

Impact of Risk Management on Construction Projects

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Abstract— The main objective of this research is to study the impact of risk management on construction projects. The study also aims at:

Studying and identifying the nature of relationship between implementing effective risk management and construction projects.

- Identifying key risk factors that could stand in front of construction processes.
- Assessing the severity and the allocation of each identified risk factor.
- Investigating management awareness of risk management, and applying their knowledge while managing these projects.
- Identifying the success criteria that were achieved in construction projects.

This research will drive the attention to the importance of a high level of awareness to risk management problems. In addition, studying the relation between risk management and project's success is important because most of projects are operating in a very dynamic and rapidly changing environment not always fixed circumstances and uncertainty factors are surrounding the firm, in such environment adopting changes very quickly is a must for the project overall to grow or even survive.

As the most common and typical project types, construction projects have several characteristics such as specific objects, time limit, financial constraints and economic requirements, special organizational and legal conditions, complexity and systematic characteristics. For that each investment project itself is a complex system. Especially for the construction projects, there are many risk facets and complicated relations, which will influence it. The complicated relations include direct, indirect, obvious, implicit or unpredictable.

The overall aim of this study report is to let everyone know what risk management is, realize the procedure of risk management in construction project and have a deeper study on the application of risk management in construction period. The study involved examples of construction projects. The results of this study present the effect of common and major risks on construction period. Meanwhile, put forward the corresponding countermeasures.

Index Terms— Risk Management, Construction Projects, Risk Factor

Area: Construction Tech.& Mgmt

Manuscript received May 31, 2016

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I. INTRODUCTION

A simple definition of 'risk' is "a problem that has not yet happened but which could cause some loss or threaten the success of the project if it did" Risk analysis has a very important role before deploying a new technology. In order to discover the possible risks of a new technology deployment project, one has to understand how an appropriate basic risk analysis can be implemented.

Risks should not only be analyzed, it has to be well managed as well. It is not only important to know the risks but to find solution for each possible (most probable) scenario is the key of managing risks and lowering the chance of failure.

This research importance stems from the essence of risk management itself, for the reason that risk management has been identified as one of the most important tools in determining any project success. As a result, Adopting overall project changes can't be applicable without the management ability to adapt model in risk management and make the new changes.

II. PROBLEM DEFINATION

This study examines the impact of risk management on construction project. A scale survey was used to measure the dependent variable of project success and the independent variable of Risk Management. The qualitative method to support the research work was adopted while quantitative method is concerned about measuring and using numerical data, qualitative method refers to collect and utilize non-numerical data. Qualitative methods are used to gain insights of unstructured problems.

The nature of the research is to collect diverse data, and the research topic of risk management in construction projects. In order to understand the influence of the company risk management towards the specific expenditures in the cash flow, as well as the management's viewpoint on applying those risk management strategies, the researcher believe qualitative method is more effective.

Literature study and analytical research are my major learning methods, which play an important role in this report. Analytical research involves analyzing existing facts and information. Today's world is based on information technology and huge amounts of information are available on all kinds of subjects

III. DETAILS OF PROJECT

3.1 Case I : Military Hospital at Dehradun (UK)

This realistic project case is a construction of Military Hospital building at Dehradun Cantt. This project is under construction. The following Risks related to the Project were anticipated:

Construction Related Risk

From the site manager's aspects, there are four main risks that would affect the construction period.

1. Safety risk

The first one would be safety risk. According to his opinion, this is the most important thing that should be paid attention to. Based on plans for safety and health, all the works should have its own precautions.

2. Material supply risk

The second one would be risk on material supply. Material supply is a compulsory part of the construction project. Under the influences of global economy crisis, many suppliers are facing bankruptcy.

3. Unforeseen extra work

Third of all, unforeseen extra work is also one of site manager's concerns. Most of the unforeseen extra works take place on soil work. It is because that geological exploration datum cannot predict and analyze the exact condition of geology. The rest extra work might happen in other construction work methods.

4. Omissions of construction work

The last main risk would be omissions of construction work. Due to the consideration of cost, clients all wish to finish the construction as soon as possible. This will bring a lot of pressure to the total contractor. They are trying to do their work faster. When rushing into doing things, more mistakes might happen. As a result, the quality of the construction will highly be reduced. This leads to the omissions during construction period.

3.2 Case II :Government Housing Building in Panchkula (Haryana).

This case study relates to the construction of a Government Housing Society (GHS) at Panchkula.

During the site visit, it was noticed that the project lasts two years more than the planned time, there must be several risks during the construction phase such as Legal risk, financial and economic risk, design risk, construction risk, etc, and these risks haven't been well under control at last, thus, affecting project performance. The following part is the main analysis of risks in construction phase.

Construction Related Risk

The main construction related risk faced in this project was substandard quality of materials and workmanship. The low quality workmanship was because some of the main contractor's workers were unskilled. Hence, quality control must be enforced strictly. The project manager recounted that the contractors changed their site management staff frequently. In response to this risk, the consultants required that any change of personnel in the main contracting, nominated and domestic subcontracting firms would need the project manager's approval. In this project, the equipment and materials are easily found in Panchkula. Specialized items however had to be imported. The local main contractor had to contend with long delivery time, delay in customs clearance and payment of tax. There was a long lead-time for equipment to arrive from market, and

the main contractor overcame this risk by placing orders early. Another construction risk faced by the project was unsafe work practices. The project manager found that most of the contractors did not have safety management systems in place. To manage this risk, the main contractor was required

to engage a safety specialist, who must ensure that safe work practices were adopted, and the working condition on site was safe. In addition, There is one of risks in construction risks that we should not be

ignored, which is nature risk. Construction work in Panchkula may be affected by heavy rain. The construction manager said that he would undertake construction work that would be affected by bad weather condition outside of the rainy season. Apart from planning work to avoid heavy rain, the project did not face any other severe natural risk that affected construction progress.

IV. ANALYSIS OF CASE STUDY

Risks may exist throughout the project lifetime from inception to design, bidding, construction and commission. From previous cases what we have uncovered is that the main and critical the risks are occurring during construction period. Actually, in the whole project process, there are other risks such as political risk, legal risk, financial and economic risks, design risk, cultural risk. Bureaucracy, inadequate legal framework, high inflation rate, those issues are significant factors affecting both clients and contractors' venture. After we know those, effective risk response techniques must be adopted to manage the risks, such as documentation reviews, checklists assumptions analysis are used often. Another effective risk response technique is to use negotiation to solve problems. It is found to be the most practical and effective way to overcome difficulties faced in the project. The implication is that practitioners should be well equipped with negotiation skills while undertaking projects. As the quality of work and safety could be compromised in projects, it is recommended that contractors provide workers with some training so that they can achieve certain skills level and safety awareness. Safety management systems should also be implemented on site.

CONCLUSION

1 Findings about risks be identified during construction period

For that the construction project itself is a complicated system, there are many influencing factors and various uncertainties result in different consequences. We can start from the viewpoint of system when identifying uncertainties. Risk identification is an organized, thorough approach to finding real risks associated with a project. It is not, however, a process of inventing highly improbable scenarios in an effort to cover every conceivable possibility. Risks cannot be assessed or managed until they are identified and described in an understandable way. We should grasp the major factors among multiple factors and then analyze the severity of input-output caused by the uncertainties. The common methods are: Expert interviews, which depend on veteran like project manager or site manager. Documentation reviews, Analogy comparisons, Brainstorming, Risk breakdown structure, and Delphi technique. In construction projects, the common uncertainties are: soil and geological conditions, weather conditions, material and equipment deficiency, imperfect design scope, equipment change, labor productivity, contractor's neglect of duty and so on.

2 Findings about the impact of risks on the construction period :

Uncertainties include three factors, operation factor, industry factor and market factor. These three facets together have an effect on the project construction period. However, the influences of the three factors made on the construction period are quite different. Operational risk is on the top, it is the most uncertainty during the implementation of a construction project.

The follows are the description of the major uncertain factors influencing construction period.

(i) The Nature risk : Open air, upper air and the underground are the major building operation field, so the weather plays an important role on the construction period and safety. For example, flood, earthquake, rainstorm etc.

(ii) **Innovation of design** : like using new technique, change of work method deficiency of design and so on.

(iii) **Equipment failure** :

(a) Uncertainty of construction technology: every building is unique and has its own characteristic. Construction technology needs to be innovated continuously because of the constant change of the design, and then the construction technology will meet the risk of "first failure".

(b) Equipment breakdown (such as crane, Hydraulic jacks, hydraulic concrete pumps, welding equipment, demolition devices)

(iv) **Labor productivity** :

(a) The quality of construction teams.

(b) Mating between labor and equipment: there need many kinds of specialized type of work cooperating in one project such as carpenter, mason, plumber, welder, and so on. Although the enterprises follow the regulations of local building environment, when they employ workers, scale of project is still so huge that it need large amounts of teams, therefore, it is hard to say if the job mating with equipment is reasonable or not.

(c) Employment dynamics: if service operations are according to construction

schedule, keep the working performance as planned, pull the job off up to standard within the limited time, after hand over or check the completed project and leave the construction site immediately or not.

(v) **Materials delay**:

(a) Dissatisfactory material quality.

(b) Uncertainty of equipment supply: the major materials used in the construction are steel, wood, concrete, sands and brick, etc. Although these construction materials are rich in the domestic market, the big amount of manufacturers the different quality of the same material and misuse of construction companies may affect the construction quality and cause direct financial loss.

(c) Uncertain price of construction materials: the bid price of the contract in construction project includes material prices. The construction period is very long and if the material prices increase, the income will decrease.

(d) Poor local transportation condition.

(vi) **Soil situation** : Geological exploration datum can't give an overall and exact explanation of the geology, so soil situation is an indispensable factor. Uncertainties exist in all kinds of activities of whole construction process and have an effect on the whole project implementation. The control planning and traditional work methods when we done before for managing construction project that do not work because of these uncertainties.

3 The countermeasures for risks in construction period :

According to the above analysis we can take actions to control those uncertainties which have great influence on the process of construction so as to provide a most effective risk control and risk management of the project period. Moreover, take the following relative measures if necessary:

(i) Try to make sure that the project gets up to a high standard on processing operation and organizational structure, more importantly on the qualifications of contractor. including the human resource required by the total contractor, the strong market competitiveness, qualified design capacity, complete project management system, powerful technical support, the ability to purchase equipment's and construction supplies, good communication skill of the contracts, the ability to face risk, advanced enterprise culture, etc.

(ii) Raise legal consciousness. We must comply with the law when we sign contracts, claim indemnity, protect rights, operate, withstand risks, financing and settle accounts, etc.

(iii) Implement talent strategy, impart knowledge of construction project management, risk management, contract management, economy, finance, insurance, operation control, etc to employees so that the enterprise can own experts and professional project managers absorbing skills, law, strategy, operation, foreign language, management.

(iv) Set specification on construction management, prepare the manuals and planning by total contractor, in addition, build up their own risk management system.

(v) Take active technical countermeasures, including risk avoidance, risk reduction, risk prevention, risk transfer and risk retention

□ Measures to avoid risk

If risks become big threats that the enterprise could hardly bear and control to the project, we should give up the contract and the project definitely to avoid greater losses. Moreover, laying down the regulation that certain project should be prohibited and avoiding the actions which may cause damage are also good measures to evade risk.

□ Measures to reduce risk

This kind of measures can reduce the incidence of risk or the damage when risk occurs. For the known risk, we can use project resources to cut down, for the predictable or unpredictable risk, we should change it to known risk through assumption and limited conditions and then take measures to reduce the possibilities risk happen to a level which risk can be accepted.

□ Measures to prevent risk

Implement technical supporting and effective control planning to prevent risk. The aiming is to prevent new risk factors; reduce existing risk factors; reduce the incidence of risk events

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