

# Comparative Assessment of Delay Analysis Approaches in a Road Project: A Case Study

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**Abstract** - Delays are a common occurrence in construction projects, and they can have a significant impact on the project's cost and schedule. Delay analysis is the process of determining the causes and effects of delays, and it is an essential tool for identifying responsible parties and recovering costs. Comprehensive studies that systematically compare and assess the practical applicability and limitations of various delay analysis methods within the context of Road construction Addressing this research gap is crucial for refining delay analysis practices in Road projects and ensuring that project delays are accurately identified, attributed, and mitigated. Such studies would not only contribute to academic discourse but also provide practical insights that could significantly improve project management and dispute resolution processes in road construction. This research endeavors to enhance understanding and knowledge by evaluating commonly employed Delay Analysis techniques (DATs) through the examination of a real-time road case study project. This study focuses on three specific Delay Analysis Techniques (DATs) within the context of a road project. Primary data sources are utilized to conduct and document the study, enabling the identification of key sources of project delays. The selected DATs—impact as-planned (IAP), Time Impact Analysis (TIA), and Window Analysis (WA)—were endorsed by the SCL protocol, and then employed on the dataset. The implementation of these techniques utilizes Primavera P6 software. Subsequently, a thorough comparative analysis is performed on the obtained results. The assessment of various DATs has led to the conclusion that the window analysis methodology is a more accurate method because it incorporates site progress and is gives reliable results. This knowledge can be invaluable in mitigating the risks associated with delays and disputes during construction.

**Key Words:** Construction Delay, Delay Analysis Techniques (DATs), Road Project, Primavera p6.

## 1. INTRODUCTION

Delays in the construction design phase can arise from various factors, including actions or circumstances involving the project owner, the contractor, unforeseeable natural events, or external third parties.

Construction design frequently faces persistent delays. Any task or activity that surpasses its scheduled timeframe can impact on the project's overall pace, potentially causing issues and legal disputes. As a result, it is crucial to explore and understand the factors contributing to construction delays. In the construction industry, Primavera is a widely utilized software tool for project planning, scheduling, and progress tracking. It can also be employed for assessing claims for extensions of time (EOT) and analyzing delays.

The aim of this study is to enhance our understanding of Delay Analysis Techniques (DATs) by examining their application in a real-time road case study. To achieve this, we conducted a thorough literature review, critically assessing various DATs and selecting three Techniques for this study. We chose a specific road design project, namely, the Baroda Main Road to Malpura via Chondpur, as our case study. The primary sources of information include insights shared by professionals who were involved in this project and related data on delays.

### 1.1 Objective of the study

1. Identify the responsible parties and causes of delays.
2. Assigning Responsibility to the Appropriate Party for which action, who is responsible for which act.
3. To track the project progress and analyze the reason for delays.
4. Comparative behavior of different DATs applied.

## 2. LITERATURE REVIEW

**SelvaKumar and Manishankar (2020)**, The paper discusses the use of Primavera software for delay analysis in highway construction projects. A delay analysis is used on Case study of four Laning of Cholahapuram – Thanjavur section of NH-45C highway construction project length is 47.835 kms. Including 184 nos. structure works in the state of Tamil Nadu. A total of 8 types of delays were considered in highway construction projects. The paper concludes by discussing the benefits of using Primavera for delay analysis and the temporary worker has implemented an updated development schedule in compliance with the contract terms, resulting in an extension of the completion time by 364 days.[1]

**Shubham Ashok Avhad, Satish M. Waysal (2020)**, According to the contractor, this survey is conducted to determine the timeliness of the road development project and to identify the elements that contribute to delays. It is conducted using the Questionnaire Survey, which was completed with the with Google Forms' aid. According to the study, there are 32 different reasons that can cause a delay or failure of the Road. According to the report, construction-related mishaps, rising material costs, and the main factors that have the greatest impact on road failure are cost and time delays. These elements were used Excel for quantitative analysis and the Severity Index Method for analysis and Google Forms, after which the outcome was computed. There are six government contractors on the panel. Six government contractors and five private contractors will participate in the panel discussion. Based on the survey, the maximum factors' impact level is high (between 60% and 80%), and the limited factors' impact is also high Moderate (40% to 60%) in intensity. [2]

**Saravanan Karunakaran, M. A. Malek (2019)**, This paper contributes a deep review on the factors that cause delay in the construction industry, especially in the construction of highway and road projects. The study included 92 factors consisting of various construction phase. The study investigated that topmost significant factor that causes delay in construction projects was poor project planning and scheduling with the highest frequency of occurrences and percentage value which is 25 and 2.5% respectively. Therefore, these findings will be useful for future planning and time management in order to minimize the delay occurrences on the highway and road construction projects.[3]

**Suroj Ghimire and Anjay Kumar Mishra (2019)**,Through the case study of an under-construction hydroelectric project and a review of pertinent issues not covered by the techniques, this research has made a comparative study of the limitations and capabilities of different Prospective "DATs," i.e., Impacted as Planned method and Time Impact Analysis method, under the same baseline program and under similar circumstances of delay occurrence. According to the study's findings, the contractor has not complied with any DATs in order to file a request for a time extension. The contractor has requested a 721-day time extension and presented a revised construction schedule in accordance with the FIDIC terms of the contract.

The delay to 620 is displayed when the Impacted as intended approach is used. The Time Impact Analysis approach indicated that the employer's delay was 529 days, whereas the contractor's delay was 101 days. [4]

**Siddesh pai & neeraj anand (2018)**, A questionnaire survey and personal interviews methodology was used for this research. Most critical variables causing construction

delay were analyzed using factor analysis. These results will significantly contribute in controlling the time overruns in Indian road construction industry.

The exorbitant costs arising from delays in road constructions results in considerable decline in the entire stretch of roads constructed and repaired yearly or it may lead to substandard quality of construction work.This research provides fresh dimensions in project management of road projects and guides the stakeholders to successfully encounter the challenges that they occur during any road construction project execution in India and to mitigate the delays, handle challenging and problematic matters in a timely way, maintain effective project monitoring, serve as a prior warning system for time and cost overruns, and help project team to take timely decisions and the monitor projects so as to upgrade, continue and/or terminate a project. [5]

**Diksha Soni, Vijay Kumar Punjabi (2018)**, this research would analyze and study the Land Acquisition Act of 1894, the various amendments and causes for disputes in land acquisition and intend to achieve this by a thorough understanding of the intricacies of land acquisition act, considering the various causes for disputes and analyzing each reason through a case study. This study explores alternate ways of dispute resolution and see if there is a need to bring about any rectification in the basic dispute resolution process.

This study concluded that it is imperative to ensure accurate valuation for compensation calculations. Site selection surveys should prioritize acquiring barren land over fertile land to minimize impact. The use of urgency clauses should be reserved for genuine emergencies. Land surveyors must conduct their work with utmost professionalism, accuracy, and transparency. When compensating for crop damage, rates should align with current market prices and the crop's maturity. [6]

**Al- Gahtani, Khalid S (2011)**, This paper examines the delay claim by analyzing current method using a fictional case study. The case study is applied to all current techniques of delay claims that have been identified from previous studies. The comparison uses the delay claim issues as criteria to evaluate all the delay claim techniques from the case study results. It pinpoints the urgent need for standardized approaches and supports the Day-by-Day approach as standard for analyzing project delays. [7]

**Jyh-Bin Yang, and Chih-Kuei Kao (2009)**, this study based on Selecting a suitable analysis methodology for resolving the schedule delay claims encountered. This study reviews 18 delay analysis methods, and compares in detail three process-based dynamic analysis methods, namely, the snapshot analysis method, the windows analysis method and the isolated delay type method. A dynamic method is ideal for resolving a delay claim. The

differences among the dynamic methods in terms of the capabilities, required documents, timing and analysis process are discussed to help delay analysts to select an appropriate method. Finally, this study attempts to propose six suggestions on developing an ideal analysis method. [8]

### 2.1 TYPES OF DELAYS

Types of Construction Delays are-

Prior to starting the schedule delay analysis, it is important to thoroughly understand the general categories of construction delays. Schedule construction delays are categorized in many ways. According to Trauner et al. (2009) identified four categories of construction delay: [9]

- Excusable or non-excusable
- Compensable or non-compensable
- Critical or noncritical
- Concurrent or non-concurrent

### 2.2 CAUSES OF DELAYS

From causation perspective delays may be categorized under the following types:

**1.Delays caused by the contractor:** these include delays caused by parties for whom the contractor is responsible in law. Under most contracts the contractor is neither entitled to extension of time nor recovery of loss and/or expense and may have to pay damages/penalties.

**2.Delays caused by the owner:** these include delays caused by parties for whom the owner is responsible in law. In most standard forms, the contractor is entitled to extension of time and recovery of loss and/or expense caused by this type of delay.

**3.Delays caused by neither party:** these include delays for which neither the owner nor the contractor is responsible, e.g. exceptionally adverse weather conditions. Most contracts allow the contractor more time to complete but with no corresponding entitlement to recover any loss and/or expense caused and no damages/penalties assessed.

### 3.METHODOLOGY

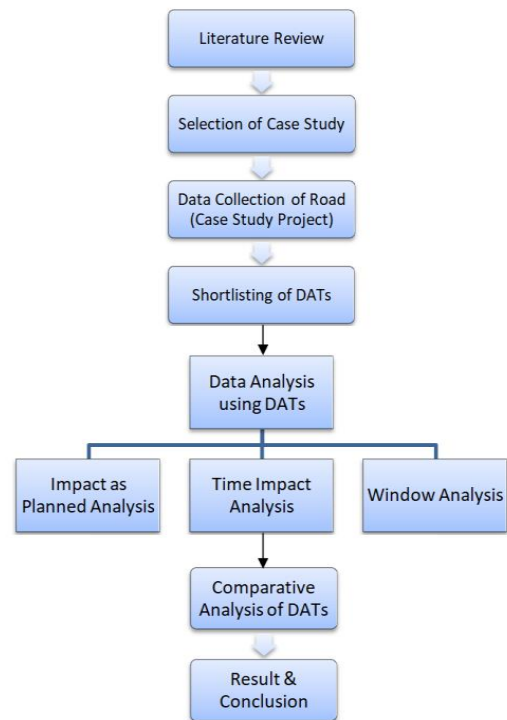


Fig.1. Methodology

### 3.1 About the study

**Name of work-** Construction of rural road under CMGSY

**Name of Road-**Baroda Main Road to Malpura via Chondpur

**Total length of Road-** 3.225 Km

**Location-** Sheopur

**Head-** CMGSY

### 3.1 COMPARISON

A comparative analysis of delay assessment techniques (DAT's) was carried out, and it was observed that each technique gave the same results. i.e., 24 days.

This occurred because the selected project had delays from both the client and the contractor, causing all following tasks to be delayed under the same baseline program and under similar circumstances of delay occurrence. Furthermore, the contractor completed all of his tasks within the time frame specified. This explains why each technique produced similar findings.

Following table provides quick comparative review on the outcomes from the application of Different DATs:

**Table-1**  
**Comparative Analysis of DATs**

S. No.	DAT's	Impacted Completion Date	Total Delay	EC	NN
1.	IAP	21-June-2021	24 days	19 days	5 days
2.	TIA	21-June-2021	24 days	19 days	5 days
3.	WA	21-June-2021	24 days	19 days	5 days

**Notation**

DATs	Delay Analysis Techniques
IAP	Impact As-Planned
TIA	Time Impact Analysis
WA	Window Analysis
EC	Client caused delay
NN	Contractor caused delay

**4. CONCLUSION**

From this research, the following conclusions have been drawn:

The delays were caused by the client and the contractor i.e. 19 days and 5 days respectively, the delay due to critical activities extended the project duration by 24 days in totality.

It is very important to assign the responsibility of the delay to the particular party to avoid the disputes. Client and contractor both are responsible for excusable and non excusable delays in the study.

Project progress is monitored using Primavera P6 and the CPM technique with Different Analysis . The causes of the delayed events can be listed as follows: Delayed procurement of Right of way, Delay in payment, Delay in Excavation, Delay in Material Supply.

To find out how delays in events affect the project's completion schedule, three primary DATs are chosen: IAP, TIA, and WA (as advised by SCL Protocol).The windows delay analysis approach is shown to be fairly accurate and appropriate for usage when comparing all of the DATs

employed because it accounts for the effects of baseline updates using fragnet. The actual impact of the delay events on the identified actual or as built critical path is determined via a retrospective delay analysis. It needs a skilled and knowledgeable planner.

Generally, out of all the commonly utilized delay analysis techniques (DATs) for claiming the Extension of Time (EOT), window analysis (WA) is a better and more reliable technique.

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