

ACTIVITY BASED COSTING

Key Topics to Know

- Job Costing relied on a single plantwide overhead rate.
- Departments with very different processes may use departmental overhead rates instead of a single plantwide rate to improve accuracy.
- Differences between activity-based costing and a traditional costing system (either single rate or multiple rates)
- Understand the ABC methodology:
 - How to compute activity rates for cost pools.
 - How to assign costs to products.
 - How to compute overhead cost per unit for each product.
 - How to compute total unit cost for each product.
 - How to apply overhead to production in work-in-process.
 - Explain why product costs computed under activity based costing and conventional costing methods differ.
- Flow of costs in an activity based costing system.

Problems

Problem #1

P Company manufactures two products, Product C and Product D. Estimated manufacturing overhead costs are \$130,890 that will be applied to products on the basis of direct labor hours. Data concerning the current period's operations appear below:

| | <u>Product C</u> | <u>Product D</u> |
|-------------------------------|------------------|------------------|
| Estimated volume | 400 units | 1,200 units |
| Direct labor hours per unit | 0.70 hour | 1.20 hours |
| Direct material cost per unit | \$10.70 | \$16.70 |
| Direct labor cost per unit | \$11.20 | \$19.20 |

Management is considering using activity-based costing to apply manufacturing overhead cost to products. The ABC system would have the following cost pools:

| <u>Activity Cost Pool</u> | <u>Activity Measure</u> | <u>Estimated Overhead Cost</u> |
|---------------------------|---------------------------|--------------------------------|
| Machine setups | Number of setups | \$ 13,570 |
| Purchase Orders | Number of purchase orders | 91,520 |
| General Factory | Direct labor hours | 25,800 |

| <u>Activity Measure</u> | <u>Product C</u> | <u>Product D</u> | <u>Total</u> |
|------------------------------|------------------|------------------|--------------|
| Number of setups | 100 | 130 | 230 |
| Number of purchase orders | 810 | 1,270 | 2,080 |
| Number of direct labor hours | 280 | 1,440 | 1,720 |

- Required:
- Compute the predetermined overhead rate under the current method and determine the unit product cost of each product.
 - Determine the activity rates (i.e. predetermined overhead rates)
 - Compute the total overhead cost applied to each product and determine the amount of overhead cost per unit of each product.
 - Compute the unit product cost of each product.
 - Compute the overhead applied to work-in-process using both traditional costing and ABC with the following actual activity:

| <u>Activity Measure</u> | <u>Job</u> |
|------------------------------|------------|
| Number of setups | 10 |
| Number of purchase orders | 40 |
| Number of direct labor hours | 60 |

Problem #2

V Corporation's activity-based costing system has two cost pools: Machining and Set Up. The company's overhead costs, which consist of equipment depreciation and indirect labor, are allocated to the cost pools in proportion to the activity cost pools' consumption of resources.

| | |
|------------------------|----------|
| Equipment depreciation | \$32,000 |
| Indirect labor | 4,000 |

Distribution of Resource Consumption by Cost Pool

| | <u>Machining</u> | <u>Set Up</u> | <u>Total</u> |
|------------------------|------------------|---------------|--------------|
| Equipment depreciation | \$12,800 | \$19,200 | \$32,000 |
| Indirect labor | <u>2,000</u> | <u>400</u> | <u>2,400</u> |
| Total | \$14,800 | \$19,600 | \$34,400 |

Costs in the Machining cost pool are assigned to products based on machine-hours (MHs) and costs in the Set Up cost pool are assigned to products based on the number of batches.

| | <u>MHs</u> | <u>Batches</u> |
|------------|------------|----------------|
| Product R3 | 3,800 | 300 |
| Product D6 | 16,200 | 700 |

Additional data concerning the company's products appears below:

| | <u>Product R3</u> | <u>Product D6</u> |
|------------------|-------------------|-------------------|
| Sales | \$168,700 | \$185,600 |
| Direct materials | 77,800 | 72,300 |
| Direct labor | 75,800 | 79,300 |

- Required:
- Calculate activity rates for each activity cost pool using ABC.
 - Determine the amount of overhead cost that would be assigned to each product using ABC.
 - Determine the operating income for each product using ABC.

Problem #3

W Corporation has an activity-based costing system with two activity cost pools- Processing and Set Up that correspond to the two manufacturing departments. Costs in the Processing cost pool are assigned to products based on machine-hours (MHs) and costs in the Setting Up cost pool are assigned to products based on the number of batches. 90% of the machine hours are worked in the Processing Department and 10% are worked in the Set Up Department. Data concerning the two products and the company's costs and activity-based costing system appear below:

| | |
|------------|----------|
| Processing | \$12,200 |
| Setting Up | 25,100 |

| | <u>Machine Hours</u> | | <u>Total</u> | <u>Batches</u> |
|------------|----------------------|---------------|---------------|----------------|
| | <u>Processing</u> | <u>Set Up</u> | | |
| Product C7 | 2,160 | 240 | 2,400 | 700 |
| Product P8 | <u>15,840</u> | <u>1,760</u> | <u>17,600</u> | <u>300</u> |
| Total | 18,000 | 2,000 | 20,000 | 1,000 |

| | <u>Product C7</u> | <u>Product P8</u> |
|------------------|-------------------|-------------------|
| Sales | \$135,700 | \$98,000 |
| Direct materials | 61,700 | 31,000 |
| Direct labor | 52,200 | 45,800 |

- Required:
- Calculate activity rates for each activity cost pool using activity-based costing.
 - Determine the amount of overhead cost that would be assigned to each product using activity-based costing.
 - Determine the single plant-wide overhead rate based on machine hours.
 - Determine the amount of overhead cost that would be assigned to each product using the single plant-wide overhead rate.
 - Determine the overhead rates for each manufacturing department based on machine hours.
 - Determine the amount of overhead cost that would be assigned to each product using the multiple department overhead rates.

Problem #4

M Company allocates overhead in the Machining Department on the basis of machine hours, while in the Assembly Department overhead is allocated on the basis of direct labor cost. The following budget data are provided:

| | <u>Machining</u> | <u>Assembly</u> |
|------------------------|------------------|-----------------|
| Manufacturing overhead | \$500,000 | \$1,075,000 |
| Direct labor | 350,000 | 500,000 |
| | | |
| Machine hours | 100,000 | 10,000 |
| Direct labor hours | 50,000 | 150,000 |

The following information is provided for a job (Job No. 510) recently completed by the company:

| | <u>Machining</u> | <u>Assembly</u> |
|--------------------|------------------|-----------------|
| Direct materials | \$25,000 | \$37,500 |
| Direct labor | 10,000 | 12,500 |
| | | |
| Machine hours | 5,000 | 1,000 |
| Direct labor hours | 2,000 | 3,000 |

- Required:
- a) Compute the two departmental overhead rates.
 - b) Compute the cost of Job No. 510.
 - c) Assume that the company decides to use a single overhead rate for the two departments, calculated by adding their overhead costs and using direct labor hours as the allocation base. What would the overhead rate be, and how much manufacturing overhead cost would be assigned to Job No. 510?

Multiple Choice Questions

The next 4 questions refer to the following information.

N Company produces two different products using two different activities: Machining, which uses machine hours as an activity driver, and Inspection, which uses number of batches as an activity driver. The cost of Machining is \$500,000, while the cost of Inspection is \$30,000. Usage of the activity drivers are as follows:

| | Product A | Product B | Total |
|-------------------|-----------|-----------|-------|
| Machine hours | 1,000 | 3,000 | 4,000 |
| Number of batches | 45 | 15 | 60 |

Product A is assigned \$125,000 in Machining cost, and \$22,500 in Inspection cost. Product B uses 75% of total machine hours and 25% of total batches.

1. What is the activity rate for Inspection?
 - a) \$125 per batch
 - b) \$500 per batch
 - c) \$667 per batch
 - d) \$2,000 per batch
2. What is the total Inspection cost assigned to Product A?
 - a) \$7,500
 - b) \$22,500
 - c) \$125,000
 - d) \$375,000
3. What is the total activity cost assigned to Product B?
 - a) \$7,500
 - b) \$147,500
 - c) \$375,000
 - d) \$382,500
4. What proportion of Machining activity is used by Product A?
 - a) 25%
 - b) 33%
 - c) 67%
 - d) 75%

5. Which of the following is most likely to be true of the manufacturing overhead costs assigned to a product with relatively low volume and high complexity?
- An ABC system will assign more manufacturing overhead costs to the product than a volume-based system.
 - A volume-based system will assign more manufacturing overhead costs to the product than an ABC system.
 - An ABC system will assign the same manufacturing overhead costs to the product as a volume-based system.
 - An ABC system will assign manufacturing overhead costs to the product, while a volume-based system will not.
6. B Company manufactures a product that uses \$15 in direct materials and \$5 in direct labor per unit. Under the traditional costing system Buhl uses, manufacturing overhead applied to each unit is \$12. Buhl is considering switching to an ABC system, under which the total overhead cost would be \$25 per unit. What is the total manufacturing cost per unit for Buhl under the ABC system?
- \$20
 - \$25
 - \$32
 - \$45
7. L Company has provided the following data from its activity-based costing accounting system:

| <u>Pools</u> | <u>Total Cost</u> | <u>Total Activity</u> | |
|---------------------|-------------------|-----------------------|----------------------|
| Designing products | \$1,372,448 | 7,798 | product design hours |
| Setting up batches | \$33,300 | 740 | batch set-ups |
| Assembling products | \$126,160 | 6,640 | assembly hours |

The activity rate for the Designing Products activity cost pool is closest to:

- \$101 per hour
- \$1,372,448 per hour
- \$176 per hour
- \$57 per hour

8. In activity-based costing, the activity rate for an activity cost pool is computed by dividing the total overhead cost in the activity cost pool by:
- the direct labor-hours required by the product.
 - the machine-hours required by the product.
 - the total activity for the activity cost pool.
 - the total direct labor-hours for the activity cost pool.
9. N Company manufactures and sells two products: Product U5 and Product X2. The company has an activity-based costing system with the following activity cost pools, activity measures, and expected activity:

| <u>Activity Cost Pools</u> | <u>Activity Measures</u> | <u>Estimated Overhead Cost</u> | <u>Expected Activity</u> | | <u>Total</u> |
|----------------------------|--------------------------|--------------------------------|--------------------------|-------------------|--------------|
| | | | <u>Product U5</u> | <u>Product X2</u> | |
| Labor-related | DLHs | \$36,180 | 2,400 | 1,200 | 3,600 |
| Product testing | tests | 65,760 | 400 | 600 | 1,000 |
| General factory | MHs | <u>133,984</u> | 4,000 | 3,900 | 7,900 |
| | | <u>\$235,924</u> | | | |

The total overhead applied to Product U5 under activity-based costing is closest to:

- \$141,555
- \$67,839
- \$157,272
- \$118,264

10. M Company manufactures and sells two products: Product K2 and Product O8. Data concerning the expected production of each product and the expected total direct labor-hours (DLHs) required to produce that output appear below:

| | <u>Expected Production</u> | <u>Direct Labor- Hours Per Unit</u> | <u>Total Direct Labor-Hours</u> |
|--------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| Product K2 | 500 | 9.0 | 4,500 |
| Product O8 | 700 | 12.0 | <u>8,400</u> |
| Total direct labor-hours | | | <u>12,900</u> |

The direct labor rate is \$21.10 per DLH. The direct materials cost per unit for each product is given below:

| | <u>Direct Materials Cost per Unit</u> |
|------------|---------------------------------------|
| Product K2 | \$201.30 |
| Product O8 | <u>\$298.90</u> |

The company is considering adopting an activity-based costing system with the following activity cost pools, activity measures, and expected activity:

| <u>Activity Cost Pools</u> | <u>Activity Measures</u> | <u>Estimated Overhead Cost</u> | <u>Expected Activity</u> | | <u>Total</u> |
|--------------------------------|------------------------------|----------------------------------------|--------------------------|-----------------------|--------------|
| | | | <u>Product K2</u> | <u>Product O8</u> | |
| Labor- related | DLHs | \$426,861 | 4,500 | 8,400 | 12,900 |
| Machine | setups | 59,328 | 400 | 500 | 900 |

| | | | | | |
|---------|-----|------------------|-------|-------|-------|
| setups | | | | | |
| General | | | | | |
| factory | MHs | <u>442,085</u> | 4,300 | 4,200 | 8,500 |
| | | <u>\$928,274</u> | | | |

The unit product cost of Product K2 under the company's traditional costing method in which all overhead is allocated on the basis of direct labor-hours is closest to:

- a) \$1,038.84
- b) \$689.01
- c) \$859.29
- d) \$984.48

Solutions to Problems

Problem #1

a)

| | <u>Product C</u> | <u>Product D</u> | <u>Total</u> |
|---------------------|------------------|------------------|--------------|
| Direct labor hours: | 400 units | 1,200 units | |
| | X .7 dlh/unit | X 1.2 dlh/unit | |
| | 280 dlh | 1,440 dlh | 1,720 dlh |

Predetermined overhead rate: $\$130,890 / 1,720 \text{ dlh} =$ $\$76.10/\text{dlh}$

| <u>Unit Product Cost:</u> | <u>Product C</u> | <u>Product D</u> |
|---------------------------|------------------|------------------|
| Direct Materials | \$10.70 | \$ 16.70 |
| Direct Labor | 11.20 | 19.20 |
| Manufacturing Overhead | * 53.27 | ** 91.32 |
| Total Unit Cost | \$ 75.17 | \$127.22 |

*.7 dlh/unit * \$76.10 = \$53.27

** 1.2 dlh/unit * \$76.10 = \$91.32

b)

| <u>Activity Cost Pool</u> | <u>OH Cost</u> | <u>Activity</u> | <u>Activity Rate</u> |
|---------------------------|----------------|-----------------|----------------------|
| Machine set-ups | \$ 13,570 | 230 setups | \$59 per setup |
| Purchase orders | 91,520 | 2,080 orders | \$44 per order |
| General Factory | 25,800 | 1,720 dlh | \$15 per dlh |

c)

| <u>Activities</u> | <u>Activity Rates</u> | <u>Product C</u> | | <u>Product D</u> | |
|------------------------|-----------------------|---------------------------|-----------------|---------------------------|----------------|
| | | <u>Estimated Activity</u> | <u>Amount</u> | <u>Estimated Activity</u> | <u>Amount</u> |
| Machine set-ups | \$59 per setup | 100 | \$5,900 | 130 | \$7,670 |
| Purchase orders | \$44 per order | 810 | 35,640 | 1,270 | 55,880 |
| General Factory | \$15 per dlh | 280 | <u>4,200</u> | 1,440 | <u>21,600</u> |
| Total overhead cost | | | \$45,740 | | \$85,150 |
| Number of Units | | | <u>400</u> | | <u>1,200</u> |
| Overhead cost per unit | | | <u>\$114.35</u> | | <u>\$70.96</u> |

d)

| <u>Unit Product Cost:</u> | <u>Product C</u> | <u>Product D</u> |
|---------------------------|------------------|------------------|
| Direct Materials | \$10.70 | \$ 16.70 |
| Direct Labor | 11.20 | 19.20 |
| Manufacturing Overhead | <u>114.35</u> | <u>70.96</u> |
| Total Unit Cost | \$136.25 | \$106.86 |

e)

| | <u>Overhead</u> | <u>Activity</u> | <u>Overhead</u> |
|-----------------|-----------------|-----------------|-----------------|
| | <u>rate</u> | | <u>applied</u> |
| Traditional | \$76.10 | 60 dlh | \$4,566 |
| ABC | | | |
| Machine set-ups | \$59.00 | 10 setups | \$590 |
| Purchase orders | \$44.00 | 40 po's | \$1,760 |
| General Factory | \$15.00 | 60 dlh | <u>\$900</u> |
| Total | | | \$3,250 |

Problem #2

a)

| <u>Activity Cost Pool</u> | <u>OH Cost</u> | <u>Activity</u> | <u>Activity Rate</u> |
|---------------------------|----------------|-----------------|----------------------|
| Machining | \$14,800 | 20,000 MHs | \$.74 per MH |
| Setting Up | 19,600 | 1,000 batches | \$19.60 per batch |

b)

| <u>Activities</u> | <u>Activity</u> <u>Rates</u> | <u>Product R3</u> | | <u>Product D6</u> | |
|---------------------|---------------------------------|-------------------------------------|---------------|-------------------------------------|---------------|
| | | <u>Estimated</u> <u>Activity</u> | <u>Amount</u> | <u>Estimated</u> <u>Activity</u> | <u>Amount</u> |
| Machining | \$.74 per MH | 3,800 | \$2,812 | 16,200 | \$11,988 |
| Setting Up | \$19.60 per batch | 300 | <u>5,880</u> | 700 | <u>13,720</u> |
| Total overhead cost | | | \$8,692 | | \$25,700 |

c)

| | <u>Product R3</u> | <u>Product D6</u> |
|--------------------|-------------------|-------------------|
| Sales | \$168,700 | \$185,600 |
| Direct materials | 77,800 | 72,300 |
| Direct labor | 75,800 | 79,300 |
| Machining overhead | 2,812 | 11,988 |
| Set Up overhead | <u>5,880</u> | <u>13,720</u> |
| Operating Income | \$6,408 | \$8,292 |

Problem #3

a)

| <u>Activity Cost Pool</u> | <u>OH Cost</u> | <u>Activity</u> | <u>Activity Rate</u> |
|---------------------------|----------------|-----------------|----------------------|
| Processing | \$12,200 | 20,000 MHs | \$.61 per MH |
| Setting Up | 25,100 | 1,000 batches | \$25.10 per batch |

b)

| <u>Activities</u> | <u>Activity Rates</u> | <u>Product C7</u> | | <u>Product P8</u> | |
|---------------------|-----------------------|---------------------------|---------------|---------------------------|---------------|
| | | <u>Estimated Activity</u> | <u>Amount</u> | <u>Estimated Activity</u> | <u>Amount</u> |
| Machining | \$.61 per MH | 2,400 | \$1,464 | 17,600 | \$10,736 |
| Setting Up | \$25.10 per batch | 700 | <u>17,570</u> | 300 | <u>7,530</u> |
| Total overhead cost | | | \$19,034 | | \$18,266 |

c)

| | |
|---------------|---------------|
| Processing | \$12,200 |
| Setting Up | <u>25,100</u> |
| Total | \$36,300 |
| Total MH | <u>20,000</u> |
| Overhead rate | \$1.815 |

d)

| | <u>Product C7</u> | <u>Product P8</u> |
|----------------|-------------------|-------------------|
| Machine hours | 2,400 | 17,600 |
| Overhead rate | <u>\$1.815</u> | <u>\$1.815</u> |
| Total overhead | \$4,356 | \$31,944 |

e)

| | <u>Processing</u> | <u>Set Up</u> |
|----------------|----------------------|-----------------|
| Overhead cost | \$12,200 | \$25,100 |
| Machine hours | <u>18,000</u> | <u>2,000</u> |
| Overhead rate | <u>\$.68</u> | <u>\$12.55</u> |
| Product C7 | | |
| Processing | 2,160 MH x .68 = | \$1,464 |
| Set-Up | 240 MH x \$12.55 = | <u>\$3,012</u> |
| Product total | | \$4,476 |
| Product P8 | | |
| Processing | 15,840 MH x \$.68 = | \$10,736 |
| Set-Up | 1,760 MH x \$12.55 = | <u>\$22,088</u> |
| Product total | | \$32,824 |
| Total overhead | | \$37,300 |

Problem #4

| | | | |
|-----------|--------------------|--|-----------------|
| a) | | | |
| Machining | <u>\$500,000</u> | | \$5.00 per MH |
| | 100,000 MH | | |
| Assembly | <u>\$1,075,000</u> | | \$2.15 per DL\$ |
| | \$500,000 DL\$ | | |

| | | | | |
|------------------|------------------|-----------------|----------------|--|
| b) | | | | |
| | <u>Machining</u> | <u>Assembly</u> | <u>Job 510</u> | |
| Direct materials | \$25,000 | \$37,500 | \$62,500 | |
| Direct labor | 10,000 | 12,500 | 22,500 | |
| Overhead | | | | |
| Machining | 25,000 | | 25,000 | |
| Assembly | | 26,875 | <u>26,875</u> | |
| Total | | | \$136,875 | |

| | | | |
|------------|--------------------|--|-----------------|
| c) | | | |
| Plant-wide | <u>\$1,575,000</u> | | \$7.875 per DLH |
| | 200,000 DLH | | |

| | | | |
|--------------|-----------------|-----------------|-----------------|
| | <u>Activity</u> | <u>Rate</u> | <u>Overhead</u> |
| Plant-wide | 5,000 DLH | \$7.875 per DLH | \$39,375 |
| Departmental | Machining | | \$25,000 |
| | Assembly | | <u>26,875</u> |
| | | | \$51,875 |

Solutions to Multiple Choice Questions

- 1. B
- 2. B
- 3. D
- 4. A
- 5. A
- 6. D
- 7. C
- 8. C
- 9. D
- 10. A