# Hilton chapter 5

**Answers to Assigned End of Chapter Exercises, Problems, Cases**

# Answers to Review Questions

5-1 In a traditional, volume-based product-costing system, only a single predetermined overhead rate is used. All manufacturing-overhead costs are combined into one cost pool, and they are applied to products on the basis of a single cost driver that is closely related to production volume. The most frequently used cost drivers in traditional product-costing systems are direct-labor hours, direct-labor dollars, machine hours, and units of production.

5-2 Management was being misled by the traditional product-costing system, because the high-volume product lines were being overcosted and the low-volume product line was being undercosted. The high-volume products essentially were subsidizing the low-volume line. The traditional product-costing system failed to show that the low-volume products were driving more than their share of overhead costs. As a result of these misleading costs, the company's management was mispricing its products.

5-3 An activity-based costing system is a two-stage process of assigning costs to products. In stage one, activity-cost pools are established. In stage two a cost driver is identified for each activity-cost pool. Then the costs in each pool are assigned to each product line in proportion to the amount of the cost driver consumed by each product line.

5-4 A cost driver is a characteristic of an event or activity that results in the incurrence of costs by that event or activity. In activity-based costing systems, the most significant cost drivers are identified. Then a database is created that shows how these cost drivers are distributed across products. This database is used to assign costs to the various products depending on the extent to which they use each cost driver.

5-5 The four broad categories of activities identified in an activity-based costing system are as follows:

 (a) Unit-level activities: Must be done for each unit of production.

 (b) Batch-level activities: Must be performed for each batch of products.

 (c) Product-sustaining activities: Needed to support an entire product line.

 (d) Facility-level (or general-operations-level) activities: Required for the entire production process to occur.

5-6 An activity-based costing system alleviated the problems management was having under its traditional, volume-based product-costing system by more accurately assigning costs to products. Products were assigned costs based on the extent to which they used various cost drivers that were determined to be closely related to the incurrence of a variety of overhead costs.

5-7 Product-costing systems based on a single, volume-based cost driver tend to overcost high-volume products, because all overhead costs are combined into one pool and distributed across all products on the basis of only one cost driver. This simple averaging process fails to recognize the fact that a disproportionate amount of costs often is associated with low-volume or complex products. The result is that low-volume products are assigned less than their share of manufacturing costs, and high-volume products are assigned more than their share of the costs.

5-8 In traditional, volume-based costing systems, only direct material and direct labor are considered direct costs. In contrast, under an activity-based costing system, an effort is made to account for as many costs as possible as direct costs of production. Any cost that can possibly be traced to a particular product line is treated as a direct cost of that product.

5-9 The pool rate is calculated by dividing the budgeted amount of an activity cost pool by the budgeted total quantity of the associated cost driver. The pool rate is the cost of a particular activity that is expected per unit of the associated cost driver.

5-10 Two factors that tend to result in product cost distortion under traditional, volume-based product-costing systems are as follows:

 (a) Non-unit level overhead costs: Many overhead costs vary with cost drivers that are not unit-level activities. Use of a unit-level cost driver to assign such costs tends to result in cost distortion.

 (b) Product diversity: When a manufacturer produces a diverse set of products, which exhibit different consumption ratios for overhead activities, use of a single cost driver to assign costs results in cost distortion.

5-11 Three important factors in selecting cost drivers for an ABC system are as follows:

 (a) *Degree of correlation* between consumption of an activity and consumption of the cost driver.

 (b) *Cost of measurement* of the cost driver.

 (c) *Behavioral effects*, that is, how the cost driver selected will affect the behavior of the individuals involved in the activity related to the cost driver.

5-12 An activity dictionary lists all of the activities identified and used in an activity-based costing analysis. The activity dictionary provides for consistency in the terminology and level of complexity in the ABC analysis in the organization’s various subunits.

5-13 Line managers are close to the production process and may realize that a complex product, which is difficult to manufacture, is undercosted by a traditional, volume-based costing system. Because of the cost distortion that is common in such systems, the undercosted product may appear to be profitable when it is really losing money. Line managers may have a "gut feeling" for this situation, even if the cost-accounting system suggests otherwise.

5-14 Diverse products typically consume support activities (such as purchasing, material handling, engineering, and inspection) in differing degrees. When there are significant differences among product lines in the ways that they consume support services (and thereby cause overhead costs), a traditional, volume-based costing system may distort product costs. Some products are overcosted; others are undercosted. An ABC system can eliminate (or at least alleviate) such cost distortion.

5-15 Activity-based costing is just as appropriate in the service industry as in the manufacturing industry. Just as in manufacturing firms, diverse services typically consume support activities in varying degrees. ABC systems are more accurate in tracking the usage of these support activities to the services (products) that are produced than are traditional, volume-based costing systems.

5-16 As indicated in the chapter, Pennsylvania Blue Shield, like many manufacturers, classifies activities as unit level, batch level, product-sustaining level, or facility level. Maintenance of the medical-services provider network (i.e., the physicians and hospitals that provide medical care to claimants) is a product-sustaining-level activity because it benefits an entire product line (service line, in this case) of personal health insurance policies.

5-17 Management could use the ABC information about the cost of various types of patient appointments for determining charges for appointments, making appointment staffing decisions (e.g., physician versus nurse practitioner), and justifying reimbursements from insurance companies or government agencies.

5-18 At Patio Grill Company, every unit of each product line manufactured requires *all eight* of the support activities covered by the ABC system. In contrast, at Delaware Medical Center, each patient sees a physician, *or* a nurse practitioner, *or* an intern, *or* a resident. Moreover, each patient is *either* a new patient *or* a continuing patient, but *not both*. Therefore, in determining the cost a patient appointment, the cost analyst would include only the relevant activity costs in the cost of a patient appointment.

5-19 The two-dimensional activity-based costing model provides one way of picturing the relationship between ABC and ABM. The vertical dimension of the model depicts the cost assignment view of an ABC system. From the *cost assignment viewpoint,* the ABC system uses two-stage cost allocation to *assign* the costs of resources to the firm's cost objects. These cost objects could be products manufactured, services produced, or customers served.

 Depicted in the horizontal dimension of the model that follows is the *process view* of an ABC system. The emphasis now is on the activities themselves, the processes by which work is accomplished in the organization. The left-hand side of the model depicts activity analysis, which is the detailed identification and description of the activities conducted in the enterprise. Activity analysis entails the identification not only of the activities, but also of their *root causes,* the events that *trigger* activities, and the *linkages* among activities. The right-hand side of the model depicts the evaluation of activities through performance measures. These processes of *activity analysis and evaluation* constitute activity-based management.

 The two-dimensional ABC model is depicted in the diagram on the next page.

5-20 Activity analysis is the detailed identification and description of the activities conducted in an enterprise. Activity analysis entails the identification not only of activities, but also of their root causes, of the events that trigger them, and of the linkages among them. Three criteria for determining whether an activity adds value are as follows:

 (a) Is the activity necessary?

 (b) Is the activity efficiently performed?

 (c) Is the activity sometimes value-added and sometimes non-value-added?

Diagram of two-dimensional ABC model (from review question 5-19 on preceding page):

Activity

Triggers

Activities

Cost Objects

(products or services

produced; customers)

Assignment of activity

costs to cost objects

using second-stage

cost drivers

Performance

 Measures

Activity evaluation

Activity analysis

*Process View*

Assignment of resource costs

to activity cost pools

associated with

significant activities

Resource Costs

*Cost Assignment View*

Root

Causes

5-21 An activity's trigger is the preceding event that indicates that the activity should be performed. The activity's root cause is the event or activity that, if it had not occurred, would have prevented the activity in question from happening. For example, the event that triggers the activity of rework is the identification of a defective part during inspection. However, the inspection is *not* the root cause of the rework activity. The root cause of the defective part, and hence the need for rework, could lie in erroneous part specifications, in an unreliable vendor, or in faulty production.

5-22 Customer profitability analysis refers to using the concepts of activity-based costing to determine how serving particular customers causes activities to be performed and costs to be incurred. Examples of activities that can be differentially demanded by customers include order frequency, order size, special packaging or handling, customized parts or engineering, and special machine setups. Such activities can make some customers more profitable than others.

5-23 Activity-based costing is used to analyze customer-related costs and determine the cost drivers for these costs. This ABC data then forms the basis for the customer profitability analysis by assigning the appropriate amount of customer-related costs to each customer.

**5-24 A customer profitability profile, usually expressed in graphical form, shows the company’s cumulative operating income as a percentage of total operating income. The customers included in the profile generally are ranked either by operating income or by sales revenue.**

5-25 Examples of customer-value-added activities in a hotel are express check-out service, room service for meals, and concierge services for local activities and transportation. Examples of business-value-added activities are customer profitability analysis, cash management policies, and inventory management procedures.

# SOLUTIONS to ASSIGNED EXERCISES

## Exercise 5-29

|  |  |  |
| --- | --- | --- |
| 1. | a. | Quality-control costs assigned to the enamel paint line under the traditional system: |
|  |  |  |  |  |
|  |  | Quality-control costs | = | 16% × direct-labor cost |
|  |  |  |  |  |
|  |  | Quality-control |  |  |
|  |  | costs assigned to |  |  |
|  |  | enamel paint line | = | 16% × $98,000 |
|  |  |  | = | $15,680 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | b. | Quality-control costs assigned to the enamel paint line under activity-based costing: |
|  |  |  |  |  |  |
|  |  |  |  | Quantity for | Assigned |
|  |  | Activity | Pool Rate | Enamel Paint | Cost |
|  |  | Incoming material inspection  | $23.00 per type  | 24 types  | $   552 |
|  |  | In-process inspection  |  .28 per unit  | 35,000 units  | 9,800 |
|  |  | Product certification  | 144.00 per order  | 50 orders  | 7,200 |
|  |  | Total quality-control costs assigned  | $17,552 |
|  |  |
| 2. | The traditional product-costing system undercosts the enamel paint product line, with respect to quality-control costs, by $1,872 ($17,552– $15,680). |

## Exercise 5-33

|  |  |
| --- | --- |
| 1. | Zodiac Model Rocketry CompanyComputation of Selling CostsBy Order Size and per Motor Within Each Order Size |
|  |
|  |
|  |  | Order Size |
|  |  | Small | Medium | Large | Total |
|  | Sales commissionsa |  |  |  |  |
|  |  (Unit cost: $675,000/225,000  = $3.00 per box) box)  | $   6,000 | $135,000 | $534,000 | $  675,000 |
|  |  |  |  |  |  |
|  | Catalogsb |  |  |  |  |
|  |  (Unit cost: $295,400/590,800  = $.50 per catalog) catalog)  | 127,150 | 105,650 | 62,600 | 295,400 |
|  |  |  |  |  |  |
|  | Costs of catalog salesc |  |  |  |  |
|  |  (Unit cost: $105,000/175,000  = $.60 per motor) skein)  | 47,400 | 31,200 | 26,400 | 105,000 |
|  |  |  |  |  |  |
|  | Credit and collectiond |  |  |  |  |
|  |  (Unit cost: $60,000/6,000  = $10.00 per order) order)  |    4,850 |   24,150 |   31,000 |    60,000 |
|  |  |  |  |  |  |
|  | Total cost for all orders of a given size  | $185,400 | $296,000 | $654,000 | $1,135,400 |
|  |  |  |  |  |  |
|  | Units (motors) solde  | 103,000 | 592,000 | 2,180,000 |  |
|  |  |  |  |  |  |
|  | Unit cost per order of a given sizef  | $1.80 | $.50 | $.30 |  |
|  |
| aRetail sales in boxesunit cost: |
|  Small, 2,000$3 |
|  Medium, 45,000$3 |
|  Large, 178,000$3 |
| bCatalogs distributedunit cost |
| cCatalog salesunit cost |
| dNumber of retail ordersunit cost |
| eSmall: (2,00012) + 79,000 = 103,000 |
|  Medium: (45,00012) + 52,000 = 592,000 |
|  Large: (178,00012) + 44,000 = 2,180,000 |
| fTotal cost for all orders of a given size ÷ units sold |

|  |  |
| --- | --- |
| 2. | The analysis of selling costs shows that small orders cost more than large orders. This fact could persuade management to market large orders more aggressively and/or offer discounts for them. |

# SOLUTIONS to ASSIGNED PROBLEMS

**PROBLEM 5-46**

**1. The predetermined overhead rate is calculated as follows:**

**Predetermined overhead rate = Budgeted manufacturing overhead/budgeted direct-labor hours = $1,224,000/102,000\* = $12 per hour**

 **\*Direct labor, budgeted hours:**

 **REG: 5,000 units × 9 hours 45,000 hours**

 **ADV: 4,000 units × 11 hours 44,000 hours**

 **SPE: 1,000 units × 13 hours 13,000 hours**

 **Total direct-labor hours 102,000 hours**

**3. Calculation of new product costs under ABC.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  **REG** |  **ADV** |  **GMT** |
| **Direct material**  | **$129.00** | **$151.00** | **$203.00** |
| **Direct labor (not including set-up time)**  | **171.00 (9 hr. @ $19)** | **209.00 (11 hr. @ $19)** | **247.00 (13 hr. @ $19)** |
| **Total direct costs per unit**  | **$300.00** | **$360.00** | **$450.00** |
|  |  |  |  |
| **Manufacturing overhead (based on ABC):** |
| **Machine-related**  | **$ 27.00** | **$ 32.40** | **$ 45.90** |
| **Material handling**  | **4.20** | **5.25** | **10.50** |
| **Purchasing**  | **5.00** | **6.00** | **26.00** |
| **Setup**  | **6.80** | **8.50** | **17.00** |
| **Inspection**  | **2.00** | **2.50** | **7.50** |
| **Packing/shipping**  | **6.00** | **6.00** | **12.00** |
| **Engineering design**  | **2.50** | **2.50** | **10.00** |
| **Facility**  | **50.00** | **60.00** | **85.00** |
| **Total ABC overhead cost per unit**  | **$103.50** | **$123.15** | **$213.90** |
| **Total product cost per unit**  | **$403.50** | **$483.15** | **$663.90** |

**PROBLEM 5-46 (CONTINUED)**

**2. Activity-based-costing analysis:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **Activity Cost Pool** | **Cost****Driver** | **Cost Driver Quantity** | **Pool Rate** | **Product Line** | **Cost Driver Quantity for Product Line** | **Activity Cost for Product Line** | **Product Line****Prod.****Volume** |  **Activity Cost per Unit of Product** |
|  |  |  |  |  |  |  |  |  |  |
| **Machine** | **$310,500** | **Machine** | **115,000** | **$ 2.70** | **REG** | **50,000** | **$135,000** | **5,000** | **$27.00** |
| **Related** |  | **Hours** |  |  | **ADV** | **48,000** |  **129,600** | **4,000** |  **32.40** |
|  |  |  |  |  | **GMT** | **17,000** | **45,900** | **1,000** |  **45.90** |
|  |  |  |  |  |  **Total** | **115,000** | **$310,500** |  |  |
| **Material** | **52,500** | **Prod.** | **100** | **525.00** | **REG** | **40** | **$ 21,000** | **5,000** |  **4.20** |
| **Hand.** |  | **Runs** |  |  | **ADV** | **40** | **21,000** | **4,000** |  **5.25** |
|  |  |  |  |  | **GMT** | **20** | **10,500** | **1,000** |  **10.50** |
|  |  |  |  |  |  **Total** | **100** | **$ 52,500** |  |  |
| **Purch.** | **75,000** | **Purch.** | **300** | **250.00** | **REG** | **100** | **$ 25,000** | **5,000** |  **5.00** |
|  |  | **Orders** |  |  | **ADV** | **96** | **24,000** | **4,000** |  **6.00** |
|  |  |  |  |  | **GMT** | **104** | **26,000** | **1,000** |  **26.00** |
|  |  |  |  |  |  **Total** | **300** | **$ 75,000** |  |  |
| **Setup** | **85,000** | **Prod.** | **100** | **850.00** | **REG** | **40** | **$ 34,000** | **5,000** |  **6.80** |
|  |  | **Runs** |  |  | **ADV** | **40** | **34,000** | **4,000** |  **8.50** |
|  |  |  |  |  | **GMT** | **20** | **17,000** | **1,000** |  **17.00** |
|  |  |  |  |  |  **Total** | **100** | **$ 85,000** |  |  |
| **Inspect.** | **27,500** | **Inspect.** | **1,100** | **25.00** | **REG** | **400** | **$ 10,000** | **5,000** |  **2.00** |
|  |  | **Hours** |  |  | **ADV** | **400** | **10,000** | **4,000** |  **2.50** |
|  |  |  |  |  | **GMT** | **300** | **7,500** | **1,000** |  **7.50** |
|  |  |  |  |  |  **Total** | **1,100** | **$ 27,500** |  |  |
| **Ship.** | **66,000** | **Ship.** | **1,100** | **60.00** | **REG** | **500** | **$ 30,000** | **5,000** |  **6.00** |
|  |  |  |  |  | **ADV** | **400** | **24,000** | **4,000** |  **6.00** |
|  |  |  |  |  | **GMT** | **200** | **12,000** | **1,000** |  **12.00** |
|  |  |  |  |  |  **Total** | **1,100** | **$ 66,000** |  |  |
| **Eng.** | **32,500** | **Eng.** | **650** | **50.00** | **REG** | **250** | **$ 12,500** | **5,000** |  **2.50** |
|  |  | **Hours** |  |  | **ADV** | **200** | **10,000** | **4,000** |  **2.50** |
|  |  |  |  |  | **GMT** | **200** | **10,000** | **1,000** |  **10.00** |
|  |  |  |  |  |  **Total** | **650** | **$ 32,500** |  |  |
| **Fac.** | **575,000** | **Machine** | **115,000** | **5.00** | **REG** | **50,000** | **$250,000** | **5,000** |  **50.00** |
|  |  | **Hours** |  |  | **ADV** | **48,000** | **240,000** | **4,000** |  **60.00** |
|  |  |  |  |  | **GMT** | **17,000** | **85,000** | **1,000** |  **85.00** |
|  |  |  |  |  |  **Total** | **115,000** | **$575,000** |  |  |
| **Grand** **Total** | **$1,224,000** |  |  |  | **Grand Total** |  | **$1,224,000** |  |  |

**PROBLEM 5-46 (CONTINUED)**

**4. Comparison of costs and target prices under two alternative product-costing systems:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **REG** | **ADV** | **GMT** |
| **Reported unit *overhead* cost:** |  |  |  |
| **Traditional, volume-based costing system**  | **$108.00** | **$132.00** | **$156.00** |
| **Activity-based costing system**  | **103.50** | **123.15** | **213.90** |
| **Reported unit *product* cost (direct material, direct labor and overhead):** |  |  |  |
| **Traditional, volume-based costing system**  | **408.00** | **492.00** | **606.00** |
| **Activity-based costing system**  | **403.50** | **483.15** | **663.90** |
| **Sales price data:** |  |  |  |
| **Original target price (130% of product cost based on traditional, volume-based costing system)**  | **530.40** | **639.60** | **787.80** |
| **New target price (130% of product cost based activity-based costing system)**  | **524.55** | **628.10** | **863.07** |
| **Actual current selling price**  | **525.00** | **628.00** | **800.00** |

**5. The REG and ADV products were overcosted by the traditional system, and the GMT product was undercosted by the traditional system**

|  |  |  |  |
| --- | --- | --- | --- |
| **Reported unit *product* cost:** |  |  |  |
| **Traditional, volume-based costing system**  | **$408.00** | **$492.00** | **$606.00** |
| **Activity-based costing system**  |  **403.50** |  **483.15** |  **663.90** |
| **Cost distortion: REG and ADV overcosted by traditional system**  | **$ 4.50** | **$ 8.85** |  |
|  **GMT undercosted by traditional system**  |  |  | **($ 57.90)** |

**PROBLEM 5-50**

1. Predetermined overhead rate = budgeted overhead ÷ budgeted direct-labor hours

 = $710,000 ÷ 20,000\* = $35.50 per direct labor hour

 \*20,000 budgeted direct-labor hours = (2,500 units of Medform)(3 hrs./unit) +

(3,125 units of Procel)(4 hrs./unit)

|  |  |  |
| --- | --- | --- |
|  | Medform | Procel |
|  |  |  |
| Direct material  | $ 30.00 | $ 45.00 |
| Direct labor: |  |  |
| 3 hours x $15  |  45.00 |  |
| 4 hours x $15  |  |  60.00 |
| Manufacturing overhead: |  |  |
| 3 hours x $35.50  |  106.50 |  |
| 4 hours x $35.50  |  |  142.00 |
| Total cost  | $181.50 | $247.00 |

1. Activity-based overhead application rates:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity | Cost |  | Activity Cost Driver |  | Application Rate |
|  |  |  |  |  |  |
| Order processing | $120,000 | ÷ | 600 orders processed (OP) | = | $200 per OP |
|  |  |  |  |  |  |
| Machine processing |  500,000 | ÷ | 50,000 machinehrs. (MH) | = | $10 per MH  |
|  |  |  |  |  |  |
| Product inspection |  90,000 | ÷ | 15,000 inspection hrs. (IH)  | = | $6 per IH |

Order processing, machine processing, and product inspection costs of a Medform unit and an Procel unit:

|  |  |  |
| --- | --- | --- |
|  Activity | Medform | Procel |
|  |  |  |
| Order processing: |  |  |
| 350 OP x $200  | $ 70,000 |  |
| 250 OP x $200  |  | $ 50,000 |
| Machine processing: |  |  |
| 23,000 MH x $10  |  230,000 |  |
| 27,000 MH x $10  |  |  270,000 |
| Product inspection: |  |  |
|  4,000 IH x $6  |  24,000 |  |
| 11,000 IH x $6  |  |  66,000 |
| Total  | $324,000 | $386,000 |
|  |  |  |
| Production volume (units) | 2,500 | 3,125 |
| Cost per unit | $129.60\* | $123.52\*\* |

 \* $324,000 ÷ 2,500 units = $129.60

 \*\* $386,000 ÷ 3,125 units = $123.52

The manufactured cost of a Medform unit is $204.60, and the manufactured cost of a Procel unit is $228.52:

|  |  |  |
| --- | --- | --- |
|  | Medform | Procel |
|  |  |  |
| Direct material………………………………. | $ 30.00 | $ 45.00 |
| Direct labor: |  |  |
| 3 hours x $15…………………………… |  45.00 |  |
| 4 hours x $15…………………………… |  |  60.00 |
| Order processing, machine processing, and product inspection……………….. |  129.60 |  123.52 |
| Total cost……………………………………. | $204.60 | $228.52 |

3. a. The Procel product is overcosted by $18.48 ($247.00 - $228.52) under the traditional product-costing system. The labor-hour application base resulted in a $247 unit cost; in contrast, the more accurate ABC approach yielded a lower unit cost of $228.52. The opposite situation occurs with the Medform product, which is undercosted by $23.10 under the traditional approach ($181.50 vs. $204.60 under ABC).

 The traditional costing system overcosts the Procel product line by a total of $57,750 ($18.48 x 3,125 units), and it undercosts the Medform product line by the same amount, $57,750 ($23.10 x 2,500 units).

b. Yes, especially since Meditech’s selling prices are based heavily on cost. An overcosted product will result in an inflated selling price, which could prove detrimental in a highly competitive marketplace. Customers will be turned off and will go elsewhere, which hurts profitability. With undercosted products, selling prices may be too low to adequately cover a product’s more accurate (higher) cost. This situation is also troublesome and will result in lower income reported for the company