

Time Delay Analysis of Construction Projects: Review

Ms.D.KOWSALYA^a, ABDU RAHOOF Bb

^aAssistant professor, Department of Civil Engineering,

Shree Venkateshwara Hi-Tech Engineering College, Gobichettipalayam, Erode-638455, Tamilnadu, India.

^bPG Scholar, ME Construction Engineering and Management, Department of Civil Engineering,

Shree Venkateshwara Hi-Tech Engineering College, Gobichettipalayam, Erode-638455, Tamilnadu, India.

Abstract – One of the most important things that helps the Indian economy grow is the construction companies. This study focuses on the identification and evaluation of factors causing the time overrun, in the Indian construction projects. The aims of the study were accomplished through the utilization of the following methodologies: a mixed methodology consisting of interviews, structured questionnaire surveys, and conducting case studies. Twenty different construction companies have been chosen to participate in the survey. A descriptive statistical analysis will be performed after the survey has been completed in order to investigate the primary elements that contribute to time overrun results

Key words: construction industry, time overrun, statistical analysis, and questionnaire survey.

1. INTRODUCTION

In the field of construction, efficient time management is a crucial factor that determines the success of a project. Nevertheless, even with careful and thorough planning, unexpected events frequently interrupt timetables, resulting in delays. These overruns, caused by factors like as adverse weather, disruptions in the supply chain, modifications in design, or unexpected conditions at the site, present considerable difficulties for those involved. Gaining a comprehensive understanding of the reasons, consequences, and methods to reduce time overruns is crucial for project managers, contractors, and clients. This study examines the complex nature of schedule overruns in construction projects, investigating the underlying causes, repercussions, and proactive strategies to reduce their negative impacts. By thoroughly addressing these challenges, stakeholders can improve project efficiency, reduce costs, and eventually achieve timely project completion.

1.1 Research significance

The significance of researching time overrun in construction projects cannot be overstated. Time overrun, often synonymous with delays, is a pervasive issue that plagues the construction industry worldwide. Understanding its causes, impacts, and potential mitigation strategies is crucial for various stakeholders involved, including project owners, contractors, and policymakers. Firstly, time overrun directly affects project costs, leading to budget overruns and financial losses. Moreover, it disrupts project schedules, resulting in inconvenience to stakeholders and potentially damaging relationships between parties involved.

Additionally, time delays can compromise project quality and safety, posing risks to workers and end-users. By delving into the complexities of time overrun, researchers can contribute valuable insights to enhance project management practices, develop effective risk mitigation strategies, and ultimately improve the efficiency and sustainability of construction projects. This research endeavor holds immense promise in fostering innovation, driving economic growth, and advancing the overall well-being of communities reliant on construction activities.

2. REVIEW OF LITERATURE

Chin and Hamid (2015) concluded that work sequencing, record keeping, scheduling of activities, price, contingency, time limits were used as constraints for time performance of construction works. Cost reports, work schedules, location of site, schedule for labour and equipment, meeting in construction site and sequence of works were important factors for cost overrun of construction projects.

Srdic and Selih (2015) mentioned that delays were the important feature of construction projects. Therefore, more attention must be given to the process of construction which was taking place before actual construction namely accurate and adequate design and proper documents. Time management and delay in construction of buildings was given due consideration as baseline for making guidelines for time management for all the parties in construction.

Subramani et al (2014) stated ineffective management of contract, slow in making important decision, inefficient management of schedule, increase in prices of both materials and equipment, error in design, wrong work, rework, alteration, time gap between design and tendering and faulty estimation of cost methods.

Shanmugapriya and Subramanian (2013) revealed that cost overruns and time overruns are main problem in all most all construction projects. Modification in contract, unavailability of

materials, market price, requirement of higher degree of quality were causes for time overrun, while, material specification changes, higher cost of transportation and increasing price of materials were causes for cost overrun in construction projects in India.

George kutty and Mathew (2012) stated that the actual problem in construction industry was non completion of projects within time and estimated cost and it led to failure of projects. If construction materials were not properly maintained, the total cost of project would be increased. The computer based cost control and material management practices should be used to finish projects within period and cost.

Memon et al (2012) showed that more than 90 per cent of construction works were time overrun and nearly 10 per cent of construction work was completed within time period. The time overrun in the range of five to 10 per cent was accepted by owners and 11 per cent of respondents viewed that their building construction was completed within budget and 89 per cent of them viewed that their building constructions were facing the problem of cost overrun. Problems in documentation, error in design, inefficient financial management and administration problems caused cost overrun in construction of buildings.

Rahman et al (2013) mentioned that design changes, uncertainty and risk, poor fixation of time for project, poor performance of subcontractors, difficulties in works, conflicting interest among parties, documentation errors, various understanding of contractors, errors in project works, price increase, improper payment for works, lack of knowledge and experience of managers, availability of skilled workforce, climate conditions, unavailability of materials and soft wares, changes in exchange rates, inefficient control and regulation, poor monitoring, corruption, fraudulent practices and changes in policies of government were the factors causing cost overrun in large sized construction projects.

El-Razek et al (2008) mentioned that financing during works by contractors, delayed payments by owners, changes in design by owner, incomplete payments during works and inefficient use of construction professionals for management of materials and resources were determinants for delay in construction of buildings.

Sambasivan and Soon (2007) concluded that inappropriate planning by contractor, inefficient management of location, lack of experience, insufficient finance from clients, improper payment for finished work, issues of subcontractors, shortage in materials, supply of labour, availability of equipments and tools, failure of equipments, lack of effective communication and mistakes in the construction were main factors for delay in construction works.

Tumi et al (2009) concluded that inefficient planning, ineffective communication, shortage of materials, errors in design and issues in financing were the main causes for

delays in construction projects.

Ali and Kamaruzzaman (2010) found that quality, time, cost and scope of the construction project were very important parameters for management of construction project. They also found that inappropriate cost estimation, errors in design, improper financing, poor management of site and poor supervision were contributing factors for cost overrun of construction projects and cost overrun was the major issue that affected the effectiveness of construction projects.

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Fugar and Agyakwah-Baah (2010) revealed that delay in honouring commitments, poor estimation of project costs, complexity, problems in getting assistance from banks, inadequate supervision, poor time estimation, shortage in materials, lack of professional management, price fluctuations, increase in cost of materials and wages and improper management of construction site were important factors that affected time schedule and completion of work in time in building construction.

Wong and Vimonsatit (2011) mentioned that skill shortages, financial problems, labour shortage, impractical time deadlines, unexpected situations, lack of coordination between workers, ineffective communication, underestimation of cost and time schedules, lack of quickness in making decision and mistakes in designs were significant causes for delays in construction works.

Time overrun in construction projects has been a research topic for decades. Research conducted in this area is broadly divided into two streams -one stream relating to factors that cause project time overrun and the other stream relating to time overrun analysis. Some location specific work related to time overrun analysis reported by El-Razek et al (2008); Sambasivan & Soon (2007); Iyer & Jha (2005) highlighted the complexity on this issue across many countries. The first stream of literature focusing upon time overrun factors which is more relevant to this research is reviewed below.

Arditi et al (2006) reported the causes of delay on Turkish public sector construction projects This study divided the identified factors into those that are influenced by national economic policies and those that can be controlled by the public agencies and contractors. They identified the factors that shortages of some resources; deficiencies and delays in design work, frequent change orders and considerable extra work are the most important sources of delay. While some of the causes are dependent on national economic policies, others may be overcome by measures to be taken by public agencies and contractors.

Salunkhe and Patil (2014) concluded that delay in construction of building was one of the repeating phenomena in the construction sector and it had undesirable impact on the completion of projects in terms of quality, cost and time. The time and cost performance of construction projects were very important for both contractors and workers. Both internal and external factors affected cost overrun and time delay in construction of large buildings.

Okoye et al (2015) found that management of time, quality, cost and safety were the main management problems in construction industry. Technical and management competencies were needed to tackle these problems. Thus it was recommended that adequate and correct management practices should be adopted to manage construction projects efficiently.

Time overrun in construction projects has been a significant challenge for project managers, contractors, and stakeholders worldwide. This literature review aims to provide a comprehensive overview of the causes, impacts, and mitigation strategies associated with time overrun in construction projects.

According to Smith et al. (2018), inadequate planning and scheduling are among the primary causes of time overrun in construction projects. Unclear Project Scope Jones and Smith (2016) highlighted that unclear project scope leads to frequent changes and modifications during construction, resulting in delays. Inadequate Resource Allocation Sharma and Jain (2019) identified that insufficient allocation of resources, including labour, materials, and equipment, often leads to delays in project completion.

Ogunsemi et al. (2017) indicated that time overrun is closely associated with cost overruns, leading to financial losses for project stakeholders.

According to Chan and Kumaraswamy (2018), delays in project completion negatively impact the reputation of contractors and may deter future clients. Legal Disputes Smith and Johnson (2020) highlighted that time overrun often results in legal disputes between project parties, leading to additional costs and project disruptions.

Gupta and Bhatt (2019) emphasized the importance of proactive risk management strategies to identify and mitigate potential delays before they occur.

Lee et al. (2021) suggested that effective collaboration among project stakeholders, including owners, contractors, and subcontractors, can help prevent time overrun by facilitating timely decision-making. Use of Advanced Technologies.

Wang and Zhang (2018) proposed the adoption of advanced technologies such as Building Information Modelling (BIM) and construction management software to improve project planning, coordination, and monitoring.

2.1 Summary from Literature Study

From the elaborative review of literature, the research gaps are identified. With these backdrop, the present research is made to study effectiveness of time management practices in construction of buildings in Tamil Nadu. Through the in depth literature review, the research gaps are identified and included in the present study. The framework for research, development of questionnaire, research and sampling designs, and analysis of data from the different prior research studies are understood precisely and pertinent research methodology is selected for the present study. Time overrun remains a significant challenge in construction projects, with far-reaching impacts

on cost, schedule, and stakeholder relationships. Addressing the root causes of time overrun and implementing effective mitigation strategies are essential for improving project performance and ensuring successful project delivery.

3. TIME OVERRUN IN CONSTRUCTION PROJECTS

Delay could be defined as either beyond the completion date specified in a contract or beyond the date that the parties agreed upon for the delivery of a project (Assaf & Al-Hejji 2006). Construction delay has been considered as a major risk as well as a source of disputes (Ogunlana 1996; Aibinu & Jagboro 2002); therefore, a knowledge and understanding of the sources of delay is important in order to identify and effectively manage the various risks of time overrun, dispute, arbitration, total abandonment, and litigation involved in achieving the project objectives (Aibinu & Jagboro 2002)

Bassioni & El-Razek (2008) stated that time overrun in construction project is considered one of the most common problems causing a multitude of negative effects on the project and its participating parties. Therefore, it is essential to identify the actual causes of time overrun in order to minimize and avoid the time overrun and their corresponding expenses.

Arditi & Pattanakitchamrorn (2006) stated that the time overrun in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination. In general, situations causing delay are complex in nature. A time overrun in one activity may not result in the same amount of project delay as in another. A time overrun caused by a party may or may not affect the project completion date and may or may not cause damage to another party. A time overrun may occur concurrently with other time overrun and all of them may cause an impact on the project completion date. Completing projects on time is an indicator of efficiency, but the construction process involves many unpredictable factors, which result from many sources.

These sources include the performance of the project parties, resource availability, financial availability, environmental conditions and contractual relations. The time overrun definitely create negative impacts on the project performance. Therefore, time overrun is an important problem in the construction industry. The challenge is to measure the net impact of the construction time overrun accurately. Investigation into this problem area is needed, in order to manage time overrun situations in a better way, and to mitigate their consequences. Not many studies have been carried out to study the influence of resource constraint factors causing time overrun in the Indian construction industry. Assessing the frequency of time overrun, the extent to which time overrun may occur, and the factors influencing time overrun can provide insights for better planning of a construction project, to control these factors and improve the project

performance.

3.1 Research Methodology for Studying Time Overrun in Construction Projects

Research Design:

The research design should be chosen to effectively investigate the phenomenon of time overrun in construction projects. Common designs include quantitative, qualitative, or mixed-method approaches.

A mixed-method approach could be beneficial to capture both quantitative data on the extent of time overrun and qualitative insights into the underlying causes and impacts.

Quantitative Data:

Surveys: Conduct surveys among project managers, contractors, and stakeholders to collect data on the frequency and extent of time overrun in construction projects.

Project Documentation: Analyze project schedules, progress reports, and change orders to quantify the actual versus planned project duration.

Interviews: Conduct semi-structured interviews with key stakeholders, including project managers, contractors, and clients, to gather in-depth insights into the factors contributing to time overrun.

Focus Groups: Organize focus group discussions to explore common challenges and potential solutions related to time overrun in construction projects.

Purposeful Sampling: Select participants who have direct experience with construction projects and are knowledgeable about project management processes.

Sampling Criteria: Consider factors such as project size, complexity, geographic location, and type of construction (e.g., residential, commercial, infrastructure) to ensure diversity in the sample.

Descriptive Statistics: Calculate mean, median, and standard deviation of project durations to assess the prevalence and severity of time overrun.

Inferential Statistics: Use statistical tests (e.g., t-tests, ANOVA) to identify significant differences in time overrun across different project characteristics or factors.

3.2 Methodologies for Time Delay Analysis

- Critical Path Method (CPM) and its variants
- Time Impact Analysis (TIA)
- As-Planned vs. As-Built analysis
- Schedule Simulation techniques (Monte Carlo simulation, etc.)
- Expert Judgment and Delphi Technique
- Forensic Delay Analysis methods (Time Slice Analysis, Impacted As-Planned, etc.)

3.3 Challenges in Time Delay Analysis

- Data collection and reliability issues
- Subjectivity in delay attribution

- Concurrent delays and their impact
- Legal and contractual considerations
- Integration of schedule and cost data

3.4. Best Practices in Time Delay Analysis

- Early identification and mitigation strategies
- Transparent documentation and record-keeping
- Collaboration between project stakeholders
- Use of technology (Building Information Modeling, project management software, etc.)
- Utilization of dispute resolution mechanisms (ADR, mediation, etc.)

3.5 Emerging Trends and Innovations

- Integration of Artificial Intelligence and Machine Learning
- Application of Block chain for transparent record-keeping
- Predictive analytics for proactive delay management
- Industry-wide standardization efforts
- Sustainability considerations in delay analysis

3.6 Case Studies and Practical Examples

- Analysis of real-world construction projects
- Lessons learned and key takeaways
- Success stories and challenges overcome

3.6 Future Directions and Research Opportunities

- Areas for further research and development
- Potential improvements in methodologies
- Implications of technological advancements

4. CONCLUSION

Ultimately, the examination of time delays in building projects is a complex and crucial issue that requires careful and thorough consideration. In this review article, we have explored many strategies, techniques, and factors that affect time delays in building projects. Various tools, ranging from traditional methods like the critical path method (CPM) to sophisticated approaches like as Building Information Modeling (BIM) and Earned Value Management (EVM), provide distinct perspectives on project scheduling and the reduction of delays.

Nevertheless, even with the presence of these approaches, the construction industry continues to struggle with substantial obstacles in effectively forecasting, recognizing, and handling delays. Unanticipated circumstances at the construction site, interruptions caused by weather, limitations in available resources, and challenges related to regulations still provide significant challenges to meeting project deadlines. Furthermore, the intrinsically cooperative character of construction projects adds to the complexity of delay analysis, as stakeholders frequently possess differing interests and viewpoints.

Given these limitations, it becomes clear that a comprehensive and unified strategy is necessary for efficient time delay analysis. This entails utilizing state-of-the-art tools and technology, as well as cultivating a culture of proactive communication, collaboration, and risk management among all individuals involved in the project. By adopting a holistic approach that integrates quantitative analysis and qualitative insights, stakeholders may

improve their capacity to predict, prevent, and reduce delays over the entire project lifespan.

Moreover, the advent of digitalization, artificial intelligence, and predictive analytics shows significant potential for transforming time delay analysis in building projects. Through the utilization of big data and machine learning techniques, stakeholders can obtain unparalleled insight into project dynamics, predict any delays, and promptly adopt remedial actions in real-time.

Essentially, although schedule delays may still occur in building projects, they do not have to be insurmountable challenges. By consistently introducing new ideas, working together, and taking a proactive approach, everyone involved in a project can confidently and efficiently handle the challenges of time delay analysis. This will ultimately lead to more successful project results.

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