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COST CONTROL IN RESIDENTIAL CONSTRUCTION PROJECTS

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Abstract: Cost control is a process that must be maintained throughout the duration of construction to ensure that the cost of the structure remains within the predetermined cost limits. The cost control can be divided into two main areas: cost control during the design phases and cost control by the contractors once construction has begun. According to Annually (1998), cost control of a project entails the measurement and collection of a project's cost record and its work progress. In addition, it entails comparing actual progress to the plan. The primary objective of a project's cost management is to maximise profit within the allotted timeframe while maintaining acceptable work quality.One of the reasons why cost overruns and delays occur in the majority of construction projects in India is the absence of an effective cost control mechanism for the proprietor, the contractor, and the consultant for the client. Our thesis attempts to examine a broad range of aspects of cost control from the perspective of the potential owner of a constructed asset through the financial feasibility studies for the investment, then through the design, and, finally, the cost control of the work on a side both from the perspective of an owner and the contractor or group actually building the facility.

1.2 Background

Cost control is becoming increasingly important for owners and contractors in a time when "Rising Costs Loom for Construction," energy shortages mean higher costs and escalation, and multi-billion dollar projects such as oil and gas pipelines, nuclear power plants, and offshore platforms are more prevalent. • Materials costing more than anticipated. • Labour costing more than anticipated.

• Labour productivity being too low.

• Supervision costs three times as much as anticipated on a cost plus fixed fee project.

• Change orders with higher costs than estimated.

The production of project cost estimations is a challenging task because construction projects are susceptible to risks and uncertainties, especially in the early phases when very little information is available. Yet, the cost estimates produced at this stage are of the utmost importance to the project sponsor, as they frequently serve as the premise for funding proposals.

Once implementation begins, the costs of a project rarely remain constant. As additional data becomes available, the costs may be refined. However, even after a cost has become fixed, there are numerous factors that can cause it to rise. Delays are a significant factor. Regardless of the cause, delays almost always increase budget costs.

The purpose of this section is to examine how risk management and more accurate estimation of contingency expenditures can improve the cost and schedule management of projects. While this is ultimately the responsibility of project sponsors and their project managers, station officers would benefit from an understanding of the underlying principles.

1.3 Objectives

The objectives of this research are as follows:
a) To examine the method of cost control in a construction project.
b) Identifying the common cost control method employed by contractors during the construction phase.
c) Determine the primary challenge the contractor faces in regulating costs on the job site.

1.4 Scope of study

The research is conducted in Pune, Maharashtra, and incorporates the contractor's perspective. Due to time constraints, the study only focuses on the construction phase and excludes the tendering and design phases.

2.1 Introduction

No matter the size of a business, keeping costs in check is crucial. Due to the high stakes involved in even one failed project, small businesses often use stricter financial controls while using less complex control methods. If a large corporation experiences a loss on one of its projects, it may likely spread that loss over its other initiatives. In this chapter, we will examine the methods for and processes involved in cost management. Cost management is not only "monitoring" expenses and keeping track of related data, but also analysing that information to predict and prevent future problems. All workers who incur expenses, not only the project office, should participate in cost control. Good cost management entails, among other things, accurate cost estimates, accurate cost accounting, timely cash flow reporting, and enough cash reserves.

- Cost estimating
- Cost accounting
- Project cash flow
- Company cash flow
- Direct labor costing
- Overhead rate costing

Developing standard costs, financial projections, a project budget, and cost control are all components of construction cost planning, with the end aim of meeting the project's profit/cost goals. job packages, job items, and activities are priced using industry-standard pricing techniques. The work package standard prices help with budgeting and cost management. Sales, costs of production, profits, and cash flow are just some of the metrics that can be tracked and analysed using financial projections. The project budget provides a monetary value for the project plan and details how the project will be funded. It uses standard cost concepts for costing work packages, work items or

activities. The standard costs of the work package facilitate the planning and

controlling of costs. Financial forecasts indicate the trends of expected sales,

production expenses and profit and cash flow at specified intervals of time. The

project budget quantifies the project plan in monetary terms and outlines the financial

plan for implementation.

Both the customer and the contractor will have their own financial resources to work with on a contractual construction job. These budgets have a similar foundation in the project schedule of work and the value of work done value (or earned value), but serve

distinct goals. The client's construction budget is essentially a capital budget that's meant to figure out how much money will be needed and when it will come from. In contrast, a contractor's budget prioritises the cost of resources and the revenue from sales.

2.2 Cost related issues

TagCost control is becoming increasingly important for owners and contractors in this era of "Rising Costs Loom for Construction," when energy shortages mean higher costs and escalations and multi-billion dollar projects like oil and gas pipelines, nuclear power plants, and offshore platforms are more commonplace. Materials costing more than anticipated is one issue that has to be addressed.

- Materials costing more than estimated.
- Labor costing more than estimated.
- Labor productivity too low.
- Supervision costing three times more than estimated on a cost plus fixed fee job.
- Change orders costing more than estimated. Solutions:
- Computerized cost accounting and integrated cost control system.
- Unit prices in cost control, etc.
- Good supervision and management.
- Incentive.

2.3 Project development process

The primary goal of every infrastructure project is to carry out a financially advantageous improvement with well defined technical performance, financial, and time-related goals.

Building new infrastructure requires a lot of time and money. All initiatives, however, may be examined in light of a universal life-cycle that consists of phases. While the steps are presented in a hierarchical format, they are not necessarily sequential..

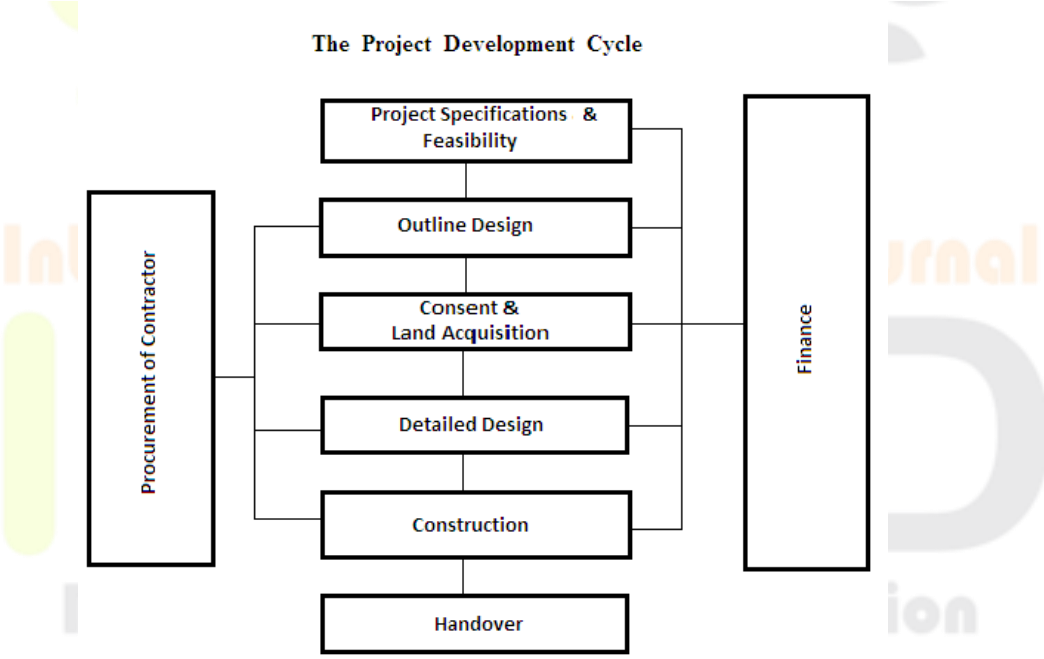

Fig 2.3. Project Development Cycle

2.4 Initial project costs and cost varying factors

Following are the key determinants of the cost in a project and cost changing factors in a project:

2.4.1 Key Determinants of Costs

No two infrastructure projects will cost the same amount of money no matter how similar they are. Apart from basic technical factors, the wide range of economic and institutional conditions in different Member States will itself always lead to variations.

Nevertheless, the fundamental project costs are based on the actual cost of the land, materials, equipment and labour in the region where the project is being procured.

These basic costs will vary depending upon a number of factors which are given below.

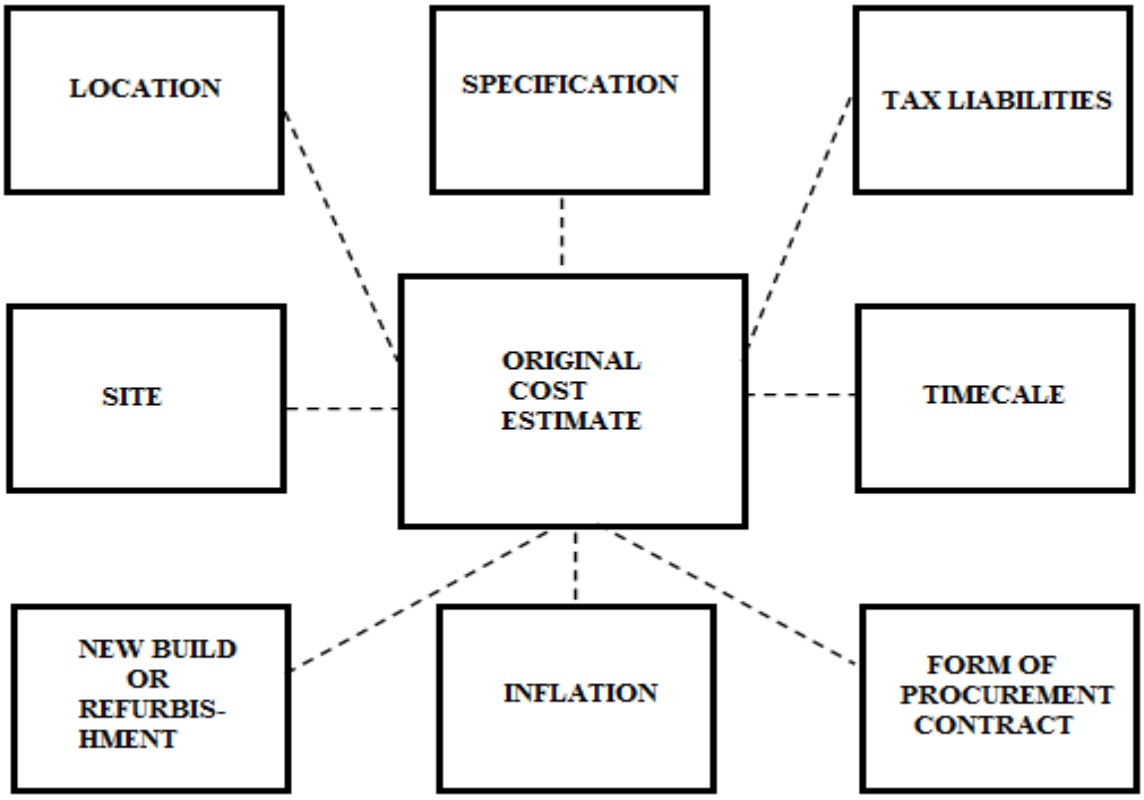

Fig 2.4.1 Key Determination of cost

2.4.2 Cost Changing Factors

Once implementation begins, a project's costs rarely remain static. As further information becomes available the costs may be further defined. Yet, even when a cost has become firmly fixed, there are numerous factors that can lead to the cost increasing. Delays are a major factor. Whatever the reason, delays almost invariably increase budget costs. Many events may have contributed to the delay - some which could have been foreseen and others which could not.

The level of certainty about the final or outturn costs will vary for each of these three situations. Obviously, if an application comes forward very early in the project development cycle, then there is a much greater chance that the project will experience time and cost over-runs. Figure below illustrates some of the factors that result in projects being delayed or costing more than originally planned.

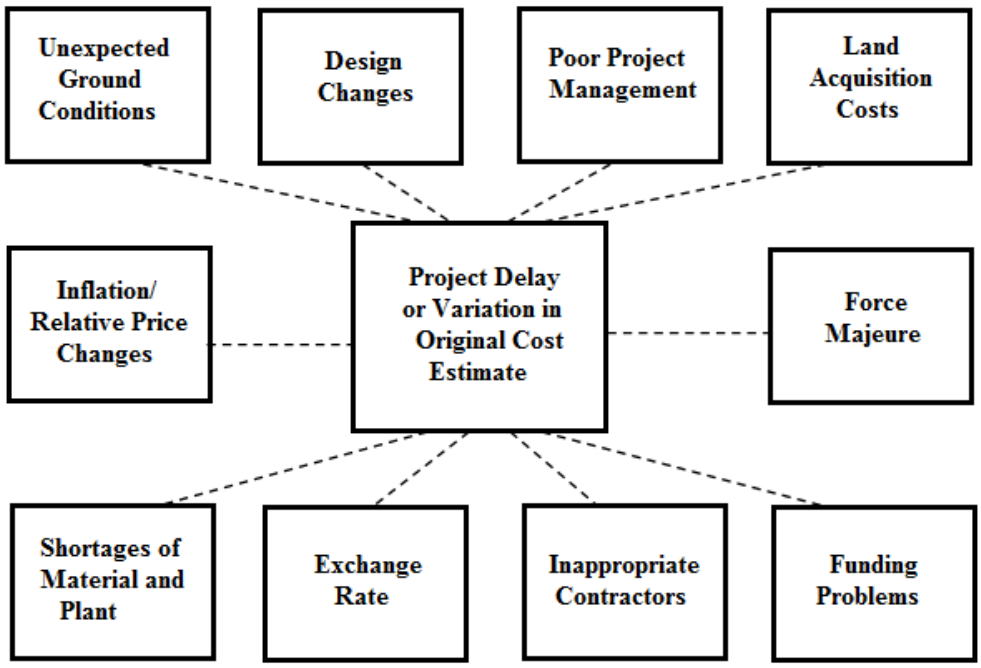

Fig 2.4.2 Cost Changing Factors

2.5 Understanding control

If you want to effectively manage a programme while it's in operation, you need a well-organized cost and control system that provides real-time feedback so you can compare actual resource utilisation against planned goals set in the planning phase. • Thorough planning of the work to be done to finish the project is a prerequisite for an effective control system (for both cost and schedule/performance).

Time, effort, and money are accurately predicted.

• Explicit description of every work that must be done.

• A well-controlled spending plan and receipt of funds.

• Accurate and timely reporting of work completed and money spent.

• Regular recalculation of how long and how much it will cost to do the remaining tasks.

3.1 General The five-year plans emphasise development in practically every facet of the economy, and construction plays a significant role in this. Expenditures for providing fundamental needs like irrigation, flood control, electricity, transportation, communication, etc. rely heavily on building. In the eleventh plan, building ate up about half of the budget, and it wouldn't look good for future plans to change that.

Along with many minor projects that come up during the course of five year plans, there are few major projects which are important for the economy of a nation as a whole. Any delays in cost overruns on these projects which can run into years and even twice the original cost respectively can be near fatal for the industry and can considerably slow down the growth and economic development in general.

This research study is in the area of management control systems and concentrates on study of the cost control systems followed by a construction company for a project. Regardless of any amount of planning and estimating practices, numerous factors prevent the plans and estimates from being totally practicable. The ever changing environment surrounding the construction work, the variable nature of construction work and the industries high dependencies on labor productivity being few of them. It is therefore,

necessary to study the steps taken by the organization to overcome them. The initially estimated cost becomes a standard against which accumulating costs of design and construction arc referred during subsequent action.

3.2 Cost control methods

It is necessary to decide which control is required and amount of detail that will be in entered into the construction stage. Many cost control methods have been used in the past in different companies and have not survived. The cost itself is a major difficulty in operating a detailed cost control system. It is an expensive operation in the time of cost clerks, etc, for a large contract to carry out a detailed cost control system. There are three types of cost control system; they are by comparison with a cost standard, by subdivision by detail and by integration with other functions.

In comparison with a cost standard method, the standard set up by estimator is compared at the time of tender. There are also other standards efficiency can be judged include set up by the work study department of a company, previous outputs achieved within the company or within the knowledge of the company's employees in the past, and standards that have been published in books primarily for use of estimator, giving data on recommended outputs for labor and plant.

In the subdivision by detail method, it is usually practiced by small scale of contractors compares the amount of money received with the amount of money he has had to pay out to complete the contract at the end of the contract. It is not expensive but a risky operation, involves little or no control of costs. It is also inaccurate since estimator often omits some contentious items from a valuation, even though payment will result from them.

In integration with other functions method, the cost control system will combine with some other necessary operation in the administration of a contract and not as a separate entity. For example, it may be combined with a labor utilization scheme, in which the control is kept on the optimal utilization of the labor employed.

3.3 Cost control and cost reduction

3.3.1 Cost Control

When overseeing the construction of a large building, the cost for various components of the building will vary. At the initial phase of construction (during the concept & budgeting phases), it may have been projected that the glass for all the windows would cost a total of Rs 1,75,000. A large project like this can take time, though, so by the time the building is far enough along in the construction phase to need the glass, the cost for the glass may have risen to Rs 2,10,000 (rising fuel prices, natural disasters, shortage of raw materials, etc). Therefore the cost will increase for this one component of the building, which impacts the overall cost of the building itself. But, to compensate, you can control the overall cost of the building by buying less expensive materials for the remainder of the project, such as carpeting, door hardware, and even plumbing fixtures and outdoor landscaping. This adjustment could be considered Cost Control, in that you are controlling the overall costs of the project and making compensations and adjustments to ensure the final price tag for the building does not grow beyond the projected amount.

3.3.2 Cost Reduction

When producing a particular product, the manufacturing of that product (say, a tennis shoe) is comprised of many individual components. Over time, the market cannot pay you more for the product you manufacture (consumer spending is down), so you can apply some methods to reduce the costs you *pay* to make that product. The price to the consumer does not change, but your *expense-to-income* ratio gap is increased, which leaves you with more profit. As an example, one of the materials you use to make the tennis shoes is shipped from a supplier three states away. You learn mat you can buy more of this material from the

supplier and have it shipped by rail rather than the smaller shipments that were trucked in each week. Since the cost for fuel has risen, the trucking company is charging you more for each shipment. To reduce the overall cost of obtaining material, you use a bulk-buy-ship method. The supplier sells this material to you at a cheaper rate since you are buying so much more at one time, and the cost of shipping it by rail is cheaper because that larger load is better handled by the rail company than by individual trucks. This cost reduction will widen the gap between how much it costs you to make the tennis shoe, and how much you are paid by the consumer.

3.3.3 Difference between the Cost Control and Cost Reduction

Cost control is the regulation of costs of operating a business and is concerned with the keeping expenditure within acceptable limit. The major assumption in cost control is that unless cost exceeds budget or standard by an excessive amount the control of cost is satisfactory. We have dealt with cost control in detail under standard costing and budgetary control. Cost control is a very routine exercise which is almost carried out for attainment of operational efficiency. On the other hand, cost reduction brings about real and permanent savings by continuous and planned research. A cost reduction programmed does not stand of its own volition. It is always planned and followed up.

Cost control is thus a primitive function and acts within the framework of some target or standard. Cost reduction is a corrective function by continuous process of analysis of costs, functions, etc, for further economy in the application of the factors of production.

3.4 Material Cost & It's Control

3.4.1 Material Cost

Material cost of a job or cost unit can be ascertained by multiplying quantity consumed for the job or cost unit by the price of the material, Thus in order to ascertain material costs we should-

1. Make valuation of purchases.

2. Make use of proper valuation of material issues and closing stock following different methods such as FIFO, LIFO, weighted average, etc.

The purchase price of material is directly obtained from the supplier's invoice. In many cases, goods are received and have to be issued to production before the invoice of materials *is* received. In order to determine the purchase price of the material, the purchase order may be consulted in detail. The rate per unit, total price of the item as shown in the purchase order plus sundry charges such as delivery and forwarding charges, sales tax, duty, etc.. may be scrutinized. Detailed information may also be obtained from the quotation of suppliers. Government's controlled prices by notifications, suppliers' catalogues and circulars may be valuable guides for obtaining rates for materials. Delivery charges may be estimated with reference to the kind of transport and similar delivery charges in earlier purchases.

So the total cost and rate per unit can be computed and entered in the stores received register and posted to stores ledger for the issue of material to production. When the invoice is received the difference between the actual amount and the amount already entered in stores received register is adjusted to the value of quantity in stock or accounted for as an item of stores overhead.

In any case, the basic prices of material needs adjustment for any discounts allowed; charges for transport, containers, etc.

Delivery charges may be estimated with reference to the kind of transport and similar delivery charges in early purchases. An examination of the invoices of the same material purchased earlier may give valuable information regarding sales tax, excise duty, freight, etc.

3.4.2 Material Control

• Material is a very important factor of production. It includes physical commodities used to manufacture the final end product. It is the starting point from which the first operations start. It is inventor able and does not get waste and exhaust(unless it is deteriorated) with the passage of time as labour is wasted with the passage of time whether in use or not.

• Materials can be purchased in varying quantities according to the requirements of the firms whereas other elements of cost like labour and other services cannot be easily varied once they are established. Thus material is most flexible and controllable input.

• Materials accounts for nearly 60 percent of the cost of production as it is clear from an analysis of the financial statements of a large number of private and public sector organizations.

• Material control is a system which ensures that right quality of material in the right quantity at the right time and right place with the right amount of investment. It can be defined as a comprehensive framework for the accounting and control of material cost designed with the object of maintaining material supplies at a level so as to ensure the uninterrupted production but at the same time minimizing investment of funds.

3.4.3 Levels of Material Control

There are two levels of material control;

a. Quantity or unit control
b. Rupee or financial control

Production executives and store-keepers are primarily interested in the quantity control because their interest is to see that there should be no stock out problem.

On the other hand, financial executives are interested that too much money should not be invested in materials and every rupee spent in materials should be efficiently and effectively utilized.

Keeping in view unit control and financial control, material control should *meet* the following two objectives;

a. The maintenance of sufficient quantity of every item of material for efficient operations, and
b. Maintenance of an inventory that is not detrimental financially.

3.4.4 Aspects of Material Control

There are two aspects of material control as given below:

• **Accounting aspect**- This aspect of material control is concerned with maintaining documentary evidence of movement of materials at every stage right from the time sales and production budgets are approved to the point when materials are purchased and actually used in production operations.

• **Operations aspect**- This aspect of material control is concerned with the maintenance of material supplies at a level so as to ensure that material is available for use in production and production services as and when required by minimizing in materials.

3.4.5 Objectives of Material Control

No system of costing can be considered as complete without a proper control of materials as materials constitute a major portion of cost of production. The following are the various objectives of material control:

- **Availability of materials** - There should be a continuous availability of all types of materials in, the factory so that, the production may not be held up for want of any material. Minimum quantity of each material is fixed to permit production to move on schedule.
- **No excessive investment in materials**- There should be no excessive investment in stocks, investment in materials must not tie up funds that could be better used in other countries. Overstocking should be avoided keeping in view the

disadvantages it carries. For this purpose, a maximum quantity is assigned to each item of material above which stock should not be exceeded.

- **Reasonable price**- While purchasing material, it is seen that it is purchased at a reasonably low price. Quality is not to be sacrificed at the cost of the lower price.
- **Minimum wastage**- There should be minimum possible wastage of materials while these are being stored in the go-downs by storekeeper or used in the factory by the workers. Wastage should be allowed up to a certain level known as normal level of wastage but should not exceed that level. Leakage or theft of materials must be avoided to keep the cost of production under control. Store-keeper and workers should not be trained to handle the materials in a scientific way to avoid the wastage.
- **Risks of spoilage and obsolescence** of the materials must be avoided. For this purpose, a maximum quantity of each material is determined and a proper method of issue of materials is followed. The materials received earlier should be issued earlier.

3.5 Techniques of Material Control

The following are the main techniques of material control:

1. Level setting
2. Economic order quantity
3. ABC analysis
4. VED analysis
5. Material (or inventory) cost reports

3.5.1 Level Setting:

In order to have proper control on the material, the following levels are set:

a. Re-order level
b. Minimum level
c. Maximum level
d. Danger level
e. Average stock level

a. Re-order level- It is the point at which the stock of a particular materials in store approaches, the store-keeper should initiate the purchase requisition for fresh supplies of that material. This level is fixed somewhere between the maximum and minimum levels in such a way that the difference of quality of the material between re-ordering level and the minimum level will be sufficient to meet the requirements of production upto the time the fresh supply of the material is received. It can be calculated by the following formulae:

Re-ordering level = Maximum consumption x Maximum re-order period.

b. Minimum (or safety stock) level - This represents the minimum quantity of the material which must be maintained in hand at all times. The quantity is fixed so that production may not be help up due to shortage of the material. In fixing this level, the following factors are taken into consideration:

1. Lead time i.e. time lag between indenting and receiving of the material. It is time required to replenish the supply.
2. Rate of consumption of the material during the lead time. Cost Control in Construction Projects"
3. Nature of the material. Minimum level is not required in case of a special material which *is* required against customer's specific order.

Formula;

Minimum stock level — Re-ordering - (normal consumption x normal re - order period)

c. Maximum level - it represents the maximum quantity of an item of material which can be held in stock at any time. Stock should not exceed this quantity. The quantity is fixed so that there may be no overstocking.

Formula;

Maximum stock level = reordering level + reordering quantity — (minimum consumption x minimum reordering quantity)

d. Danger level - This means a level at which normal issues of the material are stopped and issues are made only under specific instructions. The purchase officer will make special arrangements to get the materials which reach at their danger levels so that the production may not stop due to shortage of materials.

Formula;

Danger level - average consumption x maximum re - order period for emergency purchases.

e. Average stock level - The average stock level is calculated by the following formula:

Average stock level = minimum stock level+ 1/2of re - order quantity or 1/2 (minimum stock level + maximum stock level)

3.5.2 Economic Order Quantities (EOQ)

Understanding the EOQ is essential to fully understanding quantity discounts and inventory theory. For an item with one unit price and a known recurring demand rate, there exists an EOQ that should be purchased to minimize the life cycle costs of purchasing and holding this item.

In Fig 3.5.2.1, as the quantity purchased increases, the unit cost remains constant, the procurement costs decrease (fewer buys), and the holding costs (storage, theft, obsolescence, cost of money, and disposal costs) increase. The sum of these three sets of costs produces a total cost curve.

The EOQ is the quantity at the minimum cost on the total cost curve. Therefore, inventory systems will recommend that users buy this quantity. For a quantity discounted item, Figure 5 illustrates a set of total cost curves obtained for each range.

As shown in Figure 4.5.2.2, the EOQs of the latter ranges can occur in the earlier ranges, even the first range. The lower unit prices are valid only for purchase quantities within quantity discount Ranges 2 and 3. Thus the EOQs of Ranges 2 and 3 have to be adjusted to the first quantity of their respective ranges. This is the essence of the quantity discount analysis.

As illustrated in Figure 4.5.2.2, an EOQ Analysis Tool that does not handle quantity discounts will always recommend purchase quantity in the first range, regardless of which unit price is used in determining the EOQ.

• Objective: Find the quantity to buy with Minimum Total Cost EOQ

• Total Cost = Purchase Cost + Procurement Cost + Holding Cost

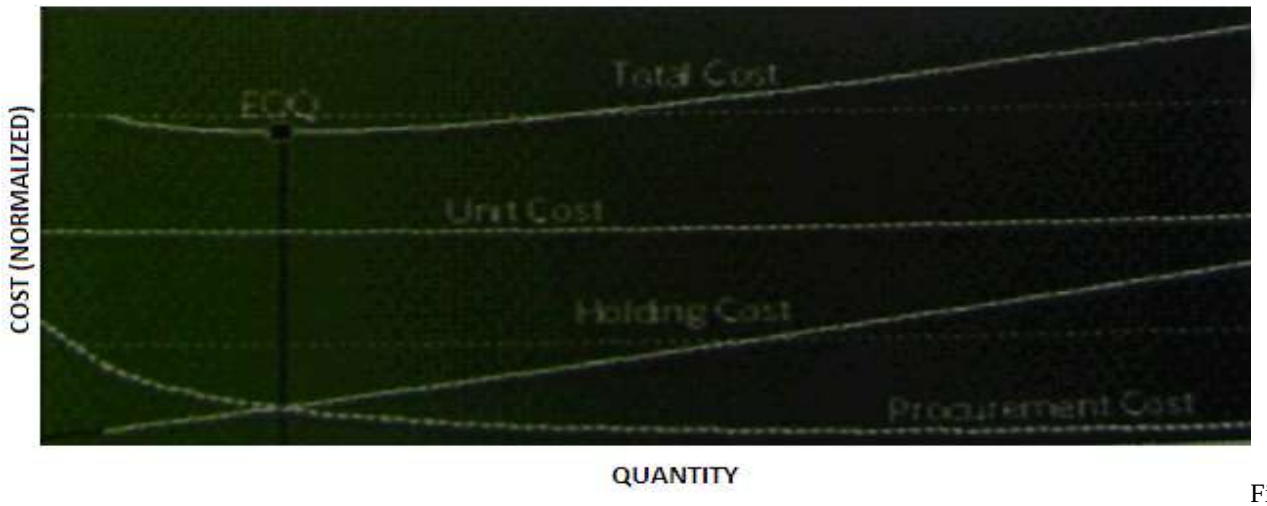

Fig. 3.5.2.1

Economic Order Quantity (EOQ)

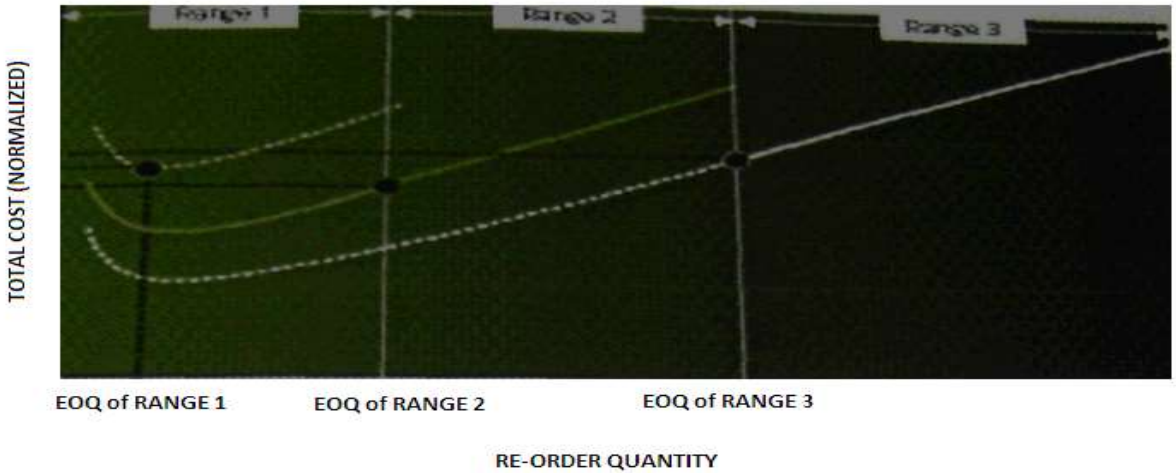

Fig. 3.5.2.2 EOQ with Range Quantity Discount

3.5.3 ABC Analysis:

Maintaining inventory through counting, placing orders, receiving stock, and so on takes personnel time and costs money. When there are limits on these resources, the logical move is to try to use the available resources to control inventory in the most efficient way; to achieve this, an ABC analysis is one way to control the inventory effectively.

The ABC' method can be used for material, purchased parts, subassemblies, component parts, or products, depending on what form of inventory the company usually carries. The procedure for an ABC analysis starts by taking each item cost. This gives the total annual use of items in terms of usage value. If the items are listed in order of decreasing annual usage by value, an item will be at the top of the list and C items will be at the bottom of the list. The unit cost of an item is not the sole determinant of the classification.

Each organization should tailor its inventory system to its own peculiarities. Organizations may choose to group their inventory into more than three classifications, but the principle is the same: high value items receive the most attention and low value items the least.

3.5.3.1 ABC Codes

1. "A class" inventory will typically contain items that account for 80% of total value, or 20% of total items.
2. "B class" inventory will have around 15% of total value, or 30% of total items.
3. "C class" inventory will account for the remaining 5%, or 50% of total items.

The advantages of the ABC system are as follows:

1. It ensures closer control on costly items in which a large amount of capital has been invested.

2. It helps in developing a scientific method of controlling inventories, Clerical costs are reduced and stock is maintained at optimum level.

3. It helps in achieving the main objective of inventory control at minimum cost. The stock turnover rate can be maintained at comparatively higher level through scientific control of inventories.

3.5.4 VED Analysis

VED Analysis can be defined as the analysis of maintenance spares in to

V Items - Items of vital importance,

E Items - Items of essential importance,

D Items - Items of desirable importance.

- Vital importance in the way of indicating the fact that M/c can't run without 'v' Item.

- Essential importance in the sense impart that company can run but without parameters as such efficiency, noise reduction etc.
- Desirable importance in the way denotes company can run but factor of safety, industrial formalities can't be satisfied.

It is the Analysis for monitoring and control of stores and spares inventory by classifying them into 3 categories viz., Vital, Essential and Desirable.

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3.5.5 Material Losses:

Material losses may be in the form of:

1. Waste,
2. Scrap,
3. Defectives and
4. Spoilage

1. Waste - It is defined as discarded substances having no values. In many industries, some waste is inevitable. Such waste may arise due to the inherent nature of materials, chemical reaction, evaporation, drying, sublimation of goods etc. Waste can also be in form of smoke, gas, slag or dust which arises in the course of a manufacturing process. Waste may be invisible or visible. The waste due to drying, evaporation etc is invisible whereas the waste like gas, smoke, slag etc is visible.

2. Scrap - Scrap is discarded material having some values. It represents fragments or remnants of material that are left from certain type of manufacture. It is a material loss but has small value without further processing. Examples of scrap are available in operations like turning, boring, punching, sawing, shavings, molding, etc from metals on which machine operations are carried out; saw dust and training in the timber industry.

There are three types of scrap, namely:

a. Legitimate scrap - It arises due to the nature of operations like turning, boring, punching etc.

b. Administrative scrap - arises due to administrative action, such as, a change in the method of production.

c. Defective scrap - arises because of use of inferior quality of material or bad workmanship or defective machines. Such type of scrap is abnormal because it arises due to abnormal reasons.

3. Defectives - Defective products or units are those which do not meet with dimensional or quality standards and are reworked for rectification of defects by application of material, labour and/or processing and salvaged to the point of either standard product or sub-standard product to be sold as seconds. So defectives are that portion which can be rectified at some extra cost of re-operation. Defectives may arise due to the following reasons:

- Sub - standard materials
- Poor workmanship
- Poor maintenance of machines
- Wrong tool setting
- Faulty design of products
- Bad supervision
- Careless inspection
- Poor working conditions
- Lack of control, such as humidity, furnace temperature etc.

4. Spoilage - Production that does not meet with dimensional or quality standards in such a way that it cannot be rectified economically and is sold for a disposal value. Net Spoilage is the difference between costs accumulated up to the point of rejection and the salvage value.

Spoilage arises due to the sub - standard materials, poor workmanship, faulty tool setting, and poor maintenance of machines, bad supervision and careless inspection.

Spoilage should not be confused with scrap. Scrap arises at the initial stages of the production whereas spoilage takes place towards the finishing production stages with larger loss of added value to the cost of material used.

Overall profit or loss (overall costs of project compared to the money received)

Cost Report for Right Home 1 - Project By RCB						
Sr.No.	Description	Rate	Planned Cost	Actual Cost	Varience	Observations / Recommendations
A	Direct Cost					
	Building	1140	79800000	87780000	10%	Obs : Manpower productivity is low and material wastage is more
						Recom : Proper Control on material and menpower cost shall be kept
B	Development works	145	10150000	10962000	8%	Obs : Material cost incresed due to wastage
						Recom : Wastage Cost shall be controlled properly
C	Amenities	20	1400000	1512000	8%	Obs : Amenities list changed during execution.
	Overall Construction Cost = 1305					Recom: Amenities Finalisation shall be done before starting project
D	Engineering Consultancy Fees	127	8890000	9601200	8%	Obs : Project Cost incresed due to increase in fees.
						Recom : Timely completion shall be ensured.
E	Statutory Expenses					
	PCMC Approval & Premiums (300)	300	21000000	22050000	5%	Obs : Approval costs changed due to change in authority
						Recom : This possibility also shall be considered
F	Overheads	20	1400000	1512000	8%	Obs : Overhead cost increased
	Overall cost including fees and overheads	1752	122640000	133417200		Recom : Control on overhead cost shall be kept.
G	Marketting Expenses (2% on sales price)	50	3500000	3500000		-
	Cum Total	1802	126140000	136917200		
	Overall (loss in profit)			1.085438402	8.54%	
	Cost Increased by	Rs	10777200	1955.96	153.96	Rs /sft

Unit Rates Estimated And Actual							
Basic Rates	Unit	Estimated	Jan	Feb	Mar	Observation	Recommendation
Cement	Bag	275	275	275	247.5	Reduced 10%	Shall be considered in estimation and if possible advantage shall be taken
Steel	Kg	40	40	40	36		
CLC blocks	No	52	52	52	46.8		
Red Brick	No	5.5	5.5	5.5	4.95		
Cr. Sand	Br	3150	3150	3150	2835		
River Sand	Br	6000	6000	6000	5400		
Metal 1/2" & 3/4"	Br	2600	2600	2600	2340		
Gypsum 25kg	Bag	185	185	185	166.5		
Door Frame	No	4000	4000	4000	3600		
Alu Window	Sft	225	225	225	202.5		
Vitrified Tile	Sft	55	55	55	49.5		
Green Marble	Sft	40	40	40	36		
Toilet Tile	Sft	50	50	50	45		
Kit Otta	Sft	1800	1800	1800	1620		
Checkered Tile	Sft	40	40	40	36		
Skin Door Shtr	Sft	150	150	150	135		
Basic Labour Rates Comparision							
RCC	Sft	165	165	165	165	Stable	No price escalation will be there
BBM / PLA / TXT	Sft	65	65	65	65		
Gypsum Putty (M+L)	Sft	50	50	50	50		
Wproof	Sft	9	9	9	9		
Carpentery	Sft	3.2	3.2	3.2	3.2		
Tiling + K ota (M+L)	Sft	70	70	70	70		
Painting (M+L0	Sft	50	50	50	50		
Electrical (M+L)	Sft	75	75	75	75		

Ideal Profit or loss based on Progress payment								
Sr. No	Particulars	Sft	Rate	Amount	Rate	Amount	Standard	Progress
1	1st slab	5000	165	825000	110	550000	825000	550000
2	2nd slab	5000	165	825000	120	600000	1650000	1150000
3	3rd slab	5000	165	825000	130	650000	2475000	1800000
4	4th slab	5000	165	825000	140	700000	3300000	2500000
5	5th slab	5000	165	825000	150	750000	4125000	3250000
6	6th slab	5000	165	825000	160	800000	4950000	4050000

7	7th slab	5000	165	825000	170	850000	5775000	4900000
8	8th salb	5000	165	825000	180	900000	6600000	5800000
9	9th slab	5000	165	825000	190	950000	7425000	6750000
10	10th slab	5000	165	825000	200	1000000	8250000	7750000
11	11th salb	5000	165	825000	210	1050000	9075000	8800000
12	12th slab	5000	165	825000	210	1050000	9075000	9850000
13	LMR & Elevations	2000	165	330000	190	380000	9900000	10230000
				10230000		10230000	10230000	

CLIENT NAME	ADITYA ENTERPRISES												
PROJECT NAME	ADITYA RESIDENCY												
PROJECT DETAILS	BUILDING (G+11)												
DATE	15/08/2015	RIVISION	R0	RIVISION DETAILS									
NOTES													
	Costing is as per current market rates												
	Rate Analysis with standard material consumption												
I	Slab Area	57,000.00	Sft	Rs.	1,229	Per/Sft		Reinforcement	2.4	Kg/Sft	on slab area		
II	Builtup Area	52,440.00	Sft	Rs.	1,336	Per/Sft							
III	Saleable Area	45,600.00	Sft	Rs.	1,536	Per/Sft		Reinforcement	3	Kg/Sft	on saleable area		

SN	ITEM DESCRIPTION	AMOUNT	RATE / SFT	%	REMARK	NOTES & DETAILS	MATERIAL COST		LABOUR COST		OVERHEADS	
							AMOUNT	RATE / SFT	AMOUNT	RATE / SFT	AMOUNT	RATE / SFT
		[Rs.]	[Rs.]				[Rs.]	[Rs.]	[Rs.]	[Rs.]	[Rs.]	[Rs.]
A	EARTH WORK	748,829	16	1.28%		[Material + Labour]- Separate	89,631	2	509,436	11	149,806	3
B	CONCRETE & REINFORCEMENT WORK	16,409,745	360	28.11%		[Material + Labour]- Separate	8,795,793	193	5,415,000	119	2,198,949	48
C	MASONARY & PLASTERING WORK	7,523,132	165	12.89%		[Material + Labour]- Separate	3,920,866	86	2,622,000	58	980,218	22

D	POP & GYPSUM PLASTER WORK	-	-	0.00%		[Material + Labour]- Separate	-	-	-	-	-	-
E	FALSE CEILING WORK	-	-	0.00%		[Labour with Material]- Contract	-	-	-	-	-	-
F	WATERPROOFING WORK	1,778,958	39	3.05%		[Material + Labour]- Separate	1,043,610	23	379,559	8	355,792	8
G	FLOORING & TILING WORK	6,938,247	152	11.88%		[Material + Labour]- Separate	3,997,081	88	1,552,932	34	1,389,070	30
H	DOOR- WOODEN WORK	1,454,375	32	2.49%		[Labour with Material]- Contract	-	-	1,163,500	26	290,875	6
I	WINDOWS WORK	1,163,968	26	1.99%		[Labour with Material]- Contract	-	-	931,174	20	232,794	5
J	GLAZING & CLADDING WORK	1,750,531	38	3.00%		[Labour with Material]- Contract	-	-	1,400,425	31	350,107	8

K	MS GRILL MISCE FABRI
L	PLUM
M	ELECT
N	PAINT
O	OTHE MISCE WORK
P	AMEN DEVEL WORK
TOTAL-[+LABOU	

Cost Control and Cost Reduction

Sr. No	Item	Affordable	Std	Luxurious
A	PLANNING	77	77	26
B	STRUCTURAL / CIVIL	100	63	
C	FINISHING	47.9	37.3	5.6
D	CARPENTERY	10.5	3.1	
E	WINDOWS / RAILING	19.5	10.5	2.5
F	PLUMBING	10.5	3.9	
G	ELECTRICAL	9.5	2.2	
H	SERVICES	24.5	7	
I	PAINTING	10.3	5.7	

Add fo conting	J	MISC	9	9	9	
Add fo & adm	K	LABOUR				
Add Consul Archite Structu Plumbi Electri	L	DEVELOPMENT	20.2	1.5		
		TOTAL (Rs)	339	220	43	
Add f Service						
Add for Municipality / MSEB / Govt. Charges	1%	583,864	13			
Add for Marketing Expenses & Advertisement Charges	5%	2,919,319	64			
NET ESTIMATED BLD.COST [MATERIAL +LABOUR+OVERHEAD]		70,063,653	256			

4.1 The Nature and Importance of Control

Controlling entails measuring event completion against plans and correcting variations to ensure that goals are met as planned. Once the plans are operational, control is required to assess progress, identify plant deviations, and advise corrective measures. "Control," according to Fayol, "consists in verifying whether everything occurs in accordance with the adapted plan, the instructions issued, and the established principles." Its goal is to identify flaws and faults so that they may be fixed and avoided in the future. It is based on things, people, and action. According to Goetz, "managerial control seeks to compel events to confirm to a plan. "The best control anticipates deviation and prevents it from happening unless action is done immediately. This is known as "Forward looking" control. In this manner, it is the role of controlling to cause the desired to occur.

4.2 Management Control System Principles

Control is an administrative role. It is the job of each manager to establish and implement controls in an effective and efficient manner. Now, the most direct type of control is used to ensure the quality of managers, implying that many deviations from the plan will not occur if the firm is efficiently managed. All gadgets that have historically been thought of as control tools are indirect. They are predicated on the notion that humans make errors. Controlling performance via manager quality control is direct because it is based on the premise that competent managers make fewer errors and so do not need as much indirect management. This direct control is more appealing to all parties concerned in the enterprise's and society's overall destiny.

4.3 Basic Steps in Controlling Process:

The following three essential characteristics or stages are found in control procedures, regardless of what is being regulated.

4.3.1 Standards: Specific standards have been developed against which actual outcomes may be assessed. They reflect the representation of the enterprise's or department's planning objectives in such a way that the actual execution of assigned responsibilities can be compared against them. Standards may be both concrete and intangible. It is quite simple to compare performance to concrete norms.

4.3.2 Evaluation: This involves basically measuring and evaluating the work in relation to the predetermined standards and communicating the variances to persons who search for reasons for deviation and have authority to develop a programme of correction and its implementation. According to Taylor, the manager should give detailed attention mainly to the unusual or exceptional items. The exceptional items are those matters where the performance significantly deviates from the standards.

A report on exception not only enables a manager to concentrate his energy and time on problem areas but also prevents the problem of information indigestion.

4.3.3 Corrective action: The corrective action is needed when the control reports indicate deviations of performance from plan. The payoff comes when corrective action is taken. Plan modifications might be part of the remedial action. The new plans may entail organizational changes, changes in personnel, changes in direction, and, if necessary, the development of fresh norms for controlling the process.

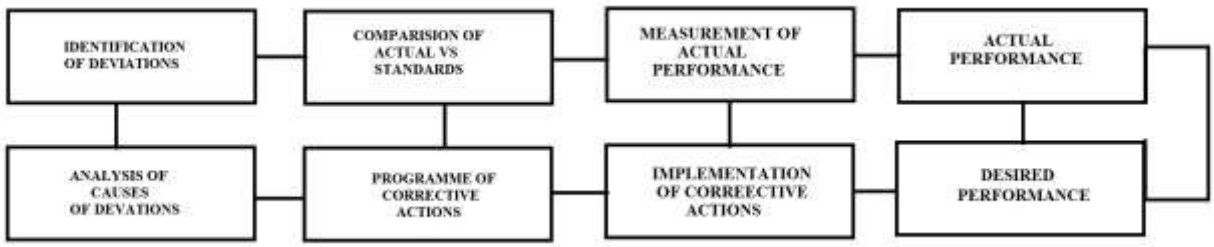


Fig. 4.3.3. Feedback Loop of Management Control

The controlling process has been divided into five stages:

- The preparation of a plan that will achieve the work's objective
- The recording of the plan, preferably formally, in terms of the inputs or outputs from the systems or both
- The definition of the quantities and the organization of the resources that will be required for the conversion of the inputs into outputs
- The use of feedback to compare what is happening in practise with what was planned

4.4 System Approach - An Overview

The system method may be characterized as a logical and disciplined problem-solving process; the term "process" refers to an active continuing system that is fed by input from its components. The system approach

- A process examination of the interrelationships of several subsystems
- Dynamic process that combines all operations into a meaningful whole system
- Looks for an alternative answer or strategy in issue solving

The system analysis method, as shown in fig, starts with a systematic assessment and comparison of this alternative action in relation to the achievement of the target. The options are then weighed against one another in terms of resource cost and benefit. The loop is then completed with feedback to establish how compatible each choice is with the organization's goal. The above analysis may be translated into the following phases.

- Enter data into mental process
- Analyse data
- Evaluate outcome and evaluate options take action
- Measure outcomes and compare them to predictions

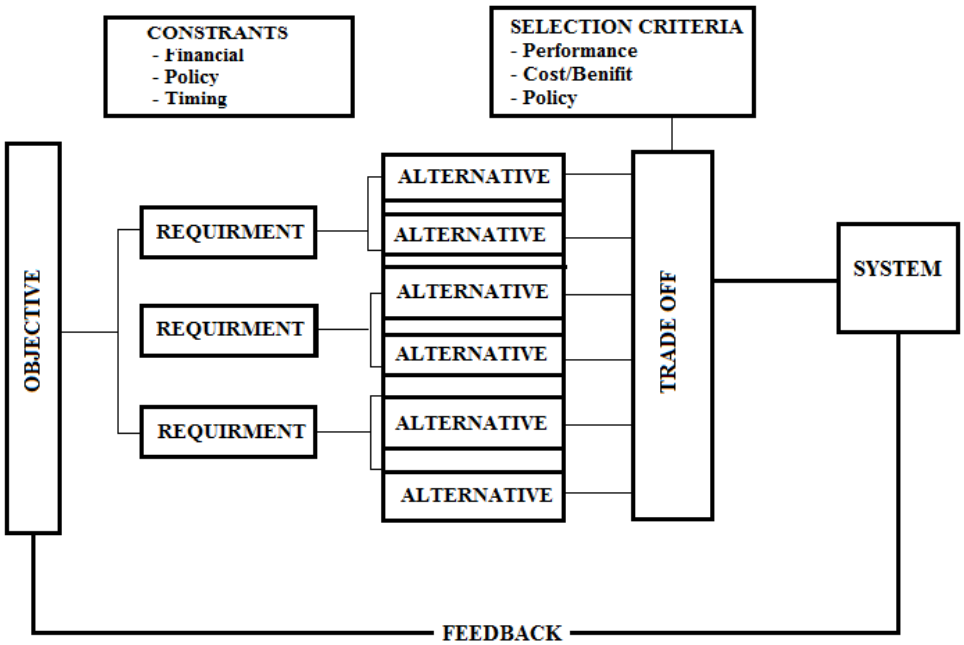


Fig. 4.4 System Approach

4.5 Management Information and Control System

"A management information system is a system that collects, processes, and communicates specific data in order to support decision-making by those responsible for resource management by providing accurate and relevant information about these at the appropriate time."

In order to maintain the output of the system at appropriate levels of quantity and quality a form of control is required. A genuine endeavour to establish the system boundary is required for this, which will allow the manager to describe more clearly the goals of a system and of each component of the system.

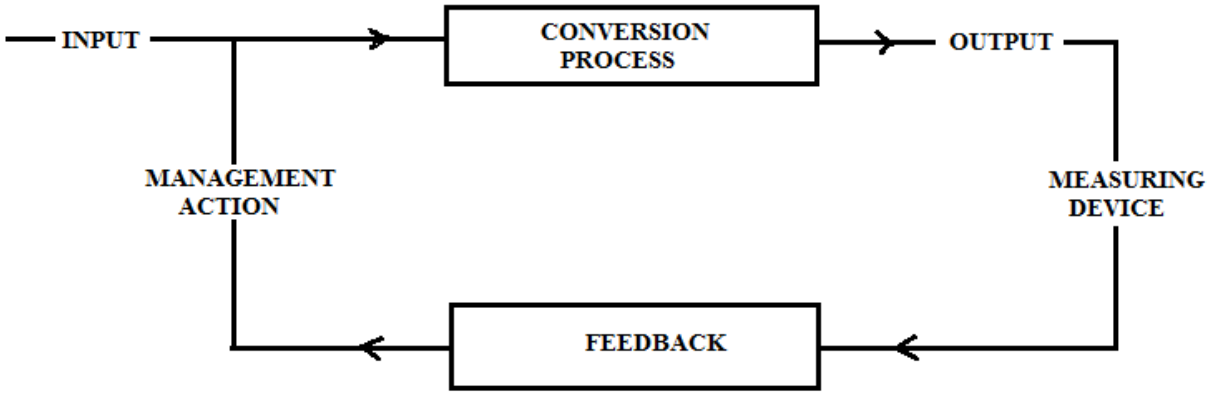


Fig. 4.5.

Management Control System

To control management, data must be offered as feedback in order to create the foundation for decision making.

5.1 The management process

In order to apply the principles of technical economics, it is required to first get an understanding of the management process of decision making, including its broad features and the typical order in which its constituent pieces will be carried out.

Having determined the enterprise's objectives, it will be possible to produce a broad plan for the future perhaps for a period of approximately five years, in which the details of the nature and size of the company's operations will be laid down the resources of labour, equipment and capital that will be made available to support the operations will be established and. as the third aspect of

the process, there will be a schedule of the major capital investments that the company anticipates making for this period of the plan. In some cases there may be commitment to research and development work and other service aspects of the company's operations and therefore, the investment in resources related to this work would also need to be included.

There are four fundamental control principles:

• Ensure achievement of enterprise objectives by identifying deviations from the plan early enough for corrective action to be taken.

• The cost of implementing a control system must be less than the cost savings realised as a result of its implementation.

• Managers must have the authority to implement their plans within their areas of responsibility in order to achieve the goals assigned to them.

• A system of control must permit immediate action on the first indication (feedback) that an activity has deviated from the predetermined plan, so that the activity can be brought back on track.

The next step is to establish a reliable cost control system that adheres to the three cost control tenets. The first forts concept will be implemented in the system, which is to create a realistic initial estimate and then decide how to divide it up among the building's pieces. In other cases, the customer may ask the design team to provide an estimate, which will serve as the cost cap once approved. Here, we examine the prices of comparable structures by taking into account a) The site's topography and climate, b) The size and quality of the available space, and c) The criteria to which such buildings adhere.

The location of site greatly influences the ultimate cost of the building. The variation in cost is often caused due to varying approaches to site/influences of climate. Availability of the building materials and distance of the market, codes and construction radices, availability of water, electricity, sewage system, public transportation, cost of adequate parking. Different soil condition will involve different type of foundation, which is required to be accounted for.

5.2 Value engineering

The major concern of designers is to produce a construction project based on practiced standards and codes, which will perform the function required by the owner outlined in a design brief. The philosophy of value engineering is to take this design to review the system from a point of view of value to the owner. It introduces a systematic analysis, which identifies the function of various elements of a project and seeks to satisfy this function at the lowest total cost without undermining performance. Once the function is determined, value can be attached to this function by comparison to what similar operations or elements have cost before, or cost elsewhere, even in other types of construction.

6.1 Introduction

The results of analyzing the questionnaire sent to businesses are reported in this chapter. The main points of this chapter are the contractor's approach to cost management throughout construction and the difficulties the contractor has in doing so. The contractor is the only professional type to be considered in this evaluation.

6.2 Narrative of the data required

Responses from each group are shown in Table 7.1 below. Only 19 of the 127 questionnaire recipients provided feedback. In this scenario, that equates to 14.96% of the population taking part.

Table7.1: Breakdown of various groups responding

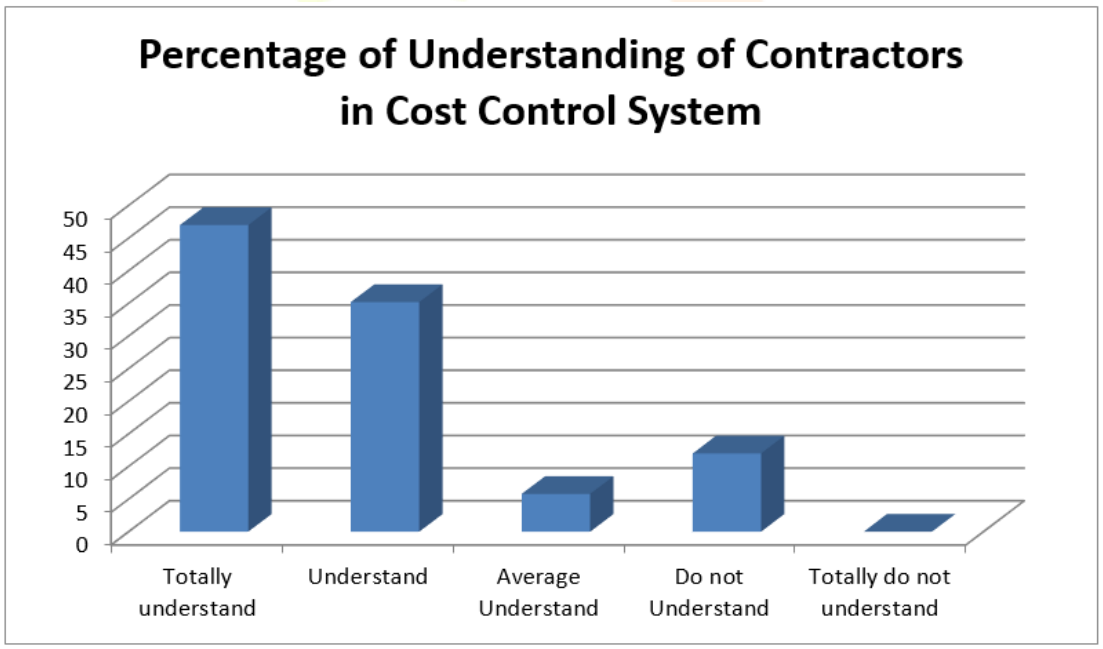
Sources : Questionnaire

Group	Number of Respondents	Percentage (%)
Developer	1	05.00
Contractor	17	90.00
Consultant	1	05.00
Sub Contractor	0	0
Total	**19**	**100**

Table 6.1 shows that there is only one developer (0.5% of total respondents), seventeen contractors (90% of total respondents), one consultant (0.5%), and no subcontractors (0% of total respondents).

6.3 Cost Control in Construction: A Contractor's Perspective

For the sake of data analysis, contractors might be categorised as having a complete comprehension, an intermediate understanding, a limited understanding, or no understanding at all. Two contractors do not understand the cost control system (12.0% of total contractors) and no contractors do not understand the cost control system at all. Eight contractors understand the cost control system (47.0% of total contractors), six contractors averagely understand the cost control system (35.2% of total contractors), one contractor averagely understands the cost control system (5.7%).



Graph 6.3 The proportion of contractors that have a firm grasp of the building industry's cost management system.

Source: Questionnaire

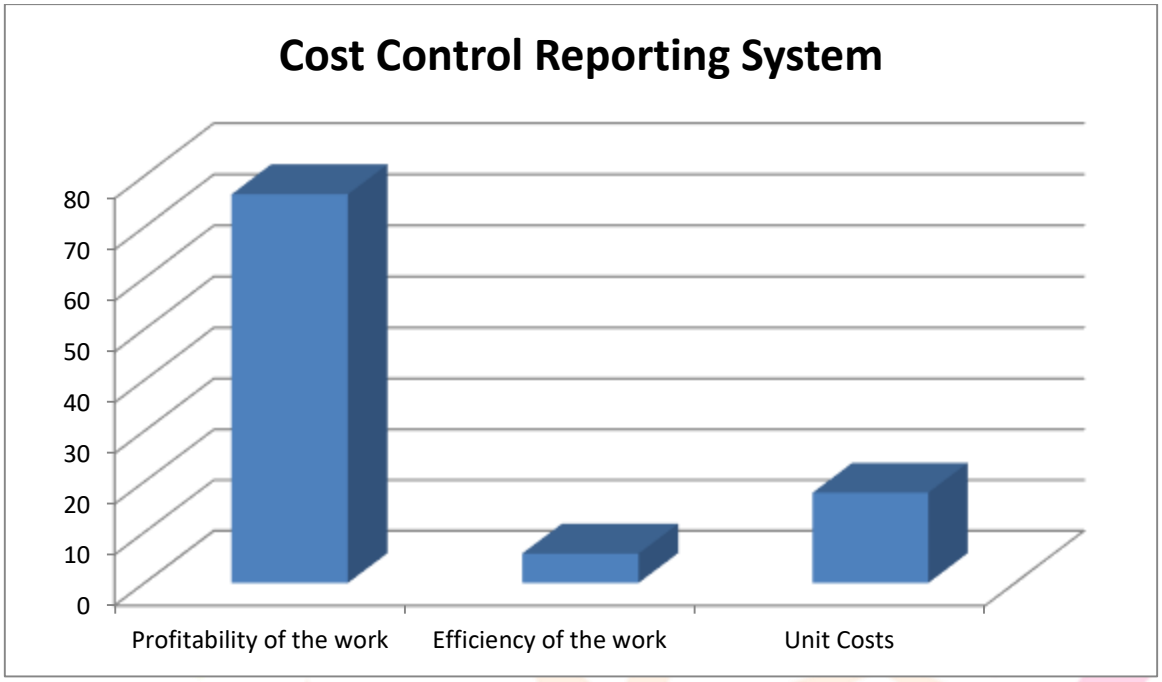
6.4 Cost Control Reporting System used by the Contractors

There are three categories of cost control reporting systems used by the contractors for data analysis; they are:

• Profitability of the work (Comparing total expenditure with values of the work done).

• Effectiveness of the work (Comparing established standards to output rates).

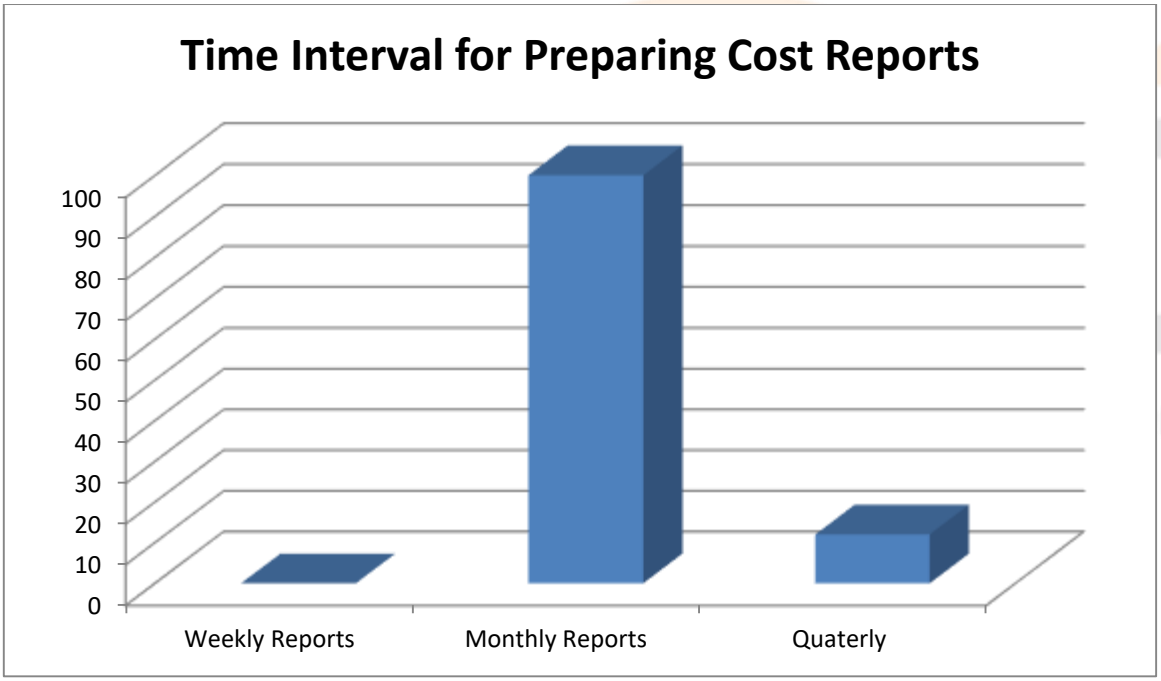
• Unit expenditures (direct expenditures for one unit or measurement operation).There are 13 contractors using the profitability of work as the cost control Reporting System (76.40%), 1 contractor using the efficiency of work as the cost control Reporting System (5.70% of Total Contractors), and 3 contractors using the unit cost system as the cost control Reporting System (17.80%). Graph 7.2 depicts the percentage of cost reporting system types utilised by contractors.



Graph 6.2 The percentages of the types of cost control reporting system used by the contractors.

6.5 The interval time of contractors to prepare the cost reports

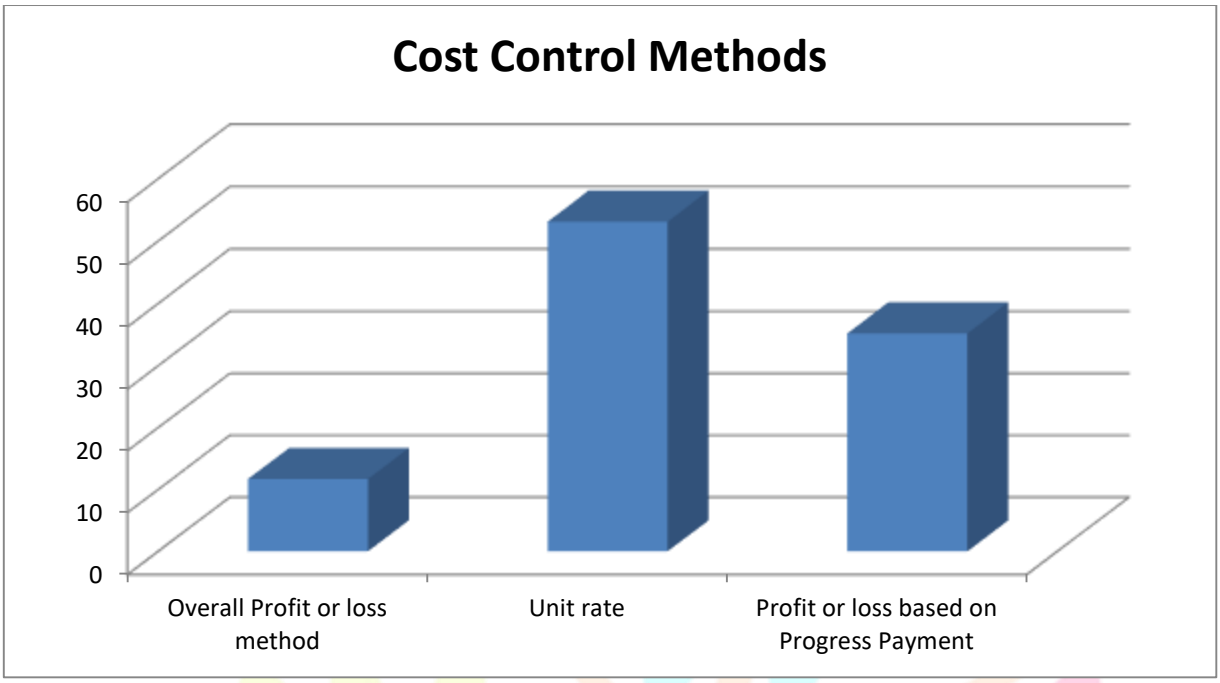
Weekly, monthly, and quarterly cost reports are prepared by the contractors for data analysis. There are no contractors who create weekly cost reports; 17 contractors (or 100% of contractors) prepare monthly cost reports; and 2 contractors (or 12% of contractors) prepare cost reports both monthly and quarterly. Contractors spend this proportion of the interval time on preparing their cost reports (Graph 7.3).



Graph 6.3 The percentages of the interval time during which contractors prepare their cost reports

Source : Questionnaire

Of the entire number of contractors, 11.7 percent utilise a modest level of Overall Profit or loss, while 9 percent use Unit Rates. Six of the contractors (or 53.1% of the total) most often use Profit or loss based on Progress Payment. None of the regular contractors (35.2 percent) are not fully using any of the cost control approaches. Graph 7.4 displays the prevalence of different approaches to cost management among contractors.



Graph 6.4 The percentages of Contractors using different Cost Control Methods

Table 7.2 : The Relative Index and ranking of main problems in controlling the costs on site.

Problems faced by contractors class F in controlling costs in site	No. of respondents in Ordinance Scale						Relative Index (RI)	Rank
	1	2	3	4	5	6		
Ever-changing environment of construction work	0	6	2	4	1	4	0.604	3
Duration of the project	4	1	2	2	4	4	0.646	5
Qualified expertise	2	4	2	1	4	4	0.625	4
Additional costs to carry out the system	0	2	6	2	4	3	0.646	6
Difficulty in collection of standard data	2	4	4	4	2	1	0.500	2
Shortages of material, labor or mechanical plants	8	0	1	4	2	2	0.479	1

8.1 Introduction

Interviews and questionnaires serve as the primary source for achieving the objectives. Additionally, literature review aids in achieving the objectives. Chapter 7 explains data analysis using relative index and frequency analysis.Overall, the study's objectives were accomplished. The accomplished objectives are as follows:

a) To examine the method of cost management in construction projects.

b) Identify the common method of cost management employed by contractors during the construction phase.

c) Determine the primary challenge contractors confront in regulating costs on the job site.

The method of cost control in a construction project was investigated through a literature review. Using questionnaires, the control method frequently employed by contractors during the construction phase and the primary problem encountered by contractors in regulating costs on site were resolved.

8.2 DiscussionEach objective was attained based on the findings of the investigation. These are the conclusions that can be drawn from the research:

Objective 1: The construction project expense control method

According to the study, there are three categories of contractor cost control methods: a) comparison with a cost standard, b) subdivision by detail, and c) integration with other functions.The primary purpose of cost management is to minimise and reduce project expenses. Cost management is essential for all varieties and sizes of projects. Most neighbourhood contractors have their own cost management system.

Objective 2: Method commonly used by contractors for cost management

According to the study, the three most common cost control methods employed by contractors are: a) Overall profit or loss (total project costs compared to money received); b) Unit rates (compare actual unit rate to estimated unit rate); and c) Profit or loss based on progress payment.

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