Supply Chain Financial Analysis

Cost Systems and Activity-Based Costing

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This session's objective

Introduce you to cost accounting/systems

Make you aware of the different methods

- Overview of the principles for each

Help you understand some of the tradeoffs

- Cost versus accuracy
- Shortcomings of traditional systems
- Limitations of existing systems to collect desired information

Not intended to make you cost accounting experts

What is Cost Accounting? Why?

Cost accounting: reporting and allocation of costs for internal use. But why?

- To measure costs that enable performance analysis, decision-making and internal reporting

Different from Financial Accounting:

- Financial accounting: costs are classified based on type of transaction for external reporting
- Cost accounting: costs are classified based on needs of management for internal use (decision-making support)
  - Does not have to follow GAAP (Generally Accepted Accounting Principles), not important to compare to outside parties

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Cost Systems

- Many different systems exist to track costs
  - Traditional standard cost accounting:
    - Sets a standard for cost, and variance from standard is considered
    - Uses one factor to allocate costs – labor or machine time/hours
    - Labor efficiency emphasized
  - Activity-Based Cost Accounting: allocated costs using cost drivers
    - "a method of measuring the cost and performance of activities and cost objects. Assigns cost to activities based on their use of resources, and assigns costs to cost objects based on their use of activities. ABC recognizes the causal relationship of cost drivers to activities."*
  - Other systems: Lean Accounting, Marginal Costing

*Turney, Peter B.B., Common Cents: The ABC Performance Breakthrough Cost Technology 1991, pg 315

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Different Types of Costs

- Fixed costs: these costs do not vary with volume.
  - Ex. Monthly payments for plant, property, equipment
- Variable & Semivariable costs: costs that vary with volume
  - Ex. Cost for materials used to produce a product; more materials are needed to make more units of production
  - Ex. Semivariable: cost for salaried employees who get commission on sales
- Direct costs: costs that can be attributed to the production of a specific product
  - Ex. Cost for raw materials or labor hours to produce the product
- Indirect costs (overhead): costs that cannot be attributed to the production of a specific product
  - Ex. Legal fees, Sales, General & Administration (SG&A), insurance

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Manufacturing Overhead

Manufacturing overhead includes the costs incurred in the factory operations other than the costs of direct materials and direct labor.

- Most often classified as an *indirect* product cost.

GAAP* requires that cost of direct materials, direct labor, and manufacturing overhead be considered as the cost of products for valuing inventory and for determining COGS.

- Expenses outside the factory (e.g. SG&A) are not product costs and are not inventoriable. They are re

Examples of manufacturing overhead include:

- depreciation or rent on factory building and equipment,
- supervisors in the factory,
- the factory quality control department,
- factory maintenance employees,
- Utilities (electricity, gas) for the factory
- indirect factory supplies, etc.
- ported as expenses on the income statement in the specific accounting period.

Ref: AccountingCoach.com

* Generally accepted accounting principles

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Overhead (OH) Allocation Challenge

Because overhead (manufacturing OH in this case) is an indirect cost

- Difficult to allocate the OH when there is no direct relationship between the product and the indirect cost
- How can the firm decide to allocate the overhead costs to provide management with an informed assessment of the cost to produce a product or serve a customer?
- This is the challenge for the cost system.

Costs & the Income Statement

- Revenue
  - Less Cost of Goods Sold (includes direct costs; some variable and some fixed)
  - Results in….
- Gross Profit
  - Less Operating Expenses (includes indirect costs such as SG&A, R&D, Depreciation)
  - Results in….
- Operating Income
  - Less Non-operating expenses (financing charges, interest expense)
  - Results in…..
- Net Income Before Taxes
- But….Cost accounting goes into more detail than COGS

Cost Allocation and Profits

- How do you think that companies track and allocate costs to the various products they make?
  - How do they identify profitability by customer?

- How does the choice of a cost system affect profits?
  - Which cost systems report more profitability?

How Traditional Cost Systems Allocate

- Most companies use 'traditional' cost systems
  - Several choices for ways to allocate costs

  - Allocate by the percentage:
    - Of volume produced
    - Of labor hours used

Traditional Cost Systems

- Most companies use 'traditional' cost systems; with several choices for ways to allocate costs:
  - Use 'standard costs' and compare versus actual costs
    - A standard cost is what is expected to be the cost (rather than the actual cost); e.g. a standard materials cost would be based on the anticipated quantity and price of the raw materials for a product. Similar approach can be used for each machine, labor, process
  - Accumulate costs by the job order, process or operation
  - Use specific labor rate or average labor rate
    - In a factory, fork lift operator cost = $12/hr (without OH) where a machine operator cost = $20+/hr (without OH). Average wage might be $16/hr.
  - Use a specific overhead rate or an average overhead rate
    - Allocate all overhead at same rate for all or use different OH rates for different products

Simple Example

•Example: A factory produced 5 products and incurs $100,000 in indirect costs.

•How much of the overhead should be allocated to the different products?

Product	Volume	Labor Hours
A	5,000	200
B	10,000	300
C	2,000	100
D	20,000	1,000
E	1,000	500
	38,000	2,100

Traditional Cost System Performance

- Can provide a 'representative' cost
  - Presuming the allocation method makes sense (eg. using labor as a factor when there is a high labor content)
  - Presuming the operation is not highly complex where a standard allocation method would not capture the cost-adding requirements
  - Presuming the operation has enough volume over which to distribute the overhead costs
- Highly relative
  - Is it representative or accurate enough? How much more effort would be required to make it more accurate? And how much more would it cost to get that incremental accuracy?

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Complexity and Traditional Cost Systems

- Factors Affecting Product Complexity
  - Small batches, requiring more frequent changeovers
  - Set-up times that are long compared to the time to produce
  - Special-order components, inspections, tests
  - Additional handling requirements
- Factors Affecting Customer Complexity
  - Fast response time requirements
  - Special inspection, testing, handling, vendors
  - Custom products, packaging and other requirements
  - Demand uncertainty
  - Additional costs for after-sales and technical support

Ref.; HBS – An Introduction to ABC,197-076

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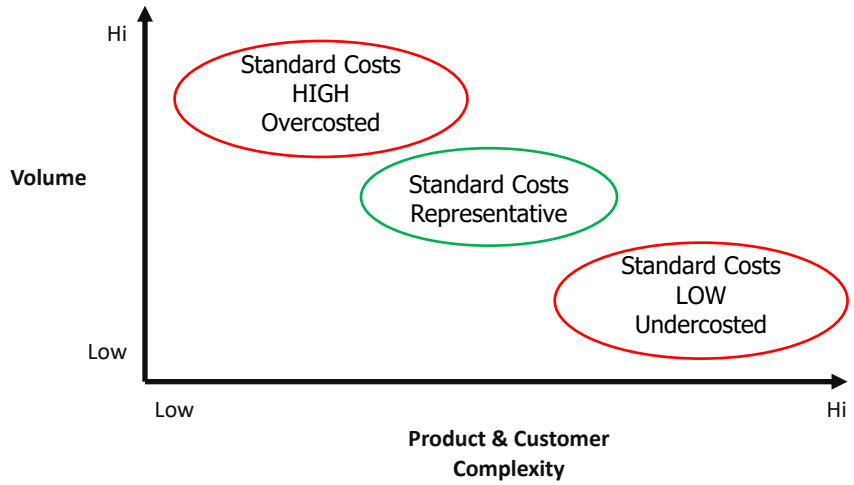
Traditional Cost System Performance



Ref.; HBS – An Introduction to ABC,197-076

Key issues & challenges in cost systems

- The cost to operate…. i.e. the cost to track and record the costs in a way that will provide accurate information.
  - How accurate is accurate enough?
- The decision of how to allocate costs (mainly indirect costs unless direct costs are not tracked)

Key Points

Cost accounting provides costs for use by management to support decision making

- These systems and methods are different than financial accounting

•Traditional cost systems are not effective enough in today's environment where labor content of products is a small portion of the product cost

Activity-Based Costing Systems

This segment's objective

Introduce you to Activity-Based Cost (ABC) Accounting

Review the principles for use of ABC

Make you aware of the ABC method

Not intended to make you ABC experts

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Which has the lower cost to serve?

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Which has the lower cost to serve?

Amazon direct shipment to consumer

Amazon ship from vendor to consumer

Walmart ship from store to consumer

Walmart ship from DC to pickup point

Walmart store pick up

What is the cost to serve for these options?

- Amazon direct shipment to consumer
  - Ship from closest/local DC – lower transportation cost
  - Requires an additional conveyance from vendor to Amazon DC – additional cost
  - Requires carrying inventory – additional cost (capital, operating cost)
- Amazon ship from vendor to consumer
  - Ship from Vendor likely longer conveyance → possibly longer distance, more cost
  - Vendor likely has less leverage negotiating transportation cost → higher transportation cost

Why Activity-Based Cost Accounting?

Traditional method to allocate overhead: labor hours or volume as proxy for OH use

- That made sense when labor represented a large part of the product cost
- Today, direct costs make up a smaller percentage of the product costs, and indirect costs make up a larger percentage.

Product costs today include some labor, but more material and overhead costs. Using labor hours or volume would not serve as a good proxy for overhead use

Why ABC? An Illustration

Example: Children's Book Company makes a popular book called Curious Giovanni, and also a custom version of the book that is tailored to a child for an additional $10. The books are customized at the distribution center.

- The DC has a small staff that does all of the handling, shipping and any customization required. The customization requires about 10 minutes to download software, 15 minutes of coding, and 10 minutes of relabeling. Each custom book is shipped direct to the consumer at no additional cost to the consumer. All the other books are shipped in bulk via LTL to retail outlets for sale.
- Last month, the company sold 1900 standard and 100 custom books.
- Standard Curious Giovanni book price → $20, volume → 1,900
- Customized Curious Giovanni books price → $30, volume → 100
- The overhead costs for all the operations are $2740, includes some costs that are specific to standard books (LTL shipment costs) and to custom books (book prep, direct shipment)

Why ABC? Example…..

Allocate overhead cost of DC using simple traditional method (use volume)

- Overhead cost/unit = $2740/2000 → $1.37 per unit
- This spreads standard and custom book expenses across all books

But Different Activities have different costs

- Custom books utilize $1475 of DC activities specifically for custom books
- Standard books utilize $190 of DC activities specifically for standard books
- Standard and custom books use $1075 ($1010 and $65 respectively) of the receiving and handling activity in close proportion to their volume, totaling $1200 and $1540 for each

Allocate overhead DC costs by activities

- Standard book DC costs = $1200, per unit allocation = $1200/1900 = $0.63
- Custom book DC costs = $1540, per unit allocation = $1540/100 = $15.40

By traditional allocation method, custom cost is understated by >$14.00

Custom book premium upcharge ($10) is less than actual cost to serve

Traditional cost allocation method would lead business leaders to mistakenly believe that their custom book business was very profitable

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Activity-Based Cost Accounting (ABC)

A method of allocating overhead costs to cost objects based on the amount of resources they consume

Costs are allocated using cost drivers

- Cost drivers consider the activities involved in producing the product/service and the resources used in those activities

A cost object can be a product, service, customer or other segmentation that management desires to better understand

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Activity-Based Costing Perspective

Product costs are the results of activities (or "processes") – costs come from activities

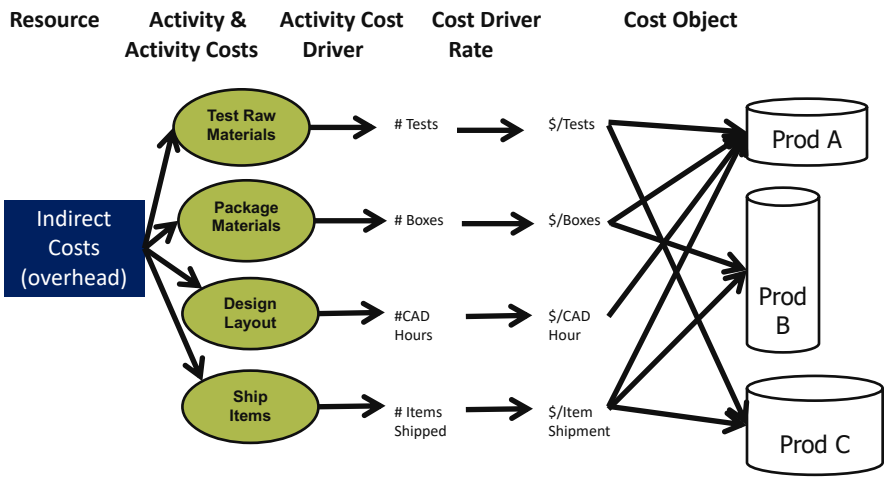
Each product (service) in the firm is thought in terms of the bundle of activities required to produce (provide) the product (service) - producing a product requires multiple activities

The costs of a product are the sum of the costs for performing the activities in order to produce (provide) a product (service)

ABC is especially useful when the variety and complexity of products, service and/or customers are high

As a result of the improved accuracy, ABC has become the one of the more important methods for product and service decision support and process analysis

ABC Expenses Flow from Resources to Activities to Cost Objects (aka Products, Services and Customers)



Basic Steps to ABC

1. Identify all activities relevant to the creation of the product/service
2. Identify the resources consumed in performing the activities
3. Determine the costs of the activities
4. Determine cost-drivers of the activities
5. Determine cost-driver rate for the activities
6. Trace costs to (secondary) cost objects

1. Identify all relevant activities

Usually, the activities are defined functionally, e.g. manufacturing, distribution, order management, etc.

Activities often take the form of [verb] [direct object], e.g., schedule production, setup machines,…

In our example:

- Test Raw Materials
- Package Materials
- Design Layout
- Ship Items

2. Identify the resources consumed in performing the activities

For each identified activity, determine the resources used: labor, facilities, equipment, materials,…

Unused capacity is not considered in the cost object allocation, but it should be considered in a separate assessment regarding the cost of carrying additional capacity.

3. Determine the costs of the activities

From Step 2, we know the resources consumed

Identify the costs for each resource, and group those costs into activity groups or cost pools

Put in a slightly different way….. determine which costs are associated with a particular activity and accumulate those costs by the activity

4. Determine cost-drivers

Identify the basis for allocating the costs to the cost object – these are called cost drivers

A cost-driver is a quantitative measure of the output of an activity

Examples:

- Ship product: Number of orders shipped
- Store packages: Number of packages stored, number of storage runs
- Test materials: Number of tests, amount of materials consumed in tests

One cost driver is identified for each activity grouping or cost pool

From our example:

- # Tests (associated with Test Raw Materials activity)
- # Boxes (associated with Package Materials activity)
- # CAD Hours (associated with Design Layout activity)
- # Items Shipped (associated with Ship Items activity)

5. Determine cost-driver rate

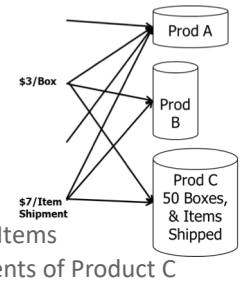
Cost-driver rate – is the cost per unit of cost driver activity

Calculate the cost-driver rate by dividing the cost of the activity by the cost driver

- From our example, divide the cost of Test Raw Materials by the number of tests → $/Test
- If Test Raw Materials consumed $300 in costs, and there were a total of 50 tests → $300/50 = $6/Test

6. Trace costs to cost objects

Identify the amount of cost driver used by specific cost objects, and apply the cost driver rate to identify the cost for that specific cost object



- From our example
  - Product C only uses two activities – Package Materials and Ship Items
  - Assume there are 50 boxes of Product C, and there are 5 shipments of Product C
  - Assume that the cost driver rates are $3/Box and $7/Item Shipped
  - The total cost to allocate to Product C would equal the sum of 50 boxes * $3/Box and 5 shipments * $7/Item Shipped for a total of $185

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Activity-based Costing

Works in environments with
- Large expenses in indirect and support resources
- Multiple product, customer or process environments

Less important with
- High labor component of cost
- Single product, limited diversity (products, customers, processes)

•Activity-Based Costing provides a different and potentially more accurate cost for producing products and providing services – but how much accuracy is enough?

•ABC can be helpful for decision makers assessing the profitability of various products, services or segmentations of those by customer or geography

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