Lectures Note

COST ACCOUNTING

Chapter 5: Volume Based Costing

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Chapter V
Volume-Based Costing

After studying this chapter, you should be able to:

1. ***Know the differences between traditional and conventional costing system***
2. ***Determine the activity and cost driver***
3. ***Calculate the service department allocations***
4. ***Make a cost of production report***

Study objectives of this chapter will give you the explanation of how to calculate and report cost by using traditional costing systems

The Traditional Costing Systems

It is a well-known fact that the traditional costing system utilizes a single, volume-based cost driver. This is the reason why the traditional product costing system distorts the cost of products. In most cases this type of costing system assigns the overhead costs to products on the basis of their relative usage of direct labor. For this reason traditional cost systems often report inaccurate product costs[9].

a. **The traditional costing systems assumption that products cause cost.** Each time a unit of product is manufactured, it is assumed that cost is incurred. This assumption makes sense for certain direct costs. The assumption does not work for activities that are not performed directly on the product units.

b. **The problem with this approach is that for most overhead activities, the proportions of the activity actually consumed by a specific product, does not universally correspond with a single cost driver.** This holds true for most modern companies where products are produced by a combination of manpower and technology. The traditional cost accounting model employs a volume-based driver, such as direct labor hours or machine hours for the assignment of all manufacturing overhead costs. The conventional cost accounting model ends up with a cost of goods sold based on absorption costing and includes only product costs as defined in financial accounting.

c. Fundamentally, **traditional costing systems try to assign cost directly to products,** rather than to activities first and then from the activities to product

units. The typical cost report gives information on what is spent, but not why it is spent.

d. **The traditional costing systems only have one or a few indirect cost pools for each department or whole plant.** The application of costs in the traditional costing system is normally based on an indirect cost driver and that the indirect cost applications are often financially based.

The traditional approach to costing of products fundamentally utilizes a system whereby the total costs to produce a number of products are divided amongst the various products. By making use of the traditional costing system, it thus means that all the costs incurred have to be allocated to one or other product.

The illustration below shows the various components needed to develop a cost accounting system.

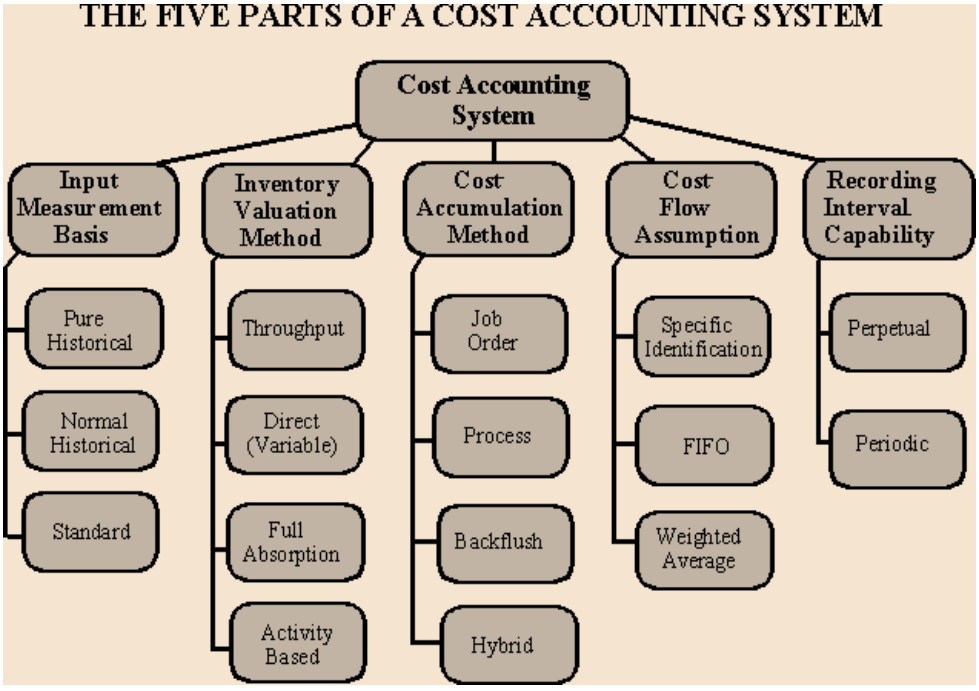

Exhibit 5-1: Cost Accounting Systems

When overhead costs are cut in order to reduce total costs it is the symptoms that are treated and not the cause. In many cases the cutting of overheads is more likely to lead to a reduction in the quality of the products than to the long term reduction of the cost.

The separation of traceable and fixed cost is crucial when doing segmented reporting of costs. This is important, since traceable fixed costs are booked to departments while common fixed costs are pooled in the traditional costing system approach. The guidelines suggested for using the traditional approach is to use a broad, general guideline in determining which costs are traceable. This approach has obvious inherent inaccuracies.

Determining Activity, Cost Driver, or Overhead Rates

Purpose: Activity rates, cost driver rates, or overhead rates, are developed for the purpose of assigning indirect costs or support costs to products.

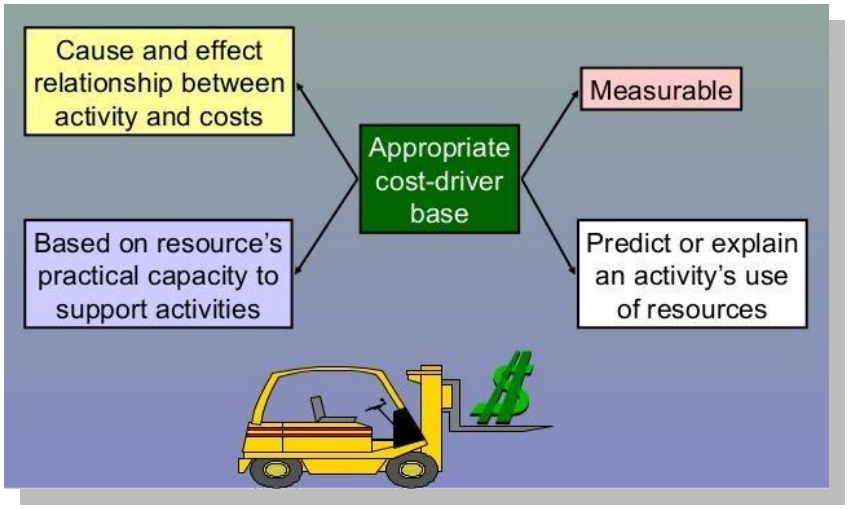

Exhibit 5.2. Cost driver rate for activities

In traditional cost systems the overhead rates were usually determined for each producing department, typically one rate per department. Most of these rates were based on a single production volume based measurement like direct labor hours or machine hours. These rates were calculated as follows:

Overhead rate = Estimated indirect costs for the period : Estimated activity level
Activity cost driver rate = Normal cost of support activity ÷ Normal level of driver

The activity in the example is machining. Annual cost = $900,000. Normal capacity is 20,000 machine hours. The activity rate is 900,000 ÷ 20,000 = $45. Then products are charged with $45 of machining costs per machine hour used.

Service Department and Cost Allocations

The various functional areas within a manufacturing facility are usually separated into producing departments and service departments. Producing departments convert raw or direct materials into finished products. Service departments provide support services to the other departments in the plant. Some examples of service departments include purchasing, receiving and storage, engineering, power, maintenance, packing, shipping, inventory control, inspection and quality control. Service department costs must be assigned (applied, allocated, or traced) to the inventory for product costing purposes.

Exhibit 5-3 below show conceptual views of the traditional two stage cost allocation approach. Service department costs are allocated to producing departments in stage one using a convenient basis, e.g., book value of machines for maintenance. Then producing department costs are allocated to products using a production volume related measurement such as direct labor costs.

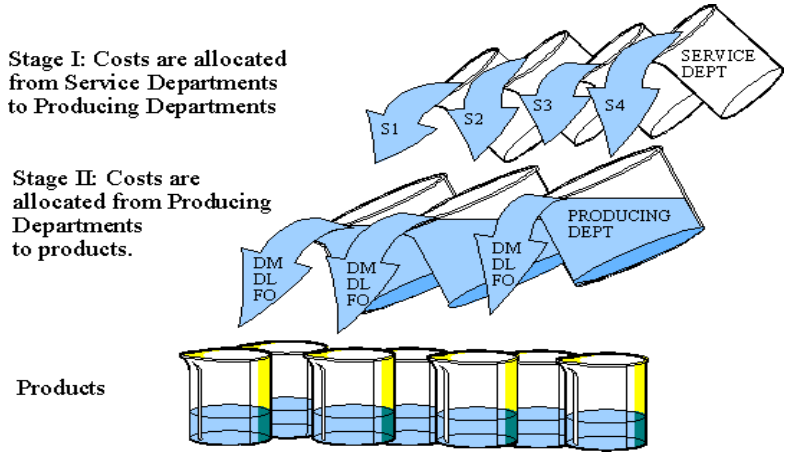

Exhibit 5-3: Two Stage Allocation Approach

In a service organization, the terms revenue producing and non-revenue producing departments might be used rather than the terms production departments and service departments. However, the concept of allocating, or tracing cost from non-

revenue (support) departments to revenue producing departments is just as applicable as it is in manufacturing. For example, support costs need to be traced to facilitate strategic decisions such as introducing new services, discontinuing services, pricing services and outsourcing services.

The Methods to Allocation Cost from Service Department to Production Department

There are three methods for allocating service department costs to producing departments. These include: 1) the direct method, 2) the step-down or sequential method and 3) the reciprocal method. A summary of these methods appears below.

First Stage Allocation Method	Recognition of Self Service	Recognition of Reciprocal Service	Procedure for Allocations	Level of Difficulty	Level of Accuracy
Direct	Ignores self services, e.g., maintenance of the maintenance department, or power consumed by the power plant.	Ignores services provided from service departments to other service departments.	Costs are allocated directly from service departments to producing departments.	Easy	Least accurate. Distorts the cost of the services for outsourcing decisions, as well as product costs.
Sequential or Step-down	Ignores self services.	Partially recognizes reciprocal services as service departments are closed in a prescribed	Costs are allocated in a sequence from service departments to some other service departments	Difficult and time consuming to establish the sequence of allocations. Sequential method	More accurate than the direct method, but still distorts the cost of the services for outsourcing decisions, as

		sequence.	and to producing departments.	problems in textbooks are the most difficult to solve.	well as product costs.
Reciprocal	Fully recognizes self services.	Fully recognizes reciprocal services.	Allocations are made based on the solution to a set of simultaneous equations that represent all the relationships.	Fairly easy to write equations representing relationships. Computer software needed to solve realistic set of equations.	Most accurate for both outsourcing decisions and product cost decisions.

Exhibit 5-4: Methods of Cost Allocation

Illustration

The data from Hinchey Company are as follows:

Department	Direct Costs Budgeted	Budgeted Kilowatt Hours*	Budgeted Maintenance Hours*
Service:			
Power	$100,000	50	20
Maintenance	40,000	100	30
Producing:			
Cutting	200,000	600	150
Assembly	160,000	200	100
Totals	$500,000	950	300

* Power costs are allocated using kilowatt hours. Maintenance costs are allocated using maintenance hours.

Allocations Based on the Direct Method

The first stage cost allocations based on the direct method are performed as follows using equations [1] and [2]:

S_1 = 100,000 and S_2 = 40,000 since self services and reciprocal services are ignored.

P_1 = 200,000 + (600÷800)(S_1) + (150÷250)(S_2)
= 200,000 + (6÷8)(100,000) + (15÷25)(40,000)
= 200,000 + 75,000 + 24,000
= $299,000

P_2 = 160,000 + (200÷800)(S_1) + (100÷250)(S_2)
= 160,000 + (2÷8)(100,000) + (10÷25)(40,000)
= 160,000 + 25,000 + 16,000
= $201,000

The self services (the 50 KWH's used by S_1 and the 30 labor hours used by S_2) are ignored along with the reciprocal services (the 100 KWH's used by S_2 and the 20 labor hours used by S_1) in developing the proportions. Thus, the denominator for developing the proportions for S_1 is 800, not 950 and the denominator for developing the proportions for S_2 is 250, not 300. The total producing department costs, after all allocations, is equal to the total direct costs budgeted, i.e., $500,000

Allocations Based on the Step-Down Method

In Example above, both service departments serve each other, but the Power Department provides a larger proportion of its' service to maintenance (100÷950 = .105) than the proportion the Maintenance Department provides to Power (20÷300 = .066). Therefore, the Power Department costs are allocated first. The relationships are developed from equation [1] in the following manner:

S_1 = 100,000 since S_1 is closed first.

S_2 = 40,000 + (100÷900)(S_1)
= 40,000 + (1÷9)(100,000)
= 40,000 + 11,111.11
= $51,111.11

Observe that the denominator for the proportion of service provided from S_1 to S_2 is 900, not 950. This is because the 50 KWH's of self service are ignored in the step-down method.

Next, the allocations to the producing departments are developed from equation [2] as follows:

P_1 = 200,000 + (600÷900)(S_1) + (150÷250)(S_2)
= 200,000 + (6÷9)(100,000) + (15÷25)(51,111.11)
= 200,000 + 66,666.67 + 30,666.67
= $297,333.34

P_2 = 160,000 + (200÷900)(S_1) + (100÷250)(S_2)
= 160,000 + (2÷9)(100,000) + (10÷25)(51,111.11)
= 160,000 + 22,222.22 + 20,444.44
= 202,666.66

The denominator for the proportions of service provided from S_1 to P_1 and P_2 is 900, not 950 and the denominator for the proportions of service provided from S_2 to P_1 and P_2 is 250 not 300. This is because the self service hours are ignored as well as the 20 hours provided to Power. Since the Power Department has already been closed, no costs are allocated from Maintenance to Power.

Allocations Based on the Reciprocal Method

Using equation [1], the relationships for the service departments are as follows:

S_1 = 100,000 + (50÷950)(S_1) + (20÷300)(S_2)

S_2 = 40,000 + (100÷950)(S_1) + (30÷300)(S_2)

Each of these equations includes two unknowns, thus determining S_1 and S_2 requires solving the equations simultaneously. Although simultaneous equations are not normally solved by hand in practice, one method is presented in Exhibit 6-6 to illustrate

A solution for S1 and S2 can be obtained as follows. First, subtract self service from both sides of the equations. The equation for S1 becomes,

(900÷950)(S1) = 100,000 + (20÷300)(S2)

and the equation for S2 becomes

(270÷300)(S2) = 40,000 + (100÷950)(S1).

Next, multiply every element in the equation for S2 by -9 and then rearrange the elements so that the two equations can be added to eliminate one of the variables. The idea is to pick a number that will allow us to adjust one of the equations so that we can eliminate one of the variables. After performing this step we obtain,

(-900÷950)(S1) = 360,000 - (2,430÷300)(S2).

Then adding this equation and the equation for S1 and we have,

0 = 460,000 - (2,410÷300)(S2)

Then solving for S2 = 57,261.

Now substitute this value for S2 in the original equation for S1 to solve for S1 = 109,585.

the concept.

Since the relative difficulty of solving simultaneous equations expands rapidly when additional service departments are involved, solutions to simultaneous equations are usually obtained using computer software designed for this purpose.

After the simultaneous equations have been solved, the allocations to the producing departments are easily determined by hand as follows.

$$
\begin{aligned}
P_1 &= 200{,}000 + (600 \div 950)(S_1) + (150 \div 300)(S_2) \\
&= 200{,}000 + (600 \div 950)(109{,}585) + (150 \div 300)(57{,}261) \\
&= 200{,}000 + 69{,}211.58 + 28{,}630.5 \\
&= \$297{,}842
\end{aligned}
$$

P_2 = 160,000 + (200÷950)(S_1) + (100÷300)(S_2)

= 160,000 + (200÷950)(109,585) + (100÷300)(57,261)

= 160,000 + 23,070.53 + 19,087

= $202,158

We can also fill in the original equations for the service departments to find the reciprocal transfers. Although the specific amounts of the reciprocal transfers are not needed to complete the allocations to the producing departments, they are needed so that entries can be made to record the transfers between the service departments.

COMPARISON OF THE ALLOCATION METHODS

Department	Direct	Step-down*	Reciprocal*
To Power:			
From Power	$ 0	$ 0	$ 5,768
From Maintenance	0	0	3,817
Total allocations	0	0	9,585
Add direct costs	100,000	100,000	100,000
Total	100,000	100,000	109,585
To Maintenance:			
From Power	0	11,111	11,535
From Maintenance	0	0	5,726
Total allocations	0	11,111	17,261
Add direct costs	40,000	40,000	40,000
Total	40,000	51,111	57,261
To Cutting:			
From Power	75,000	66,667	69,212
From Maintenance	24,000	30,667	28,631
Total allocations	99,000	97,333	97,842
Add direct costs	200,000	200,000	200,000
Total	299,000	297,333	297,842
To Assembly:			
From Power	25,000	22,222	23,071
From Maintenance	16,000	20,444	19,087
Total allocations	41,000	42,667	42,158
Add direct costs	160,000	160,000	160,000
Total	201,000	202,667	202,158

* Totals do not add precisely due to rounding.

S_1 = 100,000 + (50÷950)(S_1) + (20÷300)(S_2)

= 100,000 + (50÷950)(109,585) + (20÷300)(57,261)

= 100,000 + 5,768 + 3,817

= $109,585

S_2 = 40,000 + (100÷950)(S_1) + (30÷300)(S_2)

= 40,000 + (100÷950)(109,585) + (30÷300)(57,261)

= 40,000 + 11,535 + 5,726

= $57,261

In addition to the allocations to Cutting and Assembly, the Power Department allocates $11,535 to Maintenance and $5,768 to itself, while the Maintenance Department allocates $3,817 to the Power Department and $5,726 to itself. There may appear to be some double counting in the Power and Maintenance Departments, but this normal result when solving simultaneous equations. When we compare the original direct costs before allocations to the producing department costs after all allocations, it is clear that the double counting has not caused an overstatement in the final results. The total producing department cost after all allocations is equal to $500,000.

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