

A Survey on Cost and Time management in Highway Construction Projects

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Abstract: Time and cost estimation for infrastructure projects especially related to road construction often face challenges because of several factors included in it. Therefore, it is a tedious task to estimate the final project time, cost including contingencies especially at the prefeasibility evaluation stage of the highway project in developing countries.

In this paper, a research has been conducted to study and analyze various construction related projects to improve the quality of estimation at the prefeasibility stage cost and time performances of highway projects specifically in case study of India. The data has been collected from 252 projects executed from 1999 to 2016.

Keywords: Cost and Time management, Forecasting, Highway construction.

I. Introduction:

Highways construction management has been very popular recent time. The important parameters in cost management are time and cost. The project cost estimate is primarily concerned with the cost of resources needed to complete the project activities and include all the processes which are employed to maintain financial control over a project[1] examined various management tools and techniques with seven that have been adopted which are used in estimating and cost control. They are analogous analysis, parametric estimating, best guess estimating, cash flow/s-curve, variances, earned value, the accuracy of conceptual cost estimates for capital projects has been a major concern and a subject of much scrutiny for almost 40 years.

II. Literature Review:

In [2], A checklist, for establishing, a detailed definition rating for capital projects, has been prepared. He proposed the use of the definition checklist for applying contingency to capital cost estimates and then validated the checklist by comparing the definition ratings of 30 projects to their respective levels of cost overrun. The U.S. department of energy recognized the importance of accurate conceptual cost estimates and contracted with the Rand Corporation to study the capital cost estimation problems associated with pioneer energy and also process plants. The study determined that 74% of cost growth is caused by underestimation, that is, improper estimation[3].

In 1991, the Construction Industry Institute (CII) assembled a research team to study the impact of pre-project planning on overall project success for capital projects. The team sought to quantify the impact by establishing a success index value to rate project success. The success index value was computed and compared to a pre-project planning index value for a variety of projects[4].

[5]used a neural network (NN) approach to effectively manage construction cost data and developed a parametric cost-estimating model for highway projects. Eighteen highway projects in Newfoundland, Canada were the source of the cost data and they used weightings that produced the best cost prediction for the historical case studies to find the optimum neural model.

[6], and again in [7] reported on quantitative data they collected and analyzed from completed construction projects in the process industry. The resulting model, known as the estimate score procedure, allowed a project team to score an estimate and then predict its accuracy based on the estimate score. They identified five main factors affecting estimate accuracy and, in order of significance, were: basic design, team experience and cost information, time allowed to prepare the estimate, site requirements, and bidding and labour climate.

Engineering designs have a high level of influence on project costs. However, design performance is usually not satisfactory.[8] reported their survey that found that about one third of architectural/engineering (A/E) projects miss cost and schedule targets. Chang noted that, as reported by, there have been few instances where an engineering design was so complete that a project could be built to the exact specifications contained in the original design documents. Many construction problems are due to design defects and can be traced back to the design process[9].[10]reported that on four completed case study projects for environmental and engineering design services for roadway construction projects in California that were carried out on a cost-plus-fixed-fee basis, they experienced cost increases on average of 24.8%, based on the four sampled projects.

The estimation is affected by various cost related factors starting from the project planning and programming (inception), design, bidding, practical realization and controlled execution, post evaluation and handover of highway projects. Though a number of works have been reported for this purpose. However, because of involvement of many risk factors, it is still challenging. A review of the literature has established that poor performance of projects in terms of cost overrun is common place in the construction industry. A proper cost estimation procedure is required to fulfill all these requirements. The project cost estimate is primarily concerned with the cost of resources needed to complete the project activities and include all the processes which are employed to maintain financial control over a project. Classically the project cost estimation was done by establishing a model in mathematical form using cost governing factors. The problem with classical regression analysis is their requirement of mathematical formulation which fails because of number of variables present.

Previous studies & their findings for overrun An estimate is a forecast of a cost to be incurred sometime in the future, the problem being that the future is not always predictable. Project cost overruns are caused by rising costs largely (inflation,

inadequate analysis and inadequate information, The causes include(certain government fiscal/monetary policies/ poor costing of projects/ inflation within the economy / some practices of project participants/ especially those involving government projects.) . A further reason advanced for the incidence of project cost overrun is attributed to costing methods.

To quantify the impact that project changes have on engineering and construction project performance ,change as any event which results in a modification of the original scope, execution time or cost of work. Changes may occur throughout all phases of a project, Research focuses on the quantitative impacts that change has on the detailed design and construction phase of projects. Found that project change has a large effect on the financial performance of a construction project. The highway construction programs and reports on selected claims for project changes and cost/schedule overrun on these same projects. The study concludes that project change has a direct effect on costs and schedules of construction projects, primarily cost/schedule overrun. In construction research, Models have been developed showing cost influencing factors derived from past records of construction costs Extrapolation of past trends has been used to forecast future overall construction costs. Such models are usually only used for short-term forecasting because of their reliance on the notion that past conditions and specifications do not always prevail in the future. Numerous factors affect project construction costs and most construction cost models developed in the past have used only a few of the many possible influential factors identified to date.

A checklist was published for establishing a detailed definition rating for capital projects. He proposed the use of the definition checklist for applying contingency to capital cost estimates and then validated the checklist by comparing the definition ratings of 30 projects to their respective levels of cost overrun. Later he revised the checklist to specifically address process projects and developed a separate checklist to apply the definition rating method specifically to hazardous waste remedial projects [11]. In the late 1970s, the U.S. Department of Energy recognized the importance of accurate conceptual cost estimates and contracted with the Rand Corporation to study the capital cost estimation problems associated with pioneer energy and also process plants. The study determined that 74% of cost growth is caused by underestimation, that is, improper estimation. In India, a systematic road development plan is going on especially for construction of National highways relationship for the N.H.D.P. project. India has national highway network of about 71,772 km and carries over 40% of the total traffic across the length and breadth of the country. Road transport has emerged as the dominant mode in India's transportation sector with a share of 4.8% in India's GDP in 2011-12. Although National Highways constitute nearly about 2 percent of the total road network as on 31st December, 2016, Easy availability, adaptability to individual needs and cost savings are some of the factors which go in favor of road transport. Road transport also acts as a feeder service to railway, shipping and air traffic. The total number of registered motor vehicles has been growing at 10.5 per cent per annum during the period 2002 to 2012. The share of road traffic in total traffic movement by roads and railways has grown from 13.8 per cent of freight traffic and 15.4 per cent of passenger traffic in 1950-51 to an estimated 64.5 per cent of freight and 85.9 per cent of passenger traffic in 2011-12. The rapid expansion and strengthening of the road network, therefore, is imperative, to provide for both present and future traffic and for improved accessibility to the hinterland. In addition, road transport needs to be regulated for better energy efficiency, less pollution and enhanced road safety.

III. Conclusion

In this paper, a literature survey of various projects published in the construction planning has been discussed. Literatures from all the stages have been considered for review. An analysis has been conducted to analyze the efficacy of various risk factors involved in the construction projects

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