

Project Cost Management

PMG 213

Lecture 6

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*Cost Budgeting, Control and
Reporting*



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Cost Budgeting, Control and Reporting :

1. Overhead costs
2. Standard costs and budgeting
3. Joint Costs
4. Job Order and Process Costing
5. Cost control
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Cost Budgeting, Control and Reporting :

First: Overhead Costs:

Overhead is considered one of the most tedious problems of cost accounting. Accumulated overhead costs are allocated in stages. First the overhead costs are allocated to the cost centers and in turn are allocated to job order costs and process costs. With a large number of indirect cost classifications and a large number of cost centers, the computations can be voluminous.

Cost engineers must recognize that the cost data that emerge from these calculations are affected significantly by the measures used for allocation, and they should understand fully the techniques used for the allocation. A basis must be selected to allocate the costs fairly. Consider building maintenance as an example.

Measurement can be made on the basis of square feet and allocated on the basis of floor space occupied by each cost center. In turn, cost centers must have a measure to allocate this overhead, which might be **labor hours, machine hours, material, and so on.**

A simple illustration will show how **overhead is applied to an individual job at a cost center with allocation based on labor dollars**. Thus job **504** would be allocated \$4000 of the total overhead of **\$50,000** for cost center A.

Overhead for cost center A	\$50,000
Estimated total direct labor cost	\$25,000
Burden rate (\$50,000/\$25,000)	2
for each direct labor dollar	
Direct labor cost for job 504	\$2,000
Applied overhead: \$2000 × 2	\$4,000

Overhead is allocated using a base measure (e.g., labor dollars, hours) to find a "**burden rate**"

Example Case:

Total Overhead for Cost Center B = \$80,000

Estimated Total Direct Labor Cost = \$40,000

Burden Rate Calculation: $\text{Burden Rate} = \text{Total Overhead} / \text{Direct Labor Cost} =$

$\$80,000 / \$40,000 = \mathbf{2.0}$

Meaning: For every \$1 of direct labor, apply \$2 of overhead

If Job **702** has a direct labor cost of \$3,500, its applied overhead is

$\text{Applied Overhead} = \$3,500 * 2 = \mathbf{\$7,000}$

Allocating overhead based on actual data has two distinct disadvantages:

(1) it is complicated, and (2) the information is not timely. Units made at the beginning of a month cannot be priced out until the end of the month when actual data become known, and use of actual overhead cost is subject to fluctuation from period to period for such items as taxes, which may occur only once a year.

A shortcut method, called an estimated burden rate, has been devised. Managers predict an amount for the overhead cost for a fixed period, usually a year, and determine the measure or basis for charging a job or product for its appropriate share of the overhead cost. **Direct labor** has been used most widely for this basis.

A rate can be established by dividing total estimated overhead cost by the estimated quantity of the selected basis, which becomes the burden rate.

These are estimated amounts and variances will occur. The variances should be reviewed periodically and adjusted accordingly.

The advantages of the estimated burden rate method are:

(1) savings of time, and (2) increased possibility of obtaining better data for determination of operating efficiency.

A factory estimates annual overhead at \$120,000 and total machine hours at 30,000 hours

Question: What is the estimated burden rate per machine hour? If Job X uses 150 machine hours, how much overhead is applied?

Calculation: Burden Rate = $\$120,000 / 30,000 \text{ hours} = \$4 \text{ per machine hour}$

Applied Overhead = $150 \text{ hours} * \$4 = \600 .

Second: Standard Costs and budgeting:

Standard costs and budgets are not identical. Standard costs usually refer to a unit of production, and budget to a total concept like a department. In a sense the standard is the budget for 1 unit of production.

The purposes of standard costs are:

- To build a budget and feedback system
- To aid in management predictions
- To save in bookkeeping cost
- To aid in cash flow forecasting

Standard costs are determined with scientific techniques and objective quantity measurements. The costs developed do not necessarily represent expected performance but rather, desired objectives.

Standard costs are merely references to which actual costs are compared. The variances are used in management reports as a valuable tool to highlight areas of good and poor performance. For example, consider a manufacturer producing 10,000 heavy ashtrays. Standards are developed for direct materials and direct labor. The standards based on historical data are:

4 lb at \$10/lb = \$40/unit

2 hr at \$16/hr = \$32/unit

Direct material standard cost

Direct labor standard cost

Example Case: For 1 unit of a manufactured component:

Direct Material Standard: $5 \text{ lbs} * \$12/\text{lb} = \$60/\text{unit}$, Engineers determine that exactly 5 pounds (lbs) of raw material should be used to make 1 unit, Purchasing managers determine the material should cost \$12 per pound. **Result:** standard cost for materials inside one unit is \$60.

Direct Labor Standard: $3 \text{ hours} * \$20/\text{hr} = \60 unit , Industrial engineers determine it should take exactly 3 hours of labor to assemble 1 unit. HR determines the standard wage rate is \$20 per hour. **Result:** standard cost for labor inside one unit is \$60.

Budget cost of work scheduled (BCWS): the sum of the budgets for work scheduled to be accomplished (including work-in-process), plus the appropriate portion of the budgets for level of effort and apportioned effort for the relevant time period.

Budgeting: A process used to allocate the estimated cost of resources into cost accounts (i.e., the cost budget) against which cost performance will be measured and assessed. Budgeting often considers time-phasing in relation to a schedule and/or time-based financial requirements and constraints.



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Budget: a planned allocation of resources. The planned cost of needed materials is usually subdivided into quantity required and unit cost. The planned cost of labor is usually subdivided into the workhours required and the wage rate (plus fringe benefits and taxes).

Budget cost of work performed (BCWP): the sum of the budgets for completed portions of in-process work, plus the appropriate portion of the budget for level of effort and apportioned effort for the relevant time period BCWP is commonly referred to as “earned value.”



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For a budget of 10,000 units, the budget for materials becomes \$400,000 and for labor \$320,000.

After a run of 10,000 units, the following data are compiled:

Good units produced	10,000
Direct material costs	\$540,000
Pounds of input	50,000
Material price per pound	\$10.80
Direct labor costs	\$343,200
Hours of input	22,000
Labor price per hour	\$15.60

Budget variances are determined as follows (F indicates favorable; U indicates unfavorable):

	Total actual costs	Budget total standard costs	Budget variance
Direct materials	\$540,000	\$400,000	\$140,000 U
Direct labor	343,200	320,000	23,200 U

The variance for materials is \$140,000 unfavorable, and for labor it is \$23,200 unfavorable.

The variances can be traced in more detail. The \$140,000 unfavorable variance for material arose as follows:

Difference in quantity at \$10 standard (50,000 lbs against 40,000 lbs)	\$100,000 U
Difference in price for 50,000 lb (10.8 actual -10 standard)*50000 lb	40,000 U
Total material variance	\$140,000 U

The \$23,600 unfavorable variance for labor arose as follows:

Difference in hours at \$16 standard (22,000 hrs against 20,000 hrs)	\$32,000 U
Difference in labor rate for 22,000 hr (\$15,60/hr against \$16/hr)	8,800 F
Total labor variance	\$23,200 U

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Note that the unfavorable total labor variance is the sum of an unfavorable workhour overrun and a favorable labor rate.

Without the standard cost, analysis is meaningful only if standards are kept current and only if actual data are recorded accurately.

Close coordination and cooperation is required between the accountants and the engineers.

The budget is set for 5,000 units.

Standard Material Budget = 5,000 * \$60 = \$300,000.

Standard Labor Budget = 5,000 * \$60 = \$300,000.

Actual Results Compiled: Units Produced = 5,000 units

Actual Material Cost = \$380,000 (using 28,000 lbs at \$13.57/lb).

Actual Labor Cost = \$294,000 (using 14,000 hours at \$21/hr)

Overall Budget Variances:

Material Variance = Actual - Budget = \$380,000 - \$300,000 = \$80,000 **Unfavorable (U)**

Labor Variance = Actual - Budget = \$294,000 - \$300,000 = -\$6,000 **Favorable (F)**

Material Quantity Variance: Difference in quantity valued at the standard price.

Standard Quantity allowed = 5,000 units * 5 lbs = 25,000 lbs,

Quantity Variance = (act 28,000 lbs – std 25,000 lbs) * \$12 Std. Price = **\$36,000 (U)**

Material Price Variance: Difference in price for actual quantity purchased

Price Variance = (\$13.57 act Price - \$12.00 std Price) * 28,000 lbs Act = **\$44,000 (U).**

Check: \$36,000 (U) + \$44,000 (U) = \$80,000 (U)

Labor Efficiency (Hours) Variance: Difference in hours at standard rate

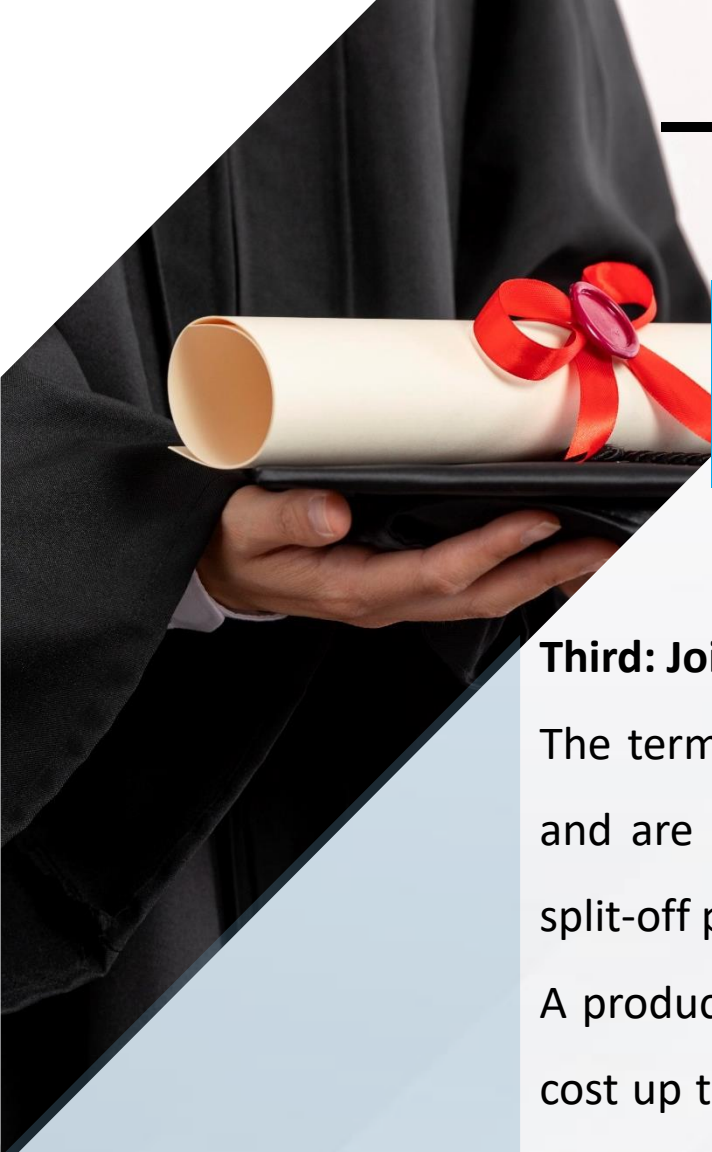
Standard Hours allowed = 5,000 units * 3 hours = 15,000 hours

Efficiency Variance = (14,000 Act. Hrs - 15,000 Std. Hrs) * \$20 Std. Rate = -\$20,000 (F)

Labor Rate Variance: Difference in pay rate for actual hours worked

Rate Variance = (\$21 Act. Rate} - \$20 Std. Rate) * 14,000 Act. Hrs = \$14,000 (U)

Check: -\$20,000 (F) + \$14,000 (U) = -\$6,000 (F)



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Third: Joint Costs

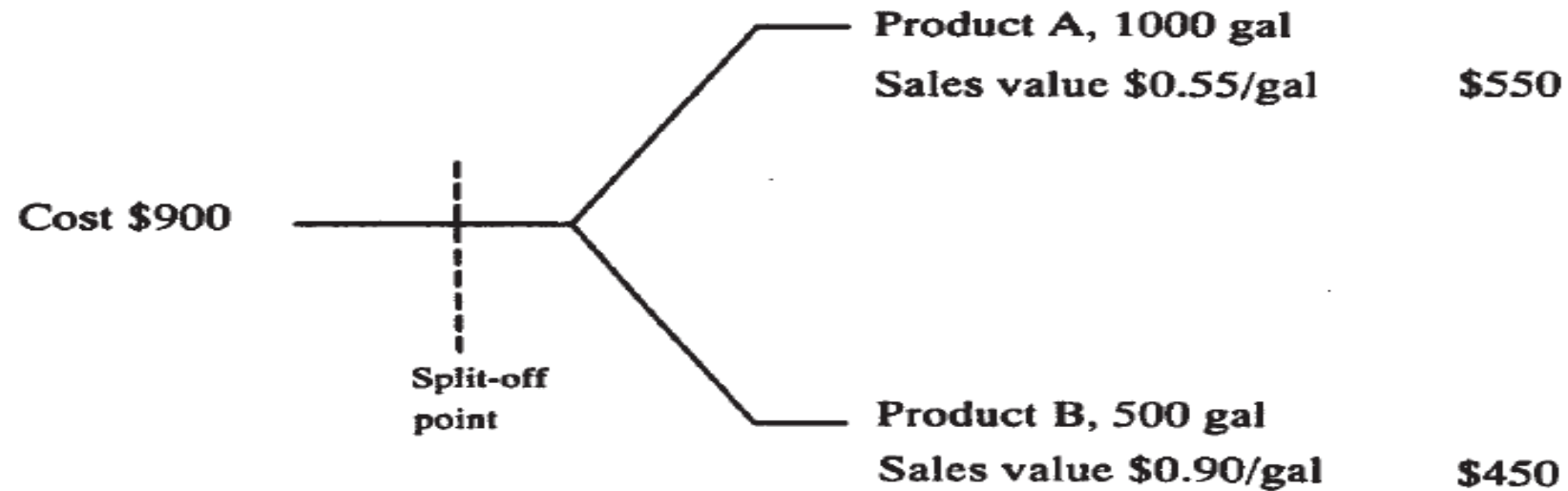
The term *joint costs* applies to two or more kinds of products that are produced simultaneously and are not identifiable as individual types of products until a certain stage of production, the split-off point, is reached.

A product for which there is little or no demand is called a by-product. Joint costs are combined cost up to the point of separation. Since joint costs cannot be traced directly to units worked, the apportioning of the costs to various units of production has to be arbitrary. Joint cost distribution is limited to purposes of **inventory costing and income measurement**.

There are two basic approaches for distributing the cost to various products:

(1) physical measures, and (2) net realizable value (relative sales value method).

Example 2.1 Consider the following flowsheet:



Both of these products become finished goods at the split-off point. Let the \$900 cost up to the split-off point be allocated on the basis of the physical measure gallons. For \$900 to be spread over 1500 gal total, the cost per gallon is \$0.60, and the allocation becomes:

Product	Production	Cost assigned
A	1000 gal	$1000 \times 0.60 = \$600$
B	500 gal	$500 \times 0.60 = 300$
		\$900

The income statement becomes:

		A		B	Total
Sales	900 gal	\$495	450 gal	\$405	\$900
Production cost	1000 gal	600	500 gal	300	900
Less inventory	100 gal	60	50 gal	30	90
Cost of sales	900 gal	\$540	450 gal	\$270	\$810
Margin		(\$45)		\$135	\$90
Margin percentages:		$\frac{45}{495} = -9.1\%$		$\frac{135}{405} = 33.3\%$	$\frac{90}{900} = 10\%$

There is a loss for A and a profit for B.

Now consider an allocation based on net realizable value.

Product	Net realizable value	Weighting	Cost assigned
A	\$550	$(550/1000) \times 900$	\$495
B	<u>450</u>	$(450/1000) \times 900$	<u>405</u>
	\$1000		\$900

The income statement becomes:

	A	B	Total
Sales	\$495	\$405	\$900
Product cost	495	405	900
Less inventory	<u>49.5</u>	<u>40.5</u>	<u>90</u>
Cost of sales	\$445.5	\$364.5	\$810
Margin	\$49.5	\$40.5	\$90
Margin percentages:	$\frac{49.5}{495} = 10\%$	$\frac{40.5}{405} = 10\%$	$\frac{90}{900} = 10\%$

Now A and B both show the identical margin percentage of 10%.

Cost engineers must be aware of the dangers associated with cost allocations for joint products, since the allocation can have a decisive impact on the cost data and on subsequent decision-making.



Base Data: Joint cost up to split-off point = **\$1,200**

Product A: 800 gallons | Sales Value = \$1.00/gal (Total = **\$800**)

Product B: 400 gallons | Sales Value = \$2.00/gal (Total = **\$800**)

Total Gallons = **1,200 gal** Total Market Value = **\$1,600**

Method 1 — Physical Measures (Gallons)

Cost assigned per gallon = $\$1,200 \text{ Joint Cost} / 1,200 \text{ Total Gallons} = \1.00 gallon

Cost Assigned to Product A: $800 \text{ gal} * \$1.00 = \800 .

Cost Assigned to Product B: $400 \text{ gal} * \$1.00 = \400 .

Method 2 — Net Realizable Value (Relative Sales Value)

Weighting for Product A: $\$800 \text{ Value} / \$1,600 \text{ Total Value} = 50\%$.

Weighting for Product B: $\$800 \text{ Value} / \$1,600 \text{ Total Value} = 50\%$.

Cost Assigned to Product A: $50\% * \$1,200 = \600 .

Cost Assigned to Product B: $50\% * \$1,200 = \600 .

Lecture 6**Fourth: Job Order and Process Costing:**

The two basic types of accounting techniques for accumulating production costs are:

(1) job order costing, and (2) process costing. In job order costing the production cycle and the cost cycle are of equal length.

Job order costing is used for specialized production jobs for which costs can be recorded accurately, but for which considerable work is involved. Job orders can be issued for individual customers or for stock items.



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Process costing is used for continuous process industries which operate 24 hours per day, such as chemical, steel, and so forth. The production cycle continues without interruption while the cost cycle is cut off for each accounting period to determine the result of operations. Process costs use averages and are less accurate than job order costs, but they are simpler and cheaper to operate.

The method is applicable to mass-production industries as well as to process industries.



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(Job Order vs. Process Costing)

Question: A shipyard constructs custom naval vessels based on client blueprints, while an adjacent refinery processes crude oil continuously. Which costing systems should they use?

Answer: The shipyard uses **Job Order Costing** (equal production/cost cycles for specialized items) The refinery uses **Process Costing** (continuous average costing over periods)

Lecture 6**Fifth: COST CONTROL:**

AACE International has defined **COST CONTROL**: as ...application of procedures to monitor expenditures and performance against progress of projects or manufacturing operations; to measure variance from authorized budgets and allow effective action to be taken to achieve minimum costs.

It is important to distinguish between **cost control and cost accounting**.

Cost accounting is the historical reporting of disbursements and costs and expenditures; it is used to establish the precise and actual cost status of a project to date. **Cost control**, on the other hand, is used to predict the final outcome of a project based on up-to-date status.

According to Clark and Lorenzoni, a project cost control system has four objectives:

1. To focus management attention on potential cost trouble spots in time for corrective or cost-minimizing action (i.e., detect potential budget overruns before, rather than after, they occur).
2. To keep each project supervisor informed of the budget for each specific area of responsibility and how expenditure performance compares to budget.
3. To create a cost-conscious atmosphere so that all persons working on a project will be cost-conscious and aware of how their activities impact on the project cost.
4. To minimize project costs by looking at all activities from the **viewpoint of cost reduction**.

(Cost Control vs. Accounting) Question: If a project team tracks last month's receipts to establish precise historical expenditures, are they performing cost accounting or cost control?

Answer: This is Cost Accounting (historical reporting) .

Cost Control uses this data to **predict final outcomes and spot trouble before overruns happen**

Sixth: PROJECT FORMATS:

There can be many different views of the objective of a cost control system depending on the owner, the contractor, or the designer. Construction projects are undertaken using different contract formats where the owner, contractor, and architect/engineer have different types of relationships with respect to the cost reporting and control functions.

The Construction Industry Institute (CII Cost/Schedule Task Force, 1987) has identified four basic contracting formats:

1-Prime contractor (or general contractor, GC): The contract for construction is between the owner and one contractor who has full responsibility for accomplishing the construction. The contract can be either fixed price (lump sum, unit price, or combination thereof) or reimbursable. It can have special features such as a guaranteed maximum cost, and incentive features such as target cost or workhours with shared savings/penalties, milestone bonus/penalties, or other performance bonuses.

The GC is responsible for establishing a cost control system, and the owner can be expected to require submission of a schedule of values and some agreed upon mechanism for progress payments.

2-Multiple Primes managed by a construction manager (CM): The CM function is handled by the owner or some agency under contract to the owner. The project is divided into major components or packages with separate contracts awarded for each component. The contracts may be between the owner and the contractors or between the CM and contractors. Normally the CM will establish the cost control system and require each contractor to operate within that system.

3-Turnkey: The total management of engineering, procurement, and construction (EPC) is given to one firm, which may choose to handle all functions using its own resources or may choose to subcontract portions to others. The turnkey contractor will establish and maintain a cost control system.

4-Owner as general contractor: The owner maintains a project management staff that directly manages company projects using a combination of direct-hire and subcontracting.

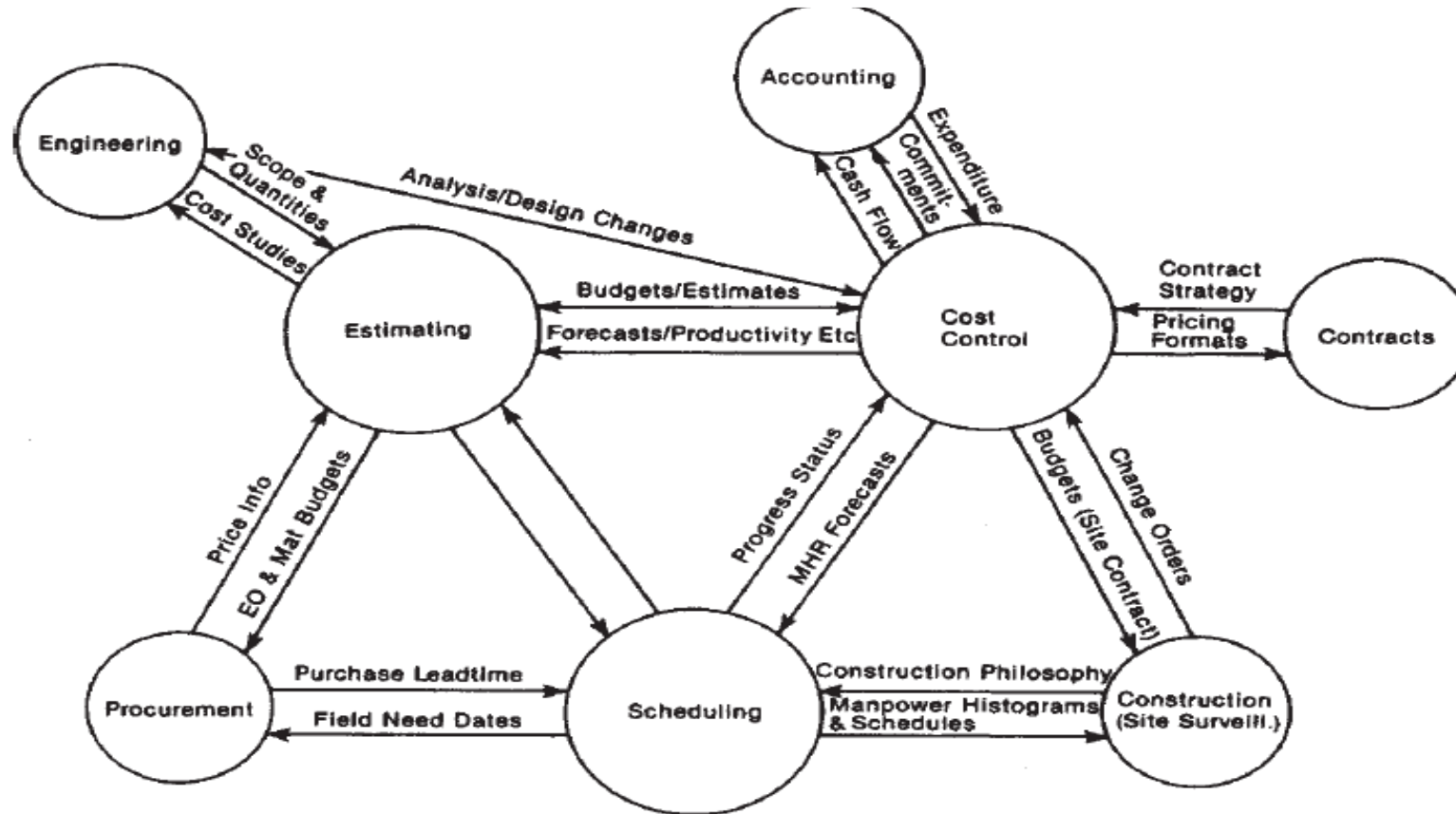
-Contracting Party Viewpoints:

Each of the contracting parties in the project formats just listed is interested in cost control.

The owner is interested in making sure that the project is completed within budget. The **architect/engineer's** involvement depends upon the level of design completion and the overlapping of engineering, procurement, and construction. The CM's interest is the same as that of the owner. The **contractor and subcontractors** are interested in detail cost control regardless of the contract type.

Project cost control requires cooperation between all parties in a project.

Figure 5.1 shows the major information flow paths between the cost control system and other areas of concern.



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Thank You