

## COMPARATIVE ANALYSIS OF THE PRIMARY CAUSES OF COST AND SCHEDULE OVERRUN IN THE CONSTRUCTION PROJECT

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**ABSTRACT:** The building industry plays a crucial part in the economic success of a country. The building construction industry has emerged as one of the foremost industries globally. The escalating intricacy of building projects places a heightened expectation on construction managers to successfully complete projects punctually, within the allocated budget, and with exceptional quality. The primary obstacle encountered by the building sector in emerging nations is the persistent issue of cost and time overruns. The construction sector possesses unique characteristics that are not typically observed in other industries. When the conditions in the construction field become more intricate than initially expected during the planning and design phase, it necessitates more expenses and time. Constructing expansive facilities is a time-consuming process that often requires a substantial financial commitment. As the project progresses, its complexity also grows, necessitating a project manager to continually minimize delays and costs while ensuring high-quality work.

### INTRODUCTION

Cost is the fundamental element of every building project. Cost overruns are a frequently encountered issue in construction projects globally and require additional research to effectively address this problem in the future. In underdeveloped countries, where cost overruns frequently surpass 100% of the project's planned cost, this tendency is much more pronounced. A cost overrun, often referred to as a cost escalation or budget overrun, refers to unforeseen expenses that occur as a result of underestimating the real cost during the budgeting process, exceeding the estimated amount. According to a comprehensive global construction study undertaken by Flyvbjerg (2002), it was discovered that 90% of projects experienced cost overruns. The occurrence of cost overruns poses significant challenges in both industrialized and developing nations. Therefore, it is imperative to thoroughly examine this situation in order to mitigate the issue in the future. Figure 1.1 depicts the constraints of cost and time overrun.



Figure 1.1 Constraints of cost and time overrun

### PROJECT SCHEDULE DELAYS

Delay is a prevalent, significant, and critical problem that impacts the timely completion of construction projects in civil engineering. Time overload remains a significant issue, despite technological developments and project managers' enhanced grasp of project management. Time overrun continues to be an important component. There are various reasons for the project delays. Delays can arise due to various circumstances, including the late arrival of materials to the site, equipment malfunctions, political issues, and adverse weather conditions. Delays can significantly exacerbate the issue in some scenarios. It is crucial to identify the reasons for delays and choose appropriate methods to reduce their negative impact on project duration in order to conduct a comprehensive evaluation.

The Construction sector in India is the most important part of the Country's Economy. This provides employment to about 54 million of people all over the country as per survey in 2021. It also contributes about 7-8% of GDP. Infrastructure activities accounted for a 13% share of the total FDI inflows of USD 81.72 bn in financial year 2021. This shows how important it is to control and manage the projects in good quality and efficiently. For managing project successfully there are four fundamental constraints needs to be considered which are scope, cost, time, and quality. It is necessary to consider whether the project is within those four constraints and how well these constraints are balanced. Majority

of construction projects in both developed and developing countries are facing the problems of cost overrun and time over.

According to a report by the Ministry of Statistics and Programme Implementation, the average cost overrun in construction projects in India was 37.5% between 2008 and 2012. Another study by the Indian Institute of Technology (IIT) Delhi found that the average cost overrun in infrastructure projects in India was around 20% to 25%. However, according to a report by the Ministry of Statistics and Programme Implementation, the average time overrun in projects monitored by them during the period of April 2020 to December 2020 was 34.33%.

Therefore, it is very important to understand cost overrun and time overrun and factors affecting them. Cost overrun occurs when the final cost or expenditure of the project exceeds the original estimation cost. And time overrun occur when project gets delayed beyond its estimated completion time. Some of the major factors for cost overrun are Poor Estimate, Design changes, Scope creep, Delays, Inflation, Poor project management, Unforeseen site conditions, Material and labour cost fluctuations and Contractual disputes. And for time overrun are Project Planning, Design Changes, Weather Conditions, Workforce Productivity, Unforeseen Conditions, Regulatory and Permitting Issues, Coordination and Communication. It is important to have control on the factors that impact cost over runs and time over run which ultimately reduces the performance of the overall project.

## COST MANAGEMENT

**1. Budgeting:** Cost management begins with establishing a budget for the project. This involves estimating the costs of resources, labour, materials, and any other expenses associated with completing the project.

**2. Cost Control:** Once the project is underway, it's essential to monitor and control costs to ensure they stay within the budget. This involves tracking expenses, comparing them to the budget, and identifying any variances.

**3. Cost Estimation:** Accurate cost estimation is vital for effective cost management. Project managers use

various techniques such as bottom-up estimating, analogous estimating, and parametric estimating to forecast costs.

**4. Resource Allocation:** Efficient allocation of resources helps in optimizing costs. Project managers need to ensure that resources are utilized effectively and efficiently throughout the project lifecycle.

**5. Cost Tracking:** Regularly tracking costs allows project managers to identify any deviations from the budget early on. This enables them to take corrective action promptly, such as renegotiating contracts, adjusting resource allocation, or revising project plans.

**6. Risk Management:** Identifying and mitigating risks that could impact project costs is an integral part of cost management. By proactively addressing risks, project managers can minimize their financial impact on the project.

## TIME DELAY MANAGEMENT

**1. Scheduling:** Time delay management starts with creating a detailed project schedule that outlines the sequence of activities, their durations, and their dependencies. This schedule serves as a roadmap for the project and helps in identifying potential delays.

**2. Critical Path Analysis:** Identifying the critical path—the longest sequence of dependent activities—helps project managers pinpoint activities that could cause delays to the overall project timeline.

**3. Monitoring Progress:** Regularly monitoring progress against the project schedule allows project managers to identify any delays as soon as they occur. This involves tracking the completion of tasks, comparing actual progress to the planned schedule, and identifying any deviations.

**4. Identifying Causes of Delays:** Once a delay is detected, it's essential to identify its root causes. Delays can be caused by various factors such as resource constraints, scope changes, unexpected issues, or external dependencies.

**5. Mitigation Strategies:** Developing mitigation strategies to address delays is crucial for minimizing their impact on the project timeline. This could

involve reallocating resources, resequencing activities, renegotiating deadlines, or implementing contingency plans.

**6. Communication:** Transparent communication with stakeholders is essential when managing time delays. Keeping stakeholders informed about delays, their causes, and the proposed mitigation strategies helps in maintaining trust and managing expectations.

By effectively managing costs and time delays, project managers can increase the likelihood of project success, delivering projects on time and within budget. This requires careful planning, proactive monitoring, and swift action to address any deviations from the plan.

### SCOPE OF THE RESEARCH

The scope of the study is confined to the examination of existing cost management approaches, the challenges encountered, and the suggested remedy. The cost control strategies employed by contractors on construction sites include the implementation of schedules, conducting site inspections, adhering to the project budget, holding meetings, maintaining records and reporting of cost and work progress, monitoring work and cost performance, and evaluating utilizing bill of quantities.

The problem encompasses various factors that contribute to delays and inefficiencies in the project. These factors include client delays in releasing funds, delays in decision-making, insufficient availability of materials and equipment, adverse weather conditions, overlapping of activities, imprecise and incomplete drawings, production of substandard work, and inadequate control over resource productivity.

Furthermore, it is recognized that the issue of cost control is not solely dependent on the procedures employed, but rather on the inadequate management and monitoring of these techniques. It proceeded to elucidate several crucial aspects pertaining to cost management on building sites, encompassing project resource and controls, materials, plant, labour, and the relationship between time and cost.

### OBJECTIVE OF THE RESEARCH

✓ The primary aim of the analysis is to determine the factors that contribute to delays and increased expenses in a building project and propose appropriate corrective measures.

✓ The study aims to achieve the following specific objectives:

Monitor deviations in the real-time and financial schedule by comparing them with the anticipated schedules and analyzing the underlying causes.

✓ To Study the pattern observed in reputable organizations by conducting surveys in the form of questionnaires.

✓ To Propose corrective actions by adjusting strategies, methods, and procedures, as well as revising the organizational structure and contract agreement.

✓ To assess the effects of over-runs on the stakeholders, particularly the client.

### LITERATURE REVIEW

#### GENERAL

The construction sector is most severely affected by cost and schedule overruns. Schedule and cost overruns are inevitable in construction projects, and their severity can vary significantly from one project to another. To effectively mitigate and eradicate these excessive expenses and delays in any given project, it is crucial to accurately pinpoint the precise factors that contribute to the overrun of both time and cost.

Hatkar K B and Hedao N A (2016) conducted a comprehensive analysis of the literature and administered a questionnaire survey. They successfully identified the causes and effects of delays in building projects. Issues include local political intervention, client's delay in progress payments, improper project planning and scheduling, inadequate cash allocation, and escalation of material prices. The Relative Importance Index (RII) was utilized to evaluate and prioritize the criteria. In addition, he employed the Spearman's Rank Correlation

Coefficient test to ascertain the existence of a substantial correlation between the viewpoints of contractors and consultants.

U. Sindhu et al. (2016) examined multiple factors using various methodologies, including the Frequency index method, Severity index method, Importance Index method, and Relative Index method. They collected questionnaires based on prior studies to gather data for their analysis. He determined that inadequate climate planning and scheduling, insufficient site management, fluctuations in material costs, inadequate monitoring and control, improper resource management in construction projects, and poor financial control on site can result in cost overruns.

Serdar Durdyev, Syuhaida Ismail, and Nooh Abu Bakar (2012) conducted a descriptive survey in Turkey, a representative developing nation, to identify and analyze the factors contributing to project overruns. They utilized the Relative Importance Index approach to analyze the collected data.

The examination of variables reveals that the primary factors influencing cost overruns in the construction of residential projects in Turkey are inaccurate project cost estimation, inadequate planning, exorbitant cost of necessary resources, shortage of skilled workforce, elevated prices of construction materials, and high land prices.

In a study conducted by Aishwarya Prashant Patil in 2017, the factors contributing to time overrun were identified based on the perspectives of the three main parties involved in the contract: the contractor, consultant, and client. These factors include delays in payment, adverse weather conditions, inaccurate planning and scheduling by contractors, inexperienced technical staff, excessive workload for contractors, labor shortages, delays in approving additional work, and poor site management and supervision by contractors. Ineffective time management was also found to be a contributing factor.

In their study, Abdul Rahman, et al. (2013) conducted a questionnaire survey to identify the key factors contributing to cost overruns in Malaysia. They analyzed the statistical data using the Relative Importance Index (RII) method, which allowed for a hierarchical assessment of these factors. The results revealed that the three most significant

factors leading to cost overruns were cash flow and financial difficulties faced by contractors, fluctuations in material prices, and inadequate site management and supervision.

Ghaleb et al. (2013) conducted a study to determine the factors that influence cost overruns in the public construction industry in Jordan. Upon conducting a thorough examination of the literature, he categorized many elements that contribute to cost overruns in construction projects as follows: escalation in material costs due to inflation, Rise in fuel expenses, Alterations in design, Insufficient quantity estimation, Limited expertise in project location, Limited expertise in project kind, Limited expertise in local rules, Unforeseeable weather circumstances, and Equipment scarcity. After conducting a PCFA analysis, it was determined that the main factors contributing to cost overruns in the Jordanian public construction sector, according to the perceptions of 30 engineers, were design changes, lack of experience with the project type, and location. Nabil et al., 2015 After conducting a thorough analysis of several documents and reports from various projects, it has been determined that the most crucial aspects contributing to project success are weather circumstances, terrain conditions, variation of order, and availability of manpower. In their 2013 study, Shanmugapriya and Subramanian investigated the significant factors that contribute to delays and increased expenses in Indian projects. They conducted a questionnaire survey, which was developed based on a thorough review of existing literature, and distributed it to Contractors, Consultants, and Owners within the Indian construction industry. The data from the questionnaire was analyzed using the Relative Important Index method. It was determined that the primary causes of time overruns are the material market rate, contract adjustment, and high quality work requirements. Similarly, the main contributing factors to cost overruns are high shipping costs, changes in material specifications, and the escalation of materials prices.

Mulla and. Waghmare, (2015 ) found that projects are negatively affected by the client's tardiness in supplying certain materials that need to be delivered to the contractor as specified in the contract, or by delays in paying the contractor's Running Account bills. These issues, combined with other challenges such as delays in obtaining clearances, exacerbate the difficulty of completing the project

within the designated timeframe and budget. The construction business encounters a significant obstacle in the form of inadequate resource productivity, particularly in relation to equipment.

Anant Narayan and Durvas Kothawade (2016) The main variables that contribute to cost overruns in construction projects include economic instability, political condition, material price volatility, rivals' levels, and currency exchange.

Vaibhav and Ghaitidak (2016) shown that a major contributing reason to cost overruns is the "delay in the initial delivery of the site". The contractor's delay in supplying materials and equipment, coupled with significant price inflation, has resulted in a cost overrun. "Insufficient productivity of workers", "Late payment of invoices", "Neglect of equipment upkeep", "Inadequate planning for material procurement", "Work stoppages, demonstrations, and other external factors were the primary cause of project delays."

Aftab Hameed et al. (2022) conducted a survey using questionnaires and interviews to gather expert opinions from experienced workers in order to identify the main factors that lead to cost overruns in Malaysia. The responses were evaluated using the average index method, which revealed a total of 59 common factors contributing to cost overruns. The results indicate that the most common and significant factors perceived by experts are: bad designs, design delays, unrealistic contract duration and requirements imposed, lack of experience, late delivery of materials and equipment, relationship between management and labor, delay in preparation and approval of drawings, inadequate planning and scheduling, poor site management and supervision, and mistakes during construction.

Sunil A. et al. (2020) have identified the primary factors that contribute to project delays and cost overruns in three distinct regions of the country: the eastern region (West Bengal and Orissa), the southern region (Karnataka and Tamilnadu), and the western region (Maharashtra and Gujarat). The data from previous studies conducted in each region was chosen for analysis. The most influential factors identified were: insufficient planning and scheduling, ineffective monitoring and feedback processes, subpar construction methods, underestimation of project

costs, payment delays, inadequate site management, and insufficient contractor experience.

Key contributors to delays in building projects include modifications to the design, suboptimal efficiency of workers, insufficient planning, and lack of resources. The elements that influence time and cost control on high-rise projects in Indonesia are presented in Table 1, as documented in the study conducted by Kaming et. al. (2007)

According to Ahmed et al (2003), construction projects' delay can be categorized into two types of factors: internal causes and external causes. The causes were internally attributed to four parties: the owner/client, designers, contractors, and consultants. External considerations encompass entities beyond the four parties mentioned, including the government, materials suppliers, and the weather. Alwi and Hampson (2003). In the case of Malaysia, the reasons identified as creating delays in construction projects were inadequate site management, construction mistakes, delayed delivery of materials to the site, and insufficient coordination of materials. In addition, the owner's financial situation is also a significant contributing aspect. In their study, Chan et al. (1996) identified that according to consultants, the main reasons of time and expense overruns on construction sites were inadequate supervision, delayed on-site education, and a lack of expertise and experience on the part of the consultants.

Harshita Ambre et al. (2019) in this research paper discusses about construction sector in India which provides employment to about 32 million people in India and contribute about 7-8% of GDP. 3 major elements that define building project is mainly cost, schedule and quality. This study focuses on cost overrun which is the biggest concern encountered by construction sector. Cost overrun is the excess of actual cost over budget. Cost overrun occur in major construction project and magnitude of cost overrun varies from project to project. It diminishes the profit margin which is mostly due to complexity of project and inadequate management of man, material, machines and resources in project.

A questionnaire survey was prepared with 15 critical questions connected to cost overrun, which was distributed to 60 construction professionals across India and from the outcome 7 important element causing cost overrun is determined. The

factors are political condition, fluctuation of prices of commodities, level of rivals, currency exchange, deficiencies in project planning, inadequate contract administration and economic instability. All the responder said that average cost overrun in building project is between 10-30%. At last few recommendations is given to avoid cost overrun which says proper project planning should be done at start of project, change in rate of material and labour should be considered while finalizing budget, stakeholder management should be done, regular meeting should be conducted to resolve disputes and avoid unnecessary additional claims, clarity in project scope at start and resource management should be done to avoid idle manpower on site

George Otim et al. (2011) in this research paper first tried to identified the problem faced by contractors of Uganda in controlling the cost on site. To identify this problem, researcher did a questionnaires survey on 130 sites in Nakawa division in Kampala city. The scope is limited to current cost control techniques being used, problem faced and proposed solution. The cost control techniques used by contractors on sites are schedules, site inspection, the project budget, meetings, cost and work progress records and reports, monitoring work and cost performance and evaluation using bill of quantities. The problem includes delays by client to release money, delays to make decision, lack of material and equipment, bad weather, overlapping of activity, unclear and incomplete drawing, making good defective work and failure to control productivity of resources. It is also understood that the problem of cost control is not about only the techniques being used, it is about the poor management of techniques and poor supervision. Then he explained some most important points related to cost control on construction site which include Project resource and controls, Materials, Plant, Labour and Time & Cost relationship.

Devanshu Pandit et al. (2014) in this research paper focuses on the role of project control from Indian perspective. The main role of project control is to create system, procedures and tools to monitor and control project delivery. The paper identified the most important 5 project control factors that are Safety, Quality, Cost, Schedule and Risk and then tried to explain each factor in detail. Clear policies, procedures & standards, housekeeping, accessibility, use of PPE's comes under Safety

Section. QA Policies, Quality audit, specification, control charts and analysis come under Quality control Section. Cost Estimates, Budget and Budgetary Controls, Cost monitoring system and Change Order Management comes under Cost control section. Construction Schedule (Master Schedule), Resource Schedule, Use of Software and tools for Schedule control comes under Schedule Control. Risk Identification, Risk Analysis- Quantitative & Qualitative, Risk Mitigation, Risk Monitoring & Control comes under Risk Management. Further to these studies author explains about Analytical Hierarchy Process (AHP) which is very useful in weighting and decision-making problems. AHP is most popular decision-making method owing to its ability to reflect the way in which people think. AHP method is used for weighing this 5 project control factors and based on this Quality control has highest weight of 32.71% followed by safety at 23.64%, Risk management at 16.44%, Schedule control at 14.74% and cost control section has lowest weight of 12.48%. It concludes that control related to quality and safety is more important than schedule and cost by the respondent.

The construction business is characterized as a highly intricate and fragmented sector that operates based on schedules and resource allocation. Timely completion of a project is a crucial factor for success in the construction sector (Rwelamilla and Hall, 1995). Time overrun refers to any delay that exceeds the original construction timetable. Reducing to the smallest possible extent the primary objective of managing a building project is to optimize both time and expense. Nevertheless, time delay is a common occurrence in every stage of a construction project, leading to an overall increase in the project's duration (Yang and Ou, 2008). Projects are seldom finished within the scheduled timeframe (Assaf and Al-Hejji 2006). Therefore, it is crucial to prioritize the management of construction time, since any delay results in a substantial loss of revenue that is difficult to recoup. Therefore, numerous studies have been carried out to determine the components that contribute to time overrun. A study conducted by Kaming et al. (2007) examined the factors that influence time overrun in 31 high-rise projects. The study identified design changes, poor labor productivity, inadequate planning, and resource constraints as the most significant factors contributing to delays.

Chan and Kumaraswamy (1996) conducted a comparative analysis of the factors contributing to time overruns in construction projects in Hong Kong. They identified five main causes of delays, which are poor site management, unforeseen ground conditions, slow decision-making processes, client-initiated changes, and necessary variations in the works.

In Ghana, Frimpong et.al. (2003) studied groundwater project and illustrated that owners, contractors and consultants ranked poor contractor management, monthly payment difficulties from agencies, material procurement, poor technical performances and escalation of material prices as major factors that can cause time overrun.

Assaf and Al-Hejji (2006) reported that 70% of projects encountered time overrun. The typical time delay varies between 10% and 30% of the original project period. The study identified six primary causes for time overrun in construction projects. These include change orders, delays in progress payments, ineffective planning and scheduling by the contractor, poor site management and supervision by the contractor, labor shortages, and difficulties in project financing by the contractor.

The primary factor contributing to schedule delays in the Zambian road construction industry is delayed payment. This is followed by lengthy financial procedures within client organizations, financial challenges resulting from delayed fund release by client organizations, contract modifications, difficulties in procuring materials and changes in drawings, staffing issues, unavailability of equipment, inadequate supervision, construction errors, insufficient coordination on site, and alterations in specifications (Kaliba et al., 2009). The primary factor leading to schedule delays and increased project length and cost is the discovery of unforeseen site circumstances (Yang and Ou, 2008).

#### SUMMARY FROM LITERATURE STUDIES

After doing the literature studies it is clear that the problem of time and cost overrun is not bound to any particular type or size of project, neither it had any limitations for the location or region. All of the faced more or less similar problems of time and cost over runs. The difference was only in the

quantum of these overruns. The reasons of these overruns were mostly known and controllable. Still they are facing these problems because of the following reasons:

- i. Poor project appraisal and formulation
- ii. Improper implementation of plans
- iii. No advanced action taken by any of the parties involved
- iv. No advance clearances from the local authorities and other agencies
- v. No adequate measures were taken for the availability and proper flow of funds
- vi. Delays in decision making
- vii. Loosely framed contracts
- viii. Poor monitoring and control of activities
- ix. Insufficient use of modern technologies available

#### CONCLUSIONS AND WORK SCHEDULE FOR PHASE-2

- ❖ Numerous risk variables have been found by utilizing past research and site observations as the basis for this identification.
- ❖ A number of risk variables, particularly those linked with cost and schedule overruns, have been discovered among the many risk factors.
- ❖ The survey questions for the questionnaire are created in advance for the purpose of conducting quantitative analysis later on.
- ❖ An analysis of the data that has been collected and provided will be carried out using statistical methods. A list of risk variables will be compiled in the future, taking into account the findings of the research investigations.

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