

Strategies for Reducing Construction Project Delays and Cost Overruns

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DOI: <https://doi.org/10.5281/zenodo.8385877>

Published Date: 28-September-2023

Abstract: The present research aims to analyze the causes of delays and cost overruns in construction projects and to identify the methods to minimize delays and cost overruns. In the present era of rising need for infrastructure and growing competitiveness, construction projects must be completed on time and without cost overrun. Most construction projects are complex and filled with challenges, unexpected hindrances, and frequently emerging issues, leading to time and cost overruns. This research identified several government construction projects that suffered from delays and cost overruns. The data from these projects was analyzed in terms of its magnitude and frequency of occurrence, its effects and remedies to minimize the effects of the problems. The significant causes of delay and cost overruns were enumerated. The main reasons for the delay are the slow decision-making process, insufficient funds, partly available work sites, and the existence of essential services passing through the site. Based on the project analysis, several recommendations have been developed to manage and reduce delays and cost overruns effectively.

Keywords: delay, time, cost, overrun, construction, project.

I. INTRODUCTION

A project is considered to be successfully accomplished if it is completed in time without cost over-run. Unfortunately, the construction projects often suffer both ways, that is, they are delayed with escalated costs. To achieve success on the both fronts, there is an urgent need to control these two major problems. In the present era of rising need of infrastructure and growing competitiveness, a construction project must be completed in time and that too without cost overrun. Most of the construction projects being complex and filled with many challenges, unexpected hindrances and issues emerge frequently, which leads to the time and cost overruns. Several techniques and methods have so far been developed for successful planning, project control and monitoring for successful accomplishment of the construction project, but a generic technique is not available yet. As per the Planning Commission of India, the construction industry accounts for about 12 % of the country's GDP. Approximately one-fourth of the workforce depends on the construction sector. In the infrastructure sector, the component of construction industry accounts for 42% of the total investment. But most of the construction projects suffer either delays or cost overruns or both.

The planning commission of India has proposed an investment of around Rs 28 Lac-Crores in the 11th five year plan (2007 -2012). There was a provision of more sustainable, inclusive growth with investment of more than Rs 56 Lac-Crores. India needs a growth rate of 9-10% annually on a continuous basis at least for 15 - 20 years. The delay and cost over-run are the two most significant concerns in a construction project. Most of the construction projects have a large number of participants linked together in a complex structure. In the government infrastructure projects, the projects are entrusted to different government organisations such as PWD, NHAI, Municipal bodies and DMRC for the implementation of the scheme and execution of construction projects. The organisation of the project owner may sign the contract with the main contractor for the whole project. Alternatively, the project can be divided into different phases such as feasibility study, design, and construction work, electrical and mechanical work.

II. LITERATURE REVIEW

The delay and cost overrun in the construction projects have been studied in many parts of the world. Assaf et al (1995) have described the measures taken to control delay and over expenditure on construction projects. Chan and Kumaraswamy (1997) in their study on the causes of time overruns in Hong Kong construction projects described the reasons of delay on construction projects in Hong Kong. Lahiri (2011) put forward the ways to utilize the advance methods and technology for speedy construction to avoid the delays on a construction project. Garg et al (2011) described the scenario of delay and cost escalation on construction projects. Also, the Reports of Major projects (Govt of NCT Delhi), Progress Monitoring of Works (MCD), Progress Reports (PWD, Delhi), and Projects Progress Reports of Northern Railways, the correspondences between various departments such as the Govt of NCT Delhi, Railways, PWD, MCD, and DDA were reviewed by Garg et al. (2011).

According to Wideman, (2002) the cost overrun may be defined as the amount by which actual costs exceed the approved baseline of costs. In the study conducted by Flyvbjerg (2003) the project cost is underestimated to obtain project approval or for fraudulent practices. It may result into the serious situation. The cost underestimation comes in four types as technical, economic, psychological and political. According to Ahmed et al (2003) and Alaghbari (2007), the possible financial-related factors that lead to delay and cost overrun in construction projects. Sharif and Wardlaw (2000) informed that generic optimization techniques have been developed to solve problems not amenable to solution by traditional methods. Popoola et al. (2017) investigated the various causes and effects of abandoning road construction projects in Nigeria. This paper utilized the quantitative research approach with Likert Scale questionnaire design of 200 questionnaires. A total of 135 questionnaires were completed and received from the respondents, representing a response rate of 67.5% Deep et al. (2017) describe how the lean construction principles would be designed and provided to clients enabling them to complete projects at their scheduled time with the minimum possibility of time overrun. Ratnesh et al. ((2017) proposed a risk assessment model that utilizes data from past construction project for the analysis of risks. The model adopts the techniques of content analysis and open coding to analyse 276 claims from 28 dispute cases. Diugwu et al. (2017) conducted a multiple regression analysis of cost overrun as the endogenous variable, with time overrun and inflation rates as the exogenous variable for private and government funded projects. There is evidence of a significant relationship between completion cost of projects and variations in time and inflation rate for both private and government funded projects. Khan and Gul (2017) identified critical risk factors causing delays in the construction projects being implemented in Islamabad and Rawalpindi. Detailed literature review and interviews with experts from construction industry were conducted, on the basis of which a total of 29 risks from 5 major categories (financial, technical, design, labor and external risks) were identified. Dief et al. (2017) describe an action plan to move through the contract scope of work within the predefined route and specific stipulated efforts that save the contract parties' rights and constitutes the parties' obligations. Wilson et al. (2014) applied a program risk management approach to data aggregated from three projects provided by the Washington State Department of Transportation (WSDOT). The results presented by Wilson et al. (2014) show that there are some statistical benefits to applying risk management at the program level rather than the project level, including an increase in cost certainty.

III. METHODOLOGY

It is essential to describe the methodologies used throughout the research to ensure all the data and information gathered is reliable and to show that it is systematically collected and analysed. The actual data obtained from actual sites of the projects in the form of case studies will be analysed. The reasons and causes of delay, and cost overruns would be enumerated. After the survey of number of government construction projects, three projects were selected for detailed analysis as cases studies to study the delay and cost overrun. In the case studies of these construction projects, the factors influencing time over-runs and cost over-runs were identified and incorporated into the questionnaire to obtain the feedback from the construction professionals. 45 out of 60 construction professionals provided the feedback. Considering all the factors of delay and cost overrun, the recommendations were made, which are feasible and can be applied to minimize the problems of delay and cost overrun in construction projects.

Data Analysis

The factors affecting the delay and cost overrun were analysed by the case studies. Then the analysis was done on the basis of a questionnaire survey.

Delays

A considerable time is spent in the processing of a construction project scheme. The processing includes all the steps of approvals, government clearances from various departments till the construction work and its allied works award to a contractor (s). The budget is generally allocated to a construction project scheme in a very early stage. If the execution

work starts very late after the processing the project scheme, there are high chances that the project would not be completed in the original budget provisions allocated to the project. This budget provision is different from the contractual amount.

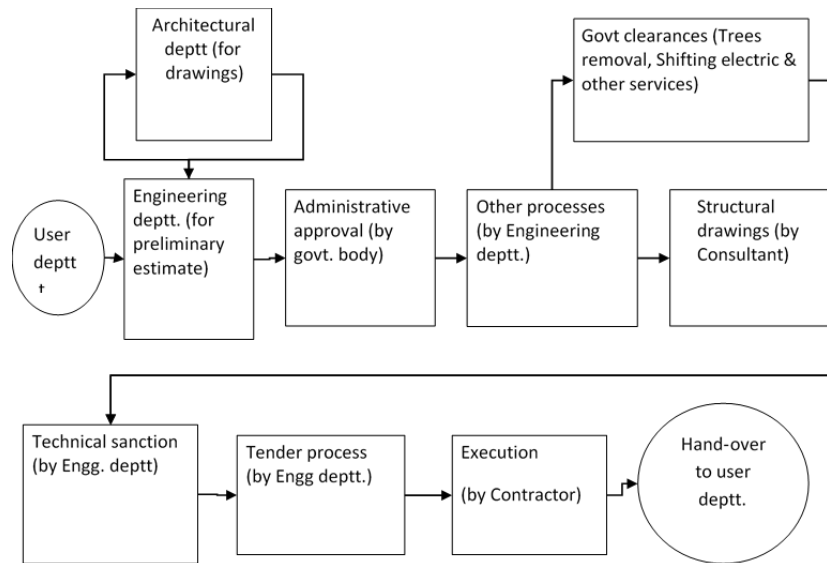


FIG 1: PROJECT EXECUTION PROCESS

TABLE I: WORK PLAN FOR PROCESSING

Description of Activity	Lead	Support as needed	Normal completion period
Project Initiative	User Department	Govt. Engineering Bodies, Consultants	Project initiation date
Administrative Approval	Govt. (Funds provider Department)	User Department, Govt. Engineering Bodies	Within 2 months
Architectural Drawings	Architectural Deptt.	Govt. Engineering Bodies	Within 0.5 months
Other Government Clearances (viz. Tree Cutting etc.)	User Department	Construction Department, Horticulture Department	Within 2 months
Shifting of Under Ground Services	User Department	Construction Department, Electrical Department	Within 3 months
Expenditure Sanction	User Department	Elected Members, Finance Department	Within 2 months
Tender Process	Construction Department	Finance Department, Information Technology Deptt.	Within 3 months
		Total	12.5 months
Execution	Construction Department	Construction Deptt, Electrical Deptt, Horticulture Deptt	Within 24 months
Handover to User Department	Construction Department	Contracting agency	Within 1 month
Total time with execution period of 24 months			37.5 months (say 3 years)

The old and traditional contractual approach is still dominant in construction sector of most of the developing countries. It may likely continue to be a trend. The construction sector comprises the clients, that is the owner of the project, contractors, subcontractors, suppliers, and others key professional actors responsible for the design and supervision of projects.

Scope creep can be a result of the following:

- Lack of proper initial identification of what is required to bring about the project objectives
- Poor change control
- Weak project manager or executive sponsor
- Poor communication between parties

A huge amount of finance is involved in the process of land acquisition, apart from other social or political factors. It may take several years, and the project gets delayed as the full or part of the site is occupied by the original/previous landowners. As a result, the project gets delayed resulting to huge cost overrun and a very large delay. Main reasons of project delay at the initial stage are slow process of decision making, insufficient funds available beforehand. In the execution stage the reasons of significant delays are partly available work site, the existence of the important services passing through the site, simultaneous work of two or more agencies on interdependent activities, shortage of manpower and material, delayed payment and public resistance and litigation.

Cost overruns

The cost overrun is the magnitude of fund by which actual costs exceed the approved baseline of costs. It is also observed that the project cost is underestimated to obtain project approval that leads to a serious situation. The explanations of cost underestimation come in four types as: Technical, Economic, Psychological and Political.

The possible financial-related factors that lead to cost overrun in construction projects, are financial problems of clients such as delayed payments, financial difficulties, financial and cash flow problems of contractors, and external factor of poor economic conditions such as currency and inflation rate. Also, the process of land acquisition entails significant financial compensation. The delays also result in substantial cost overruns.

IV. DATA COLLECTION AND PRELIMINARY ANALYSIS

In this research a flyover situated at Shahdara in Delhi was selected, which has suffered a large amount of time and cost overrun. The data related to cost and time was collected from the client's office. Following is the table of cost revision in various stages:

TABLE II: WORK PLAN FOR PROCESSING

S. No,	Item of work	Original scheme (Rs in Lacs)	First cost revision (Rs in Lacs)	Second cost revision (Rs in Lacs)
		In year 1987	In year 1993	In year 2006
1	Flyover, service roads, drainage	1413.49	2560.55	3546.04
2	Land acquisition	200	803	1395.66
3	Shifting of electrical services	63	280.13	795.47
4	Shifting of water services	8	42.02	239.92
5	Horticulture	1	39.7	50
6	Enclosing space under bridge	19.14	85.8	175
7	Drainage of service roads	--	156.13	252
8	Retaining walls (other than flyover)	--	10.35	10.5
9	Widening of roads	--	--	200
10	Footpath along service roads	101.48	--	185
11	Protection around piers	--	--	50
12	Protective paint	--	--	126
13	Miscellaneous	8	20	20
14	Escalations	48.19	669.27	100
15	Contingencies	38.38	70.93	214.37
16	Quality assurance	14.47	24.5	178.64
	Total	1915.15	4762.38	7538.6

The process of construction work on this project was held up due to the non-acquisition of land. As a result, again in the year 2006, the budget for this project was revised to Rs 7538.60 lakhs due to the following main reasons:

- Change in the scope of work.
- Heavy amount to be paid for the land acquisition.
- Shifting of underground services, maintained by various departments.
- Cost escalations due to price rise.

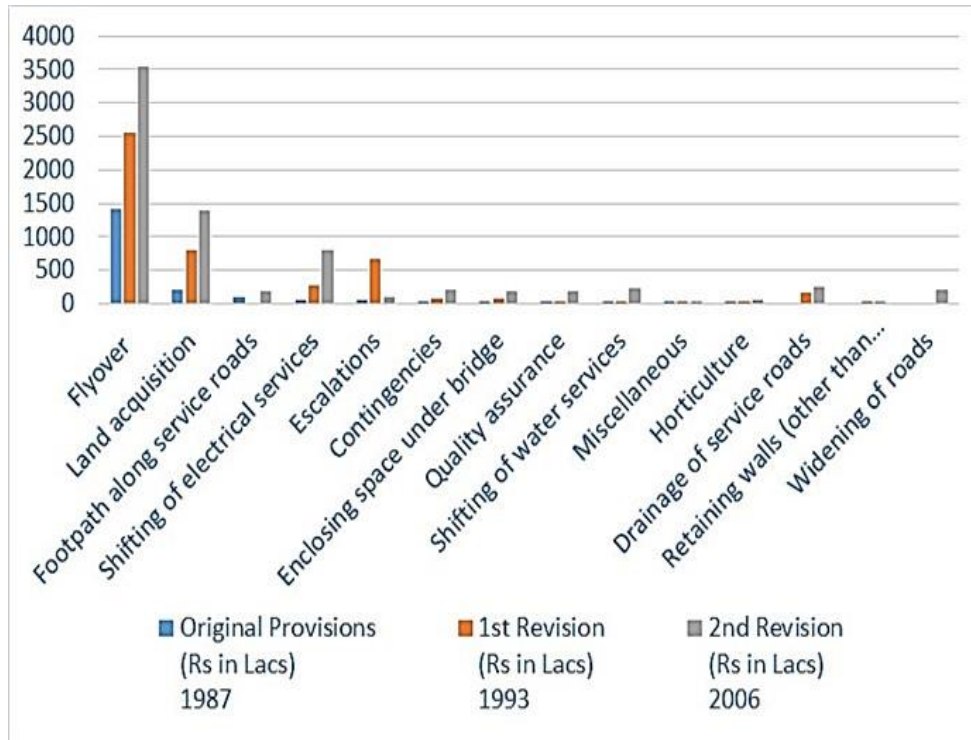


Figure 2: Cost revision in Flyover components

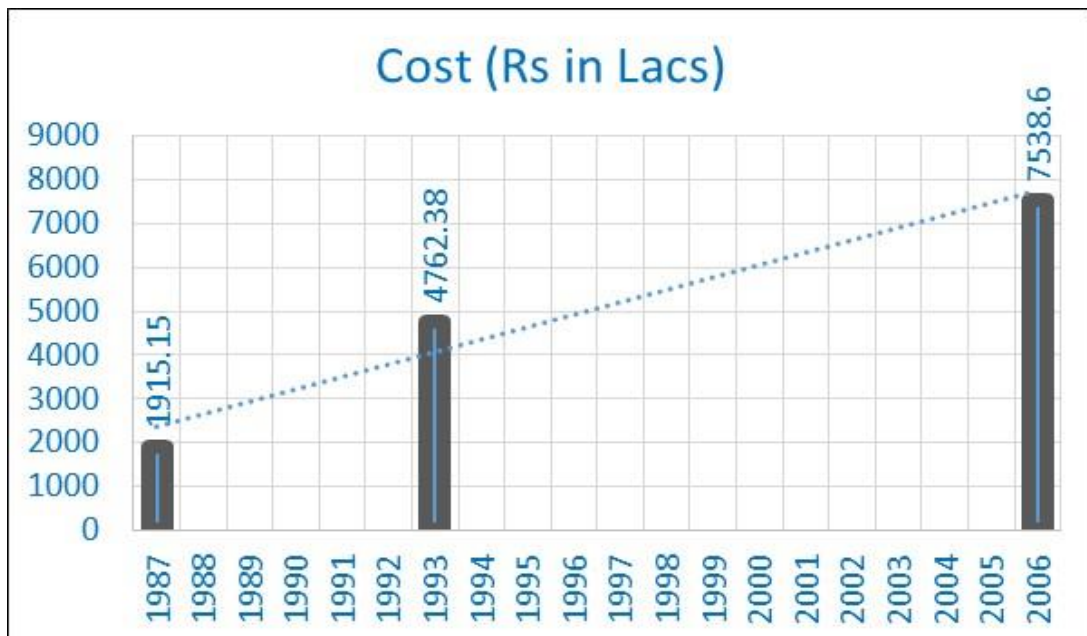


Figure 3: Flyover Project's Cost Revision with time

V. RESULTS

The comparison of budget provisions in the project estimate has been carried out and analysis has been undertaken. While comparing the provisions of project scheme, it is clearly visible that the largest escalation occurred in the cost of land/property acquisition. In 1987 the amount of land acquisition was estimated as Rs 200 lakhs, which shoot up about Rs 2500 lakhs in cost estimates in 1993. Since the properties were not acquired till then, the cost of land to be acquired was further escalated and the provisions were further revised to the tune of Rs. 3500 lakhs for land acquisition. In the original scheme the component of the main flyover was approximately 70% of the total project estimate. It reduced to 54% in the first revision of the scheme, due to the increase in the cost of other components of the scheme, which could be completed in a less budget, if these components had been completed in time. The other components, except main flyover, further

increased till the second revision of the scheme in 2006. In this revision, the component of main flyover further reduced to 47%.

Project delays originate from various factors including involvement with external agencies, the presence of underground services like cables and pipes, delayed site handovers by owner/user departments, and other unmentioned reasons. Land acquisition issues, budget constraints, and government clearance delays are among the challenges faced during project execution. Inadequate infrastructure can also impede progress, as can legal complications such as court cases and adverse weather conditions. Additionally, procedural bottlenecks, like delays in obtaining clearances from third-party quality assurance agencies, further contribute to project delays. The impact of law and order issues on project schedules was noted as well.

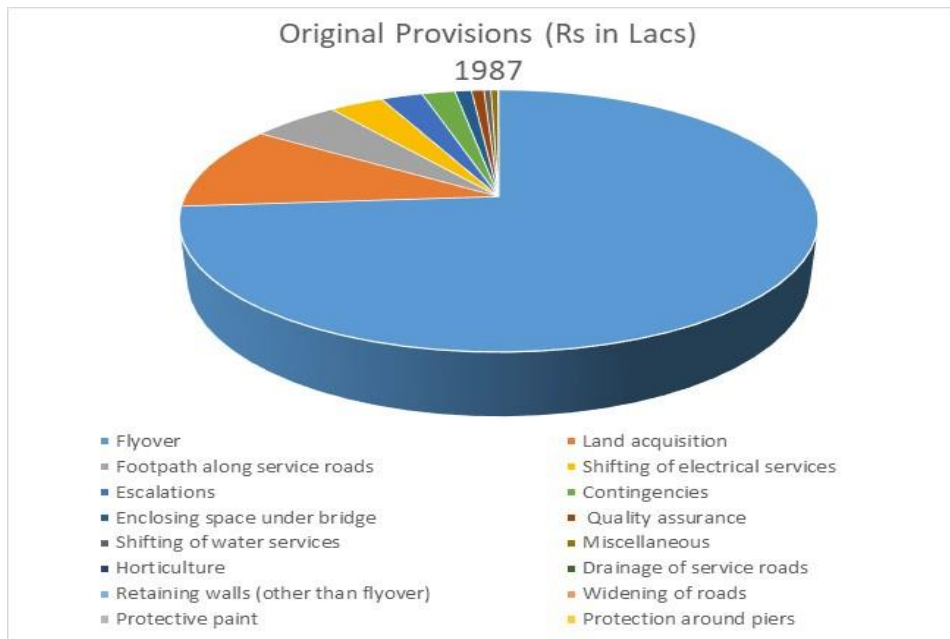


Figure 3: Comparison budget provision for project components in 1987

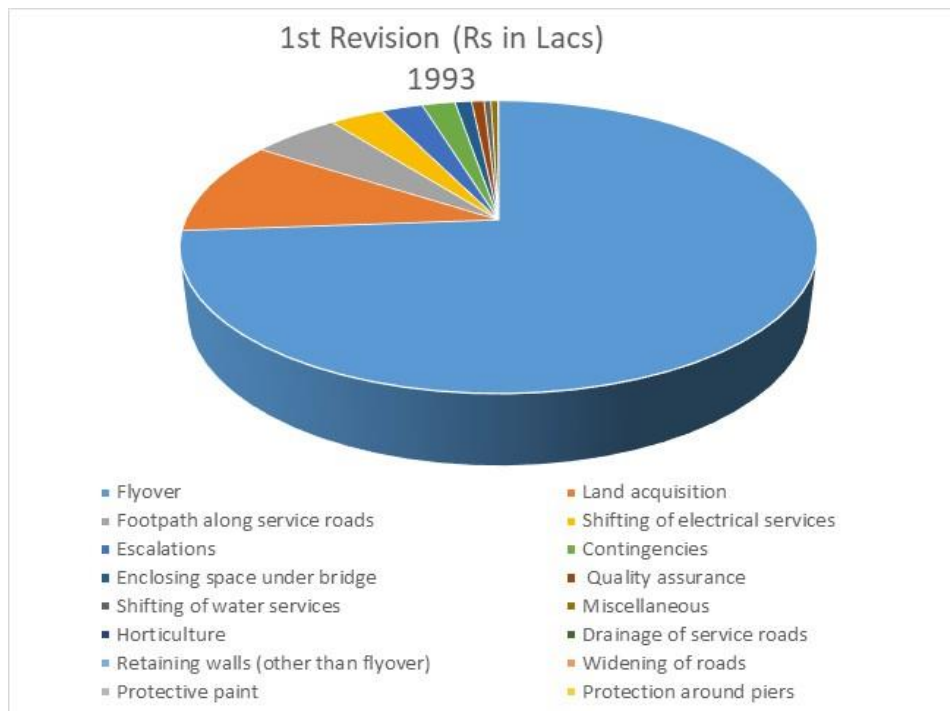


Figure 4: Comparison budget provision for project components in 1993

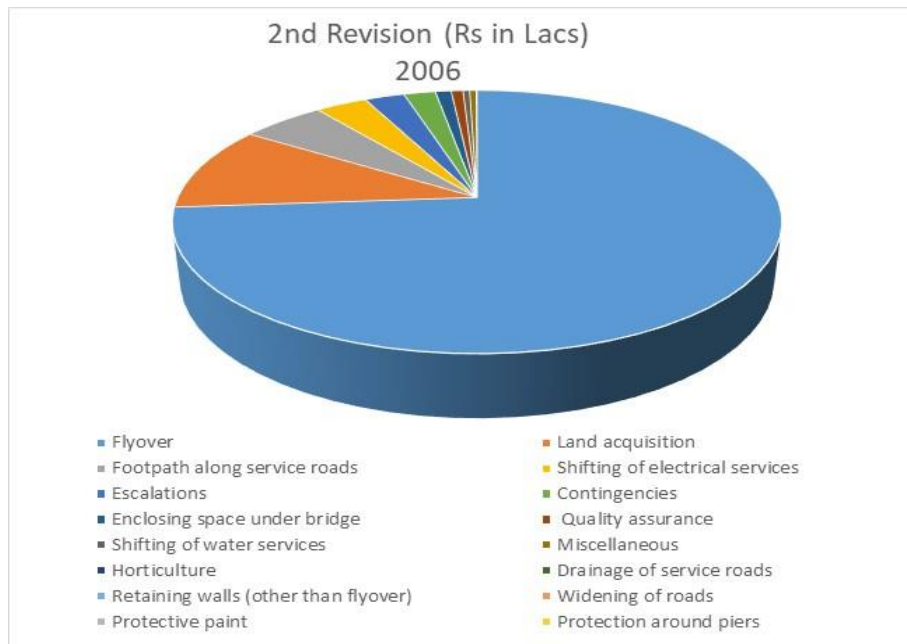


Figure 5: Comparison budget provision for project components in 2006

VI. CONCLUSIONS

The delays in projects that originate from various factors can be addressed with effective communication, meetings and clearly defined roles. This can facilitate decision-making when dealing with external agencies. Challenges related to underground services can be managed through comprehensive pre-project site surveys and contingency planning for unexpected discoveries. Late site handovers can involve proactive dialogue with owner/user departments to stress adherence to agreed-upon timelines. Land acquisition and budget constraints can be resolved through early planning and engagement with relevant authorities. Strategies such as streamlining procedural clearances, addressing legal issues, and maintaining project security in the face of law and order concerns are encompassed by effective delay management.

The cost overruns in projects can be also be tackled in several ways. First, it is crucial to carefully manage changes in the project's scope of work, only allowing adjustments that are truly necessary. Second, focusing on thorough and accurate project designs and specifications can prevent the need for constant revisions. Third, conducting detailed cost estimations and risk assessments during the planning phase can help identify and plan for escalations and unforeseen events. Fourth, any changes made during the project should be evaluated, documented, and communicated effectively. Fifth, invest in more accurate forecasting techniques to improve cost predictions. Lastly, establish robust monitoring and control mechanisms to detect cost overruns early, enabling prompt corrective actions. By implementing these steps, projects can better manage costs and improve overall project outcomes.

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