

# Activity-Based Costing (ABC)

## Addressing the Criticisms of Absorption Cost Systems with Activity Based Costing (ABC)

### Outline of our discussion of absorption costing

- In this lecture we will introduce activity-based costing (ABC) and compare it to traditional absorption costing.
- The last several lectures began the discussion of absorption costing, and it's discontents.

### Outline of our discussion of absorption costing

- We also discussed how changes in performance measurement require changes in other parts of organizational architecture (performance measurement and decision rights partitioning).

### Problems with absorption costing

1. Allocating fixed costs on a unit basis makes the seem variable.
  - The death spiral
  - Bad outsourcing choices
2. Incentive to overproduce.
  - Earnings manipulation.

### Alternatives have problems too

- Ignoring (i.e. not allocating) fixed costs leads to incentives to over invest.
  - Not allocating makes the fixed costs seem free (*gratis* not *libre*). May need to centralize investment decisions with this method as well.
- Allocating fixed costs all at once (i.e. variable costing) may lead to under-investment:
  - The manager's horizon (i.e. planned career with the company) may not match the horizon of the company.
  - Off-setting the reputation effects of reduced earnings may be hard.
  - This leads to specialist managers (i.e. who specialize in executing large investments/restructuring).

- Also leads to direct incentives to invest. Executive compensation plans often specifically mention investments. This is a hybrid approach to centralizing the investment decision.

#### **One more problem: Inaccurate Product Costs**

- **multiple products**, absorption costing often does not accurately represent the opportunity costs of different products.
- Absorption costing uses few input factors, such as direct labor hours or machine hours, to allocate overhead costs

#### **One more problem: Inaccurate Product Costs**

- Absorption costing does not clearly show how costs are influenced by the diversity and complexity of production processes.
- Absorption cost systems assign too few costs to small batches and complex special orders.

#### **ABC's Major Features**

- Better identifies activities that drive costs
  - Remember: fixed costs are costs that do not vary with the number of units produced.
  - ABC's trick is to identify the activities that drive costs, or identifying the level at which 'fixed' costs are variable (or the level at which indirect costs are direct).
- Tracks set-up costs associated with each batch and product line
- Analyzes activities rather than input resources
- Allows cost drivers to vary across the firm.

#### **ABC's Major Features**

- Cost analysts attempt to identify cause-and-effect cost drivers for allocating overhead costs.
- Reduces overhead cost pools that are allocated with an arbitrary allocation base.

#### **Classifying ABC Cost Drivers**

Classify cost drivers into one of four categories:

1. Unit-level
2. Batch-level
3. Product-level
4. Production-sustaining

### ABC isn't really anything new

- Indirect costs are classified as 'indirect' not because they are **impossible** to directly track, but because they are **difficult** to directly track.
- ABC is essentially the decision to track costs *more* directly.
- This has several effects:
  - Some fixed overheads are not truly fixed (or overheads).
  - Can reduce the portion of fixed costs in any one allocation, diffusing the perverse incentives we've been discussing.
  - Most importantly, ABC can help isolate costs from production decisions.

### ABC allows us to isolate costs from production decisions

- This is core to overproduction, death spirals, and incorrect outsourcing choices.

### ABC allows us to isolate costs from production decisions

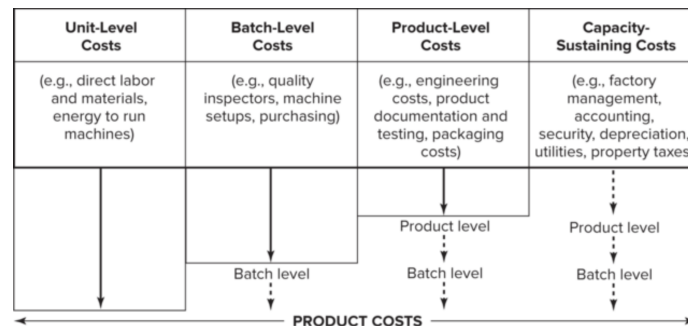


Figure 1: ABC

### ABC allows us to isolate costs from production decisions

- Notice the separation of unit-level costs (and decisions) from batch, and product level decisions.
- More detailed cost allocation allows us to ignore fixed costs when we make *unit-level* decisions and then consider them when we make decisions at other levels.
- This allows us to consider the costs of investment decisions (i.e. fixed costs) when we make them, and set them aside when we do not.
- Can help avoid the death spiral, and outsourcing mistakes.
  - These are both problems that come from cost numbers *miscommunicating* the nature of costs. I.e. suggesting that a decision changes costs that it does not.

- Focusing on the activities that drive costs allows us to connect costs to the choices that drive them.

### Unit-level Costs

- **Unit-level costs:** activities that are performed at least once for each unit of product
- Total amount of unit-level costs is a linear function of the quantity produced.

Examples:

- *Direct* labor and *direct* material
- Machine servicing related to number of units produced

### Unit-level Costs

- Very little fixed-cost is allocated to each unit!
- What are the implications for:
  - the death spiral?
  - the overproduction (earnings manipulation) problem.

### Unit-level Costs (Answer)

- Very little fixed-cost is allocated to each unit!
- What are the implications for:
  - the death spiral? **Less likely, because choice of production volume drives less allocation of fixed costs.**
  - the overproduction (earnings manipulation) problem. **Still exists, because we are still eventually assigning fixed costs to finished goods. Improved accuracy and cost transparency helps, but absorption costing will always have this problem.**

### Batch-level Costs

- **Batch-level costs:** activities that are performed once for each batch of products.
- Batch-level costs are independent of the number of units in the batch.

Examples:

- Indirect labor, such as production supervisors
- Machine set-ups
- Moving batches

### Product-level Costs

- **Product-level costs:** activities that support production of a product type or model
- Product-level costs do not vary with the number of batches produced.

Examples:

- Engineering support
- Equipment usable for only one product line

### Production-sustaining Costs

- **Production-sustaining costs:** all remaining activities required for overall operation of production facility
- Production-sustaining costs do not depend on number of units, batches, or product lines.

Examples:

- Plant security, insurance, general maintenance
- Plant accounting and administration

### Example: ABC vs. Absorption

- **Similarities:** Direct and unit-level costs are allocated similarly.
- **Differences:** ABC allocates more indirect costs to products with smaller production volume and more complex set-up. This is *more accurate*.

### Absorption costing schematic

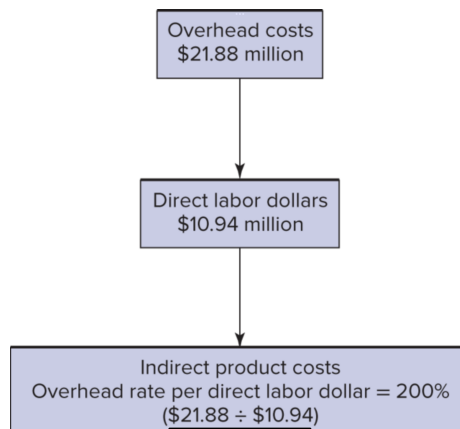


Figure 2: Absorption costing

### ABC costing schematic

#### Two questions

- Is this simple?
- Is this transparent?

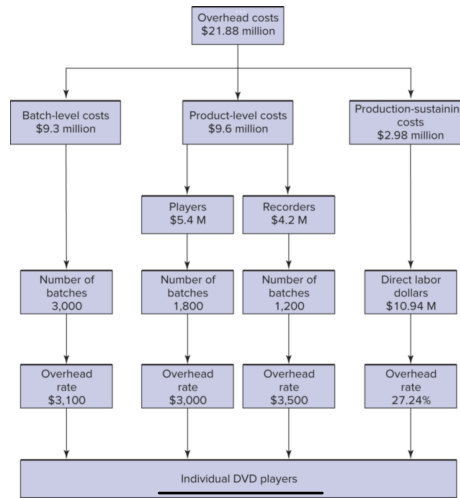


Figure 3: ABC

## Two questions

When we answer these questions, we also have to make sure that we are accurately comparing the two methods. We want to achieve our goals with methods that are simple and transparent, but the methods we choose between must *actually achieve our goals*.

- The minimum number of dimensions of control required to operate a system, **is determined by the system itself**.
- Remember, planes, trains, and automobiles!

## Remember, planes, trains, and automobiles

The number of controls is determined by the system itself.

- **Train:** One dimension of control (i.e. speed)
  - Speed control: throttle, break
- **Automobile:** Two dimensions of control (i.e. speed and direction)
  - Speed control: throttle, break
  - Direction control: steering wheel
- **Plane:** Three dimensions of control (i.e. speed, direction, and altitude)
  - Speed control: throttle, flaps (... kinda)
  - Direction control: Stick (nose up/down, roll left/right), rudder (yaw left/right, rotates the plane around the vertical axis), trim controls (adjust elevators), flaps (increase lift and drag for take off and landing)

**Example: ABC vs. Absorption**

Consider the following example where models 801 and 901 are more complex/lower volume products.

Model number	105	205	305	801	901
Batches per year (100 units/batch)	800	1,000	600	400	200
Absorption cost per unit	\$162	\$169	\$173	\$206	\$217
ABC cost per unit	\$157	\$162	\$164	\$234	\$242
Difference	-3%	-4%	-5%	+14%	+12%

**Kiddo Inc Example**

Kiddo Incorporated manufactures running shoes. Recently, it added a new line of pump sneakers. Over the past two years, sales of both the Runner and the Pump have been flat at 5,000,000 and 2,400,000 pairs, respectively. However, in anticipation of increased sales, production was increased from 5,140,000 to 5,200,000 for the Runner and from 3,000,000 to 3,564,000 for the Pump from year 1 to year 2.

**Kiddo Inc Example**

Production costs for the two sneakers are very different. Materials cost \$14.00 per Runner and \$17.75 per Pump. Labor costs are \$4.60 and \$5.00 and variable overhead costs are \$6.60 and \$7.30 for the Runner and the Pump, respectively. Fixed overhead costs are \$50 million and are allocated based on direct labor cost. Kiddo uses LIFO.

**Kiddo Inc Example: Year 1 Absorption Income statement**

	Runner	Pump	Total
Revenue	\$160,000,000	\$110,400,000	\$270,400,000
Expenses:			
Material	70,000,000	42,600,000	112,600,000
Labor	23,000,000	12,000,000	35,000,000
Variable overhead	33,000,000	17,520,000	50,520,000
<b>Fixed overhead*</b>	29,650,000	15,480,000	45,130,000
Net income	\$ 4,350,000	\$ 22,800,000	\$ 27,150,000

*Note: We will allocate FOH on the next few slides.*

**Kiddo Inc Example: Year 1 Fixed Overhead rate**

First, find the fixed overhead rate per unit of the allocation base (direct labor dollars):

	Runner	Pump	Total
Direct labor per pair	\$ 4.60	\$5.00	
× Units produced	5,140,000	3,000,000	
Direct labor cost	\$23,644,000	\$15,000,000	<b>\$38,644,000</b>

- Fixed overhead:

$$50,000,000 / \$38,644,000 = \$1.29$$

**Kiddo Inc Example: Year 1 FOH allocation**

	Runner	Pump	Total
Direct labor per pair	\$4.60	\$5.00	
× FOH rate	\$1.29	\$1.29	
FOH per pair	\$5.93	\$6.45	
× Number of pairs sold	5,000,000	2,400,000	
FOH Allocated	\$29,650,000	\$15,480,000	\$45,130,000

**Kiddo Inc Example**

Further analysis of Kiddo's production process has allowed it to allocate costs using activity-based costing. Engineering costs, rework expenses, and equipment maintenance and depreciation were estimated for each production line.

**Kiddo Inc Example**

Product-line costs for the Runner and Pump sneakers are \$5 million and \$12 million, respectively. Setup costs for each batch are \$2,500. The batch size for the Runner is 1,000 pairs of sneakers. The batch size for the Pump in year 1 is 500 pairs and 600 pairs for year 2. Remaining fixed overhead costs total \$5,150,000 and were allocated based on direct labor cost.

**Kiddo Inc Example: Year 1 ABC Income statement**

	Runner	Pump	Total
Revenue	\$160,000,000	\$110,400,000	\$270,400,000
Expenses:			
Material	\$70,000,000	\$42,600,000	\$112,600,000



	Runner	Pump	Total
Labor	\$23,000,000	\$12,000,000	\$35,000,000
Variable overhead	\$33,000,000	\$17,520,000	\$50,520,000
Gross margin	\$ 34,000,000	\$ 38,280,000	\$ 72,280,000
<b>Batch costs*</b>	\$12,500,000	\$12,000,000	\$24,500,000
<b>Product-line costs*</b>	\$4,863,813	\$9,600,000	\$14,463,813
<b>Fixed overhead*</b>	\$3,065,159	\$1,599,213	\$4,664,372
Net profit	\$ 13,571,028	\$ 15,080,787	\$ 28,651,815

*Note: We will do these allocations on the following slides.*

#### Kiddo batch costs

	Runner	Pump
Cost per batch	\$ 2,500	\$ 2,500
× Units sold	5,000,000	2,400,000
÷ Units per batch	1,000	500
Allocated batch costs	\$12,500,000	\$12,000,000

*Notice that we aren't estimating or deriving this rate, we are **observing** it.*

#### Kiddo product-line costs

	Runner	Pump
Total product-line costs	\$5,000,000	\$12,000,000
÷ Units produced	5,140,000	5,000,000
× Units sold	3,000,000	2,400,000
Allocated line costs	\$ 4,863,813	\$ 9,600,000

*Notice that we aren't estimating or deriving this rate, we are **observing** it.*

#### Kiddo Fixed Overhead Costs

	Runner	Pump	Total
Remaining fixed overhead			\$ 5,150,000
Units produced	5,140,000	3,000,000	
× Direct labor per pair	\$4.60	\$5.00	
Total labor cost	\$23,644,000	\$15,000,000	\$38,644,000
Fixed overhead per direct labor \$			\$ 0.1333
Direct labor of units sold	\$23,000,000	\$12,000,000	

	Runner	Pump	Total
Fixed overhead allocated ( $\times \$0.1333$ )	\$ 3,065,159	\$ 1,599,213	

### ABC and Decision Making

- ABC improves pricing decisions because product costs are presumably more accurate estimates of opportunity cost.
- Low-volume high-complexity products should get higher prices or be dropped. The benefit here is that this decision will be based on the actual **avoidable costs**.
- ABC focuses attention on reducing use of activities that are most associated with costs.

### ABC and Decision Control

- ABC requires more monitoring.
- Time to identify and measure activities.
- Meetings to resolve disputes over activity drivers
- ABC shifts decision rights over activity drivers to lower-level managers with specialized knowledge of the relation between costs and activities.
- Departmental managers could opportunistically pick cost drivers that maximize their performance rewards.

### ABC Measures Costs, Not Benefits

- ABC does not measure the benefits of producing/selling multiple products.
- Firms offer multiple products because of economies of scale and scope.
- ABC allocates common costs – not the common or joint benefits of multiple products.

### History of ABC

- Pre-cursors of ABC were efforts to improve cost allocations in 19th century businesses.
- Activity-based costing terminology was invented and popularized in the late 1980s to early 1990s.
- In the later 1990s and up to the present, the success of ABC systems has been mixed and alternative strategies have been successfully applied to achieve some of the same benefits of ABC with less cost.

### ABC Cost Accumulation and Allocation

1. Unit-level costs are directly assigned to products.
2. Indirect costs are accumulated in the appropriate activity cost pools.

3. Indirect costs are allocated from the activity cost pools using the batch, product, and production-sustaining cost drivers.

#### **Acceptance of ABC is evolving with internal information systems**

- When data collection, management and analysis were expensive and difficult ABC was also expensive and difficult.
- So, although many controllers were interested in ABC, adoption was slow.
- Now, however, most companies already gather much of the needed information as a part of other systems.
- Today, implementing ABC requires management and analysis of data generated throughout the organization.
- Much of the writing in textbooks and on the internet references old information systems. \_\_\_\_ Consider ATK (link).\_\_\_\_

#### **ABC for strategic analysis rather than to replace absorption costing**

- Absorption required for external reporting
- ABC for strategic analysis and special studies
- ABC is most likely to be adopted by:
  - Manufacturers in price-sensitive competitive markets
  - Large plants with many different products and processes

#### **Cost Allocation and Automation**

- In highly automated plants where direct labor costs are a small share of total costs, using machine hours as an activity base gives more accurate cost than direct labor.
- Automation improves efficiency and eliminates bottlenecks so that less indirect labor is needed for moving, inspecting, and expediting products.

#### **Cost Allocation as a Tax System**

(Motivation versus Accuracy)

- Cost allocations are an internal tax system that motivate managers to use less of resources with high cost allocations. (Chapter 7).
- Cycle time: Zytec uses total time to manufacture the product as its allocation base to motivate managers to reduce cycle time.
- Direct labor: Hitachi allocates overhead on direct labor hours so that managers improve automation as a way to eliminate costly direct labor.