

Delay in Construction Project in India

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Abstract:

In India, construction is the second-largest economic sector, next only to agriculture. The issue of delays in the construction industry is a global phenomenon, affecting both simple and complex projects. To mitigate project delays, it is essential to analyze and manage the factors that cause them. This report examines delays in construction projects by identifying and categorizing various contributing factors.

A comprehensive questionnaire was developed, encompassing 63 identified causes of delay, which were classified into seven distinct categories. The questionnaire was distributed to owners, consultants, and contractors to rank the factors based on their significance. The data collected was used to analyze the "Frequency Index," "Severity Index," and "Importance Index" of each factor. The study aimed to gather the perspectives of various stakeholders, and the results clearly indicated that different groups provided varying rankings for the factors causing delays

The study revealed several recurring factors contributing to delays across most projects, including insufficient funds to complete the project, labor shortages, material shortages, ineffective communication, lack of supervision, and changes in design drawings. The goal of the research was to offer recommendations for controlling delays during the construction phase.

Based on the analysis, the top five delay-causing factors were ranked in terms of their likelihood and impact on construction projects. These are: (1) Equipment breakdown, (2) Labor shortages, (3) Delays in sub-contractor work, (4) Equipment shortages, and (5) Low productivity levels among laborers. The study provides actionable insights to help manage and reduce delays in construction projects.

Keywords— Delay analysis technique, causes of delay, tools to evaluate delay in construction, delay control measure

I. Introduction

Study on Delay Analysis

A. Construction project planning

Planning explains “what” is going to be done, “how”, “where”, by “whom”, and “when” for effective monitoring and control of complex projects. The objective of project planning is to complete the construction within the specified time and budget. In construction project planning the steps need to be identified are as follows.

- Feasibility of the project
- Project management

- plan
- Identifying the constraints in the project (time, cost, resources)
- Project delivery method, stakeholders, funding sources
- Construction method
- Identifying risk in project
- Milestone, duration and budget
- Roles and responsibility
- Preparation of contract documentation

B. Project scheduling

Project scheduling only addresses the question of when. i.e., when tasks must be carried out and finished. Project scheduling aids in the measurement and control of the project's length

and furnishes data for prompt decision-making in the event of a schedule modification. A thorough project schedule makes it easier to track the project's duration and completion date, calculate the start and end of a given activity, assess the impact of changes, increase work efficiency, forecast and compute cash flow, address claims of delays, and act as a useful tool for project control.

C. Types of project scheduling

The scale and complexity of the construction project, the preferences of the organisation creating the schedule, and the contract's scheduling criteria all play a role in choosing the best scheduling method. Gantt charts, also known as bar charts, linear schedules, program assessment and review approaches, and Critical Path Method (CPM) schedules are the most often used scheduling methods for construction projects.

D. Progress monitoring

When updating a project, actual progress is recorded for each activity relative to the date of each update. This regular update will include progress on values for: dates on which activities started or finished actual percent of work completed within each task, actual resources expended on each task and actual cost expended on each task. There are six basic techniques for measuring the progress of a task in a CPM network as follows: Unit Measure, Incremental Milestones, Start/finish, Observational Assessment, Level of Effort/Cost Ratio and Equivalent Units

E. Classification of construction delays

The classification of delays is dependent upon the type and magnitude of the effect that an activity will have on the project and who is responsible for the delay among the stake holders. Hence they are classified into four categories such as Critical or noncritical, Excusable or non-excusable, Compensable or Non-compensable and Concurrent or Nonconcurrent

1.3 Critical Versus Non-Critical Delays

Delays that impact the project's completion time

or date are classified as **critical delays**, while those that do not affect the completion time are considered **non-critical delays**. In a construction project, if certain key activities are delayed, the overall project completion date will also be delayed. Determining which activities actually influence the project completion date depends on several factors: the nature of the project, the contractor's plan and schedule (especially the critical path), the contractual requirements for sequencing and phasing, and any physical constraints specific to the project.

II.Literature Survey & Background

Tiware V.S.,Mane D. M.,Soundattikar N.M.Patil A.R (2018) "Root Cause Analysis Of Delays On Residential Construction Projects In Kolhapur City" In this paper The data was collected from residential buildings from Kolhapur region, Maharashtra, India having suitability mentioned in site selection criteria. These sites were tracked. The data collection was done from the bar chart & muster of actual work which is followed by a set of questionnaires. Four residential site with well-prepared bar chart is taken for the data collection purpose. At the initial stage planned data is compared to actual work data & the number of delays or its magnitude in days is calculated.

Vidya M. Patil, Aniket M. Undale, Govinda M. Singh, Sangram S. Patil Sushant T. Satheand Vaibhav H. Pisal (2017)" Analysis Of Causes Of Delay In Any Construction Project" The research methodology for the present study included the two stages which are primary data collection and secondary data collection. The primary data collection included collection of information from personal investigation, questionnaire survey, interviews of various respondents.In the secondary data collection, the data is collected

from already published, analyzed work of other researchers or people. Therefore, this information was used to support the current study or findings

III.Questionnaire Survey and Data Collection

The purpose of this study is to critically review and assess the relevance of previous research on identifying factors that cause time delays and cost overruns in construction projects. When a project experiences delays, it is either extended or expedited, both of which result in additional costs. To gain a comprehensive understanding of these issues, research literature from around the world has been gathered and consolidated. Various authors have focused on selected categories for analysis, acknowledging that cost and schedule overruns are caused by a wide range of factors. There has been a noticeable rise in the number of construction projects facing significant delays, leading to time and budget overruns. The study's findings are primarily based on responses from questionnaire surveys designed to evaluate the frequency of occurrence, severity, and importance of the identified delay causes. The questionnaire was distributed to contractors, consultants, and clients. Respondents were asked to indicate the level of importance for each cause using a five-point Likert scale, ranging from 1 (least important) to 5 (most important). The investigation was conducted in two phases.

The first phase involved a literature review, which identified 63 potential causes of delays. In the second phase, a questionnaire was developed based on these delay factors. The scope of the study was limited to industry experts, contractors, architects, and public owners. A total of 20 responses were collected, with 7 responses from project managers and 13 from site engineers. Their feedback was used to refine the questionnaire. The final questionnaire responses were analyzed, and the causes were ranked based on their frequency of occurrence and level of influence on project delays and cost overruns.

IV.Result Recommendations For Major Causes Of Delay Causes

The Survey is designed based on the objective of the study to find out the causes of delays in construction projects and effect of the delays on overall project. The Survey is framed in such a way that the personal view of different people involved in different projects (Architect, Consultant, Owner, Project manager, Contractor) is collected and analyzed. This questionnaire consists of 63 causes of delay on which a detailed analysis will be carried out by using statistical concept. These causes are classified into nine groups according to the sources of delay: Factors related to Project, Owner, Contractor, Consultant, Architect/design-team, materials, equipment, manpower (labor), and external factors.

Table 4.1 Recommendations For Major Causes Of Delay Causes

Causes of delay	Recommendations
Weathercondition	Conducting detailed and perfect surveys towards the field condition and previous weather data
External factors	Monitor the work done by the earlier contractors to make sure that delays outside your control are recognized and documented.
Lack of funds	Optimize cash flow in accordance with the requirements and make sure fund needed for project is available to execute the project

Deviation of scheduling	Develop detailed and accurate schedule to facilitate easy and controlled scheduled execution
Lack of communication	Planning and applying Management Information System(MIS)
Poor decision making process	Conduct routine/regular coordination meeting and develop a procedure regarding decision making.
Lack of coordination / Wrong delegation of authority	Develop a good, simple and easy to understand system to regulate coordination procedures and responsibility of units. Make organization chart with detail job description which includes responsibilities and roles of each function
Lack of inspection	Provide separate technical staff or site manager for periodic inspection and monitoring work process which includes starting late, late submission of drawings, mistakes or errors, resource availability, etc. then proper record has to be maintained to detect risk and mitigate.
Improper planning	Understand the level of supply and demand to produce detail planning and schedule. Implement automatic machine work to avoid shortage of labor such as automatic plastering machine, wall painting, precast concrete wall, etc.
Lack of knowledge	Contractor needs to aware of new technology and techniques to reduce time duration for activity or labor force
Lack of facilities at site	Site management should be properly done to ensure proper resource; basic facilities for worker are available to increase productivity by doing detail study in site condition.
Poor selection of vendors	Consider supplier daily capacity and material quality for selecting vendors to avoid delay and conflicts.
Labor shortage	Early workforce planning is essential for owners and contractors to effectively manage project labor risks. Then providing incentives/awards for workers like best employer of the year/ month so that productivity and quality of work will be increased.
Skilled labor shortage	Providing training and upgrade skills to use new technology and techniques for unskilled labors to increase productivity and efficiency of the worker.

V. Conclusion

This research has identified 63 factors contributing to delays in construction projects,

categorized into seven distinct groups, through a thorough literature review and an analysis of questionnaire responses from twenty

respondents. This comprehensive approach captures various combinations of factors and categories responsible for construction delays. The ratings provided by respondents varied, reflecting the different perspectives of organizations on the causes of delay.

The data collected from the questionnaire survey were analyzed, resulting in a consolidated list of factors ranked according to their significance. Various indices—Importance Index (I.I), Frequency Index (F.I), and Severity Index (S.I)—were determined to evaluate the probability and impact of these factors at different stages of the project.

Each factor was rated for its influence on the project, allowing for a comparative analysis to enhance understanding. The study identified the top five factors that are primarily responsible for delays in construction projects:

1. **Equipment Breakdown** (Rank 1)
2. **Shortage of Labor** (Rank 2)
3. **Delay in Sub-Contractor Work** (Rank 3)
4. **Shortage of Equipment** (Rank 4)
5. **Low Productivity Level of Labor** (Rank 5)

Additionally, the study quantified the duration of delays using Primavera software, revealing a net effective delay of **67 days**. This finding underscores the significance of addressing these key factors to minimize delays and enhance project efficiency.

Delay analysis in construction projects is essential for understanding the causes, impact, and responsibility of delays. Delays can arise from various sources such as design changes, unforeseen site conditions, supply chain disruptions, or poor project management. Accurate identification and classification of delays—whether excusable, compensable, or concurrent—enable better dispute resolution, enhanced communication among stakeholders, and improved planning for future projects.

The adoption of methodologies like Critical Path Method (CPM), Time Impact Analysis (TIA), and As-Planned vs. As-Built analysis helps in

providing objective assessments. These techniques are vital for determining the true cause of delays, quantifying their effects, and ensuring that appropriate mitigation strategies are implemented.

Ultimately, delay analysis serves as a powerful tool for risk management, providing valuable insights for avoiding or minimizing delays in future construction projects, while protecting the financial and legal interests of all involved parties. Effective delay analysis contributes to more predictable timelines, better resource allocation, and overall project success.

VI Future Scope

In this study delay analysis has been done by calculating frequency index, severity index and importance index and by quantifying delay using Primavera. Some other methodology can be adopted for delay analysis in construction projects like Computerizing Isolated Collapsed But –For (ICBF), Integrated Approach and Delay Section

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