

---

## Cost Reduction in Construction Projects

**Urmila A Mahadik**

Assistant Professor, Rajashri Shahu College of Engineering, Tathawade,  
Pune, Maharashtra, India

### ABSTRACT

The construction project can vary from extremely profitable to barely worth it and sometimes end up costing the contractor more than what he or she is getting paid to complete it. In construction industry the aim of project control is to ensure the projects finish on time, within budget and achieving other project activities. Time and cost are two main concerns which increase importance of cost reduction techniques. Reduction of cost of construction is a constant goal for construction industry. One way of reducing construction cost is to develop innovative technologies as well as methodologies to increase productivity. This paper covers types of cost, factors affecting cost of projects as well as discussion on achievement of satisfactory results of time and cost by applying cost reduction techniques.

**KEYWORDS:** *Cost reduction, Value engineering, construction, function, quality, cost, value, project,*

### 1. INTRODUCTION

In many construction projects project managers and contractors find difficulties like poor planning of project, poor material, labour shortages, increased cost of material, delays in deliveries, wastage of material, over budgeting, unexpected weather changes, lapse in management and control, loss of material, poor communication etc. This results into cost and time overruns, conflicts in project. So there is need to study costs included in projects and to identify cost reduction or cost control techniques for carrying construction projects effectively. Reduction of cost of construction is a constant goal for construction industry. One way of reducing construction cost is to develop innovative technologies as well as methodologies to increase productivity. Due to cost reduction techniques cost of project is managed so that contractor does not suffer losses while carrying different activities of projects.

### 2. Cost

#### 2.1 What is Cost?

Expense incurred by a contractor for labour, material, equipment, financing, service utilities etc. plus overheads and contractors' profit. Cost of land, architectural design, fee of consultant and engineer are not construction costs.

#### 2.2 Types of cost

##### Fixed Costs

Fixed costs are those that do not change throughout the [life-cycle of a project](#).

For example, if construction of road is there, the excavators and bulldozers are fixed costs. For software development projects, the physical development space and development computers are fixed costs to the project.

##### Direct Costs

Direct costs are expenses that come out of the project budget directly. For example, if outsourcing some of the development work, the developers are expected to put in a specific amount of time, which is then billed for. The developer salaries are direct costs.

##### Sunk Costs

Sunk costs are those that have been incurred in a project, but have not produced value towards the project's objectives.

### 3. FACTORS AFFECTING CONSTRUCTION COST

There are many factors which affect the construction cost estimate and have significant impact on project cost and they are as following:

- 1) **Similar Construction Projects:** For the construction estimate, the best reference will be similar construction projects. The final cost of those similar projects can give the idea for the new construction project cost calculation. The final cost of past project needs to be factored with current construction cost indices.
- 2) **Construction Material Costs:** Construction material cost consists of material cost, shipping charges and taxes applicable if any. So, it is important consider all these variations while calculating construction material cost.
- 3) **Labor Wage Rates:** Labor wages varies place to place. So, local wage rate should be considered in calculation. If the project has to be started after several months of estimating the project cost, the probable variation in wage rates has to be considered in the calculation.
- 4) **Construction Site Conditions:** Project site conditions can increase construction costs. Site conditions such as poor soil conditions, wetlands, contaminated materials, conflicting utilities (buried pipe, cables, overhead lines, etc.), environmentally sensitivity area, ground water, river or stream crossings, heavy traffic, buried storage tanks, archaeological sites, endangered species habitat and similar existing conditions etc. can increase the project cost during construction phase if these variations are not considered during estimation.
- 5) **Inflation Factor:** A construction project can continue for years before completion. During the construction period, the cost of materials, tools, labors, equipments etc. may vary from time to time. This variation in the prices should be considered during cost estimation process.
- 6) **Project Schedule:** Duration of construction project is affects the cost. Increase in project duration can increase the construction project cost due to increase in indirect costs, while reduction in construction cost also increases the project cost due to increase in direct costs. Therefore, construction project schedules also need to be considered during project cost estimation.
- 7) **Quality of Plans & Specifications:** A good quality construction plans and specifications reduces the construction time by proper execution at site without delay. Any vague wording or poorly drawn plan not only causes confusion, but places doubt in the contractor's mind which generally results in a higher construction cost.
- 8) **Reputation of Engineer:** Smooth running of construction is vital for project to complete in time. The cost of projects will be higher with sound construction professional reputation. If a contractor is comfortable working with a particular engineer, or engineering firm, the project runs smoother and therefore is more cost-effective.
- 9) **Regulatory Requirements:** Approvals from regulatory agencies can sometimes be costly. These costs also need to be considered during cost estimate.
- 10) **Insurance Requirements:** Cost estimation for construction projects should also need to consider costs of insurance for various tools, equipments, construction workers etc. General insurance requirements, such as performance bond, payment bond and contractors general liability are normal costs of construction projects. In some special projects, there can be additional requirements which may have additional costs.
- 11) **Size and Type of Construction Project:** For a large construction project, there can be high demand for workforce. For such a requirements, local workmen may not be sufficient and workmen from different regions need be called. These may incur extra costs such projects and also for the type of construction project where specialized workforce is required.
- 12) **Location of Construction:** When a location of construction project is far away from available resources, it increases the project cost. Cost of transportation for workmen, equipments, materials, tools etc. increases with distance and adds to the project cost.
- 13) **Engineering Review:** Sometimes it is necessary to carry out technical review of construction project to make sure the project will serve the required purpose with optimum operational and maintenance cost. This review cost shall also be added to the project cost.

14) Contingency: It is always advisable to add at least 10% contingency towards the total project costs for unforeseen costs and inflation

#### 4. COST REDUCTION TECHNIQUES

4.1 So, there are various cost effective techniques of construction. Lots of them are also energy efficient and easily adoptable. Since India is a developing country, the economy has importance

There is a need for the adoption of strong, durable, environment friendly, ecologically appropriate, energy efficient and yet cost effective materials and appropriate technologies in construction.

4.2 In construction project reduction in cost can be achieved by some of the following techniques:

- a) Value Engineering
- b) Material Management
- c) Budgetary Control
- d) Cost optimization Techniques
- e) Cost Reduction Techniques at site

**a) Value Engineering:** Value engineering is a systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall cost. Application of Value Engineering (VE) to construction projects is a solution which emphasizes the function of project which helps to team to make final choice and which results in cost effective design for project.

**b) Material Management:** To manage productivity and cost efficiency material management is essential. It contributes the major portion of expenses in construction projects. Controlling procurement, carrying cost can reduce total project cost and complete the project in a fast track method. ABC (Always Better Control) is the tool to identify those material. By resource leveling, smoothing usage can be brought to optimum refined level so that much storage cost can be eliminated. Economic Order Quantity (EOQ) is arrived, then sensitivity of material is checked using what-if analysis. Then effect of project is checked to find optimum solution. This optimizes total project cost.

**c) Budgetary Control:** For cost control on a project, the construction plan and the associated cash flow estimates can provide the baseline reference for subsequent project monitoring and control. For schedules, progress on individual activities and the achievement of milestone completions can be compared with the project schedule to monitor the progress of activities. Contract and job specifications provide the criteria by which to assess and assure the required quality of construction. The final or detailed cost estimate provides a baseline for the assessment of financial performance during the project. To the extent that costs are within the detailed cost estimate, then the project is thought to be under financial control. Overruns in particular cost categories signal the possibility of problems and give an indication of exactly what problems are being encountered. Expense oriented construction planning and control focuses upon the categories included in the final cost estimation. For control and monitoring purposes, the original detailed cost estimate is typically converted to a project budget, and the project budget is used subsequently as a guide for management. Specific items in the detailed cost estimate become job cost elements. Expenses incurred during the course of a project are recorded in specific job cost accounts to be compared with the original cost estimates in each category. Thus, individual job cost accounts generally represent the basic unit for cost control. The PERT and CPM techniques bar chart, Gantt chart relate to time and shows how to accelerate the project for the lowest possible cost.

**d) Cost Optimization Techniques:** In design, construction, and maintenance of any engineering system engineers have to take many technological and managerial decisions at several stages. So ultimate goal is to minimize the effort or to maximize desired benefit. Various mathematical programming techniques are used for optimization of construction cost of project. Some of them are non linear programming, dynamic programming, integer programming, stochastic programming etc.



**e) Cost Reduction Techniques at site:** Contractor uses schedule to monitor the progress of the work which is related to cost. Inspection of work is done and comparison with budget is made. Meetings held to review the progress of work provides motivation to all workers and stake holders to improve their performance. Documentation of all activities or record keeping is important to enable detection of deviation from the set standards. Clients, consultants and the contractors use monitoring tools of budget, schedule and feedback to keep watch on cost performance. Quantification of work, and comparing cost with bill quantities helps to evaluate the work and to check the progress of work.

#### 4. CONCLUSION

It was discussed that using cost reduction techniques by multidisciplinary team, value and economy are improved through study of alternative design concepts, material and construction methods without compromising functional requirement and quality. Cost effective construction techniques, material and different management strategies during the execution of project plays important role in saving time as well as cost of construction. Thus, cost reduction techniques assures best cost, value will be obtained over life cycle of the building or structure.

#### 5. REFERENCES

1. Value Standard and Body of Knowledge, Save International, June2007.
2. J. R. Wixon, Value Engineering The Forgotten Lean Technique, University of Idaho.
3. J. S. Russel, Constructability Related To TQM, Value Engineering and Cost/Benefits.
4. Naief Turki Ibn\_ HOmaid/A comparative evaluation of construction and manufacturing material management/international journal of project management20(2002) 263-270
5. The international journal of advanced engineering research and studies which has published paper on study of cost control on construction project.
6. Switzerland Research Park journal published quality control and cost reduction in construction machinery management: different cost estimation methods.
7. Hendrickson C. 1998. Project management for construction. Carnegie Mellon University PA 15213.