

# Cost and Time Overrun in Various Construction Projects: A Review

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## ABSTRACT

A common problem being faced in the construction industry is that work completion after stipulated time frame and that also with some additional expenditure than that estimated at the time of commencement of project. Irrespective of any specific kind of construction work, all projects including consultancy work in construction industry has an issue of cost overrun and time overrun. These overrun have detrimental effects over organization's finance and economy of the nation. The purpose of this study is to find out various reasons for cost and time overrun in a construction project and measures to mitigate the issue by reviewing various existing literature and publications. The imperative findings can be classified in different various parts viz. poor pre-planning, weak material management, financing management, Poor site management, Problems of Contractor and Problems from client side. It is also found that, by adapting proper methodology and thoroughly understanding these factors may help to mitigate or limit the problem of cost and time overrun

## Keywords

cost overrun, time overrun, construction work, mitigate

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## Introduction

Construction plays a vital role in economy of various developing and developed nations. In India, the sector is among the one which employee second largest group of people after farming. This industry deals with large numbers of products and hence creates a market for them. It eventually helps in encouraging small business and increases GDP. The increasing technological skills and project complexity demand the contractors to complete the project in decided time frame within approved budget.

To complete any construction project successfully, three key parameters namely: Time, Cost and Quality are very important. A proper understanding of project before inviting tender is very much important. However, all other stage from tendering to work completion are also very crucial. For a developing country India, project overrun and time overrun are big concerns. Every year, plethora fund id utilized to compensate cost overrun and huge working hours of manpower are wasted over delay of the construction project.

As per MOSPI report and report of joint study conducted by KPMG and PMI on infrastructure projects in India, supported by MOSPI, the time and cost overrun in various government projects in India for past 8 years are shown in figure 1. As per chart, in India, every 5<sup>th</sup> project is running behind the time and every 7<sup>th</sup> project is running over budgeted.

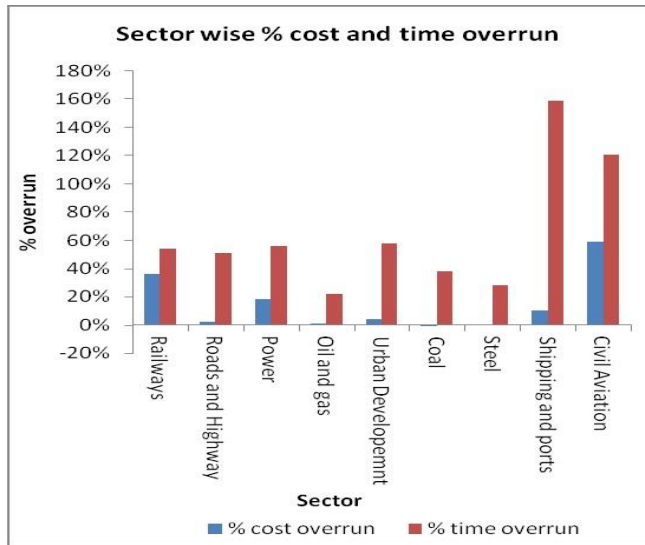


**Fig. 1.**Figure 1 – Percentage projects –time and cost overrun in India

As per MOSPI annual report for year 2019-20 [13], the cost overrun of 1635 government projects was Rs. 3,94,322.1 crore. Out of these projects, 565 projects (about 35% projects) were delayed by large margin. The cost overrun of these delayed projects had about 60% share of total cost overrun i.e. Rs. 2,36,163.29 crore. Hence, 35% projects were responsible for 65% of cost overrun.

As per report of KPMG and PMI, The time and cost overrun details by studying 1268 projects, for some major sectors are shown in figure 2.

The reasons for delay of the project and cost overrun can be classified in two parts. First one is delay due to uncontrollable reasons such as due to national calamities or any pandemic



**Fig. 2.**Figure 2 – Sector wise percentage cost and time overrun

conditions. The second one is delay and cost escalation due to controllable reasons. This includes delay by lack of management, lack of cooperation or lack of calculations. However, the uncontrollable reasons are not in our hand but, by identifying and understanding controllable reasons, the problem of project delay and higher cost implication can be mitigated to a greater extent. Hence, this paper examines such causes based on literature review and their remedies to cope up with cost and time overrun.

### Critical Literature Review

Chintan Hitesh Patel, Himanshu Chaturvedi, Megha R. Rao, Priyanka Katta and K.N. Narasimha Prasad (June 2015) [1], had carried out analysis for cost and time overrun in construction projects. They conducted a questionnaire survey to analysis the causes of delay by consulting various government engineers. The statistical analysis was done with three tests namely Univariant analysis, Spearman's rank correlation and one tailed test. As per the study, it was concluded that all the parameters for cost and time overrun were interdependent. The reason for cost overrun was significant difference between estimated quantities and actually executed quantities. The cause for time overrun were lack of project understanding due to less time for tender submission and poor coordination. The other critical reasons for overrun were frequent change in scope of work, non-timely preparation of working drawings and large number of non-tender item execution. They suggested that, for a project, an expert team shall be formed comprising experience departmental members, private consultant or a combination of both to go through the project in detail and shall take responsibility for better planning and timely execution.

T. Subramani, P S Sruthi, M. Kavitha (2014) [2], had carried out analysis for cost overrun in construction projects through questionnaire survey and analysis of it by Spearman's analysis. They gave 30 questionnaires to contractors, client and consultants and collected it back after filling. The questionnaire response rate was as high as about

85%. They found that key factor for cost overrun for clients were due to slow decision making, for consultants were due to delay in providing design details along with poor time management and for contractors was due to non-performance of sub-contractors. In addition to this, various other factors for cost and time overrun were increase in material/machine prices due to inflation or higher currency exchange rate, poor contract management, rework due to poor practice/ wrong work, wrong estimation/ estimation method, and long period between design and time of bidding/tendering.

**Swapnil Wanjari and Gaurav Dobariya (2016) [3]** had carried out study on "Identifying factors causing cost overrun of the construction projects" in India by questionnaire survey with 85 contractors, clients or consultants across the nation. They emphasized on 15 prime factors based on their literature study and gathered response from the vendors over it. Based on received response, the analysis was carried out with the help of few statistical tools viz. Reliability Analysis (RA), ANOVA and SPSS. As per the result, they identified that as per RA, price escalation is prime reason for cost overrun. Whereas, as per ANOVA, the reason for cost overrun was poor financial control on site. They have bifurcated all factors in three components namely Client control component, Project management component and Contractor control component and found Component Factor for Cost overrun (CFC) with SPSS software calculation and identified various prime causes for each component. Based on the study, they suggested that contract shall have clause for price escalation in the scope of contractor, client shall freeze all the requirements before commencement, provide required managerial training to staff and lastly, the client shall deploy an advisory body to eliminate communication gap between client and contractor. **Surabattuni Murali and Sanjeet Kumar (2019) [4]** had carried out case study of an anchoring project at Lucknow, India and found out various reasons for time and cost overrun. They had prepared various 81 factors for survey purpose based on literature review and did questionnaire survey with scale rating. As per the responses from various site engineers, they analyzed it with relative importance index and found out Risk rating levels. As per the result, out of 81 factors, the prime factor for delay was poor material management followed by site conditions, various labour issues like strike and nonavailability of skilled labours, contractor's financial difficulties and machine related difficulties. They have concluded that proper project management techniques, site controlling and streamline procedures shall help in reducing such overrun. Moreover, they suggested that by regulating proper funding, dedicated team for material management and proper selection for skilled manpower shall help to boost project speed and shall limit over expenditure.

**Abhimanyu S. Rathi and Pravin V. Khandve (2016) [5]** had carried out study on parameters for cost and time overrun. As per their study, key parameters were improper estimates, in situ design modifications, improper tender terms, poor material management and other geographical conditions. Moreover, the concluded that for successful project implementation in stipulated time and budget, few of the parameters shall be taken care of namely: labour crisis,

market slowdown, thorough knowledge of government guidelines and other environment effects such as heavy rain, thunderstorm etc.

Hariharan S. and P. H. Sawant (2012) [6] carried out study of 257 projects having different project cost for duration of 1991 to 2009. They analyzed them with 'F test' of ANOVA tool. They concluded that time and cost overrun are linked with each other but, their drivers are not the same. The main drivers for time overrun were change in scope on later stage, poor and delayed tender documents and less time given for tender submission. Whereas, driver affecting cost overrun was difference between estimated and actual quantities. They emphasized on adopting new technologies and better managerial tools to reduce the problem of time and cost overrun. Addition to this, they concluded that by reviewing current traditional approach of construction management and modifying it with onsite issues may help to reduce time and cost overrun.

G. T. N Veerendra, V. Sainath, A. V. Phani Manoj (2018) [7] had categorized delays in two components namely forgivable delay and unforgivable delay. To evaluate unforgivable delay, they prepared a questionnaire and gathered response of PMC team and contractor team. Their responses were evaluated with the use of Principal Component Analysis (PCAS) and Relative Importance index (RI). They concluded that, the micro and macro scaled construction companies shall maintain skilled manpower, skilled project team and contractor representatives to limit delay. Moreover, implementation of key performance indicators (KPI's), a proper documentation process from project commencement to end, a good communication between client and contractor engineers and a strict vigil over work and cash flow shall help in reducing cost and time overrun.

D.A.R. Dolage and D.LG. Rathnamali (2013) [8] had carried out study for delay of various construction projects handled by the Department of Engineering Services (DOES) of Sabaragamuwa Provincial Council (SPC). The questionnaires were prepared as per literature review and factors were categorized in 5 different groups: Client related, contractor related, consultant related, contractual relationship related and external factors. The questionnaires were distributed to provincial ministries, contractors, clients and consultants. Based on the response, the frequency index and severity index prepared according to contractor's perception, consultant's perception and client's perception. Their rankings were given as per Spearman's index. The prime parameter from client related factor was Delay in payment, from consultant related factor were delay in approving extra work and variation, from contractor related factor were in accurate planning and scheduling as well as poor liquidity, contractual relationship related factor was nonstandard awarding practice (i.e. preferring lowest agency) and external factor was rainy weather. They suggested that by keeping thorough monitoring of project, providing mobilization advance to contractor, modifying tender clause for not awarding tender to unrealistic low bid agency, modifying tender evaluation process and adding clause for payment of interest to delayed payment shall help to limit the time and cost overrun problem.

Dinesh kumar R. (2016) [9] inspected effects and causes of delays in Indian construction projects and identified about 103 attributes from various literature reviews. Accordingly, he categorized all factors in 8 subparts. Based on it, a questionnaire prepared and after analysis, ranking was given for various delay attributes. The prime ones were lack of work experience of contractor and inadequacy followed by poor communication, delay in material delivery, poor planning, poor supervision, unqualified labours, late payment, frequent change in sub-contractors, change in scope of work at later stage, improper drawings and estimation, delay in approval, improper pre-feasibility study, poor site supervision work and manpower shortage. Out of this, major attributes were caused by either contractor, client or consultant. He concluded that major reason for all such overrun causes was lack of commitment and coordination within project participants. In addition to this, he suggested that contractor shall plan the project by considering certain risk factors such as nature and culture of locality.

**Ashwini Arun Salunkhe and Rahul S. Patil (2014) [10]** had carried out study of various 17 governmental projects before 2012 with costing above 1000 crores. They classified project delays in three groups: Inexcusable delay, Excusable delay and Concurrent delay. Based on data available on MOSPI website, they segregated projects having maximum delay and cost escalation. Even, one of the projects had cost escalation of about 1162%. Based on the study, they concluded that major factors for delay from client side were due to change in planning during execution, incapability to understand the technical terms and delay in payment. However, the mentioned that factor for delay from contractor side were poor planning and scheduling, lack of experienced engineers and poor coordination between client and contractor.

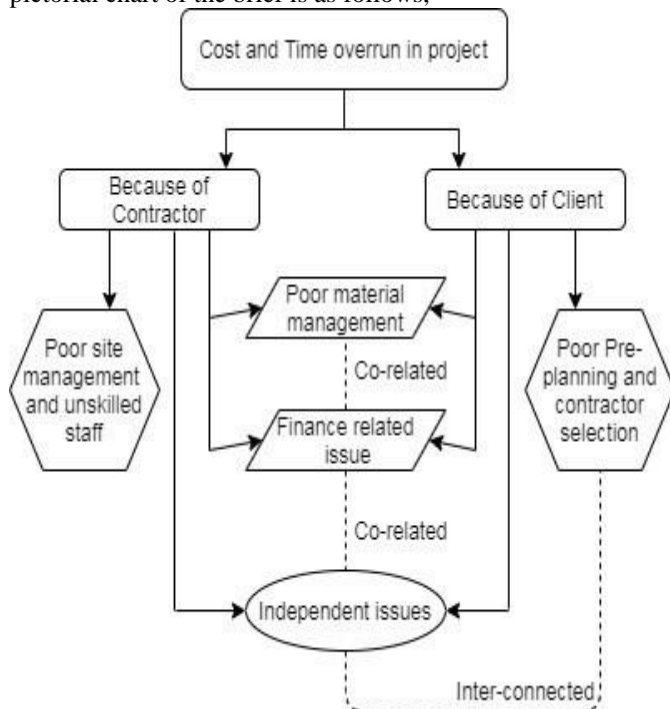
Mr. Salim S. Mulla and Prof. Ashish P. Waghmare (2015) [11] had carried out study on time and cost overrun and suggested various remedies. Based on literature review, they prepared questionnaires and taken interview of various project representatives. Based on their study, the main attributes for any project delay and cost escalation were poor estimation, design faults, problem during land acquisition, poor bidding, uncertain cash flow, payment delay, poor management and poor decision-making skills. They suggested various remedies were better team formulation and adding appraisal parameters in link with timely completion of projects, a sound planning using good managerial tool with considering 10-15% risk factor during bid submission, advance actions for land acquisition and to deal with government bodies, better fund management since commencement, implication of penalty for poor work and rewards for effective work and thorough vigil over the project.

KPMG and PMI in association with MOSPI (2019) [12] had carried out study of government infrastructure projects in India. They contacted and interviewed various contractors as well as clients. As per their report, major reason for delay are lack of project implementation, poor contract document framing which cause dispute, inefficient and inadequate risk management, time consuming court matters and slow decisionmaking process. They suggested that by properly implementing online approval process, employing and up

skilling contractor manpower, preparation of detailed project report in depth with all necessary consideration and eliminating inadequate project bids may limit the issue of project and time overrun.

## Major Findings

As per study of various literature, major causes for time and cost overrun can be classified in various stages. The pictorial chart of the brief is as follows,



Major reason from client side for project delay is poor preplanning and contractor selection procedure. Whereas, from contractor side, major delay and cost escalation is caused by poor site management and unskilled staff. However, poor material management, finance related issues and other independent issues which are mostly co-related to each other also play an important role in cost and time overrun. The brief of this causes are as follows,

1. Poor site management and unskilled staff: This factor is mainly from contractor side. Its key sub-factors are lack of monitoring, more time over unproductive work at site, lack of experience of staff, poor quality checking which leads to rework, deploying unskilled manpower to save labour cost, poor resource planning which leads to manpower sitting idle, over expense towards unnecessary resources, poor work scheduling, conflict between labours and lack of commitment towards project.

2. Poor pre-planning and contractor selection: This factor is mainly from client side. Its key sub-factors are delay by means of poor site study, poor estimation work, incapability of considering various onsite actual problems, tender with certain loopholes poor contractual terms which may create dispute during execution, less time for tender submission, adoption of traditional method for tender evaluation, more emphasize on cost than quality while selecting contractor, improper design, non-defining a complete scope of work at the time of tendering and inexperienced team. This factor also creates a problem at

later stage and may lead contract into legality due to poor contract document framework.

3. Poor material management: The sub-factors pertaining to material management phase on either side are poor calculation of material requirement at site, poor material classification, inexperienced team for material procurement, lack of commitment towards project, poor market study and limited vision over future requirements in compare to climatic conditions, poor coordination between execution authority and material procurement team, incapability of understanding market fluctuations and poor estimation by not considering rate increase due to inflation.

4. Financing management: The sub-factors pertaining to financing management on either side are poor cash flow analysis, delay in paying amount to contractors and subcontractors, lacking in generation of required finance in between construction time, insolvency, delay in receiving required funds from government, high contingency charges and higher indirect and avoidable expenses due to lack of monitoring from client/ owner.

5. Independent issues: The sub-factors pertaining to contractor's side are dispute between contractor and subcontractor, inadequate experience, lack of skilled manpower, quoting unrealistic price to get the tender, fraudulent practice, frequent change in market rates and having too much projects on hand.

The sub-factors pertaining to client side are increase in scope of work during execution, non-availability of drawing at the time of tender inviting process, delay in site investigation, delay in approval of drawings, lack of experience for such kind of work and non-willingness to pay non-tendered items.

## Conclusion

The cost and time overrun in a construction project are not always caused by any single factor. The large delay and cost overburden are summation of multiple independent factors which are interconnected. The key factors for time and cost overrun are,

1. Notable difference between estimated quantities and actual site quantities and change in scope of work at later stage.
2. Significant time gap between estimation, tender invite and work execution.
3. Lack of management from contractor side and client side.
4. Poor tendering method and orthodox tender evaluation process.
5. Lack of experience on contractor side as well as client side.
6. Change in product price due to market fluctuation, season change and inflation.

## Recommendation

The collaborative effort and correction at different stages in the project shall help to mitigate the issue to larger extent.



Some of the recommendation to limit the issue of cost and time overrun are,

1. Preparing a proper estimate and multi-level check for estimation by experienced person shall help in reducing cost overrun caused by variation of estimated and work quantity.
2. By optimizing the time between project estimation, tender invitation and work execution shall help to reduce cost overrun by inflation and higher currency exchange rates.
3. A thorough study of site location before preparing tender, collection of all site parameters e.g. soil data, water quality, ground water level, nearby locality etc., considering all parameters while preparing detailed drawing and estimating project cost from it may help to reduce delay at later stage. Moreover, a cost overrun can also be eliminated to a larger extent through this.
4. By reviewing tender terms, conditions and detailed activity specifications at multi-level in the organization may help to eliminate any delay due to disputable clause and nontender item execution. Because any remained tender clauses and specifications shall be rectified and added by senior executive at higher level.  
By funding more in pre-planning stage and tender preparation with the help of experienced team for any project shall considerably mitigate cost and time overrun.
5. Exploring new tender evaluation methods in which contractor evaluation shall be carried out based on not only commercial part but also on technical parameters and vendor profile shall reduce chances of schedule and cost overrun.  
For e.g. adoption of Quality and Cost Based Selection (QCBS) analysis may help in contractor selection process. In this method, client has to give weighted to different parameters like experience of vendor, client list of vendors, technical team details, annual turnover, available resources, cost etc. Client set different criteria for different attributes and give weighted to all attributes as per project need. The contract is not awarded to commercially L1 agency but awarded to contractor who gains maximum score in evaluation.  
This may help in selection of experienced and capable contractor through which, the problem by inexperience or poor performing contractor can be mitigated.
6. By adding Key Performance Indicators (KPI) at the time of tendering may encourage the contractor to complete the work in stipulated time with good quality and skilled manpower. Certain points which have less visible impact but have significant impact on cost and time overrun on project such as site cleaning work after completion, Good practice for material and equipment handling, lack of intention to carry out minor works simultaneously etc.  
Even, by linking such parameters to the incentive of contractor and client's engineer may also help to avoid cost and time overrun.
7. A qualified and experienced consultant on behalf of client with having independent power to review the status may help to quicken the work as it adds more responsibility to client's engineer. Time to time review meeting and providing required training to contractor personnel and client personnel shall also help to eliminate delay in work.

8. Adoption and strict implementation of good material management practices such as Last in First out (LIFO), First in First out (FIFO), Just in time (JIT) may also reduce issue related to delay in material delivery, wastage of material and material procurement delay.

9. A proper financial planning, good documentation work and pre-selection of vendors for certain often required product procurement may help in avoiding cost and time overrun. A dedicated team for preparation of bills, timely submitting and checking the measurements with minimal dispute and timely submission of invoice may help in proper cash flow planning.

10. By providing financial assistance to contractor at the commencement of project, shall help to reduce time and cost overrun as contractor shall procure required materials in time.

11. Providing periodical onsite training to contractor workers shall help to reduce time overrun by lack of skill in manpower. Moreover, project reviewing through certain Lean techniques may help to find root cause for delay. By correcting such small measures, the delay and cost escalation can be limited to certain extent.

12. By keeping a single point of contact on contractor side, client side and consultant side shall significantly reduce the problem due to communication gap at different levels within the organization and with client/ consultant or vice versa. Moreover, it also improves coordination between different teams.

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