

A Study of Factors Caused for Time & Cost Overruns in Construction Project & their Remedial Measures

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ABSTRACT

The Construction industry is one of the key economic industry in India and is the main motivating force in Indian national economy. But, it suffers from a number of problems that affect time, cost and quality performances. Successful management of construction projects is based on three major factors i.e. time, cost and quality. The successful completion of construction projects within the specified time has become the most valuable and challenging task for the Managers, Architects, Engineers and Contractors. How to achieve this task is a problem, which should be solved. The overall objective of this study is to identify the factors responsible for overruns in time and cost of the construction project and suggest the suitable remedial solutions. Poor planning, implementation and management are the main reasons for time and cost overruns in construction projects in India. Since most of the reasons are well known and can be controlled if a proper arrangement is made.

Keywords – Cost overruns, Construction project, Remedial measures, Time overruns

I. INTRODUCTION

A. BACKGROUND

The Construction industry is one of the key economic industry in India and is the main motivating force in Indian national economy. But, it suffers from a number of problems that affect time, cost and quality performances. Successful management of construction projects is based on three major factors i.e. time, cost and quality. Time and cost are the lifelines of any and every project. The success or failure of any project depends largely on these two factors apart from its quality. They are vital, still they are neglected.

India is the tenth largest country in the World and yet her record of implementing major projects has been far from satisfactory. It has been observed very frequently that most of the projects in India ended with extra involvement of time, money and resources. It's a rare scene in construction industry, that a project is completed well within the estimated budget and time and with desired quality.

Technological advances are fast making their inroads into construction as a result of the process of global sharing of experience and wider networking. The New World order has impressed upon us the need for a paradigm shift in approach in construction management and the constituent processes. The involvement of multiple skills, equipment's, machineries and materials dependency on number of interrelated activities makes construction a complicated process. And if the industry is largely unorganized as well, the problem is compounded.

That is why to manage and successfully coordinate and complete a project is a formidable problem.

The client and contractor in a project, although, have a common objective i.e. to complete the project on time. The client in order to utilize the end result of the project, which has a value to him, the contractor in order to terminate indirect expenditure on it as early as possible in order to start further projects. Still, most of the projects cross the limits of time. Delay in completion results in definite increase in cost, because of immense sums held up, which bring no income. In fact, some projects often become uneconomical due to the time and cost overrun.

Time or Money used unnecessarily is of course 'time' and 'money' wasted. Hence, an efficient control system must be employed to achieve desired results. Effective and meaningful control must begin at design stage and should be backed up by proper and scientific estimation and data analysis.

B. OBJECTIVE OF THE STUDY

The overall objective of the study is to identify the factors responsible for the over-runs of time and cost in a construction project and suggest suitable remedial solutions. The specific objectives of the study are as follows:

- Track slippages in the actual time & cost schedule by comparing with the planned schedules & study of the reasons behind the same
- Study the trend followed by organizations of good repute, by conducting surveys in the form of questionnaire

- Suggest remedial measures in terms of modifying strategies, practices and procedures, organizational structure, contract agreement
- To find out the impact of over-runs on the stakeholders, especially the client.

C. LIMITATIONS

The study is limited to the following respects

- The sample interview was for ten projects & could vary for other projects.
- Reluctance from the part of the project authorities to reveal the data.

II. LITURATURE REVIEW

i. FACTORS CAUSING PROJECT COST OVERRUNS

From the 1980s various studies have investigated the causes for project cost overruns on construction projects.

Kaming, Olomolaiye, Holt & Harris (1997), who studied 31 construction projects in Indonesia, found that from a contractor's point of view, cost overruns were mainly caused by "inaccuracy of material take-off", "increase in material costs" and "cost increase due to environmental restrictions".

S. Shanmugapriya, Dr. K. Subramanian (2013), who found reasons for Cost overruns were high transportation cost, change in material specification, and escalation of material price, frequent breakdown of construction plants and equipment's and rework.

T. Subramani, P S Sruthi , M. Kavitha (2014), who found slow decision making, poor schedule management, increase in material/machine prices, poor contract management, poor design/ delay in providing design, rework due to wrong work, problems in land acquisition, wrong estimation/ estimation method, and long period between design and time of bidding/tendering are the major causes of cost overrun.

Reviewing public sector construction projects in Nigeria, Dlakwa & Culpin (1990) found that the three main reasons for cost overruns are "fluctuations in material, labour and plant costs", "construction delays" and "inadequate pre-planning".

In another study on construction projects in Nigeria, conducted by Okpala & Aniekwu (1988), it was found that architects, consultants and clients agreed that 'shortage of materials', 'finance and payment of completed works' and 'poor contract management' were the most important causes of cost overruns.

In reviewing all literature, following can be concluded:

- The most significant factor causing cost overruns due to client action is 'additional work or changes to work'.

- From a contractor's perspective the most significant contributor to cost overruns is 'time delays'.
- The most significant factor for cost overruns is evident from external factors and that is 'material price changes'.

Other common factors listed among contractors, consultants and clients were 'poor estimates and material take-off' and 'delay in payments'.

ii. FACTORS CAUSING PROJECT TIME DELAYS

Kaming et al. (1997) investigated that 'design changes', 'materials shortage' and 'inadequate planning' were the most significant contributors to time delays on construction projects. Similarly Sambasivan & Soon (2007) divided their findings into client, contractor and consultant categories, with all three categories listing 'poor site management', 'inadequate contractor experience' and 'poor subcontractors' among the top five causes for time delays on construction projects.

Ogunlana, Promkuntong & Jearkjirm (1996) investigated 12 highrise buildings and differentiated their findings into client/consultant-related, contractor-related and external causes for time delays. The weighted findings among these three categories indicated that 'material shortages', 'overstretching of technical personnel' and 'design changes' were the most important causes for project delays.

Assaf, Al-Khalil & Al-Hazmi (1995) used 56 questions in three categories, namely owner, architects/engineers and contractors, to determine the main causes of delays on large building projects in Saudi Arabia. Their survey showed that contractors believed that 'preparation of shop drawings', 'delays in contractor's progress' and 'payment by owners' were the most important factors contributing to time delays. According to architects/engineers, 'cash flow', 'subcontractors' schedules' and 'slowness of owner decision making' caused the most delays. Finally, owners were of the opinion that 'design errors', 'excessive bureaucracy in projectowner organisation' and 'labour shortages' contributed most to time delays.

Walker (1995) surveyed Australian project representatives and found that the most important factors that affect time delays are 'the ability of the organisation to manage risk', 'planning capabilities' and 'effective resource coordination'.

Kumaraswamy & Chan (1998) studied time delays on Hong Kong projects and found that 'unforeseen ground conditions', 'poor site management' and 'slow speed of decision-making' were the most prominent causes of time delays.

The results from a study of 130 public projects in Jordan by Al-Momani (2000) indicated that 'poor

design and negligence by the owner', 'change orders' and 'poor weather and site conditions' contributed most to delays.

Al-Khalil & Al-Ghafly (1999) studied public utility projects in Saudi Arabia and found that contractors considered 'delay in claim settlement', 'slow decision-making' and 'delays in progress payments' as the most important delay factors. Owners believed that 'poor early planning', 'scope changes' and 'financial difficulties by the contractors' were the major causes of delay. The consultants somehow supported the owners' views by indicating 'financial difficulties by the contractor', 'improper contract knowledge' and 'ineffective planning' as the most significant delay factors.

The following can be concluded from the results published in the reviewed literature:

- The highest frequencies of time delay factors attributed to client actions were 'changes to design and drawings' and 'slow decision-making'
- The highest time delay factor attributed to contractor action was 'poor site management' followed by 'poor planning'
- As far as external factors are concerned, the overwhelming contributing factors to time delay were 'material shortages'.

III. METHODOLOGY

The data has been collected by interviewing the officials of the construction industry. The study has been broadly undertaken as follows:

- Identified the projects, which has undergone time and cost over-runs.
- Studied all the available plans, estimates, schedules and work procedures in detail and collected all the relevant data about the project.
- Analyzed the data obtained and compared the estimated and actual schedules and budget to understand the causes and implications of overruns.
- Examined the reasons for the over-runs through either personal interviews or questionnaires.
- Listed out all the shortcomings.
- Identified the reasons of Time and cost overruns through a general survey of opinion from Architects, Consultants and Contractors and suggest the possible remedial solutions.

IV. FINDINGS OF THE STUDY

The specific findings from the cases and the survey are as follows:

1) INFERENCE FROM THE CASE STUDIES

After doing the case 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 has any

limitations for the location or region. All of them faced more or less similar problems of time and cost overruns. 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

In all, poor planning, implementation and management are the main reasons for time and cost overruns in both the projects. Since most of the reasons are well known and can be controlled if a proper arrangement is made.

2) INFERENCE FROM THE SURVEY

The following inferences can be drawn out from the opinion survey: The time and cost overruns of any project are mainly due to

- i. Inaccurate estimate of time and cost
- ii. Faulty designs
- iii. Land acquisition problem
- iv. Poor bidding
- v. Irregular flow of finance
- vi. Delay in payment of work done
- vii. Deficiencies in management
- viii. Delay in decision by Client/ Architect
- ix. Lack of coordination between different parties involved
- x. Change in scope of work

Note: The factors above are written in a decreasing order of ranking from factor which affects the project highest. The ranking is derived from the survey conducted.

3) RECOMMENDATIONS TO MINIMIZE TIME AND COST OVER-RUNS

Since the time and cost overrun and its control is extremely vast and complex subject which requires in-depth studies and it also requires a sound knowledge of other specialized subjects like. Financial Management, Risks Management, Legal Frameworks for Construction, Project Management and others, it becomes difficult to suggest any solution to minimize the overruns.

However, the foregoing analysis of the reasons for time and cost overruns definitely provides some

clues for the remedial steps. These can be listed as follows:

i. Better Formulation and Appraisal of Projects

Investment decision on a project should be undertaken only after full investigation, collection of data, analysis and crystallization of the concept. Since in many projects, this analysis may be expensive and may require preparation of the detailed project report, the fast stage clearance should be used to eliminate those project ideas which are prima-facie not viable and on which expenses for detailed analysis may not be incurred. The appraisal system also needs to be made more effective for checking the data, questioning underestimates and unrealistic assumptions. For this purpose, suitable databank for project analysis containing data about other similar projects (past and present) should be developed. Evaluation studies of completed projects should also help in developing this data bank. Once final investment decision after sound appraisal is taken, no significant change in project concept, location, technology and scope should normally be permitted.

ii. Sound Implementation Planning

Sound implementation planning is a pre-requisite for effective implementation. Realistic, resource - based (resource requirements matched with availability constraints) implementable plans can be formulated by using techniques such as PERT/CPM and estimating activity times, linkages and resource requirements realistically through an inter-disciplinary group-process where experiences of many persons is pooled together. Here also a data bank on similar projects (past and present) would be useful. Where project authorities do not have sufficient experience or data, consultants can be employed for this task. Generally, a slack of about 10-15 per cent should be kept in reserve and an internal network for shorter duration may be drawn up which may be used by the implementing staff. Alternatively, the 10-15 per cent stock may be implicitly included in the time duration of the last one or two activities. This 'reserve' is a means to meet the contingency of unforeseeable delays. Good computer software packages are available for project planning with PERT/CPM, equipment scheduling, manpower planning, cost optimization and control, monitoring etc. which could be effectively used. With sound implementation planning after proper project formulation more than half of the battle is won.

iii. Advance Action

Even after the government approval of the project, there may be many clearances required from various government agencies, in order to save time,

there may be one or more Empowered Committees', consisting of the secretaries or senior officials from concerned ministries, which may give some of the necessary clearances. Some major projects, for which such committees were constituted, were successful in minimizing time and cost over-runs.

iv. Assurance of Funds Resources

Once a project is approved for investment and 'go ahead' is given, funds should be committed to meet the requirements (both for the project and for the inter-linked activities/projects of other agencies on which it is dependent) as determined from the programme of work projected by resource-based network. There should not be piecemeal or adhoc based network. It may be advisable to determine year-wise requirement of funds for all projects under implementation for the whole plan period, which may be updated at each annual plan. Similarly, year-wise requirements for key materials like cement; steel can also be worked out in advance which should be committed by the respective allocating agencies, till the completion of the project.

v. Better Contract Management, Penalties and Incentives

Since in majority of projects, execution is through contracts, their proper management is a key to minimize time and cost over-runs. The contract planning (both for works and equipment supplies) has to be linked closely to resource-based implementation planning of the projects. Contractors and suppliers should be bound to give their resource and time plans integrated with project plans (based on PERT/ CPM) and follow them. Each contract's dates should be as per the detailed network. There should be close follow-up and interaction. Existing penalties and incentives need to be considerably enhanced so that contractors are also interested in on-time performance. Where delays are anticipated, project authorities should be able to off-load contracts (partially or fully) to other parties (either within the country or abroad) well in time. Target cost contracts with incentives for savings should be encouraged to minimize time over-runs. Where consultants are used for planning, awarding and following up the contracts, the effectiveness of consultants in contract management should be properly evaluated. 'Expeditors' from project authorities or consultants can be helpful in watching progress, expediting deliveries and giving advance warnings, as they will be stationed at or visiting the suppliers' shops. Contractors should be considered as partners in project execution and help should be provided in solving their genuine problems, as otherwise project execution will be help up.

vi. Monitoring

A simple and effective monitoring system is essential to identify and anticipate the deviations from implementation plan, analyze the underlying problem areas and suggest corrective action. Anticipation is important from the point of view of preventing or overcoming the problems before they occur or taking alternative steps to minimize their impact on project time and cost. A good data bank on implementation of activities of this and other similar projects (past and present) could greatly help in the monitoring process. Over-monitoring should be avoided as it leads to unnecessary paper work, tying up of project manpower resources and viewing of monitoring as an end in itself rather than as means to achieving the ends. Emergence of 'Project Monitoring', as a specialized profession should be encouraged. The objective of external agencies, which are monitoring the performance, should also be to provide help in solving problems rather than finding faults. Joint 'Monitoring groups' can be established, which may consist of representatives of the project as well as inter-linked agencies and the parties concerned. The groups could monitor and review the progress of the complete system -the project and the inter-linked activities/projects. For problem solving and action, the primary agency is the project authority.

vii. Management Techniques, Systems, Incentives

Industrial engineering and management techniques such as method study, value engineering, etc., can help in reducing time duration of activities and giving up of unnecessary items/activities. Over-specification can be avoided so that the costs can be reduced. The project organisation should be distinct, separate from operation side, complete with all functions, under the charge of one competent project leader and with all responsibilities clearly defined. There should be full delegation to project leader and his team and down the line. The systems and methods should be clearly laid down and manualised. Human side of project management is an important (if not more) as the quantitative techniques and attention to inter-personal skills, interaction, human resources development etc. is important from the very initial stage. After all, implementation of a project is a group or team effort. It is the effectiveness of this team effort, which will determine the success of the project. The consciousness to adhere to time and cost schedules is to be generated at all levels. In the projects which were successful in meeting their time cost targets, the core project management team, starting from the top person, had full commitment and made it a mission or a goal to complete the project within its time schedule/cost, whatever may be problems and they achieved this. This spirit should also be

followed up with incentives (in the form of rewards, promotions, recognitions etc.) for those who achieve time and cost targets and punishment for those who fail badly, and this linkage between project performance and incentives/punishment should be clearly visible. The core project team should be properly chosen and placed preferably during the formulation stage and thereafter it should stay till the completion of the project. Changes in the team, particularly, the project leader, should be made only in exceptional cases.

V. CONCLUSION

The above discussion reveals that even though there are plenty of management techniques to control time and cost overrun in construction projects, most of the projects are facing the problem. Many projects are suffering because of delay from the part of the client to supply of some of the material which as part of the contractual agreement they have to supply to the contractor or delay in settling Running Account bills. These problems together with other problems such as delay in getting clearances and other problems listed above makes it more difficult to complete the project on time and within planned budget. Another difficulty faced by the construction industry is the low productivity of resources, especially equipment productivity.

Even then, the use and implementation of better project management and management techniques can improve the situation and can lead to achievement of more growth and development to the economy as a whole, since the quantum of planned investment per annum, according to Rakesh Mohan Committee, in the construction sector is Rs. 10,000 crores till 2005.

The study is limited to a sample interview for seventeen projects, which are real-estate projects & could vary for infrastructure projects. A study of infrastructure projects could give quite a different picture. Moreover, there is usually reluctance from the part of the project authorities to reveal the data. More number of samples would give a clearer picture.

REFERENCES

Journal Papers:

- [1] Kaming, P.F., Olomolaiye, P.O., Holt, G.D. & Harris, F.C. 1997. Factors influencing construction time and cost overruns on high-rise projects in Indonesia. *Construction Management Economics*, 15(1), pp. 83-94.
- [2] S. Shanmugapriya (2013) *Investigation of Significant Factors Influencing Time and Cost Overruns in Indian Construction Projects*, *International Journal of emerging*

- Technology & advanced engineering*,
(Volume 3 Issue 10, October 2013)
- [3] T. Subramani, P. S. Sruthi, M. Kavitha (2014), *Causes of Cost Overruns in Construction*, *IOSR Journal of Engineering (IOSRJEN)*, 06(04), pp.01-07
- [4] Dlakwa, M.M. & Culpin, M.F. 1990. Reasons for overrun in public sector construction projects in Nigeria. *International Journal of Project Management* 8(4), pp. 237-241.
- [5] Okpala, D.C. & Aniekwu, A.N. 1988. Causes of high costs of construction in Nigeria. *Journal of Construction Engineering and Management*, 114(2), pp. 233-244.
- [6] Kaming, P.F., Olomolaiye, P.O., Holt, G.D. & Harris, F.C. 1997. Factors influencing construction time and cost overruns on high-rise projects in Indonesia. *Construction Management Economics*, 15(1), pp. 83-94.
- [7] Sambasivan, M. and Soon, Y. (2007) 'Causes and effects of delays in Malaysian construction industry', *International Journal of Project Management*, 25 (5), 517-526
- [8] Ogunlana, S.O., Promkuntong, K. & Jearkjirm, V. (1996). Construction delays in a fast-growing economy: Comparing Thailand with other countries. *International Journal of Project Management*, 14(1), pp. 37-45.
- [9] Assaf, S.A., Al-Khalil, M. & Al-Hazmi, M. (1995). Causes of delay in large building construction projects. *Journal of Management in Engineering*, 11(2), pp. 45-50.
- [10] Walker, D.H.T. 1995. An investigation into construction time performance. *Construction Management and Economics*, 13(3), pp. 263-274.
- [11] Kumaraswamy, M.M. & Chan, D.W.M. 1998. Contributors to construction delays. *Construction Management and Economics*, 16(1), pp. 17-29.
- [12] Al-Momani, A.H. 2000. Construction delay: A quantitative analysis. *International Journal of Project Management*, 18(1), pp. 51-59.
- [13] Al-Khalil, M.I. & Al-Ghafly, M.A. (1999). Important causes of delay in public utility projects in Saudi Arabia. *Construction Management and Economics*, 17(5), pp. 647-655.