

Study of Factors For Cost Overrun In Road Construction Projects

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Abstract- India has a road network of over 4,236,000 kilometers in 2011, the third largest road network in the world. At 0.66 km of roads per square kilometer of land, the quantitative density of India's road network is similar to that of the United States (0.65) and far higher than that of China (0.16) or Brazil (0.20). However, qualitatively India's roads are a mix of modern highways and narrow, unpaved roads, and are undergoing drastic improvement. India in its past did not allocate enough resources to build or maintain its road network. The success of the construction projects mainly depend on their accomplishment of essential factors such as cost, time and quality. In case cost and time are not properly planned and utilized, the project will not accomplish its goals and will cause failure to the overall project. It is essential to find out various critical factors which are mostly influencing the cost overruns, its origin, causes, and problems associated are also to be identified. Finding out the causes of cost overrun and rectification of the causes will be very useful to achieve the goals; scope of the project, to maximize the return on investment, to complete the project within actual budgeted cost and to minimize the wastage of funds, will avoid such critical instances to occur in future.

Keywords- Cos toverruns; Road construction projects ; quantitative density ; time and quality.

I. INTRODUCTION

India in its past did not allocate enough resources to build or maintain its road network. This has changed since 1995, with major efforts currently underway to modernize the country's road infrastructure. India plans to spend approximately US\$70 Billion by 2013 to modernize its highway network. As of October 2013, India had completed and placed in use over 21,300 kilometers of recently built 4 or 6-lane highways connecting many of its major manufacturing centers, commercial and cultural centers. The rate of new highway construction across India has accelerated in recent years. As of October 2011, the country was adding 11 kilometers of new highways, on average, every day. The expected pace of project initiations and completion suggests

that India would add about 600 kilometers of modern highway per month, on average, through 2014. Some of the major projects that are being implemented include the National Highways Development Project, Yamuna Expressway and the KMP Expressway. According to 2009 estimates by Goldman Sachs, India will need to invest US\$1.7 trillion on infrastructure projects before 2020 to meet its economic needs, a part of which would be in upgrading India's road network. The government of India is attempting to promote foreign investment in road projects by offering financial incentives. This has led the government to create ambitious targets of building an average of 20kms a day, which according to figures from the NHAI, only 12kms a day has been completed since April 2007. But meeting these targets is imperative in accompanying the growing pace of the country. So the Indian government has moved to financing projects through PPPs – as their overseeing of projects using the government budget was inadequate to assist the required growth. Poor cost performance of construction projects seems to be the norm rather than the exception particularly in most developing countries where the problem is more acute. Road construction is generally undertaken by private companies on B.O.T. basis. Cost estimation is necessary for application of tenders to get a project. Generally, the estimated cost of the project and the actual cost of the project vary to a large extent. This is because; road construction costs depend on a large number of parameters related to construction, climatic conditions, financial status and many other. As we know the most cost affecting parameter of road projects, we can make feasible improvement in road alignment, design features as well as in selection of site. As a result we can reduce the cost of road projects. In India cost of road and infrastructure projects is most overgrowing issue, due to our economic status as a developing country significant cost overruns. Road construction is one of the major activities in the construction industry.

The Government of India takes initiatives to improve and increase the infrastructure facilities for better, smooth and modern transportation. It also increases the funds for investment for the growth and development of Infrastructure.

Over the past few years the Indian economy has been in a phase of enhanced growth of about 8-10% per year. Indian construction industry is playing an important role in the economic growth of our Nation; it widely involves high risk due to its varying nature of its construction activities. The success of the construction projects mainly depend on their accomplishment of essential factors such as cost, time and quality. In case cost and time are not properly planned and utilized, the project will not accomplish its goals and will cause failure to the overall project. In most of the Indian road construction activities, it was observed very few projects were completed in a planned manner within estimated cost. Due to the major problems and delays in construction, most of the projects were suffered from cost overrun issue due to many reasons such as ineffective planning, monitoring and execution of work. Better planning of cost and allocation of funds are to be achieved to complete the project task with high precision. Now a days, Indian road projects are facing a lot of problems and difficulties from the starting phase till the completion of the projects. Throughout the project cycle, a series of issues and challenges are to be tackled by the construction activities. Rather than any other developing country, growth of Indian road projects is seriously affected by numerous issues. An immediate need for the future projects to avoid such problems is a good effective plan. It is essential to find out various critical factors which are mostly influencing the cost overruns, its origin, causes, and problems associated are also to be identified. Based on the study of the problems, remedies and recommendations to avoid such circumstances are to be suggested. There is no alternative to avoid the issue of cost overrun rather than above for future projects. Finding out the causes of cost overrun and rectification of the causes will be very useful to achieve the goals; scope of the project, to maximize the return on investment, to complete the project within actual budgeted cost and to minimize the wastage of funds, will avoid such critical instances to occur in future.

II. OBJECTIVES

1. To Study variables or factors responsible for cost overrun in road construction project
2. To find the most predominant factors influencing the cost overruns are to be sorted out from the literature survey and those factors are to be considered for preparing questionnaire survey.
3. To study various cost control techniques.
4. To suggest the processes that can help improve the possibility of avoiding cost overrun.

III. METHODOLOGY

The following section presents the steps to achieve the mentioned objectives.

1. Various factors responsible for cost overruns were collected from literature study and they were sorted in a desired category.
2. A questionnaire was prepared with 17 items and a survey was conducted to gather the data from selected respondents to find out critical factors causing cost overruns.
3. Each factor was given a scale of 1 to 4, so that person could easily express the severity range or impact. i.e., 1 being the lowest and 4 being the highest.
4. The scale for impact is categorized into 4 types.
 - a. 1 for No effect.
 - b. 2 for Less effect.
 - c. 3 for Moderate effect.
 - d. 4 for Strong effect.
5. Questionnaires were administered to a sample of 50 people selected from various organizations, from which 30 questionnaires were returned with completed responses.
6. The scale value obtained for each factors were found out and ranked based on Relative Importance Index (RII) and Mean Values (MV) of the responses are computed for their impact and significance.
7. Finally suggestions and recommendations are given to avoid the cost overruns in future road construction activities.

IV. THEORETICAL CONTENTS

A. Relative Index Important Method (RII)

Relative Importance Index method to find out importance of the various causes of delay of the project. The same method is adopted in this study. A four-point scale ranged from 1 (No effect) to 4 (Strong effect) will be adopted. It will be converted in terms of relative importance indices (RII) for each factor from the received responses.

The RII was computed as follow:

$$RII = (\Sigma W)/A * N$$

Where, W represents the weightage provided by the respondents to each factor (ranging from 1 to 4), A represents highest impact value (in this case, 4 is the highest weightage given to the scoring the factor), and N represents respondents in terms of number.

Higher the range value of RII, more importance for the causes of delays. The RII was used to find out the rank (R)

for the different causes. Each individual response should be used to find out RII, finally rankings are provided in order to give a clear view to the cost overrun in Road construction projects.

B. Mean Value Method (MV)

Mean value based method used to rank the factors based on responses received. The investigator adopted the same Mean Value technique to find out the rank, for checking the accuracy of results. Like Relative Importance Index, a four point scale was used, based on the Mean Value of the responses for each factors obtained from the respondents, the ranks were given using the formula.

$$\text{Mean Value} = \Sigma W/N$$

Where, W represents the weightage provided by the respondents to each factor (ranging from 0 to 3), and N represents the total number of respondents. Mean values were calculated for verifying the ranks with relative importance index to give a clear idea for confirming the results obtained from RII technique.

V. RESULT AND DISCUSSIONS

1. Land acquisition and increase in land cost

Land acquisition is ranked at top. Most of the road projects are kept aside and are delayed due to objections from owners of the land. In the present scenario many projects are sanctioned by the Government, but after that it is not even started due to land issues at the initial phase of the project itself. The impact of land issues are getting serious now a days. It not only causes delay but also causes overrun of cost in the project. Therefore it is essential to formulate a strategy to overcome the issue in the initial stage itself. So introducing a national policy, widely in the country and also laws and amendment for land acquisitions are to be immediately implemented. Effective and timely plan and actions are needed to solve this problem in the earlier stages.

2. Change in cost of services

Second ranked cost overrun factor in road projects is the change in cost of services. It means increase in price of money. It is caused due to price changes in the men, material, machinery and other construction related activity cost. This price change is mainly due to inflation and it is one of the predominant factors for the cost overrun in road projects. This uncontrollable cost is mainly applicable for labour wages and material price change. It seems there is no solution for this

problem, but effective planning at the procurement stage will reduce the price escalation, a little amount. For avoiding this issue, a standard cost escalation method is adopted in construction contracts in the contractual stage itself and provisions for contingencies are also to be included in the contract to avoid change in cost.

3. Delay in payment

Delays in payments, financing for completed works are ranked at three among the various factors. Almost 95% of road projects are funded by Government organizations and due to various Government policies and reasons, funds will not be given in time. This will reflect in the performance and progress of works. Due to the delays in payment, contractor will not able to circulate the money and his cash flow is mainly affected.

4. Act of God

Act of god is ranked at fourth, next to delays in payments. It includes unexpected rain, earthquake, natural calamities, political and economic instabilities. There is no preventive measure for such happenings. Usually the contractor is advised to insure against such events during the contractual stage itself to avoid the cost overruns.

5. Design changes during construction

Fifth rank is given to the design changes during construction. Improper planning, inadequate site investigation, misinterpretation of data, unaware of future needs are some of the causes for design changes. So proper planning, adequate investigation of site and accurate design procedure are needed to execute the project with high precision. If the design stage is not carefully examined and properly monitored, it will make additional cost to rectify the errors.

6. Delays in shifting existing utilities

Delays in shifting existing utilities are sixth highest ranked critical factor. Most of the road construction projects are started, before the utilities are relocated from the site. This is one of the unavoidable situations that cause delays in construction, which finally leads to overrun of cost. So it is necessary to plan the relocation process and schedule the projects according to that. It is the prime solution to avoid the cost overruns in the road projects.

7. Increase in quantities due to actual site conditions

Seventh highest ranked factor is, increase in quantity of materials due to actual site conditions. It occurs due to unexpected ground and terrain conditions. Because of improper assessment of ground conditions and nature of soil strata during preliminary survey, the actual quantity varies. Unexpected sub surface condition will also affect the quantities. Changes in ground conditions may lead to several issues in moving machineries, in undertaking excavation, and in foundation laying. To avoid these problems, additional care is provided at preliminary and reconnaissance survey, if not, this leads to increase in total cost and time also.

VI. CONCLUSION

1. Land acquisition and increase in land cost, Change in cost of services, Delay in payment, Act of god, Design changes during construction, Delays in shifting existing utilities, Increase in quantities due to actual site conditions are the top seven factors responsible for the cost overrun in road construction project.
2. Early identification of lands to be acquired is the best solution to avoid the land acquisition of the project.
3. To avoid the design changes in construction stage, final approval of design is made before starting the work.
4. Non availability of construction material issue can be avoided by preplanned purchase strategy.
5. The factors responsible for the cost overrun of road construction project identified by the questionnaire survey and ranking of each factor decided by the relative important index method and mean value method .

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