

“A Case study of underground construction Management”

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Abstract— to presents the features of sophisticated instrumentation available today for geotechnical monitoring. A wide range of sophisticated electronic & mechanical instrumentation have been described with their applications with different instrumentation schemes used to meet the requirements of different types of structures. These world class instruments are extensively manufactured in India and exported all over the world. The features and usefulness of instrumentation for different types of Underground Structure have been discussed. Case Studies from projects executed by the author are described. The author has presented data obtained from instrumentation used and highlighted the usefulness of instrumentation monitoring in achieving economy, better control of construction, design verification and safety of the structures.. On the other hand, ventilation also carries the potential risks of spreading air pollutants or fire smoke through the complex wind environment as well as produces continuous noise. Assessment and management of health risks associated with subway ventilation is essential to attain a healthy subway environment. This, however, requires exposure, threshold data, and thereby necessitates more research into long-term effects, and toxicity as well as epidemiological studies. Additionally, more research is needed to further examine the design and maintenance of ventilation systems. An understanding of the pathogenic mechanisms and aerodynamic characteristics of various pollutants can help formulate ventilation strategies to reduce pollutant concentrations. Moreover, current comprehensive underground space development affords a possibility for creating flexible spaces that optimize ventilation efficiency, acoustic comfort, and space perception.

Keywords- civil engineering; construction technology; sustainability; decision-making; project management, multi-actor systems, information processing

INTRODUCTION

Risk analysis begins with a detailed study of the risk issues that have been identified and approved by decisionmakers for further evaluation. The objective is to gather enough information about the risk issues to judge the likelihood of occurrence and cost, schedule, and technical consequences if the risk occurs. Risk analyses are often based on detailed information that may come from a variety of techniques, but not limited to:

- Comparisons with similar systems
- Relevant lessons-learned studies
- Experience
- Results from tests and prototype development
- Data from engineering or other models
- Specialist and expert judgments
- Analysis of plans and related documents
- Modeling and simulation
- Sensitivity analysis of alternatives

The impact of risk handling measures most project management methodologies include risk management, which can be used to:

- Create an understanding of the potential risks and their effects
- Provide an early warning system when the risk event is imminent
- Provide clear guidance on how to manage and contain the risk event, if possible
- Restore the system/process after the risk event occurs
- Provide a means for escape and rescue should all attempts fail

The management of construction projects requires knowledge of modern management as well as understanding of the design and the construction process. Construction projects have a specific set of objectives and constraints such as a required time frame for completion. Change is inherent in construction work. The majority of the projects fail to meet deadlines, cost and quality targets.

Change cannot be eliminated, but by applying the principles of risk management, engineers are able to improve the effective management of this change. In construction projects, each of the three primary targets of Cost, Time and Performance are likely to be subject to risk and uncertainty. Many people, in order to make change in the project with minimum cost, get the project into trouble. The lack of risk management, even an insufficient risk analysis can affect productivity, performance, quality, and budget of the construction project.



Figure1.1: Block Diagram

Metro construction industry around the world contributes to the socio-economic and infrastructures development growth of any region. In developing countries, vital indicator of the development is metro construction and its opportunities to grow faster. The construction industry is dynamic in nature due to the increasing of uncertainties in technology, budgets and development processes around the world.

Time and cost overruns in construction industry or venture these days, become a serious issue around the world and in India during last few decades. Increasing need of infrastructure for the growing population around world, especially in developing countries, the project managers need to deliver assigned projects in time and within the estimated budget. A large number of metro construction projects in India have been delayed due to various reasons and issues.

LITERATURE REVIEW

Safety risk management of underground engineering in China: Progress, challenges and strategies, Qihu Qian a, Peng Lin, Journal of Rock Mechanics and Geotechnical Engineering, 2016
 The laws and regulations of underground engineering should be improved. (2) The safety risk management plans should be implemented in construction management of underground projects. (3) Information technology should be employed to implement early-warning and decision-making support functions for safety risk management. (4) More resources should be invested into researches

on safety risk management, prediction and prevention of major accidents.

Management of complex underground construction projects, M. Leijten, Delft Centre for Sustainable Urban Areas, 2018,

The complexity of underground projects confronts many project clients with serious manageability problems. Project organization is Analysis in closely, with a focus on the interface between project managers and functional managers and the information asymmetry between them.

Management of complex underground construction projects, Research Gate, August 2018, Martijn Leijten

Decision makers are usually not the actors with the most extensive information resources and the principal owners of these resources are often not the ones who make decisions. This all keeps uncertainty intact. Rather than attempting to increase information to reduce uncertainty in traditional project manager-functional manager relationships, avoidance of the principal-agent problem between those two types of managers may provide more support.

Sustainable Decision-Making in Civil Engineering, Construction and Building Technology, 22 December 2017 MDPI Journal, Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene , Tatjana Vilutiene and Hojjat Adeli

To introduce the thematic issue, to summarize the latest research in the field under study; sustainable decision-making in civil engineering, construction and building technology is based on fundamental scientific achievements and can be supported by multiple-criteria decision-making approach.

Comparison of Risk Assessments for Underground Construction Projects, Lisa Avestedt, June 2012

- ✓ Identify a theoretical general approach to risk management and specifically risk assessments based on a literature study
- ✓ Identify similarities between risk management practices in the two countries
- ✓ Identify differences between risk management practices in the two countries
- ✓ Identify how risk management practices differ in the two countries from the theoretical approach established from the literature study

Management and planning under complexities of metro construction, Mahdi Khosravi and Kalle Kähkönen, 8th Nordic Conference on Construction Economics and Organization, 2015

The aim of this study is to investigate these complexities in subway construction. This may develop the possibility of high predictability for these challenges. As metro projects are also urban underground projects, both internal and external issues are studied and their impacts on project management are discussed. It is concluded that exceptional differences in the managing and planning of these constructions is that combined internal and external complexities are carried out simultaneously

Risk Safety Management in Construction of Metro Rail Projects, G.Poovizhi S.Manoj, D.Ambika , V.Santha Rubini, V.Nandhini, S.Dhinu Priya, International Journal of Advanced Science and Technology, 2020

The aim is to construct a new type of model for risk safety management in metro rail projects, to study the existing risk safety management system and to identify the risks that occur during construction and to create, implement, and determine the efficiency of the model for safety in the construction of metro rail projects.

Collation between Underground and Elevated System, Rajwardhan Kale, Kartik Kharde, Mohanish Vengurlekar, Shantini Bokil, International Journal of Engineering Research in Mechanical and Civil Engineering, 2017

An underground connectivity will be more beneficial rather than an elevated as in Delhi, Mumbai and Bangalore and highlights various parameters of its onsite implementation

Effect of Construction Ventilation Scheme on Pollutant Transport in a High-Speed Railway Tunnel, 2020

G Zhang, International Journal of Pure and Applied Mathematics, 2014, To find out the distribution of dust and harmful gases and check the effect of ventilation and dust prevention after blasting in tunnel construction with the drilling and blasting method, the wind velocity, dust concentration and the concentration of harmful gas in You-zhu-shan tunnel of Gui-Guang high-speed railway were studied by CFD simulation and field test.

A new megaproject model and a new funding model; travelling concepts and local adaptations around the Delhi metro, Anwar, International journal of research 2019,

Deals with the governance patterns at different scales through Delhi Metro Megaproject and its financing mechanism through Land value capture

Land value capture finance for transport accessibility: a review, W. P Chakrun2012,

Deals with the main land value capture finance (LVC) mechanisms (betterment tax, accessibility increment contribution, and joint development) in relation to increased transport accessibility.

Summary

- There exist many suggested approaches for how to execute risk management in construction. Generally it seems there is similar approach to how to work with risk programs in construction projects; a subjective analysis is carried out relying on historical information and the experiences of participants.
- The projects studied from Sweden and USA follow the same standard approaches found in literature in regards to risk management.
- The projects studied included probabilistic simulations in addition the subjective analytical method.
- The quantification in terms of relating the severity of impact and likelihood of occurrence to a value is part of the qualitative analysis in this alternative manner of defining qualitative risk analysis. The analysis then also includes calculating the product of S and P and obtaining the ranking of the risk.
- The quantitative part of the risk assessment would be evaluating the level of the likelihood/ probability of occurrence and severity of impact and also Analyzing and determining the level of the resulting risk.
- The risk registers studied contain by suggesting monitoring programs, testing etc. during construction, which would increase the detectability. They also include descriptions on activities which have to happen before other activities.

Aim

To study lack of proper assessment and management of the risk magnify the time and cost involved in underground Construction

Objectives

- To promote and incorporate into the process of any feasibility study, elements that come along with the principles of sustainable development
- It has been framed from economic, environmental and social attributes, while the factors which stimulate the rail use, through the passengers' satisfaction, were incorporated into this methodology
- To identify a general or standard approach to risk analysis through a literature review
- To study the risk analysis process through some underground construction projects
- To compare and discuss the differences of the risk analysis process

Problem Statement

“To study economic feasibility for underground construction; the study addresses the factors that determine location, the attributes that enhance use through satisfaction and financial analysis, presents the social impacts and their requirements for the achievement of the social objectives, and discusses the benefits social, economic, environmental that are accrued from the existence of underground Construction.”

Research Methodology



Figure: Flow of Methodology

Therefore, improving construction efficiency by means of cost-effectiveness and timeliness would certainly contribute to cost savings for the country as a whole. Efforts directed to cost and time effectiveness were associated with managing time and cost.

It also aims to identify the main factors that lead to project delays and to suggest recommendations on how to overcome or mitigate effects of the problem. Data is gathered from responses from questionnaire survey and interviews with those involved in construction project.

The surveys and research findings indicate that delay incidents occur mainly during the construction phase of a project and one or more parties usually contribute to delay. This paper highlights the importance of having more experienced and capable construction managers as well as skilled labourers to enable the industry to develop at a faster rate either nationally or internationally.

A questionnaire and personal interviews have formed the basis of this research. Factor analysis and regression modelling were used to examine the significance of the delay factors. From the factor analysis, most critical factors of construction delay were identified as

- Lack of commitment;
- Inefficient site management;
- Poor site coordination;
- Improper planning;
- lack of clarity in project scope;
- lack of communication; and
- Sub-standard contract.

DATA COLLECTION & ANALYSIS

By reading guideline I observed that because of delays in releasing of payment from the government agencies and sanctioning of material from the government engineers caused delay in construction activity.

By operating advance technology at construction project reduce delay in transporting of material and increase efficiency of work that ultimately reflect of time and cost.

From literature found that because of frequent change of project managers, Appointment of staffs in the site who are not experienced and also Non sequential progress of works and that Work was not followed as per procedure instead it was followed as per availability of resources caused delays in construction project.

Miss out of few materials while quoting tender by the tendering department. Delay in planning of resources from tendering department. Requirement of materials for future use, not noticed by the site engineer; no stock yard available for storing materials leads to material wastage

Unavailability of adequately trained health workers and lack of experience in managing an unprecedented emergency; the pandemic and the confinement measures created a psychosocial burden for the population and, especially, the wellbeing of the health workforce.

The construction industry is the vehicle through which physical development is achieved, and this is truly the locomotive of the national economy. The more resources, engineering know-how, labor, materials, equipment, capital, and market exchange provided from within the national economy, the higher the extent of self-reliance. The increasing complexity of infrastructure projects and the environment, within which they are constructed, place greater demands on construction managers to deliver projects on time, within the planned budget and with high quality.

CONCLUSION

- Benefits to Public for comfortable, economic and secure travel, connecting unconnected areas, decongestion of roads along with Social, Economic and many environment and benefits. This study has involved various civil engineering concepts which is used in practical fields.
- The development such metro projects would boost the infrastructure and help the economy to develop.
- Studied the different Risk factors and analysis process for the underground construction
- Construction and operation of long tunnels for high-speed by examining others that have already been completed & that can be planned and executed in a way such that the experiences and bottlenecks identified in previous projects can be eliminated

LIMITATION

- This impact assessment study has been undertaken for the alignment that was approved.
- Any change in project location, alignment, proposed project components, proposed project activities is likely to result in variation of the impacts.
- It is to be noted that any technological advances during the course of construction and execution of the project will alter the extent and severity of impacts on the surroundings.

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