construction projects into external & internal risk factors. External risk factors include Financial and Economic, Environmental and Political and Acts of God. Internal risk factors include Design, Site-related-job and Managerial and Operational.

Ali F. Bakr (2012) developed a heuristic approach for risk assessment modeling and developed RBS in term of EPCCM (Engineer, Procure, Construct, Contract, Management) which includes Engineer- Economic Risk, Procure- Political Risk, Construct- Construction Risk, Contract- Contractual Risk, Management- Management risk.

Sowmya and Srinivasa Raghavan (2014) have categorized risks into 9 groups; External environment group factors, contractor group factors, owner group factors, project group factors, resource group factors, PM group factors, contractor clause group factors and finance group factors which are composed of total of ninety three risk factors. Neeraj et al.,(2015) have categorized risks into 8 groups; Environmental group factors, Construction group factors, Financial group factors, Management group factors, Political group factors, Design group factors, Sub-Contractors group factors, Procurement group factors, and Technology group factors and total of 38 risks were identified. Renuka and Kamal (2014) have categorized risks into 2 groups; Engineered and Non-Engineered risks and total of 10 risk factors have been identified. Laila and Mohamed (2015) have classified total 63 risk factors. Remon (2013) have classified total 99 risk factors. Kadiri et al.,(2014) have classified total 23 risk factors.

Abdulaziz M. Jarkas and Theodore C. Haupt (Haupt, 2014) have classified 37 potential risks by general contractors in Qatar. Jasper Mbachu and Samuel Taylor (Taylor, 2014) has broadly classified risk category groups into 6 which are risks at site, risks concerned with main contractor, risks pricing, risks concerned with subcontractor, risks which are external and risks concerned with client with 21 risk factors included. Nicholas Chileshe and Adwoa BoaduaYirenkyi-Fianko (Yirenkyi-Fianko, 2011) has classified risk factors into five categories which are worst weather condition, method of construction, conditions of ground and pollution at the site, inflation of price, and lack of communication within project team and potential 25 risks factors were included.

Gunduz and Sonmez (SamanAminbakhsh, 2013) classified risk factors into five (5) categories which includes Technically related risk category, Acts of God, Risks which are related to economic, politics and finance, Risk related with organization and Risk related to Statutory Clearance Smith, Merna and Jobling (Nigel J. Smith, 2014) have risk categorizes whose source was related to types: pure, business, project, operational, technical, political risks. Pejman (Rezakhani, 2011)and Katti (Katti Rhushikesh Siddhappa, 2016) have risk categories which are related to their sources, i.e. risks engaged by client, contractor and consultant. Many authors made great efforts in finding potential risk factors and the categorization of them (Lester, 2014), (Smith. N. J., 2014), (Darnall, 2010), (NiiAnkrah, 2014), (Lina María Sastoque, 2016) which includes Monetary (Finance, Economic and Investment),

Political (Legal, Political), Environment (Environment, Natural and physical), Technical Project (Technical, Contractual, client, Project objectives, Planning and scheduling, Construction, Design, Quality and Operational), Human (Organization, Labor, stakeholders, Human factors), Market Safety (Cultural, Market, Safety, Security and crime) and Materials (Resources and Logistics).

3. Research Methodology

The aim of this research is to find out the potential risk factors that arise during project's implementation and categories them by keeping in view about contractor's perspective in Pakistan construction industry and prioritize them by using relative importance index technique. The overall aim is to develop more understanding of management of risk practices which will prove very beneficial for the contractor. For this purpose, questionnaire survey is selected as a research methodology. A closed-ended questionnaire is prepared for data collection from respondents. Questionnaire comprises of 88 risk factors divided into 11 groups.

The failure and success of research depends on the accuracy of information collected. It is the most vital element of the study. Many project managers were contacted but only 20 complete questionnaires will be collected of each category (Valerie J. Easton and John H. McColl's Statistics). Simple random sampling technique was applied to collect data.

MS Excel is used for statistical analysis of data collected. Below is the list of statistical analysis which were performed in order to find out the results

- Coding and defining of each factor/ category/ technique/ method
- Entering the data in Excel sheet
- Calculate the total weight & mean of each
- Apply reliability test (Coefficient of reliability test, Cronbach's alpha) to determine the consistency of data
- Apply Relative Importance Index (RII) to prioritize the factor / techniques/ methods

$$RII = \frac{\sum w}{AN}$$

Where w is the weighting given to each factor by the respondents, ranging from 1 to 7, maximum weight is A (equals to 7) and number of respondents (total) is N which is equal to 20. By using the above equation, the values of (RII) can be determined ranging from 0 to1.

- In case of prioritization of risk factor categories; compare the mean value of each category.

4. Results

4.1 Risk Factors

Table 1: Risk Factors

Symbol	Risk Factors	Scale (1-7)	RII	Rank
CI	Unavailability of financing	6.40	0.914	1
DII	Defective/ incorrect design	6.15	0.879	2
DIV	Design work awarded to unqualified designers	5.95	0.850	3
DV	Design error & omission	5.85	0.836	4
DVII	Lack of uniformity between BOQs, drawings, specification & requirements	5.75	0.821	5
EIV	Poor documentation of contracts	5.75	0.821	5
CVII	Improper cost estimation	5.70	0.814	6
DI	Incomplete design scope	5.65	0.807	7
AV	Lack of skilled personnel	5.55	0.793	8
DIII	Inadequate specification	5.55	0.793	8
CVIII	Poor understanding of future material cost fluctuation	5.50	0.786	9
EI	Improper sub-contractor/ consultant selection	5.50	0.786	9
HIII	Force majeure events	5.50	0.786	9
KIII	Undefined scope of working	5.50	0.786	9
AVII	Lack of co-ordination, co-operation & communication among project participants	5.45	0.779	10
LI	Poor leadership	5.45	0.779	10
BIV	Poor documentation of project	5.40	0.771	11
DVI	Rush design	5.40	0.771	11
GVI	War threat	5.40	0.771	11
KI	Unavailability of material, labor & equipment	5.40	0.771	11
KV	Material supply interruption	5.40	0.771	11

EII	Poor sub-contractor/ consultant/ supplier performance	5.35	0.764	12
LIX	Misunderstanding of drawing & specifications in execution	5.35	0.764	12
LX	Untrained construction staff	5.30	0.757	13
AVI	Non-availability of accurate information	5.25	0.750	14
FIII	Legal disputes among parties of the contract	5.25	0.750	14
CX	Delays in payment of completed work	5.20	0.743	15
GV	Unstable security circumstances	5.20	0.743	15
LVIII	Uncertainty about the availability of material	5.15	0.736	16
AII	Poor management's capabilities/ structures	5.10	0.729	17
AIV	Poor work practices	5.10	0.729	17
EIII	Negligence of individual parties	5.10	0.729	17
AIII	Poor resource management	5.00	0.714	18
BIII	Insufficient site investigation	5.00	0.714	18
EVI	Work conditions differ from contract	5.00	0.714	18
LIII	Design viability	5.00	0.714	18
AVIII	Ineffective communication system	4.95	0.707	19
CVI	Poor cash flow management	4.95	0.707	19
EV	Ambiguous clauses of contracts having several meanings	4.95	0.707	19
LII	Poor sub-contractor capability	4.95	0.707	19
LIV	Undocumented changes order	4.95	0.707	19
CIX	Monopoly of suppliers/ sub contractors	4.90	0.700	20
KIV	Communication gap between main office & site offices	4.90	0.700	20
AIX	Poor industrial relations	4.85	0.693	21
BII	Poor implementation methodologies selection	4.85	0.693	21
CIV	Economic downturn	4.85	0.693	21
LVI	Unsuitable construction program planning	4.85	0.693	21
CXI	Slow payment by clients due to dispute	4.80	0.686	22
EXI	Ambiguous warranty obligation and defective performance liabilities	4.75	0.679	23
FV	Delays in appointment of arbitrator	4.75	0.679	23
LXI	Labor disputes	4.75	0.679	23
BVII	Equipment failure	4.70	0.671	24
EX	Third party delays & defaults	4.70	0.671	24
LXIII	Damages of equipments/ structures	4.70	0.671	24
BI	Changes in project scope & requirements	4.65	0.664	25
CIII	Inflation	4.65	0.664	25
FI	Change in legislation	4.60	0.657	26
GI	Political instability	4.60	0.657	26
CII	Fluctuation in foreign exchange	4.55	0.650	27
KII	Insufficient availability of transportation facilities	4.55	0.650	27
FIV	Delays in dispute resolution	4.50	0.643	28
EIX	Misinterpretation	4.45	0.636	29
JI	Pressure group	4.45	0.636	29
LVII	Obsolete quality controls	4.45	0.636	29
FII	Ambiguity of work legislation	4.30	0.614	30
LV	Tight project schedule	4.30	0.614	30
CV	Local taxes	4.25	0.607	31
CXII	Inadequate payment for variations	4.25	0.607	31
GII	Imposition of new governmental acts	4.25	0.607	31
HI	Unfamiliarity with local conditions	4.20	0.600	32
BVI	Use of obsolete technology	4.05	0.579	33
BVIII	Technology change	4.05	0.579	33
EXII	Improper details of insurance policy terms, conditions limits & exclusions	4.05	0.579	33
HIV	Difficulty to access the site	4.05	0.579	33
HII	Excessive approval procedures in government administrative departments	4.00	0.571	34
JII	Non-compliance of community expectation	4.00	0.571	34
LXII	Labor injuries	4.00	0.571	34
EVII	Variation orders	3.95	0.564	35
GIII	Customs & import restriction	3.80	0.543	36
GIV	Difficulties in obtaining permits & licenses	3.80	0.543	36
BV	Expected quality above specifications and standard by owner	3.75	0.536	37
JIII	Constraints on the availability & employment of staff	3.75	0.536	37
AI	Low top management involvement	3.70	0.529	38
HV	Adverse weather conditions	3.55	0.507	39
LXIV	Theft	3.55	0.507	39
JIV	Non-familiarity with local culture, norms & customs	3.45	0.493	40
EVIII	Interference by client	3.30	0.471	41
HVI	Noise/ pollution caused by construction	3.30	0.471	41

4.2 Risk Categorizes

Total weight assigned to each category by the respondents is divided by the No. of factors in each category in order to prioritize the risk factors categories

Table 2: Risk categorizes

Symbol	Risks Categories	Average	Rank
D	Design Group	115.14	1
K	Logistical Group	103.00	2
C	Finance & Economic Group	100.00	3
A	Organization Group	99.89	4
L	Construction Group	95.36	5
E	Procurement & Contractual Group	94.75	6
F	Legal Group	93.60	7
B	Technical Group	91.13	8
G	Political Group	90.17	9
H	Environmental Group	82.00	10
J	Socio-Culture Group	78.25	11

5. Conclusion

5.1 Risk Factors

All project managers were agreed to a common point i.e. if financing is enough then risk of any kind can be handled while without it every kind of expertise is useless. Therefore it is ranked first. 'Defective/ incorrect design' is the second top risk factor that belongs to 'Design group'. Majority of the top ten risks belongs to design group which shows its importance and project manager should spend huge time for proper designing of project in hand. 'Design awarded to unqualified designer', 'Deign error & omission' and 'Lack of uniformity between BOQs, drawings, specification & requirements' are the third, fourth & fifth ranked risks respectively which also belong to design group. The sixth risk belongs to 'Procurement & Contractual' group i.e. 'Poor documentation of contracts'. There are two risks at ranked seven i.e. 'Improper cost estimation' & 'Incomplete design scope' belongs to 'Financial & Economic' & 'Design' groups respectively. Similarly, There are two risks at ranked eight i.e. 'Lack of skilled personnel' & 'Inadequate specifications' belongs to 'Organization' & 'Design' groups respectively.

Table 3 Conclusion-Risk Factors- Project Manager's perspective

Rank	Risk Factors	Risk Category/ Group
1	Unavailability of financing	Financial & Economic
2	Defective/ incorrect design	Design
3	Design work awarded to unqualified designers	Design
4	Design error & omission	Design
5	Lack of uniformity between BOQs, drawings, specification & requirements	Design
6	Poor documentation of contracts	Procurement & Contractual
7	Improper cost estimation	Financial & Economic
7	Incomplete design scope	Design
8	Lack of skilled personnel	Organization
8	Inadequate specifications	Design

5.2 Risk Categories

Top five risk categories are highlighted. It is concluded that the most important group for project success or failure is 'Design' group" on which project heavily depends upon. Better the designing of the project, more probably the chances of the success of project. After this, "Logistical' group is second most important as it includes the availability of material/ labor & equipment. 'Financial & Economic' is ranked third while 'Organization' & 'Construction' groups are ranked fourth & fifth respectively.

Table 4 Conclusion-Risk Categories- Project Manager's perspective

Rank	Risk Categories/ Groups
1	Design
2	Logistical
3	Financial & Economic
4	Organization
5	Construction

6. Recommendations

In order to reduce the chances of failure in construction projects, management of risks must be carried out properly. This study reveals the important risk factors and risk categories. This research can be viewed as a model of current attitude of contractors towards risk management.

- It is essential to establish a designated group within the organization for risk management. The members of that group should be taken from various departments i.e. finance, supply chain, top management, technical, EHS etc. if possible, otherwise the same work could be done by hiring specialized professionals outside.
- It is very essential that companies must be well familiar of the output of the process.
- Ownerships of the risks should be determined. To do this, the owners have to invest more resources/ efforts in order to determine the potential risks and find the appropriate actions well before the occurrences of unwanted events.
- When quoting a tender, contractor should consider the risk premium in cost & time estimation.
- Contractors should be well aware of the latest technology & trends in the field of construction. They should be aware to safe measures in execution of projects. Contractors should deploy these measures in their organization and continuous follow up & review.
- Contracting companies should promote the risk culture in their organizations.
- Contractors should provide proper trainings to their employees from specialized persons.
- Contractors should know their weaknesses in every field and should transfer the work of those areas to a specialized sub-contractors or direct hiring of trained staff. In this way risk would be shared/ transferred.
- Contractors should manage cash flow properly.
- Contractors should have deep understanding of the contracts documents and should have proper information about the project location prior any undertaking.
- Proper documentations should be applied for the work in progress and should computerize the historical data of finished projects.
- Companies should establish a proper mechanism to resolve any dispute.
- Contractors should apply proactive approach rather than reactive.
- Contractor should establish an open communication system within organization in order to get better ideas from their employees & among projects participants for timely flow of information.
- Contractors should invest more effects in getting accurate and reliable information for better cost estimation and future forecasting

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