

Investigation on the Causes and impacts of Delays in Infrastructure Road and Bridge Projects

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Abstract: *Improving performance is becoming more and more important for the success of building projects. And has garnered substantial scientific interest over the past two decades. Delays remain a major issue and even though this is a fact, over the last fifteen years, there has been a lack of initiatives to effectively control the problem, which has led to poor projects. performance. This study aims to identify, analyses, and prioritization the factors that contribute to delays in Egyptian construction projects based on their significance, and to suggest potential strategies for minimizing these delays.*

Keywords: - *Project delay factor, Infrastructure Projects, Road and Bridge, Cost and Time Overrun.*

1. INTRODUCTION

In most countries, research and industry practice indicates that A construction project is considered successful when it is finished on time and within the planned budget. Delays usually happen due to the contractor's financial difficulties or when the client makes unrealistic demands related to the project's design or scope. Factors like bad weather or changes in regulations are generally not seen as major causes of delays. It's also important to understand that any delay in a construction project has a direct impact on its overall performance, the quality, the cost, and the level of uncertainty that surrounds the project. It is also important to mention that Contractor problems money and the unreasonable demands of the owner are the main reasons why the construction projects

2. RESEARCH BACKGROUND

One should inquire about the causes behind delays in road construction projects since time, not mentioning price and type, are three of the most crucial part of the construction project .That is why it could be beneficial to investigate the issue of project delays so that we could learn more about the reasons why road construction projects tend to go wrong.All the data of the study has been gained only through consulting engineering firms and contractors.As a result, only those delays caused in the process of construction are explored, but not the ones that may have been experienced before the construction process.

3. RESEARCH METHODOLOGY

The study employed a systematic approach whereby all the late factors identified were assembled in nine broad categories. Such teams were then ranked accordingly according to the decisions made after a thorough examination of literature and also upon the personal views of the industry experts working on the HCRP works through an interview questionnaire. This instrument allowed the respondents to scale the severity of the delay factors. One hundred and ninety practitioners were the participants in the assessment. The three analytical techniques that were used to analyze the acquired data were the Average Method (AM), the Relative Importance Index (RII), and the Relative Importance Index (ORII).The data obtained was analyzed by involving project managers, site engineers, technical office teams, procurement personnel, consultants, as well as the representatives of both the main and subcontractors. These techniques were employed to determine the ranking and weightage every delay factor. The ultimate decision of the findings identified the factors and categories that contribute the greatest impact in contributing to project delays.

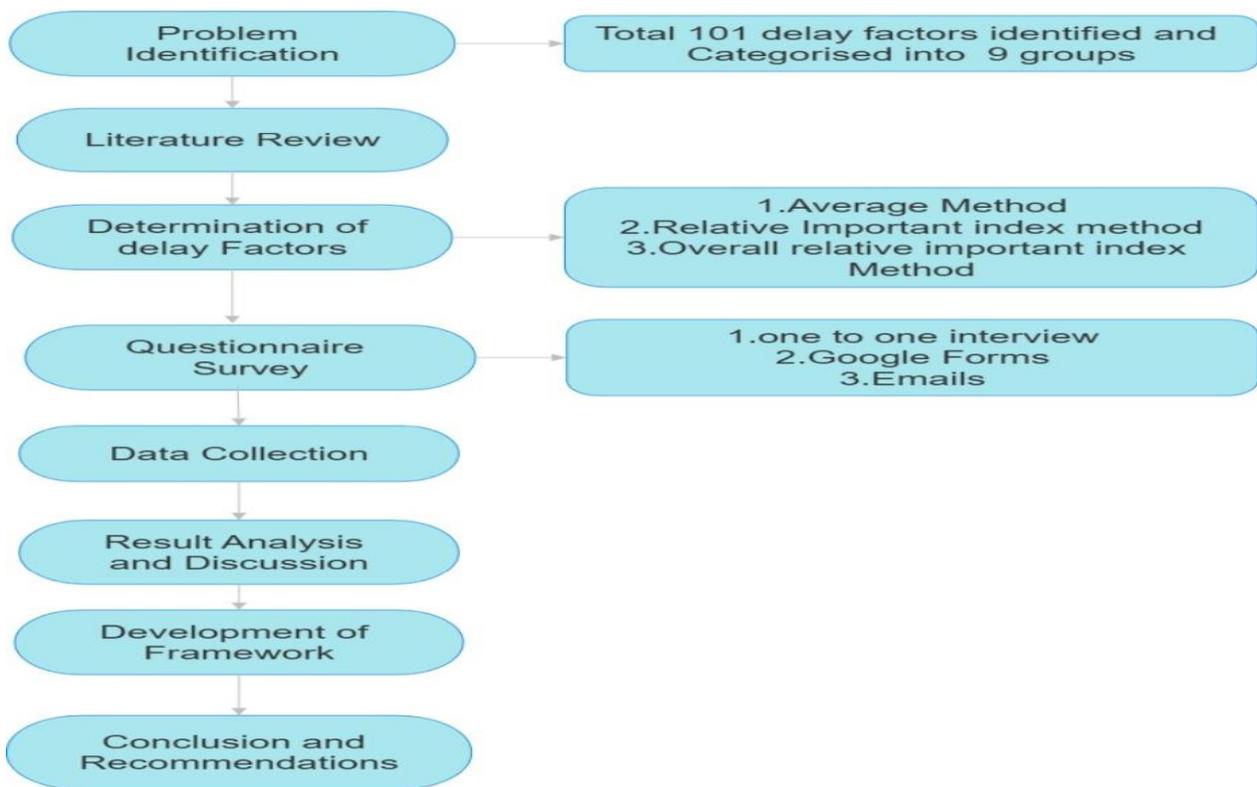


Figure 1 : Main Activities/ Methodology

4. DEVELOPMENT OF DELAY FACTORS.

To pinpoint the main and most common reasons behind delays in road construction projects, a detailed list of potential delay factors was prepared. Based on the existing state in the industry and past studies, 101 factors were identified. These reasons are a lack of experience of the consultants, disagreement between consultants, design engineers, discrepancy in approving the significant scope changes, delay in inspection and testing processes, poor site investigations, weak project management support team, delayed review and approval of design reports, and lack of communication/coordination among the project stakeholders. Additional contributing factors include the consultant's inflexibility, land acquisition problems, frequent changes in subcontractors, limited contractor experience, improper construction techniques, an under qualified project team, ineffective scheduling and planning, outdated technology, and poor communication between contractors and owners, among others.

5. CASE STUDY – HOSPET CHITRADURGA ROAD PROJECT

The project consists of rehabilitation and upgrading of existing National Highway to two lane with paved shoulder configuration for National Highway Sections in the State of Karnataka. EPC Contract awarded to L&T Limited by TRIL. Project Cost is 944.44 crores and schedule completion of the project is 850 days from the days of issue of NTP. The project stretch starts after Hospet bypass km: 299+000 at the end of the Hungund – Hospet package which is recently widened to four lane carriageway and ends at the junction of

NH 13 and NH 4 near Chitradurga bypass at km 418+750, having a total length of 119.750 km.

Figure 2: Location Map of Project Road



6. Conduction of Survey

A survey was carried out using google form, Email and one to one interview, during which participants were asked to evaluate and rank the delay factors based on their professional experience. There was a 82.50 response rate as 129 out of 160 questionnaires posted had been responded to. The feedback collected from the respondents was examined and analyzed to determine the primary factors contributing to project delays. The detailed analysis formed the basis for proposing recommendations aimed at improving the execution of construction projects.

7. Determination and Selection of Samples.

Sampling was done in a representative group of participants in the target population through a systematic random sampling method. A finite population was computed by the following: The formula used was

$$n = \frac{m}{1 + \left(\frac{m-1}{N}\right)}$$

where n represents the required sample size for a limited population, m is the sample size calculated for an unlimited population, and N (which is 200) is the total population.

$$m = \frac{Z^2 \times P \times (1 - P)}{e^2}$$

To determine the value of m, the formula was applied.

Where Z in this equation is the standard normal value equivalent to the desired level of confidence i.e. 2.575, 1.96 or 1.645.

8. QUESTIONNAIRE SURVEY

The data obtained were assessed through three procedures, the Average Method, The study used the Relative Importance Index (RII) and the Overall Relative Importance Index (ORII). Participants rated each factor on a five-point scale: 1 indicating very low impact, 2 low impact, 3 moderate impact, 4 high impact, and 5 very high impact on project delays. It is important to note that although the scale uses numbers from 1 to 5, the intervals between these values are not necessarily equal and represent absolute values. The questionnaire scale is founded on Likert scale, which is a structured and unidimensional method of ratings that gives the respondent a chance to indicate the option that best corresponds to their opinion. The Likert scales usually include four to seven possible answers to the question, with five being the most popular. Respondents also

respond to a statement by showing the degree of their acceptance or perceived impact and the numerical scores are given to their responses to aid in analysis. The fact that the questions are easy is one of the greatest advantages of this scale as it assists in ensuring that the responses are consistent and reliable.

9.Delay Factor Development identified factors are:

1. Consultant related: Incorrect site investigation, lack of promptness of approving changes in the design, inflexibility of consultant.
2. Contractor based: Low financial management, high turnover of subcontractors, poor planning.
3. Design-related: Unfinished project design, mistakes and omissions, owner changes.
4. Equipment issues: Allocation issues, equipment breakdowns, poor modern equipment.
5. External related: Authorize delays, government policies change, changes in prices, weather conditions.
6. Labour related: Under supply of skilled labour, low labour productivity, strikes.
7. Material related: Late delivery, substandard, shortages.
8. Owner related: Low payment and site hand over and poor coordination.
9. Project related: Catching up, poor punitive measures, lawsuits.

10.Comparative Method Analysis.

The simplest approach is the Average Method which is less accurate. RII enhances uniformity and ORII offers maximum reliability because it will refer to experience of respondents. Final ranking was therefore adopted by use of ORII.

11.Results and Analysis &Key Findings

Table -1. Top 10 Delay factor

ID - Heading	Sub-Heading	Overall RII Index
1 Contractor Related Factors	Poor financial control on site	90.90
2 Owner Related Factors	Delay in site delivery.	89.40
3 Contractor Related Factors	Unreliable subcontractors	89.19
4 Materials Related Factors	Shortage of construction materials	88.17
5 External related factors	Delay in obtaining permits from municipality	83.03
6 Contractor Related Factors	Inadequate contractor experience	82.00
7 Equipment Related	Equipment allocation problem Factors	81.99
8 Contractor Related Factors	Frequent change of subcontractors	81.66
9 Labours related factors	Low productivity of labour	81.14
10 External related factors	Delay in performing final inspection and certification by third party	80.17



Figure 3. Horizontal bar chart of Consultant related delay factor.

Discussion: -

Figure 3. bar chart shows the ranks and relative relevance indices of the ten (10) components that are included in the "Consultant Related Factors Category." The owners, who took part in the study chose the "Delay due to Land Acquisition by consultant" factor as the main reason for HCRP delay in this category, giving it a Relative Importance Index of 70.90%. This top-ranked component has a significant influence on the reasons for HCRP delays, as seen by its effect ranking of twenty-seven out of all the factors that were examined.

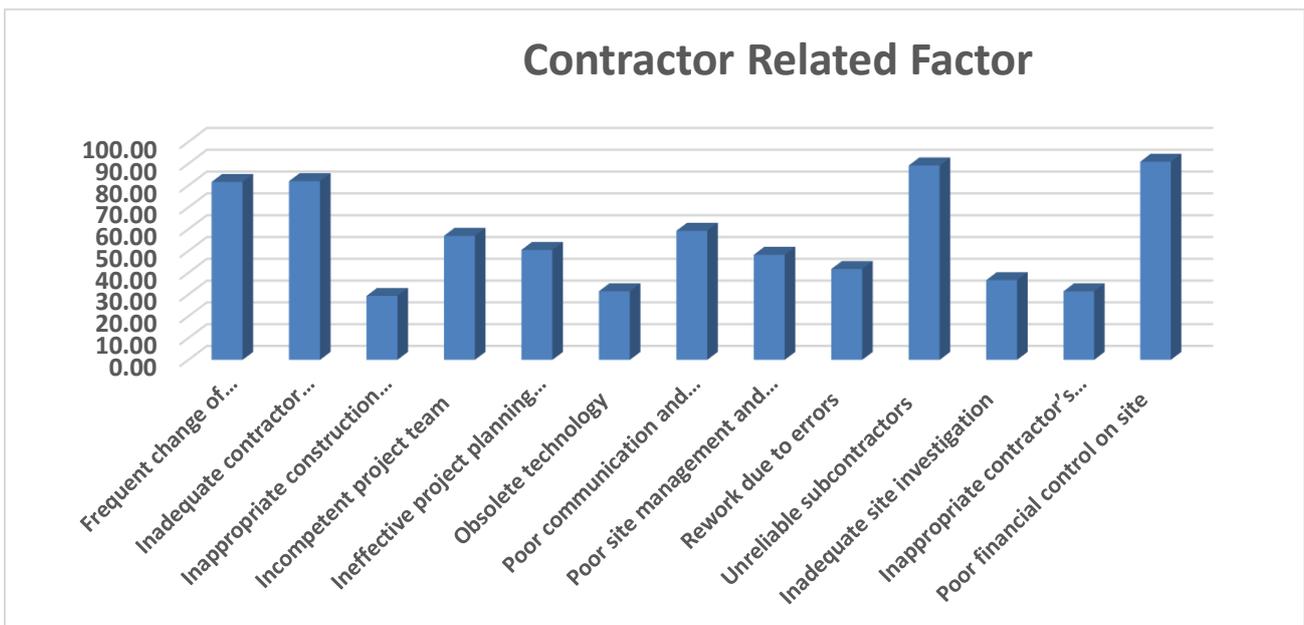


Figure 4. Horizontal bar chart of Contractor related delay factor.

Discussion: -

Figure 4.0 Horizontal bar chart lists the ranks and relative significance indices for the thirteen (13) components that make up the "Contractor Related Factors Category." The owners, who took part in the survey considered "poor financial control on site" to be the main cause of construction delays, with a Relative Importance Index of 91.99%. The degree to which this top-ranked component influences the delay is demonstrated by the fact that it also ranks first in its effect among all the factors that were examined

12. Conclusion

1. Till date 129 Response have been received. The data for these response is tabulated and partial working is done to find out the most important factors of the delay.
2. The Relative index for each of the particular work experience group is calculated separately and the Overall Relative Importance Index have been obtained as the weighted average.
3. It has been observed from the available data that major causes of the delay are because of the Shortage of Construction material, Delay in Land Acquisition, Poor financial control, unreliable sub-contractors, lack of owner's experience.
4. From the project progress data, it is observed that the amount of work scheduled from inception till 27th march 2017 was 444.06 Cr. and the actual amount of work completed is 219.53 Cr.

13. Mitigation Strategies and Framework

1. A mitigation strategy was designed by focusing on the most significant contributing factors.
2. Financial Management: Have stringent cost management measures and milestone tracked disbursement.
3. Subcontractor Control: Pre-qualification and performance-based assessment.
4. Material Planning: Impact of early procurement plans and performance auditing of suppliers.
5. Labour Productivity: Train, offer incentives and exercise correct supervision.
6. Coordination Mechanisms: Consistent coordination meetings between the owners, consultants and contractors.
7. Technology Adoption: Project management (Primavera, MS Project) tools will be used to monitor the progress and make predictions of the delay

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