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Study of Risk in Construction Projects

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ABSTRACT

Risks are very common in construction sector , Managing risks in construction projects has been recognised as a very important management process in order to achieve the project objectives in terms of time, cost, quality, safety and environmental sustainability. Risk is the Possibility of suffering loss and the impact on the involved parties. Risk is identified and then risk assessment and analysis is done. Then risk management and risk mitigation is carried out. Risk affect construction sector negatively and focusing on risk reduction measure it important. The purpose of this study is to study different types of risk, factors affecting risk, common sources of risk, advantage and disadvantage of risk management in construction projects.

KEYWORDS: Risk Management, Construction Projects

INTRODUCTION: Construction Industry plays a major role in the economic growth of a nation and occupies a pivotal position in the nation's development plans. India's construction industry employs a work force of nearly 32 million and its market size is worth about ` 6, 70,778 crores 2011-12 to the national GDP (a share of around 8%). It is the second largest contributor to the GDP after the agricultural sector. The Planning Commission has estimated that investment requirement in infrastructure to the tune of about ` 14, 50,000 crores during the 11th Five Year Plan Period.

Construction sector is viewed as a service industry. It generates substantial employment and provides growth impetus to other manufacturing sectors like cement, bitumen, iron and steel, chemicals, bricks, paints, tiles and the construction equipment market.

Risks and uncertainties inherent in the construction industry are more than other industries. The process of planning, executing and maintaining all project activities is complex and time-consuming. The whole process requires a myriad of people with diverse skill sets and the coordination of a vast amount of complex and interrelated activities. The situation is made complex by many external factors. The track record of construction industry is very poor in terms of coping with risks, resulting in the failure of many projects to meet time schedules, targets of budget and sometimes even the scope of work. As a result, a lot of suffering is inflicted to the clients and contractors of such projects and also to the general public. Risk in the construction industry is perceived to be a combination of activities, which adversely affect the project objectives of time, cost, scope and quality. Some risks in construction processes can be easily predicted or readily identified; still some can be totally unforeseen.

Construction risks can be related to technical, management, logistical, or socio-political aspects or can be related to natural disasters. In the domain of project management, some of the critical effects of risks are failure to achieve operational requirements and the required quality, non completion of the project within stipulated time and estimated cost.

RESEARCH SIGNIFICANCE AND OBJECTIVES

The development of infrastructure is one of the most important activities that can boost up the business of various industries, thereby increasing the gross domestic product (GDP) of a country. Due to this fact countries stress on infrastructure development and provide finances for the same in their short term and long term financial plans. The vastness of construction projects leaves a lot of scope for various environmental, socio- political and other unforeseen problems during conceptual phase, land expropriation, and execution leading to time and cost overruns in projects and compromise in quality.

The cost overruns can be of huge magnitude in a project involving a large amount of money. The loss of services given by the project during the time in which the project overruns can be enormous if put into monetary terms. Hence, to reduce the losses, efficient management of a construction project is required.

Application of various project management techniques have to be made from the conception to the completion stage, which include managing various risks associated with the project in its every stage. Risk management becomes an important part of project management. The construction industry, perhaps more than most of other industries, is overwhelmed by risks. If these risks are not dealt with satisfactorily there is a maximum likelihood of cost overruns, time delays and low quality, resulting in dissatisfaction of clients and public. In Pakistan, like other developing countries less importance is given to this aspect of project management. The basic aim of the current research is to identify and assess the current risks and uncertainties in the construction industry around the globe; and to evaluate the current state of risk management practices and make a basis for future studies for development of a framework for effective risk management which can be adopted by prospective foreign and local investors, developers and contractors.

Construction is a high-risk business. Or is it? This is a classic dilemma, which haunts every participant in the business. The Project owner, construction companies, consultants, bankers and financial institutions, vendors & suppliers and even the service providers, each has his own fears of facing risks in the conduct of business. The magnitude of the risks is indeterminate at times. What needs to be determined is:

The proportion of real versus perceived risks.
The monetary quantification of risks.
The real import and the impact of a type of risk.

Risks, when indeterminate, are worse than assessed risks. The obvious outcome of the situation is that the Banks and Financial Institutions hesitate in lending to the operators of Construction Industry or alternatively lend in absence of authentic and reliable inputs. Either of the situations is detrimental to the overall growth of the industry and thus, the economy.

It is therefore of paramount importance that the present operating systems be substantially strengthened to provide comfort to the financial systems.

Mitigation of risks is the all en-compassing requirement. Broadly speaking, Construction Projects face the following type of risks:

- Business Risks
- Financial Risks
- Technology Risk
- Project Risk
- Political Risk

CONCEPTS OF RISK ANALYSIS AND MANAGEMENT:
The concept of risk is multi-dimensional. In the context of construction industry, the probability that a definite factor detrimental to the overall project occurs is always present. A lack of predictability related to the consequences of a planning situation and the associated uncertainty of estimated outcomes leads to the consequence that results can either be better than expected or can be worse. In addition to the different definitions of risks, risks can be categorized for different purposes as well. The broad categories of construction risks are external risks and internal risks; while some other categories curtail risks as political, social and safety risk etc.

PROJECT RISK: Risk management in a project encompasses the identification of influencing factors which could negatively impact the cost schedule or quality objectives of the project, quantification of the associated impact of the potential risk and implementation of measures to mitigate the potential impact of the risk. The riskier the activity is, the costlier will be the consequences in case a wrong decision is made. Proper evaluation and analysis of risks will help decide justification of costly measures to reduce the level of risk. It can also help to decide if sharing the risk with an insurance company is justified. Some risks such as natural disasters are virtually unavoidable and effect many people. In fact, all choices in life involve risks. Risks cannot be totally avoided but with proper management these can be minimized.

FACTORS AFFECTING RISK: Several factors expose projects to normal than higher risk.

a) History: Newer projects pose more risk because the process has not been refined with the passage of time. If a project of similar nature has been done many times before, then the likelihood of success with the current project is also enhanced.

b) Management Stability: Management stability means that the whole management team shares the same vision and direction, thereby leading successful achievement of goals. If the management is unstable then it can lead to unrealistic and impractical schedules for the project and inefficient use of resources.

c) Staff expertise and experience: In the event that the members of a project team lack the direct working knowledge and experience of the area, there is a likelihood of time delays, estimated cost upsets and poor quality.

d) Team Size: In case of large teams, the probability of problem occurrence increases due to the team size. One of the reasons can be the difficulty of communication due to the large team size

e) Resource Availability: If the availability of resources is easy, the probability of responding to problems in real time also increases. For example, easy availability of money makes securing human, material and equipment resources easy on as needed basis. However, an abundance of resources does not provide quarantine against risks, all it does is to equip the project team with the tactics to respond to risks.

f) Time Compression: In case of highly compressed time schedule, the risks are magnified in the project. When more time is available, more flexibility is present in the project and there is an opportunity to mitigate and reduce the impact of occurring risks.

g) Complexity: In case of a highly complex or sophisticated project, the opportunity of a mistake or a problem is also enhanced.

TYPES OF RISKS: Risks can be associated to technical, operational or business aspects of projects. A technical risk is the inability to build a product that complies with the customer's requirement. An operational risk arises when the project team members are unable to work cohesively with the customer. Risks can be either acceptable or unacceptable. An unacceptable risk is one which has a negative impact on the critical path of a project. Risks can either have short term or long term duration. In case of a short term risk, the impact is visible immediately, such as a requirement change in a deliverable. The impact of a long term risk is visible in the distant future, such as a product released without adequate testing.

Risks can also be viewed as manageable and unmanageable. A manageable risk can be accommodated, example being a small change in project requirements. An unmanageable risk, on the other hand, cannot be accommodated, such as turnover of critical team members. Finally, the risks can be characterized as internal or external.

An internal risk is unique to a project and is caused by sources inherent in the project; example can be the inability of a product to function properly. Whereas, an external risk has origin in sources external to the project scope, such as cost cuts by senior management

Few other types of risk in major projects are:

Completion Risk: This is the risk that the project may not be completed on time, or at all, due to various reasons such as cost overruns, technology failure, force majeure etc.

Price Risk: This is the risk that the price of the project's output might be volatile due to supply-demand factors. If new capacities are coming up or if there is likelihood of fall in demand of the project output, the price risk is high.

Resource Risk: This risk includes the non-availability of raw materials for the project operation. It also includes the risk that the raw material prices might move adversely.

Technology Risk: This is the risk that the technology used in the project is not sufficiently proven.

Operating Risk: This is a risk that the project operational and maintenance costs would escalate. It also includes the risk that the project will have operational problems.

Political Risk: This risk relates to matters such as increased taxes and royalties, revocations or changes to the concession, exchange controls on proceeds, forced government participation in shares and refusal of import licenses for essential equipment.

Casualty Risk: This is the risk of physical damage to the project equipment. It also includes liabilities to third parties on account of accidents at the project site.

Environmental Risk: This risk refers to increased project costs for complying with new environmental standards. There could also be environmental protests from the local populace against the project.

Permission Risk: This is the risk that official clearances for the project may not be forthcoming or subject to expensive conditions.

Exchange Rate Risk: This is the risk that the currency of sale of the project produce would depreciate with reference to the currency of the project loans. Even though the debt being rated might be Rupee denominated, the presence of foreign currency liabilities can decrease the debt service coverage ratio of the bonds in case there is adverse exchange rate movement.

Interest Rate Risk: This is the risk that the floating interest rate of the project loans would increase beyond the levels assumed for preparing projected cash flows.

Insolvency Risk: This is the risk of insolvency of contractors, project sponsors, suppliers and purchasers of project output, insurers or a syndicate bank.

Project Development Risk: This is the risk that the project development might not take place in an orderly manner.

Site Risk: This is the risk that the project site might have legal encumbrances. It also includes the risk that the site has technical problems.

Financial Closure Risk: This is the risk that the project that the project might not reach financial closure.

Risks Associated with the Construction Industry can be Broadly Categorised Into:
a) Technical risks:

- site investigation
- Incomplete design
- Appropriateness of specifications
- Uncertainty over the source and availability of materials

b) Logistical risks:
- Availability of sufficient transportation facilities
- Availability of resources-particularly construction equipment spare parts, fuel and labour.

c) Management related risks:
- Uncertain productivity of resources
- Industrial relations problems

d) Environmental risks:
- Weather and seasonal implications
- Natural disasters

e) Financial risks:
- Availability and fluctuation in foreign exchange
- Delays in Payment
- Inflation
- Local taxes
- Repatriation of funds

f) Socio-political risks:
- Constraints on the availability and employment of expatriate staff
- Customs and import restrictions and procedures
- Difficulties in disposing of plant and equipment
- Insistence on use of local firms and agents

COMMON SOURCES OF RISK IN CONSTRUCTION PROJECTS: The common sources of risks in construction industry are listed below:

- Changes in project scope and requirements
- Design errors and omissions
- Inadequately defined roles and responsibilities
- Insufficiently skilled staff
- Subcontractors
- Inadequate contractor experience
- Uncertainty about the fundamental relationships between project participants
- New technology
- Unfamiliarity with local conditions
- Force majeure

MAJOR PROCESSES OF PROJECT RISK MANAGEMENT: Risk management involves four processes namely:

a) Risk Identification: Determination of most likely risks affecting the project and documentation of characteristics of each risk

b) Risk quantification: Assessment of risks and the possible interactions of risks with project activities to evaluate the possible outcomes of the project

c) Risk Response Development: Definition of response steps for opportunities and threats associated with risks

d) Risk Response Control: Response to the changes implemented to remove risks throughout the project duration

RESPONSE TO RISK: There are five categories of classic risk response strategies: accepting, avoiding, monitoring, transferring and mitigating the risk.

a) Accepting the Risk: This category implies to understand the risk, its consequences and probability of occurrence, and not doing anything about it. The project team will react to the risk in case of occurrence. This strategy is commonly used in cases when the probability of a problem occurrence is minimal. This strategy makes sense for cases when consequences are cheaper than the cure.

b) Risk Quantification: Risk can be avoided by not doing part of the project which contains risk. Scope of the project is changed in this manner, which might change the business case as well, since a scaled down product could lead to lesser revenue or cost saving opportunities. More risk is involved with high return on an investment. Avoiding risks on projects can have same effect on low risk, low return projects.

c) Monitor the Risk and Prepare Contingency Plans: Risk can be monitored by employing a predictive indicator to watch the project as it approaches a risky point. The risk strategy is to monitor the risk by being part of the test team. Contingency plans are the alternative courses of action prepared before the risk event occurs. The most common contingency plan is to set aside extra money, a contingency fund, to draw on in the event of unforeseen cost overruns. Contingency plans can be looked on as a kind of insurance and, like insurance policies, they can be expensive.

d) Transfer the Risk: In order to transfer the risk in a project, many large scale projects purchase insurance for risks ranging from theft to fire. By doing so, the risk is effectively transferred to the insurance company in such a way that if a disaster occurs, the insurance company would be liable to pay the costs associated with the disaster. Insurance certainly is the most direct method of transferring risk; however, there are other methods as well. For example, a fixed price contract with a contractor states that work will be done for a pre-specified amount. Fixed schedule can also be added to such a contract, and penalties are imposes in case of overruns. Thus these measures effectively transfer cost and schedule risks from the project to the subcontracting firm and any overruns will be the responsibility of the sub contractor. The only drawback in this case is that the sub contractor knowingly makes a higher bid to make up for the risk he is assuming. Risk can also be transferred by hiring an expert. Transferring risk to another party has advantages, but it also introduces new risks.

e) Mitigate the risk: Mitigation is process of response to the risk after it has affected the project. Mitigation covers all actions the project team can take to overcome risks from the project environment.

DETERMINATION OF RISK: There are two methods to determine risks in a project, namely the qualitative and quantitative approach. The quantitative analysis relies on statistics to calculate the probability of occurrence of risk and the impact of the risk on the project. The most common way of employing quantitative analysis is to use decision tree analysis, which involves the application of probabilities to two or more outcomes. Another method is Monte Carlo simulation, which generates value from a probability distribution and other factors. The qualitative approach relies on judgments and it uses criteria to determine outcome. A common qualitative approach is the precedence diagramming method, which uses ordinal numbers to determine priorities and outcomes. Another way of employing qualitative approach is to make a list of the processes of a project in descending order, calculate the risks associated with each process and list the controls that may exist for each risk.

ADVANTAGES OF RISK MANAGEMENT: Following are advantages of risk management:

a) Achievement of objectives
b) Shareholders reliability
c) Reduction of capital cost
d) Less uncertainty
e) Creation of value

LIMITATIONS OF RISK MANAGEMENT: In the event of improper assessment of risks, important time can be wasted in dealing with risk losses which are unlikely to occur. If too much time is spent on the assessment and management of unlikely risks, then important resources can be diverted which otherwise could have been very profitable. Unlikely events can occur, but if the likelihood of the risk occurrence is too low, then it is better to retain the risk and deal with the result if the risk in fact occurs.

POSSIBLE WAYS OF MITIGATION OF RISKS: Where as the basic premises remain unaltered and the broader classification is still valid, the exigencies and the systems adopted, reduce or enhance the intensity of encounter, even in the present day.

An effort, therefore, has to be made, to make an assessment of such risks, quantify them and also to work out solutions, products, or the

practices, to mitigate them. If not mitigated, following could be the possible repercussions (behavioural) outcome:-

- Dilemma of the Project Owner to invest in the project.
- Dilemma of the construction company to complete the project in time and within the scheduled costs.
- Dilemma of the consultants to provide effective support services.
- Dilemma of the Banker to provide the required financial support to the venture.
- Dilemma of the vendor to meet his supply obligations in time.

Regarding mitigation of such risks, the elements continue to remain unchanged, with varying degree of sophistication arising out of the type and the nature of mitigant used. While defining the elements, one can again classify them in the following broad categories. By evolving a risk spread system, to reduce the impact. By following better work practices and enacting regulations to allow only the acknowledged masters of the trade to practice independently. By creating systems and sub-systems to facilitate the operationally and the practices in consonance with above two premises. (e.g. initiation of formal training and HRD)

Having thus articulated the premises, and cutting out the charter of activities, one vital question yet confronts all concerned, and that is to devise the mechanisms of Profiling and quantifying the risks. The answer is found in creation of a database (Some call it colloquial wisdom, or experience) and applying the principles of mathematics.

An attempt, therefore, is to be made to develop following:

- Risk identification Instruments.
- Risk management Instruments.
- Risk mitigation Instruments, & eventually.
- Damage control, containment and resolutions Instruments.

Experts, who work on evaluating the possibility and the quantum of risks as numbers, are named as Actuaries. Actuaries document the details of the events, which lead to failures, analyse the causes as mathematical expressions, determining the frequencies, and the extent of damage/ losses.

Construction, as a large economic activity, has now started drawing attention from several quarters, and work in right earnest has begun on such aspects, which, though vital, remained neglected all this while.

Evolution of techno-commercial grading systems, Institutional Systems for performance surveillance, designing of Insurance/ non-insurance backed products, and several other such services and support systems are being designed and practiced to continuously improve the performance of the Industry as a whole.

CONCLUSION

In absence of the above mentioned systems and procedures, the obvious result is impeded and stinted progress of work, employment of obsolete technology, impeded supply of resources and therefore rampant time & cost over runs in the execution of projects.

This could be achieved by collecting data regarding functioning of the Industry, analysing the same and evolving systems, which could be offered as service to the stakeholders.

Thus, there is a definite need of developing the following,

An effort to collect and sample data's, conduct research, analyse causes and develop models to profile, and quantify various types of business risks.

A network of several Service Organizations, who may adopt the models and systems developed thus and offer professional services to the stakeholders. Needless to mention, such networks would emerge as an obvious reaction of market forces, and may for the time being be kept out of the purview of present paper, however, working models and procedures would have to be created, and this is where the Apex Organizations would have to play the role of a Catalyst / facilitator.

REFERENCES

1. Acelya Ecem Yildiz1, Irem Dikmen2, M.Talat Birgonul3, Kerem Ercoskun4and Selcuk Alten5 - "RISK MAPPING IN CONSTRUCTION PROJECTS" - Proceedings – EPOC 2012 Conference. | 2. John Baartz, Partner, Nick Longley, Special Counsel, Allens Arthur Robinson – "Construction and Infrastructure Projects - Risk Management through Insurance". | 3. Dr Patrick. X.W. Zou1, Dr Guomin Zhang2 and Professor Jia-Yuan Wang3 – "Identifying Key Risks in Construction Projects: Life Cycle and Stakeholder Perspectives". | 4. Nerija Banaitiene and Audrius Banaitis - Risk Management in Construction Projects. | 5. CIDC Report on "Construction Industry and Risks" | 6. Risk Management and Construction by Roger Flanagan & George Norman |