

## **CHAPTER 7**

### **ACTIVITY-BASED COSTING (ABC)**

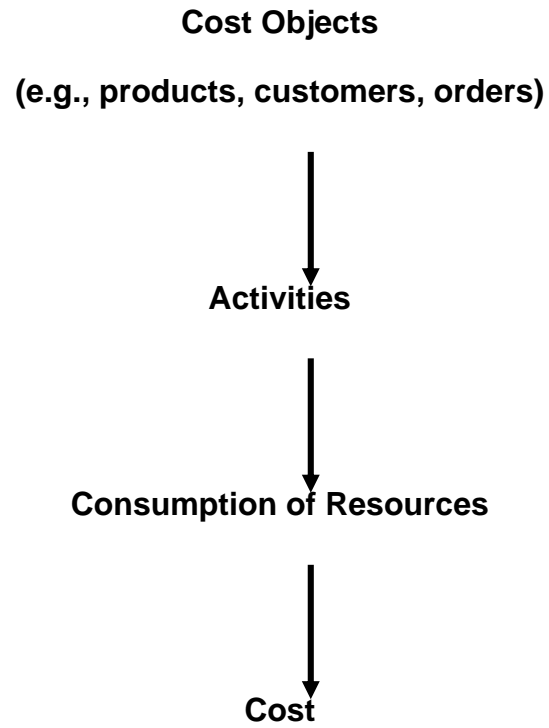
#### **AGENDA**

1. The activity-based costing model
2. Differences between traditional costing and activity-based costing
3. Steps for implementing activity-based costing
4. The ABC cost hierarchy
5. An example of activity-based costing
6. Contrasting traditional costing and activity-based costing product costs
7. Typical impacts on product costs from implementing activity-based costing

Appendix 7A: Action analysis report

Appendix 7B: Activity-based costing for external reports

## I. ACTIVITY-BASED COSTING MODEL



The emphasis is on decision-making and managing activities, not on assigning costs to products for external financial reports.

## **II. DIFFERENCES BETWEEN TRADITIONAL COSTING AND ACTIVITY-BASED COSTING**

In traditional costing systems:

- All manufacturing costs are assigned to products whether or not they are caused by the products.
- Nonmanufacturing costs are not assigned to products—even those nonmanufacturing costs that *are* caused by the products.
- The entire facility may have only one overhead cost pool and a single measure of activity such as direct labor-hours.
- Predetermined overhead rates are based on estimated costs at the budgeted or expected level of activity.

In activity-based costing:

- Nonmanufacturing costs, as well as manufacturing costs, may be assigned to products.
- Some manufacturing costs may be excluded from product costs.
- There are a number of overhead cost pools, each of which has its own unique measure of activity.
- The allocation bases (i.e., measures of activity) often differ from those used in traditional costing.
- The activity rates (i.e., overhead rates) may be based on the level of activity at capacity rather than on the budgeted or expected level of activity.

### **III. STEPS FOR IMPLEMENTING ACTIVITY-BASED COSTING**

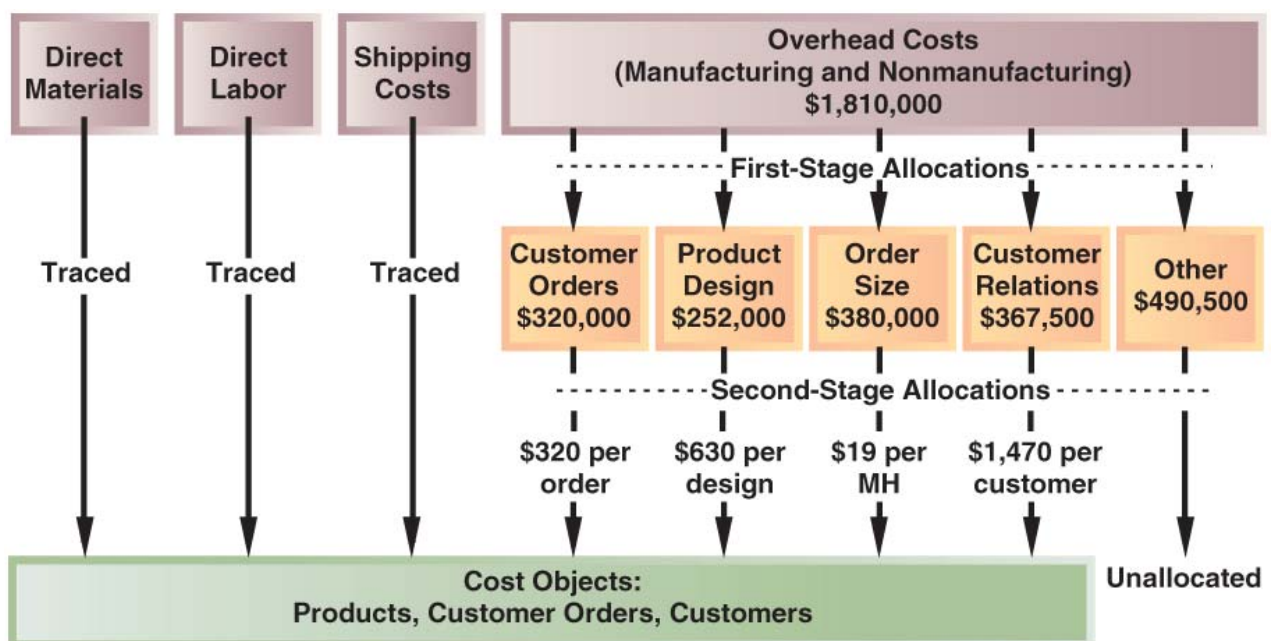
1. Define activities, activity cost pools, and activity measures.
2. Assign overhead costs to activity cost pools.
3. Calculate activity rates.
4. Assign overhead costs to cost objects using the activity rates and activity measures.
5. Prepare management reports.

#### **IV. COST HIERARCHY**

1. Unit-level activities are performed each time a unit is produced. The costs of unit-level activities should be proportional to the number of units produced.
2. Batch-level activities are performed each time a batch is handled or processed, regardless of how many units are in the batch. Costs at the batch level do not depend on the number of units produced, the number of units sold, or other unit-level measures of volume.
3. Product-level activities relate to specific products and typically must be carried out regardless of how many batches or units of product are produced or sold.
4. Customer-level activities relate to specific customers and include activities such as sales calls, catalog mailings, and general technical support that are not tied to any specific product.
5. Organization-sustaining activities are carried out regardless of which products are produced, how many batches are run, or how many units are made.

### V. THE CLASSIC BRASS EXAMPLE

<u>Activity Cost Pool</u>	<u>Activity Measure</u>
Customer Orders	Number of customer orders
Product Design	Number of product designs
Order Size	Machine-hours
Customer Relations	Number of active customers
Other	Not applicable



**THE CLASSIC BRASS EXAMPLE (continued)**

*Exhibit 7-3  
Annual Overhead Costs  
(both Manufacturing and Nonmanufacturing)  
at Classic Brass*

Production Department:		
Indirect factory wages .....	\$500,000	
Factory equipment depreciation.....	300,000	
Factory utilities .....	120,000	
Factory building lease .....	<u>80,000</u>	\$1,000,000
General Administrative Department:		
Administrative wages and salaries.....	400,000	
Office equipment depreciation .....	50,000	
Administrative building lease .....	<u>60,000</u>	510,000
Marketing Department:		
Marketing wages and salaries .....	250,000	
Selling expenses.....	<u>50,000</u>	<u>300,000</u>
Total overhead cost.....		<u>\$1,810,000</u>

**THE CLASSIC BRASS EXAMPLE (continued)**

*Exhibit 7-4  
Results of Interviews*

	<i>Activity Cost Pools</i>					<i>Total</i>
	<i>Customer Orders</i>	<i>Product Design</i>	<i>Order Size</i>	<i>Customer Relations</i>	<i>Other</i>	
<b>Production Department:</b>						
Indirect factory wages.....	25%	40%	20%	10%	5%	100%
Factory equipment depreciation .....	20%	0%	60%	0%	20%	100%
Factory utilities.....	0%	10%	50%	0%	40%	100%
Factory building lease.....	0%	0%	0%	0%	100%	100%
<b>General Administrative Department:</b>						
Administrative wages and salaries .....	15%	5%	10%	30%	40%	100%
Office equipment depreciation .....	30%	0%	0%	25%	45%	100%
Administrative building lease .....	0%	0%	0%	0%	100%	100%
<b>Marketing Department:</b>						
Marketing wages and salaries .....	22%	8%	0%	60%	10%	100%
Selling expenses .....	10%	0%	0%	70%	20%	100%

**THE CLASSIC BRASS EXAMPLE (continued)**

*Exhibit 7-5  
First-Stage Allocations to Activity Cost Pools*

	<i>Activity Cost Pools</i>					<i>Total</i>
	<i>Customer Orders</i>	<i>Product Design</i>	<i>Order Size</i>	<i>Customer Relations</i>	<i>Other</i>	
<b>Production Department:</b>						
Indirect factory wages.....	\$125,000	\$200,000	\$100,000	\$50,000	\$25,000	\$500,000
Factory equipment depreciation .....	60,000	0	180,000	0	60,000	300,000
Factory utilities.....	0	12,000	60,000	0	48,000	120,000
Factory building lease.....	0	0	0	0	80,000	80,000
<b>General Administrative Department:</b>						
Administrative wages and salaries .....	60,000	20,000	40,000	120,000	160,000	400,000
Office equipment depreciation .....	15,000	0	0	12,500	22,500	50,000
Administrative building lease .....	0	0	0	0	60,000	60,000
<b>Marketing Department:</b>						
Marketing wages and salaries .....	55,000	20,000	0	150,000	25,000	250,000
Selling expenses .....	<u>5,000</u>	<u>0</u>	<u>0</u>	<u>35,000</u>	<u>10,000</u>	<u>50,000</u>
Total.....	<u>\$320,000</u>	<u>\$252,000</u>	<u>\$380,000</u>	<u>\$367,500</u>	<u>\$490,500</u>	<u>\$1,810,000</u>

**THE CLASSIC BRASS EXAMPLE (continued)**

Exhibit 7-6  
Computation of Activity Rates

<i>Activity Cost Pools</i>	<i>(a)</i> <i>Total Cost</i>	<i>(b)</i> <i>Total Activity</i>	<i>(a) ÷ (b)</i> <i>Activity Rate</i>
Customer orders .....	\$320,000	1,000 orders	\$320 per order
Product design .....	\$252,000	400 designs	\$630 per design
Order size.....	\$380,000	20,000 MHs	\$19 per MH
Customer relations .....	\$367,500	250 customers	\$1,470 per customer
Other .....	\$490,500	Not applicable	Not applicable

**THE CLASSIC BRASS EXAMPLE (continued)****Standard Stanchions**

1. This product does not require any new design resources.
2. Thirty thousand units were ordered during the year, comprising 600 separate orders.
3. Each stanchion requires 35 minutes of machine time for a total of 17,500 machine-hours.

**Custom Compass Housings**

1. This is a custom product that requires new design resources.
2. There were 400 orders for custom compass housings. Orders for this product are placed separately from orders for standard stanchions.
3. There were 400 custom designs prepared. One custom design was prepared for each order.
4. Because some orders were for more than one unit, a total of 1,250 custom compass housings were produced during the year. A custom compass housing requires an average of 2 machine-hours for a total of 2,500 machine-hours.

	<i>Standard Stanchions</i>	<i>Custom Compass Housings</i>	<i>Total</i>
Sales	\$2,660,000	\$540,000	\$3,200,000
Direct costs:			
Direct materials .....	\$905,500	\$69,500	\$975,000
Direct labor.....	\$263,750	\$87,500	\$351,250
Shipping.....	\$60,000	\$5,000	\$65,000

**THE CLASSIC BRASS EXAMPLE (continued)**

*Exhibit 7-8  
Assigning Overhead Costs to Products*

<i>Activity Cost Pools</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
<i>Standard Stanchions</i>			
Customer orders.....	\$320 per order	600 orders	\$192,000
Product design .....	\$630 per design	0 designs	0
Order size.....	\$19 per MH	17,500 MHs	<u>332,500</u>
Total .....			<u>\$524,500</u>
<i>Custom Compass Housings</i>			
Customer orders.....	\$320 per order	400 orders	\$128,000
Product design .....	\$630 per design	400 designs	252,000
Order size.....	\$19 per MH	2,500 MHs	<u>47,500</u>
Total .....			<u>\$427,500</u>

**THE CLASSIC BRASS EXAMPLE (continued)**

*Exhibit 7-10  
Product Margins—Activity-Based Costing*

	<u>Standard Stanchions</u>	<u>Custom Compass Housings</u>
Sales .....	\$2,660,000	\$540,000
Costs:		
Direct materials.....	\$905,500	\$ 69,500
Direct labor .....	263,750	87,500
Shipping .....	60,000	5,000
Customer orders (from Exhibit 7-8) .....	192,000	128,000
Product design (from Exhibit 7-8) .....	0	252,000
Order size (from Exhibit 7-8) .....	<u>332,500</u>	<u>47,500</u>
Total cost.....	<u>1,753,750</u>	<u>589,500</u>
Product margin .....	<u>\$ 906,250</u>	<u>\$(49,500)</u>

**THE CLASSIC BRASS EXAMPLE (continued)***Exhibit 7-9  
Assigning Overhead Costs to Customers**Overhead Cost for Windward Yachts*

<i>Activity Cost Pools</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Customer orders .....	\$320 per order	3 orders	\$ 960
Product design .....	\$630 per design	1 designs	630
Order size.....	\$19 per MH	177 MHs	3,363
Customer relations .....	\$1,470 per customer	1 customer	<u>1,470</u>
Total .....			<u>\$6,423</u>

*Exhibit 7-11  
Customer Margin—Activity-Based Costing**Customer Margin for Windward Yachts*

Sales (given) .....		\$11,350
Costs:		
Direct materials (given) .....	\$2,123	
Direct labor (given) .....	1,900	
Shipping costs (given) .....	205	
Customer orders (from Exhibit 7-9).....	960	
Product design (from Exhibit 7-9) .....	630	
Order size (from Exhibit 7-9).....	3,363	
Customer relations (from Exhibit 7-9) .....	<u>1,470</u>	<u>10,651</u>
Customer margin.....		<u>\$ 699</u>

**THE CLASSIC BRASS EXAMPLE (continued)**

*Exhibit 7-12  
Product Margins—Traditional Costing System*

	<u>Standard Stanchions</u>	<u>Custom Compass Housing</u>		<u>Total</u>
Sales (given) .....	\$2,660,000	\$540,000		\$3,200,000
Cost:				
Direct materials (given) .....	\$905,500	\$ 69,500	\$ 975,000	
Direct labor (given) .....	263,750	87,500	351,250	
Manufacturing overhead (see below) .....	<u>875,000</u>	<u>125,000</u>	<u>282,000</u>	<u>1,000,000</u>
Product margin .....	<u>\$ 615,750</u>	<u>\$258,000</u>		<u>873,750</u>
Selling and administrative expense (given) .....				<u>875,000</u>
Net operating income .....				<u>\$ ( 1,250)</u>

$$\begin{aligned}
 \text{Predetermined manufacturing overhead rate} &= \frac{\text{Total estimated manufacturing overhead}}{\text{Total estimated machine-hours}} \\
 &= \frac{\$1,000,000}{20,000 \text{ machine-hours}} = \$50 \text{ per machine-hour}
 \end{aligned}$$

The standard stanchions require 17,500 machine-hours and the custom compass housings require 2,500 machine-hours. Therefore, \$875,000 (= 17,500 machine-hours × \$50 per machine-hour) of manufacturing overhead would be charged to the standard stanchions and \$125,000 (= 2,500 machine-hours × \$50 per machine-hour) to the custom compass housing.

### CONTRASTING ACTIVITY-BASED COSTING AND TRADITIONAL COSTING

Traditional Cost System	Standard Stanchions		Custom Compass Housings		(c) Total
	(a) Amount	(a) ÷ (c) %	(b) Amount	(b) ÷ (c) %	
Direct materials . . . . .	\$ 905,500	92.9%	\$ 69,500	7.1%	\$ 975,000
Direct labor . . . . .	263,750	75.1%	87,500	24.9%	351,250
Manufacturing overhead . . . . .	875,000	87.5%	125,000	12.5%	1,000,000
Total cost assigned to products . . . . .	<u>\$2,044,250</u>		<u>\$282,000</u>		2,326,250
Selling and administrative . . . . .					875,000
Total cost . . . . .					<u>\$3,201,250</u>
<b>Activity-Based Costing System</b>					
Direct costs:					
Direct materials . . . . .	\$ 905,500	92.9%	\$ 69,500	7.1%	\$ 975,000
Direct labor . . . . .	263,750	75.1%	87,500	24.9%	351,250
Shipping . . . . .	60,000	92.3%	5,000	7.7%	65,000
Indirect costs:					
Customer orders . . . . .	192,000	60.0%	128,000	40.0%	320,000
Product design . . . . .	0	0.0%	252,000	100.0%	252,000
Order size . . . . .	332,500	87.5%	47,500	12.5%	380,000
Total cost assigned to products . . . . .	<u>\$1,753,750</u>		<u>\$589,500</u>		2,343,250
Costs not assigned to products:					
Customer relations . . . . .					367,500
Other . . . . .					490,500
Total cost . . . . .					<u>\$3,201,250</u>

### **TYPICAL IMPACT ON PRODUCT COSTS FROM IMPLEMENTING ABC**

- Adopting activity-based costing usually results in shifting manufacturing overhead costs from high-volume products (e.g., stanchions) to low-volume products (e.g., custom compass housings).
- The cost per unit of the low-volume products increases and the cost per unit of the high-volume products decreases because of better assignment of batch-level and product-level costs.
- The effects are not symmetrical—the dollar effect on the cost per unit of the low-volume products is usually larger.

Note: The product costs from the activity-based costing system described here would not be acceptable for external financial reports.

- Excludes some manufacturing costs (i.e., costs of idle capacity and organization-sustaining costs)
- Includes some nonmanufacturing costs.
- Relies on subjective interview data.

### **APPENDIX 7A: ABC ACTION ANALYSIS**

- Many decisions involve changes in activity, for example:
  - If a product or customer is dropped, all of the activities associated with that product or customer can be avoided.
  - Changes in prices affect sales volume, which in turn affects activity.
  - Process improvements often result in decreases in redundant and nonvalue-added activities.
- A change in activity does not necessarily result in a change in cost. Many costs (i.e., the costs of salaried employees) must be managed up or down as a result of a change in activity. An action analysis report helps decision-makers by:
  - Distinguishing between costs that are easy to adjust to changes in activity and those that are difficult to adjust.
  - Identifying where cost adjustments would have to be made in the organization.

**APPENDIX 7A: ABC ACTION ANALYSIS**

*Exhibit 7A-2*  
*Computation of the Activity Rates for the Action Analysis Report*

	<u>Activity Cost Pools</u>			
	<i>Customer Orders</i>	<i>Product Design</i>	<i>Order Size</i>	<i>Customer Relations</i>
Total activity .....	1,000 orders	400 product designs	20,000 machine- hours	250 active customers
Production Department:				
Indirect factory wages.....	\$125	\$500	\$5	\$ 200
Factory equipment depreciation .....	60	0	9	0
Factory utilities .....	0	30	3	0
Factory building lease.....	0	0	0	0
General Administrative Department:				
Administrative wages and salaries .....	60	50	2	480
Office equipment depreciation.....	15	0	0	50
Administrative building lease .....	0	0	0	0
Marketing Department:				
Marketing wages and salaries .....	55	50	0	600
Selling expenses .....	<u>5</u>	<u>0</u>	<u>0</u>	<u>140</u>
Total (conventional ABC analysis) .....	<u>\$320</u>	<u>\$630</u>	<u>\$19</u>	<u>\$1,470</u>

Note: Activity rates are not computed for the Other cost pool because these are costs of idle capacity and organization-sustaining costs that are not allocated to products and other cost objects.

**APPENDIX 7A: ABC ACTION ANALYSIS**

*Exhibit 7A-3*  
*Action Analysis Cost Matrix for the Custom Compass Housing*

	<i>Activity Cost Pools</i>			<i>Total</i>
	<i>Customer Orders</i>	<i>Product Design</i>	<i>Order Size</i>	
Total activity .....	400 orders	400 product designs	2,500 machine- hours	
Production Department:				
Indirect factory wages.....	\$50,000	\$200,000	\$12,500	\$262,500
Factory equipment depreciation .....	24,000	0	22,500	46,500
Factory utilities .....	0	12,000	7,500	19,500
Factory building lease.....	0	0	0	0
General Administrative Department:				
Administrative wages and salaries .....	24,000	20,000	5,000	49,000
Office equipment depreciation.....	6,000	0	0	6,000
Administrative building lease .....	0	0	0	0
Marketing Department:				
Marketing wages and salaries .....	22,000	20,000	0	42,000
Selling expenses .....	<u>2,000</u>	<u>0</u>	<u>0</u>	<u>2,000</u>
Total (conventional ABC analysis) .....	<u>\$128,000</u>	<u>\$252,000</u>	<u>\$47,500</u>	<u>\$427,500</u>

Note: The activity rates for the Customer Relations cost pool are applied to customers, not products.

## APPENDIX 7A: ABC ACTION ANALYSIS

**Green:** *Costs that adjust automatically to changes in activity without management action.*

- Direct materials
- Shipping costs

**Yellow:** *Costs that could, in principle, be adjusted to changes in activity, but management action would be required.*

- Direct labor
- Indirect factory wages
- Factory utilities
- Administrative wages and salaries
- Office equipment depreciation
- Marketing wages and salaries
- Selling expenses

**Red:** *Costs that would be very difficult to adjust to changes in activity and management action would be required.*

- Factory equipment depreciation
- Factory building lease
- Administrative building lease

**APPENDIX 7A: ABC ACTION ANALYSIS**

*Exhibit 7A-5*  
*Action Analysis of the Custom Compass Housings*

Sales (from Exhibit 7-10).....		\$540,000
Green costs:		
Direct materials (from Exhibit 7-10) .....	\$69,500	
Shipping (from Exhibit 7-10) .....	<u>5,000</u>	<u>74,500</u>
Green margin .....		465,500
Yellow costs:		
Direct labor (from Exhibit 7-10) .....	87,500	
Indirect factory wages (from Exhibit 7A-3) .....	262,500	
Factory utilities (from Exhibit 7A-3) .....	19,500	
Administrative wages and salaries (from Exhibit 7A-3).....	49,000	
Office equipment depreciation (from Exhibit 7A-3) .....	6,000	
Marketing wages and salaries (from Exhibit 7A-3).....	42,000	
Selling expenses (from Exhibit 7A-3).....	<u>2,000</u>	<u>468,500</u>
Yellow margin .....		(3,000)
Red costs:		
Factory equipment depreciation (from Exhibit 7A-3).....	46,500	
Factory building lease (from Exhibit 7A-3) .....	0	
Administrative building lease (from Exhibit 7A-3).....	<u>0</u>	<u>46,500</u>
Red margin.....		<u>\$(49,500)</u>

Question: Do you think all of the above costs would be eliminated if jobs like the custom compass housing were no longer accepted? What impact would dropping such jobs have on follow-on sales and other sales from these customers?