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Risk Management in Construction Project

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ABSTRACT

Risks have a significant impact on a construction project's performance in terms of cost, time and quality. As the size and complexity of the projects have increased, an ability to manage risks throughout the construction process has become a central element preventing unwanted consequences. How risks are shared between the project actors is to a large extent governed by the procurement option and the content of the related contract documents. Therefore, selecting an appropriate project procurement option is a key issue for project actors.

The overall aim of this research is to increase the understanding of risk management in the different procurement options: design-bid-build contracts, design-build contracts and collaborative form of partnering. Deeper understanding is expected to contribute to a more effective risk management and, therefore, a better project output and better value for both clients and contractors. The study involves nine construction projects recently performed in Sweden and comprises a questionnaire survey and a series of interviews with clients, contractors and consultants involved in these construction projects.

The findings of this work show a lack of an iterative approach to risk management, which is a weakness in current procurement practices. This aspect must be addressed if the risk management process is to serve projects and, thus, their clients. The absence of systematic risk management is especially noted in the programme phase, where it arguably has the greatest potential impact. The production phase is where most interest and activity are to be found. As a matter of practice, the communication of risks between the actors simply does not work to the extent that it must if projects are to be delivered with certainty, irrespective of the form of procurement.

A clear connection between the procurement option and risk management in construction projects has been found. Traditional design-bid-build contracts do not create opportunities for open discussion of project risks and joint risk management. A number of drivers of and obstacles to effective risk management have been explored in the study. Every actor's involvement in dialogue, effective communication and information exchange, open attitudes and trustful relationship are the factors that support open discussion of project risks and, therefore, contribute to successful risk management.

Based on the findings, a number of recommendations facilitating more effective risk management have been developed for the industry practitioners.

Keywords--- Risk Management, Risk Allocation, Construction Project, Construction Contract, Design-Bid-Build, Design-Build, Partnering

I. INTRODUCTION

1.1 Overview

The aim of this study is to determine the risk factors in construction industry, allocation of these factors, methods used to deal with risks and the techniques adopted in analysing these risks. The results of the study are illustrated in this here. Mainly, the severity of risk factors, allocation of each, methods of dealing with risks and techniques of analysis. Then, a comparison will be held between contractors and owners' perspectives regarding the severity and allocation of each risk factor. Also, in this chapter the results and findings of this research are discussed in detail.

Risk management is one of the nine knowledge areas propagated by the project Management institute. Furthermore, risk management in the construction project Management context is a comprehensive and systematic way of identifying, analysing and Responding to risks to achieve the project objectives. [4] The benefits of the Risk Management Process include identifying and analysing risks, and improvement of Construction project management processes and effective use of resources. Risk and Uncertainty can potentially have damaging consequences for the construction projects. Therefore nowadays, the risk analysis and management continue to

be a major feature of the Project management of construction projects in an attempt to deal effectively with Uncertainty and unexpected events and to achieve project success. Construction projects are always unique and risks raise from a number of the different sources. Construction projects are inherently complex and dynamic, and involving multiple feedback processes. A lot of participants – individuals and organizations are actively involved in the construction project, and they interest may be positively or negatively affected as a result of the project execution or project completion. Different participants with different experience and skills usually have different expectations and interests. This naturally creates problems and confusion for even the most experienced Project managers and contractors.

1.2 Objective

- To apply Risk Management fundamentals to identify Human Risk Factors
- To introduce a new methodology to analyses Human Risk Factors using Systems Theory and Financial Modelling techniques
- To identify and propose solutions to problems which pose risk in the area of occupational and environmental health and safety
- To identify and minimize the exposure to hazards in the area of fi re and life safety
- To investigate health and safety concerns of staff, faculty and students
- To procure liability, automobile, property, workers' compensation and other insurance that protects university assets and manage all insurance claims in these areas
- To manage cash reserves to cover uninsured claims
- To assess the risk of new and existing programs or activities and suggest ways to minimize liabilities and accidents
- To conduct training on safety and health relating to driving, ergonomics, chemical use, exposure to blood borne pathogens, and environmental awareness
- To conduct campus inspections to assess fi re, chemical and other safety hazards, as well as non-compliance issues
- To advise campus safety committees including Institutional Radiation Safety, Institutional
- Bio safety Committee, Institutional Review Board, Students at Risk, and Emergency
- Identifying key risk factors that could stand in front of construction processes by reviewing the literature and through the additions that could be made by the industry practitioners, i.e. contractors and owners.
- Investigating the severity and the allocation of each identified risk factor according to the perspectives of contractors and owners.
- Examining the risk management actions efficiency that are applied in the industry by each category (contractors and owners).

1.3 Overview on Risk Involved in Construction

The construction industry generally has a bad reputation for its work. The industry has a reputation for time and cost overruns at present. This bad reputation is due to many reasons. One of them is that the construction industry is one of riskiest of all business types. There are many types of risk in the construction contracts; they are:

- Physical works
- Delay and disputes
- Direction and supervision
- Damage and injury to persons and property
- External factors
- Payment
- Law and arbitration

1.4 Causes of Risk as Threats

There exists no comprehensive study explaining the causes of risks among construction companies, moreover research covering the subject matter has tended to identify the12symptoms rather than causes, general threats in construction industry are:

- A highly fragmented industry.
- Industry highly sensitive to economic cycles.
- Fierce competition as result of an over-capacitated market.
- Relative ease of entry.
- Management problems.
- Trading including:
- Competitive quoting.
- Outsize projects.
- High gearing.
- Resistance to change.
- Accounting, where inconsistencies occur in the financial data generated for management.
- Increase in project size.
- Unfamiliarity with new geographic area.
- Moving into new type of construction.
- Change in key personnel.

1.5 Sources of Risks

- Commercial risk.
- Financial risk.
- Legal risks.
- Political risks.
- Social risks.
- Environmental risks.
- Communications risks.
- Geographical risks.
- Geotechnical risks.
- Construction risks.

- Technological risks.
- Operational risks.
- Demand/product risks.
- Management risks.

II. LITERATURE REVIEW

2.1 Related Work

Risk management is probably the most difficult aspect of project management. A project manager must be able to recognize and identify the root causes of risks and to trace these causes through the project to their consequences. Furthermore, risk management in the construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives. The use of risk management from the early stages of a project, where major decisions such as choice of alignment and selection of construction methods can be influenced, is essential. The benefits of the risk management process include identifying and analyzing risks, and improvement of construction project management processes and effective use of resources. The construction industry is heterogeneous and enormously complex. There are several major classifications of construction that differ markedly from one another: housing, non-residential building, heavy, highway, utility, and industrial. Construction projects include new construction, renovation, and demolition for both residential and non-residential projects, as well as public works projects, such as streets, roads, highways, utility plants, bridges, tunnels, and overpasses. The success parameters for any project are in time completion, within specific budget and requisite performance (technical requirement). The main barriers for their achievement are the change in the project environment. The problem multiplies with the size of the project as uncertainties in project outcome increase with size. Large construction projects are exposed to uncertain environment because of such factors as planning, design and construction complexity, presence of various interest groups (owner, consultants, contractors, suppliers, etc.), resources (manpower, materials, equipment, and funds) availability, environmental factors, the economic and political environment and statutory regulations.

Construction projects can be unpredictable. Managing risks in construction projects has been recognized as a very important process in order to achieve project objectives in terms of time, cost, quality, safety and environmental sustainability. Project risk management is an iterative process: the process is beneficial when is implemented in a systematic manner throughout the lifecycle of a construction project, from the planning stage to completion. In the European Union construction is the sector most at risk of accidents, with more than 1300 people being killed in construction accidents every year. Worldwide, construction workers are three times more likely to be killed and twice as likely to be injured as workers in other occupations. The costs of these accidents are immense to the individual, to the employer and to society. They can amount to an appreciable proportion of the contract price. Construction activities in Lithuania provided employment to an estimated 93.7 thousand persons in 2011, while an annual turnover in excess of EUR 1.91 billion. Construction is one of Lithuania's largest industries. Unfortunately, it has also the occupational health and safety problems. More construction workers are killed, injured or suffer ill-health than in any other industry. In 2011, 13 construction workers killed whilst at work, compared to 7 industrial workers and 4 agricultural workers. In comparison with 2010, the number of fatal accidents in construction enterprises increased by more than 2 times, i.e. from 6 to 13 cases has been reported. The risk analysis and management techniques have been described in detail by many authors. A typical risk management process includes the following key steps.

- Risk identification
- Risk assessment
- Risk mitigation
- Risk monitoring

2.2 Current industry trends indicate that there is also

- Increasing demand for efficient and technologically Complex solutions in shorter timescales and within Tighter financial constraints;
- High demand for an accurate completion date, as required by many commercial and public benefit projects;
- A growing trend for employers to require the contractor to take more of the risk that is traditionally taken by the Employer,
- A growth in the use of design and build (D&B), Guaranteed maximum price (GMP) and engineer Procure and construct contracts (EPC); and
- Potentially devastating consequences of the failure to manage time in construction projects.

2.3 The main purpose of this research is to

- Further awareness in the industry of time-management Issues;
- Identify the current level of understanding of the
- Importance of project engineers and project schedulers in the management of time;
- Gauge members' opinions on the state of standards of education and training; and
- Determine the use of available technology.

2.4 The research also helped to identify the

- Degree of incidence of unresolved delay in different types of building and building contracts;

- Degree of understanding in the industry of project Control techniques by different disciplines; and
- Need and support for training and accreditation of Planners and project schedulers.

III. RESERCH METHODOLOGY

3.1 Research design

Research design is about turning research questions into the research project (Robson 2002). It means that in order to answer research questions, the appropriate strategies, methods and techniques should be chosen. Yin (1994) proposes that the types of research questions determine the most suitable strategy. The research questions in this study focus mainly on "what" questions. To answer this type of question, a survey strategy is suggested (Yin 1994).

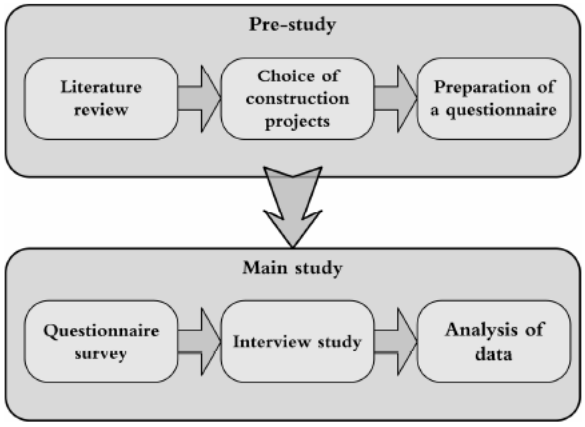

Figure 1. Research Design

3.2 Survey Area

Superintending Wngineer
Building Design Circle-3
Building construction Department
Bihar, Patna
Chief Engineer
Building construction Department
Bihar, Patna
Assistant Engineer
Building Design Circle-3
Building construction Department
Bihar, Patna

IV. EXPERIMENTAL RESULTS

Survey on Construction Related Problems

During construction period of any structure, lot of problems are generated. Here I am doing a Survey on the same through a table consisting of some of the most critical problems arising during construction works.

N 0.	TOPIC	Yes (%)	No (%)	Majority
1	Financial Reasons	85	15	Yes
2	Availability of Commodity/Resource	40	60	No
3	Quality of Commodity/Resource	65	35	Yes
4	Problem during execution of construction work	36	64	No
5	Due to Policy & Hedging Management	44	56	No
6	Nature of Human Behaviour	30	70	No
7	Due to delay of work	55	45	Yes
8	Due to variation of cost from current position to after completion of work	53	74	Yes
9	Contract Management	60	40	Yes
10	Availability of Fire controlling panel	70	30	Yes
11	Life safety Management	80	20	Yes
12	Delay of work due to Information/Communication problem from top management to lower management	60	40	Yes
13	Due to lack of labour and Engineer	30	70	No
14	Due to quality of labour and Engineer	75	25	Yes
15	Handover of the project after Its Completion.	30	70	No
16	Due to lack and availability of highly effective equipment	75	25	Yes
17	Due to surrounding local body	30	70	No
18	Due to environmental issue	20	80	No
19	Due to demanding the project before completing time	90	10	Yes
20	Due to transfer of the project to other contractor because of any reason	80	20	Yes

V. CONCLUSION

In this study, identifying the risk factors faced by construction industry is based on collecting information about construction risks, their consequences and corrective actions that may be done to prevent or mitigate the risk effects. Risk analysis techniques were investigated too. However, determination of severity and allocation of these risk factors was the main result of this research.

- Risk is perceived as a negative term, even though in theory it can have two dimensions.

- Professionals in the construction industry are using techniques described in the literature concerning RM but are not aware of it. Risks are being managed every day in the industry, but not in such a structured way as the literature describes. As also other researchers confirmed, the knowledge of RM and RMP is close to zero, even though the concept of risk management is becoming more popular in the construction sector.
- There is a willingness among respondents to start using RMP, but it has to bring profits to the organization.
- By applying a simple method, it is possible to identify potential risks in an easy way. Moreover, it gives possibility to detect which of the identified risks has the biggest impact on time, cost and quality. Those risks should be eliminated or mitigated by taking an appropriate action. The research showed that the most common action was risk mitigation. Moreover, it was proven that the results from probability and impact method may differ among projects due to the fact that each project and its scope are unique.
- It was important to establish during the interview which phase of the PLC the respondents were taking part in and what their role in the project was. Based on that, we could systematize the answers and see types of risks identified in various phases of the PLC. The conclusion was that there are risks which are characteristic for each project stage.
- As the research showed, unstructured form of RM is to some extent used in the construction sector. Thus, application of actual RM into companies should not be difficult. As proved by the research, knowledge is the factor which is missing for organizations to implement RM. Thus, this aspect of application of RM could be further investigated in terms of how to facilitate use of RM in a construction sector. Moreover, a simple RM manual could be developed including basic theoretical information as well as ready-to use guidance for one of the RM methods.

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