Chapter 7

Activity-Based Costing: A Tool to Aid   
Decision Making

Solutions to Questions

**7-1** Activity-based costing differs from traditional costing systems in a number of ways. In activity-based costing, nonmanufacturing as well as manufacturing costs may be assigned to products. And, some manufacturing costs—including the costs of idle capacity—may be excluded from product costs. An activity-based costing system typically includes a number of activity cost pools, each of which has its unique measure of activity. These measures of activity often differ from the allocation bases used in traditional costing systems.

**7-2** When direct labor is used as an allocation base for overhead, it is implicitly assumed that overhead cost is directly proportional to direct labor. When cost systems were originally developed in the 1800s, this assumption may have been reasonably accurate. However, direct labor has declined in importance over the years while overhead has been increasing. This suggests that there is no longer a direct link between the level of direct labor and overhead. Indeed, when a company automates, direct labor is replaced by machines; a decrease in direct labor is accompanied by an increase in overhead. This violates the assumption that overhead cost is directly proportional to direct labor. Overhead cost appears to be driven by factors such as product diversity and complexity as well as by volume, for which direct labor has served as a convenient measure.

**7-3** Top managers provide leadership that is needed to properly motivate all employees to embrace the need to implement ABC. Top managers also have the authority to link ABC data to the employee evaluation and reward system. Cross-functional employees are also important because they possess intimate knowledge of operations that is needed to design an effective ABC system. Tapping the knowledge of cross-functional employees also lessens their resistance to ABC because they feel included in the implementation process.

**7-4** *Unit-level* activities are performed for each unit that is produced. *Batch-level* activities are performed for each batch regardless of how many units are in the batch. *Product-level* activities must be carried out to support a product regardless of how many batches are run or units produced. *Customer-level* activities must be carried out to support customers regardless of what products or services they buy. *Organization-sustaining* activities are carried out regardless of the company’s precise product mix or mix of customers.

**7-5** Organization-sustaining costs, customer-level costs, and the costs of idle capacity should not be assigned to products. These costs represent resources that are not consumed by the products.

**7-6** In activity-based costing, costs must first be allocated to activity cost pools and then they are allocated from the activity cost pools to products, customers, and other cost objects.

**7-7** Because people are often involved in more than one activity, some way must be found to estimate how much time they spend in each activity. The most practical approach is often to ask employees how they spend their time. It is also possible to ask people to keep records of how they spend their time or observe them as they perform their tasks, but both of these alternatives are costly and it is not obvious that the data would be any better. People who know they are being observed may change how they behave.

**7-8** In traditional cost systems, product-level costs are indiscriminately spread across all products using direct labor-hours or some other allocation base related to volume. As a consequence, high-volume products are assigned the bulk of such costs. If a product is responsible for 40% of the direct labor in a factory, it will be assigned 40% of the manufacturing overhead cost in the factory—including 40% of the product-level costs of low-volume products. In an activity-based costing system, batch-level and product-level costs are assigned more appropriately. This results in shifting product-level costs back to the products that cause them and away from the high-volume products. (A similar effect will be observed with batch-level costs if high-volume products are produced in larger batches than low-volume products.)

**7-9** Activity rates tell managers the average cost of resources consumed to carry out a particular activity such as processing purchase orders. An activity whose average cost is high may be a good candidate for process improvements. Benchmarking can be used to identify which activities have unusually large costs. If some other organization is able to carry out the activity at a significantly lower cost, it is reasonable to suppose that improvement may be possible.

**7-10** The activity-based costing approach described in the chapter is probably unacceptable for external financial reports for two reasons. First, activity-based product costs, as described in this chapter, exclude some manufacturing costs and include some nonmanufacturing costs. Second, the first-stage allocations are based on interviews rather than verifiable, objective data.

The Foundational 15

1. The plantwide overhead rate is computed as follows:

|  |  |  |
| --- | --- | --- |
| Total estimated overhead cost (a) | $684,000 |  |
| Total expected direct labor-hours (b) | 12,000 | DLHs |
| Predetermined overhead rate (a) ÷ (b) | $57.00 | per DLH |

2. The overhead cost assignments to Products Y and Z are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Product Y | | Product Z |
| Total direct labor hours (a) | | 8,000 | 4,000 |
| Plantwide overhead rate per DLH (b) | | $57.00 | $57.00 |
| Manufacturing overhead assigned (a) × (b) | | $456,000 | $228,000 |

3-6.

The activity rates are computed as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity Cost Pool | (a)  Estimated  Overhead  Cost | (b)  Expected  Activity | | (a) ÷ (b)  Activity  Rate | |
| Machining | $200,000 | 10,000 | MH | $20 | per MH |
| Machine setups | $100,000 | 200 | setups | $500 | per setup |
| Product design | $84,000 | 2 | products | $42,000 | per product |
| General factory | $300,000 | 12,000 | DLHs | $25 | Per DLH |

7. Machine setups is a batch-level activity. A setup is performed to run a batch of units. The cost of the setup is determined by the resources consumed performing the setup and it is not influenced by the number of units processed once the setup is complete.

8. The product design activity is a product-level activity. The product design cost is determined by the number of products supported and it is not influenced by the number of batches or units processed.

**The Foundational 15** (continued)

9-10. Using the ABC system, the total overhead assigned to Products Y and Z is computed as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Product Y | |  | Product Z | |
|  | Expected  Activity | Amount |  | Expected |  |
|  |  | Activity | Amount |
| Machining, at $20.00 per machine-hour | 7,000 | $140,000 |  | 3,000 | $  60,000 |
| Machine setups, at $500.00 per setup | 50 | 25,000 |  | 150 | 75,000 |
| Product design, at $42,000 per product | 1 | 42,000 |  | 1 | 42,000 |
| General factory, at $25.00 per direct labor-hour | 8,000 | 200,000 |  | 4,000 | 100,000 |
| Total overhead cost assigned |  | $407,000 |  |  | $277,000 |

The Foundational 15 (continued)

11-15. The percentages of overhead assigned using the plantwide and ABC approaches are computed as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Product Y* | | *Product Z* | | *Total* |
| *Plantwide Approach* | (a)  Amount | (a) ÷ (c)  % | (b)  Amount | (b) ÷ (c)  % | (c)  Amount |
| Manufacturing overhead | $456,000 | 66.7% | $228,000 | 33.3% | $684,000 |
|  |  |  |  |  |  |
| *Activity-Based Costing System* |  |  |  |  |  |
| Machining | $140,000 | 70.0% | $ 60,000 | 30.0% | $200,000 |
| Machine setups | 25,000 | 25.0% | 75,000 | 75.0% | 100,000 |
| Product design | 42,000 | 50.0% | 42,000 | 50.0% | 84,000 |
| General factory | 200,000 | 66.7% | 100,000 | 33.3% | 300,000 |
| Total cost assigned to products | $407,000 |  | $277,000 |  | $684,000 |

The Machining allocation percentages used in the ABC system are similar to the plantwide allocation percentages because the Machining cost pool uses a unit-level activity measure (machine-hours). Since the plantwide cost pool also uses a unit-level allocation base (direct labor-hours), it is reasonable to expect these cost allocations percentages to be comparable.

Under the ABC system, 25% and 75% of the Machine Setups cost is allocated to Products Y and Z, respectively, whereas the plantwide approach allocates 67% and 33% of all overhead costs to the two products. These allocation percentages are different because Machine Setups is a batch-level cost pool. Although Product Y is the high-volume product (14,000 units) and Product Z is the low-volume product (6,000 units), Product Y only consumes 25% of the total machine setups and Product Z consumes 75% of the total machine setups. The conventional system is allocating too much of the machine setup costs to Product Y and too little of these costs to Product Z.

The Foundational 15 (continued)

Under the ABC system, 50% of the Product Design cost is allocated to each product, whereas the plantwide approach allocates 67% and 33% of all overhead costs to Products Y and Z, respectively. These percentages are different because Product Design is a product-level cost pool. Although Product Y is the high volume product (14,000 units) and Product Z is the low-volume product (6,000 units), both products consume 50% of the product design resources. The conventional system is allocating too much of the product design costs to Product Y and too little of these costs to Product Z.

Under the ABC system, the General Factory allocation percentages are the same as the plantwide allocation percentages because the General Factory cost pool is allocated to products using the same unit-level activity measure (direct labor-hours) as the plantwide approach.

**Exercise 7-1** (10 minutes)

|  |  |  |
| --- | --- | --- |
| a. | Receive raw materials from suppliers. | Batch-level |
| b. | Manage parts inventories. | Product-level |
| c. | Do rough milling work on products. | Unit-level |
| d. | Interview and process new employees in the personnel department. | Organization-sustaining |
| e. | Design new products. | Product-level |
| f. | Perform periodic preventive maintenance on general- use equipment. | Organization-sustaining |
| g. | Use the general factory building. | Organization-sustaining |
| h. | Issue purchase orders for a job. | Batch-level |

Some of these classifications are debatable and depend on the specific circumstances found in particular companies.

**Exercise 7-2** (15 minutes)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Travel* | *Pickup and  Delivery* | *Customer  Service* | *Other* | *Totals* |
| Driver and guard wages | $360,000 | $252,000 | $ 72,000 | $ 36,000 | $  720,000 |
| Vehicle operating expense | 196,000 | 14,000 | 0 | 70,000 | 280,000 |
| Vehicle depreciation | 72,000 | 18,000 | 0 | 30,000 | 120,000 |
| Customer representative salaries and expenses | 0 | 0 | 144,000 | 16,000 | 160,000 |
| Office expenses | 0 | 6,000 | 9,000 | 15,000 | 30,000 |
| Administrative expenses | 0 | 16,000 | 192,000 | 112,000 | 320,000 |
| Total cost | $628,000 | $306,000 | $417,000 | $279,000 | $1,630,000 |

Each entry in the table is derived by multiplying the total cost for the cost category by the percentage taken from the table below that shows the distribution of resource consumption:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Travel* | *Pickup and  Delivery* | *Customer  Service* | *Other* | *Totals* |
| Driver and guard wages | 50% | 35% | 10% | 5% | 100% |
| Vehicle operating expense | 70% | 5% | 0% | 25% | 100% |
| Vehicle depreciation | 60% | 15% | 0% | 25% | 100% |
| Customer representative salaries and expenses | 0% | 0% | 90% | 10% | 100% |
| Office expenses | 0% | 20% | 30% | 50% | 100% |
| Administrative expenses | 0% | 5% | 60% | 35% | 100% |

**Exercise 7-3** (10 minutes)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Activity Cost Pool* | *Estimated Overhead Cost* | *Expected Activity* | | *Activity Rate* | |
| Caring for lawn | $72,000 | 150,000 | square feet of lawn | $0.48 | per square foot of lawn |
| Caring for garden beds– low maintenance | $26,400 | 20,000 | square feet of low maintenance beds | $1.32 | per square foot of low maintenance beds |
| Caring for garden beds–high maintenance | $41,400 | 15,000 | square feet of high maintenance beds | $2.76 | per square foot of high maintenance beds |
| Travel to jobs | $3,250 | 12,500 | miles | $0.26 | per mile |
| Customer billing and service | $8,750 | 25 | customers | $350 | per customer |

The activity rate for each activity cost pool is computed by dividing its estimated overhead cost by its expected activity.

**Exercise 7-4** (10 minutes)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *K425* | | | | | |
| *Activity Cost Pool* | *Activity Rate* | | *Activity* | | *ABC Cost* |
| Supporting direct labor | $6 | per direct labor-hour | 80 | direct labor-hours | $   480 |
| Machine processing | $4 | per machine-hour | 100 | machine-hours | 400 |
| Machine setups | $50 | per setup | 1 | setups | 50 |
| Production orders | $90 | per order | 1 | order | 90 |
| Shipments | $14 | per shipment | 1 | shipment | 14 |
| Product sustaining | $840 | per product | 1 | product | 840 |
| Total |  |  |  |  | $1,874 |
|  |  |  |  |  |  |
| *M67* | | | | | |
| *Activity Cost Pool* | *Activity Rate* | | *Activity* | | *ABC Cost* |
| Supporting direct labor | $6 | per direct labor-hour | 500 | direct labor-hours | $ 3,000 |
| Machine processing | $4 | per machine-hour | 1,500 | machine-hours | 6,000 |
| Machine setups | $50 | per setup | 4 | setups | 200 |
| Production orders | $90 | per order | 4 | orders | 360 |
| Shipments | $14 | per shipment | 10 | shipments | 140 |
| Product sustaining | $840 | per product | 1 | product | 840 |
| Total |  |  |  |  | $10,540 |

|  |  |  |
| --- | --- | --- |
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|  |  |  |
|  |  |  |
|  |  |  |

**Exercise 7-5** (15 minutes)

|  |  |  |
| --- | --- | --- |
| Sales ($1,850 per standard model glider × 20 standard model gliders + $2,400 per custom designed glider × 3 custom designed gliders) |  | $44,200 |
| Costs: |  |  |
| Direct materials ($564 per standard model glider × 20 standard model gliders + $634 per custom  designed glider × 3 custom designed gliders) | $13,182 |  |
| Direct labor ($19.50 per direct labor-hour × 26.35 direct labor-hours per standard model glider × 20 standard model gliders + $19.50 per direct labor-hour × 28 direct labor-hours per custom designed glider × 3 custom designed gliders) | 11,915 |  |
| Supporting direct labor ($26 per direct labor-hour × 26.35 direct labor-hours per standard model glider × 20 standard model gliders + $26 per direct labor-hour × 28 direct labor-hours per custom designed glider × 3 custom designed gliders) | 15,886 |  |
| Order processing ($284 per order × 4 orders) | 1,136 |  |
| Custom designing ($186 per custom design × 3 custom designs) | 558 |  |
| Customer service ($379 per customer ×  1 customer) | 379 | 43,056 |
| Customer margin |  | $  1,144 |

**Exercise 7-6** (10 minutes)

|  |  |  |
| --- | --- | --- |
|  | Activity | Level |
| a. | Sales representatives’ periodic visits to customers to keep them informed about the services provided by CD Express. | Customer-level |
| b. | Ordering labels from the printer for a  particular CD\*. | Product-level |
| c. | Setting up the CD duplicating machine to make copies from a particular master CD. | Batch-level |
| d. | Loading the automatic labeling machine with labels for a particular CD\*. | Batch-level |
| e. | Visually inspecting CDs and placing them by hand into protective plastic cases prior to shipping. | Unit-level |
| f. | Preparation of the shipping documents for the order. | Product-level |
| g. | Periodic maintenance of equipment. | Organization-sustaining |
| h. | Lighting and heating the company’s  production facility. | Organization-sustaining |
| i. | Preparation of quarterly financial reports. | Organization-sustaining |

\*The cost of the labels themselves would be part of direct materials.

**Exercise 7-7** (10 minutes)

|  |  |
| --- | --- |
| Teller wages | $160,000 |
| Assistant branch manager salary | $75,000 |
| Branch manager salary | $80,000 |

|  | Distribution of Resource Consumption Across Activities | | | | |
| --- | --- | --- | --- | --- | --- |
|  | Opening Accounts | Processing Deposits and Withdrawals | Processing Other  Customer Transactions | Other  Activities | Totals |
| Teller wages | 5% | 65% | 20% | 10% | 100% |
| Assistant branch manager salary | 15% | 5% | 30% | 50% | 100% |
| Branch manager salary | 5% | 0% | 10% | 85% | 100% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Opening Accounts | Processing Deposits and Withdrawals | Processing Other  Customer Transactions | Other  Activities | Totals |
| Teller wages | $  8,000 | $104,000 | $32,000 | $ 16,000 | $160,000 |
| Assistant branch manager salary | 11,250 | 3,750 | 22,500 | 37,500 | 75,000 |
| Branch manager salary | 4,000 | 0 | 8,000 | 68,000 | 80,000 |
| Total cost | $23,250 | $107,750 | $62,500 | $121,500 | $315,000 |

Teller wages are $160,000 and 65% of the tellers’ time is spent processing deposits and withdrawals:

$160,000 × 65% = $104,000.

Other entries in the table are determined similarly.

**Exercise 7-8** (20 minutes)

1. Computation of activity rates:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity Cost Pools | (a) Total Cost | (b) Total Activity | | (a) ÷ (b) Activity Rate | |
| Opening accounts | $23,250 | 500 | accounts opened | $46.50 | per account opened |
| Processing deposits and withdrawals | $107,750 | 100,000 | deposits and withdrawals | $1.08 | per deposit or withdrawal |
| Processing other customer transactions | $62,500 | 5,000 | other customer transactions | $12.50 | per other customer transaction |

2. The cost of opening an account at the Westfield branch is much higher than at the lowest cost branch ($46.50 versus $26.75). On the other hand, the cost of processing deposits and withdrawals is lower than at the lowest cost branch ($1.08 versus $1.24). And the cost of processing other customer transactions is higher at the Westfield branch ($12.50 versus $11.86). The other branches may have something to learn from Westfield concerning processing deposits and withdrawals and Westfield may benefit from learning about how some of the other branches open accounts and process other transactions. It may be particularly instructive to compare the details of the activity rates. For example, is the cost of opening accounts at Westfield high because of the involvement of the assistant branch manager in this activity? Perhaps tellers open new accounts at other branches.

The apparent differences in the costs of the activities at the various branches may be due to inaccuracies in employees’ reports of the amount of time they devote to the activities. The differences in costs may also reflect different strategies. For example, the Westfield branch may purposely spend more time with new customers in order to win their loyalty. The higher cost of opening new accounts at the Westfield branch may be justified by future benefits of having more satisfied customers. Nevertheless, comparative studies of the costs of activities may provide a useful starting point for identifying best practices within a company and where improvements can be made.

**Exercise 7-9** (10 minutes)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
| Order size | $16.85 | per direct labor-hour | 200 | direct labor-hours | $3,370 |
| Customer orders | $320.00 | per customer order | 1 | customer order | 320 |
| Product testing | $89.00 | per product testing hour | 4 | product testing hours | 356 |
| Selling | $1,090.00 | per sales call | 2 | sales calls | 2,180 |
| Total |  |  |  |  | $6,226 |

According to these calculations, the total overhead cost of the order was $6,226.

**Exercise 7-10** (30 minutes)

1. Total revenue received:

|  |  |  |
| --- | --- | --- |
|  | *University* | *Memorial* |
| Cost of goods sold to the hospital (a) | $30,000 | $30,000 |
| Markup percentage | × 5% | × 5% |
| Markup in dollars (b) | $1,500 | $1,500 |
| Revenue received from hospitals (a) + (b) | $31,500 | $31,500 |

2. Activity Rates:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Activity Cost Pool* | *(a)*  *Estimated Overhead*  *Cost* | *(b)*  *Expected*  *Activity* | | *(a) ÷ (b)*  *Activity*  *rate* | |
| Customer deliveries | $500,000 | 5,000 | deliveries | $100.00 | per delivery |
| Manual order processing | $248,000 | 4,000 | orders | $62.00 | per manual order |
| Electronic order processing | $200,000 | 12,500 | orders | $16.00 | per electronic order |
| Line item picking | $450,000 | 450,000 | line items | $1.00 | per line item picked |

**Exercise 7-10** (continued)

3. Activity costs are assigned to the two hospitals as follows:

*University:*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | | (b) Activity | | | (a) × (b) ABC Cost |
|  | Customer deliveries | $100.00 | | per delivery | | 10 | deliveries | $1,000 |
|  | Manual order processing | $62.00 | | per order | | 0 | orders | 0 |
|  | Electronic order processing | $16.00 | | per order | | 15 | orders | 240 |
|  | Line item picking | $1.00 | | per line item | | 120 | line items | 120 |
|  | Total activity costs |  |  | |  | |  | $1,360 |

*Memorial:*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | | (b) Activity | | | (a) × (b) ABC Cost |
|  | Customer deliveries | $100.00 | | per delivery | | 25 | deliveries | $   2,500 |
|  | Manual order processing | $62.00 | | per order | | 30 | orders | 1,860 |
|  | Electronic order processing | $16.00 | | per order | | 0 | orders | 0 |
|  | Line item picking | $1.00 | | per line item | | 250 | line items | 250 |
|  | Total activity costs |  |  | |  | |  | $4,610 |

**Exercise 7-10** (continued)

4. Customer margins for the two hospitals:

|  |  |  |
| --- | --- | --- |
|  | *University* | *Memorial* |
| Sales | $31,500 | $31,500 |
| Cost of goods sold | 30,000 | 30,000 |
| Gross margin | 1,500 | 1,500 |
| Customer deliveries | 1,000 | 2,500 |
| Manual order processing | 0 | 1,860 |
| Electronic order processing | 240 | 0 |
| Line item picking | 120 | 250 |
| Total activity costs | 1,360 | 4,610 |
| Customer margin | $     140 | $(3,110) |

5. Hospitals that require frequent deliveries, place a high volume of manual orders, and order many line items are likely to be unprofitable.

**Exercise 7-11** (15 minutes)

|  |  |  |
| --- | --- | --- |
| *Customer Margin—ABC Analysis* |  |  |
| Sales (1,000 seats × $20 per unit) |  | $20,000.00 |
| Costs: |  |  |
| Direct materials ($8.50 per unit × 1,000 units) | $8,500.00 |  |
| Direct labor ($6.00 per unit × 1,000 units) | 6,000.00 |  |
| Supporting direct labor ($5.55 per DLH × 0.25 DLH per unit × 1,000 units) | 1,387.50 |  |
| Batch processing ($107 per batch × 2 batches) | 214.00 |  |
| Order processing ($275 per order × 1 order) | 275.00 |  |
| Customer service overhead ($2,463 per customer × 1 customer) | 2,463.00 | 18,839.50 |
| Customer margin |  | $  1,160.50 |

**Exercise 7-12** (10 minutes)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Activity | Activity  Classification | Examples of Activity  Measures |
| a. | Direct labor workers assemble a product. | Unit | Direct labor-hours |
| b. | Products are designed by engineers. | Product | Number of new products designed; hours of design time |
| c. | Equipment is set up. | Batch | Number of setups; setup hours |
| d. | Machines are used to shape and cut materials. | Unit | Number of units processed; machine-hours |
| e. | Monthly bills are sent out to regular customers. | Customer | Number of bills sent; time spent preparing bills |
| f. | Materials are moved from the receiving dock to production lines. | Batch | Number of loads transferred; time spent moving materials |
| g. | All completed units are inspected for defects. | Unit | Number of units inspected; Inspection hours |

Notes:

1. In all cases except for direct labor in part (a), two activity measures are listed. The first is a “transaction driver” and the second is a “duration driver.” Transaction drivers are simple counts of the number of times an activity occurs such as the number of times materials are moved. Duration drivers are measures of the amount of time required to perform an activity such as the time spent moving materials. In general, duration drivers are more accurate measures of the consumption of resources than transaction drivers, but they take more effort to record.

**Exercise 7-13** (30 minutes)

1. Activity rates are computed as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity Cost Pool | (a)  Estimated  Overhead  Cost | (b)  Expected  Activity | | (a) ÷ (b)  Activity  Rate | |
| Machine setups | $72,000 | 400 | setups | $180 | per setup |
| Special processing | $200,000 | 5,000 | MHs | $40 | per MH |

There is no activity rate for the General Factory activity because it is an organization-sustaining activity. Organization-sustaining costs should not be allocated to products.

2. Overhead is assigned to the two products as follows:

*Hubs:*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Machine setups | $180 | per setup | 100 | setups | $  18,000 |
|  | Special processing | $40 | per MH | 5,000 | MHs | 200,000 |
|  | Total |  |  |  |  | $218,000 |

*Sprockets:*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Machine setups | $180 | per setup | 300 | setups | $54,000 |
|  | Special processing | $40 | per MH | 0 | MHs | 0 |
|  | Total |  |  |  |  | $54,000 |

**Exercise 7-13** (continued)

|  |  |  |
| --- | --- | --- |
|  | Hubs | Sprockets |
| Direct materials | $32.00 | $18.00 |
| Direct labor: |  |  |
| $15 per DLH × 0.80 DLHs per unit | 12.00 |  |
| $15 per DLH × 0.40 DLHs per unit |  | 6.00 |
| Overhead: |  |  |
| $218,000 ÷ 10,000 units | 21.80 |  |
| $54,000 ÷ 40,000 units |  | 1.35 |
| Unit cost | $65.80 | $25.35 |

**Exercise 7-14** (30 minutes)

1. The first step is to determine the activity rates:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pools | (a) Total Cost | (b) Total Activity | | (a) ÷ (b) Activity Rate | |
|  | Serving parties | $33,000 | 6,000 | parties | $5.50 | per party |
|  | Serving diners | $138,000 | 15,000 | diners | $9.20 | per diner |
|  | Serving drinks | $24,000 | 10,000 | drinks | $2.40 | per drink |

According to the activity-based costing system, the cost of serving each of the parties can be computed as follows:

a. Party of 4 persons who order a total of 3 drinks:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Serving parties | $5.50 | per party | 1 | party | $ 5.50 |
|  | Serving diners | $9.20 | per diner | 4 | diners | 36.80 |
|  | Serving drinks | $2.40 | per drink | 3 | drinks | 7.20 |
|  | Total |  |  |  |  | $49.50 |

b. Party of 2 persons who order no drinks:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Serving parties | $5.50 | per party | 1 | party | $ 5.50 |
|  | Serving diners | $9.20 | per diner | 2 | diners | 18.40 |
|  | Serving drinks | $2.40 | per drink | 0 | drinks | 0 |
|  | Total |  |  |  |  | $23.90 |

c. Party of 1 person who orders 2 drinks:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Serving parties | $5.50 | per party | 1 | party | $ 5.50 |
|  | Serving diners | $9.20 | per diner | 1 | diner | 9.20 |
|  | Serving drinks | $2.40 | per drink | 2 | drinks | 4.80 |
|  | Total |  |  |  |  | $19.50 |

**Exercise 7-14** (continued)

2. The average cost per diner for each party can be computed by dividing the total cost of the party by the number of diners in the party as follows:

a. $49.50 ÷ 4 diners = $12.375 per diner

b. $23.90 ÷ 2 diners = $11.95 per diner

c. $19.50 ÷ 1 diner = $19.50 per diner

3. The average cost per diner differs from party to party under the activity-based costing system for two reasons. First, the cost of serving a party ($5.50) does not depend on the number of diners in the party. Therefore, the average cost per diner of this activity decreases as the number of diners in the party increases. With only one diner, the cost is $5.50. With two diners, the average cost per diner is cut in half to $2.75. With five diners, the average cost per diner would be only $1.10, and so on. Second, the average cost per diner differs also because of the differences in the number of drinks ordered by the diners. If a party does not order any drinks, as was the case with the party of two, no costs of serving drinks are assigned to the party.

The average cost per diner differs from the overall average cost of $16 per diner for several reasons. First, the average cost of $16 per diner includes organization-sustaining costs that are excluded from the computations in the activity-based costing system. Second, the $16 per diner figure does not recognize differences in the diners’ demands on resources. It does not recognize that some diners order more drinks than others nor does it recognize the economies of scale in serving larger parties. (The batch-level costs of serving a party can be spread over more diners if the party is larger.)

We should note that the activity-based costing system itself does not recognize all of the differences in diners’ demands on resources. For example, there are undoubtedly differences in the costs of preparing the various meals on the menu. It may or may not be worth the effort to build a more detailed activity-based costing system that would take such nuances into account.

**Exercise 7-15** (30 minutes)

1. First-stage allocations of overhead costs to the activity cost pools:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Distribution of Resource Consumption  Across Activity Cost Pools | | | |  |
|  | Supporting Direct Labor | Order Processing | Customer Support | Other | Totals |
| Wages and salaries | 40% | 30% | 20% | 10% | 100% |
| Other overhead costs | 30% | 10% | 20% | 40% | 100% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Direct Labor Support | Order Processing | Customer Support | Other | Totals |
| Wages and salaries | $120,000 | $ 90,000 | $ 60,000 | $ 30,000 | $300,000 |
| Other overhead costs | 30,000 | 10,000 | 20,000 | 40,000 | 100,000 |
| Total cost | $150,000 | $100,000 | $ 80,000 | $ 70,000 | $400,000 |

Example: 40% of $300,000 is $120,000.

2. Computation of activity rates:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Activity Cost Pools | (a) Total Cost | (b) Total Activity | | (a) ÷ (b) Activity Rate | | |
| Supporting direct  labor | $150,000 | 20,000 | DLHs | | $7.50 | per DLH | |
| Order processing | $100,000 | 400 | orders | | $250 | per order | |
| Customer support | $80,000 | 200 | customers | | $400 | per customer | |

**Exercise 7-15** (continued)

3. Computation of the overhead costs for the Shenzhen Enterprises order:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
| Supporting direct labor | $7.50 | per DLH | 20 | DLHs\* | $150 | |
| Order processing | $250 | per order | 1 | order | 250 | |
| Customer support | $400 | per customer | 1 | customer | 400 | |
| Total |  |  |  |  | $800 | |

\*2 DLHs per unit × 10 units = 20 DLHs.

4. The customer margin for Shenzhen Enterprises is computed as follows:

|  |  |  |
| --- | --- | --- |
| *Customer Margin—ABC Analysis* |  |  |
| Sales (10 units × $300 per unit) |  | $3,000 |
| Costs: |  |  |
| Direct materials ($180 per unit × 10 units) | $1,800 |  |
| Direct labor ($50 per unit × 10 units) | 500 |  |
| Support direct labor overhead (see part 3 above) | 150 |  |
| Order processing overhead (see part 3 above) | 250 |  |
| Customer support overhead (see part 3 above) | 400 | 3,100 |
| Customer margin |  | $ (100) |

**Problem 7-16** (45 minutes)

1. Under the traditional direct labor-dollar based costing system, manufacturing overhead is applied to products using the predetermined overhead rate computed as follows:



The product margins using the traditional approach would be computed as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | *B300* | *T500* | *Total* |
| Sales | $1,400,000 | $700,000 | $2,100,000 | |
| Direct materials | 436,300 | 251,700 | 688,000 | |
| Direct labor | 200,000 | 104,000 | 304,000 | |
| Manufacturing overhead applied @ $2.00 per direct labor-dollar | 400,000 | 208,000 | 608,000 | |
| Total manufacturing cost | 1,036,300 | 563,700 | 1,600,000 | |
| Product margin | $  363,700 | $136,300 | $ 500,000 | |

Note that all of the manufacturing overhead cost is applied to the products under the company’s traditional costing system.

**Problem 7-16** (continued)

2. The first step is to determine the activity rates:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pools | (a) Total Cost | | (b) Total Activity | | (a) ÷ (b) Activity Rate | | |
|  | Machining | $213,500 | 152,500 | | MHR | | $1.40 | per MHR | |
|  | Setups | $157,500 | 375 | | setup hrs. | | $420 | per setup hr. | |
|  | Product sustaining | $120,000 | 2 | | products | | $60,000 | per product | |

\*The Other activity cost pool is not shown above because it includes organization-sustaining and idle capacity costs that should not be assigned to products.

Under the activity-based costing system, the product margins would be computed as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | *B300* | *T500* | *Total* | |
| Sales | $1,400,000 | | $700,000 | | $2,100,000 | |
| Direct materials | 436,300 | | 251,700 | | 688,000 | |
| Direct labor | 200,000 | | 104,000 | | 304,000 | |
| Advertising expense | 50,000 | | 100,000 | | 150,000 | |
| Machining | 126,000 | | 87,500 | | 213,500 | |
| Setups | 31,500 | | 126,000 | | 157,500 | |
| Product sustaining | 60,000 | | 60,000 | | 120,000 | |
| Total cost | 903,800 | | 729,200 | | 1,633,000 | |
| Product margin | $  496,200 | | $(29,200) | $ 467,000 | | |

**Problem 7-16** (continued)

3. The quantitative comparison is as follows:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B300 | | T500 | | | | Total | | | |
| *Traditional Cost System* | (a)  Amount | (a) ÷ (c)  % | | (b)  Amount | | (b) ÷ (c)  % | | | (c)  Amount | |
| Direct materials | $436,300 | 63.4% | | $251,700 | | 36.6% | | | $  688,000 | |
| Direct labor | 200,000 | 65.8% | | 104,000 | | 34.2% | | | 304,000 | |
| Manufacturing overhead | 400,000 | 65.8% | | 208,000 | | 34.2% | | | 608,000 | |
| Total cost assigned to products | $1,036,300 |  | $563,700 | | |  | $1,600,000 | | | |
| Selling and administrative |  |  |  | |  | | 550,000 | | | |
| Total cost |  |  |  | |  | | $2,150,000 | | | |
|  |  |  |  | |  | |  | | | |
| *Activity-Based Costing System* |  |  |  | |  | |  | | | |
| Direct costs: |  |  |  | |  | |  | | | |
| Direct materials | $436,300 | 63.4% | | $251,700 | | 36.6% | | $  688,000 | | |
| Direct labor | 200,000 | 65.8% | | 104,000 | | 34.2% | | 304,000 | | |
| Advertising expense | 50,000 | 33.3% | | 100,000 | | 66.7% | | 150,000 | | |
| Indirect costs: |  |  | |  | |  | |  | | |
| Machining | 126,000 | 59.0% | | 87,500 | | 41.0% | | 213,500 | | |
| Setups | 31,500 | 20.0% | | 126,000 | | 80.0% | | 157,500 | | |
| Product sustaining | 60,000 | 50.0% | | 60,000 | | 50.0% | | 120,000 | | |
| Total cost assigned to products | $903,800 |  | $729,200 | | |  | 1,633,000 | | | |
| Costs not assigned to products: |  |  |  | | |  |  | | |
| Selling and administrative |  |  |  | | |  | 400,000 | | | |
| Other |  |  |  | | |  | 117,000 | | | |
| Total cost |  |  |  | | |  | $2,150,000 | | | |

**Problem 7-16** (continued)

The traditional and activity-based cost assignments differ for three reasons. First, the traditional system assigns all $608,000 of manufacturing overhead to products. The ABC system assigns only $491,000 of manufacturing overhead to products. The ABC system does not assign the $117,000 of Other activity costs to products because they represent organization-sustaining costs. Second, the traditional system uses one unit-level activity measure, direct labor dollars, to assign 65.8% of all overhead to the B300 product line and 34.2% of all overhead to the T500 product line. The ABC system assigns 59.0% of Machining costs to the B300 product line and 41.0% to the T500 product line. The ABC system assigns 20.0% of Setup costs (a batch-level activity) to the B300 product line and 80.0% to the T500 product line. The ABC system assigns 50% of Product sustaining costs (a product-level activity) to each product line. Third, the traditional system does not trace any advertising expenses to the two products. The ABC system traces $50,000 of advertising to the B300 and $100,000 of advertising to the T500 product line.

**Problem 7-17** (45 minutes)

1. Under the traditional direct labor-hour based costing system, manufacturing overhead is applied to products using the predetermined overhead rate computed as follows:



\*20,000 units of Xtreme @ 2.00 DLH per unit + 80,000 units of the Pathfinder@ 1.0 DLH per unit = 40,000 DLHs + 80,000 DLHs = 120,000 DLHs.

Consequently, the product margins using the traditional approach would be computed as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Xtreme* | *Pathfinder* | *Total* |
| Sales | $2,800,000 | $7,920,000 | $10,720,000 | |
| Direct materials | 1,440,000 | 4,240,000 | 5,680,000 | |
| Direct labor | 480,000 | 960,000 | 1,440,000 | |
| Manufacturing overhead  applied @ $16.50 per  direct labor-hour | 660,000 | 1,320,000 | 1,980,000 | |
| Total manufacturing cost | 2,580,000 | 6,520,000 | 9,100,000 | |
| Product margin | $  220,000 | $1,400,000 | $ 1,620,000 | |

Note that all of the manufacturing overhead cost is applied to the products under the company’s traditional costing system.

**Problem 7-17** (continued)

2. The first step is to determine the activity rates:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pools | (a) Total Cost | | (b) Total Activity | | (a) ÷ (b) Activity Rate | | |
|  | Supporting direct labor | $783,600 | 120,000 | | DLH | | $6.53 | per DLH | |
|  | Batch setups | $495,000 | 300 | | setups | | $1,650 | per setup | |
|  | Product sustaining | $602,400 | 2 | | products | | $301,200 | per product | |

\*The Other activity cost pool is not shown above because it includes organization-sustaining and idle capacity costs that should not be assigned to products.

Under the activity-based costing system, the product margins would be computed as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | *Xtreme* | *Pathfinder* | *Total* |
| Sales | $2,800,000 | | $7,920,000 | $10,720,000 | |
| Direct materials | 1,440,000 | | 4,240,000 | 5,680,000 | |
| Direct labor | 480,000 | | 960,000 | 1,440,000 | |
| Supporting direct labor | 261,200 | | 522,400 | 783,600 | |
| Batch setups | 330,000 | | 165,000 | 495,000 | |
| Product sustaining | 301,200 | | 301,200 | 602,400 | |
| Total cost | 2,812,400 | | 6,188,600 | 9,001,000 | |
| Product margin | $   (12,400) | | $1,731,400 | $ 1,719,000 | |

**Problem 7-17** (continued)

3. The quantitative comparison is as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Xtreme | | Pathfinder | | Total |
| *Traditional Cost System* | (a)  Amount | (a) ÷ (c)  % | (b)  Amount | (b) ÷ (c)  % | (c)  Amount |
| Direct materials | $1,440,000 | 25.4% | $4,240,000 | 74.6% | $5,680,000 |
| Direct labor | 480,000 | 33.3% | 960,000 | 66.7% | 1,440,000 |
| Manufacturing overhead | 660,000 | 33.3% | 1,320,000 | 66.7% | 1,980,000 |
| Total cost assigned to products | $2,580,000 |  | $6,520,000 |  | $9,100,000 |
|  |  |  |  |  |  |
| *Activity-Based Costing System* |  |  |  |  |  |
| Direct costs: |  |  |  |  |  |
| Direct materials | $1,440,000 | 25.4% | $4,240,000 | 74.6% | $5,680,000 |
| Direct labor | 480,000 | 33.3% | 960,000 | 66.7% | 1,440,000 |
| Indirect costs: |  |  |  |  |  |
| Supporting direct labor | 261,200 | 33.3% | 522,400 | 66.7% | 783,600 |
| Batch setups | 330,000 | 66.7% | 165,000 | 33.3% | 495,000 |
| Product sustaining | 301,200 | 50.0% | 301,200 | 50.0% | 602,400 |
| Total cost assigned to products | $2,812,400 |  | $6,188,600 |  | 9,001,000 |
| Costs not assigned to products: |  |  |  |  |  |
| Other |  |  |  |  | 99,000 |
| Total cost |  |  |  |  | $9,100,000 |

**Problem 7-17** (continued)

The traditional and activity-based cost assignments differ for two reasons. First, the traditional system assigns all $1,980,000 of manufacturing overhead to products. The ABC system assigns only $1,881,000 of manufacturing overhead to products. The ABC system does not assign the $99,000 of Other activity costs to products because they represent organization-sustaining and idle capacity costs. Second, the traditional system uses one unit-level activity measure, direct labor hours, to assign 33.3% of all overhead to the Xtreme product line and 66.7% of all overhead to the Pathfinder product line. The ABC system assigns 66.7% of Batch setup costs (a batch-level activity) to the Xtreme product line and 33.3% to the Pathfinder product line. The ABC system assigns 50% of Product sustaining costs (a product-level activity) to each product line.

**Problem 7-18** (45 minutes)

1. The results of the first-stage allocation appear below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Job Size | Estimating and Job Setup | Working on Nonroutine Jobs | Other | Totals |
|  | Wages and salaries | $150,000 | $ 30,000 | $  90,000 | $ 30,000 | $   300,000 |
|  | Disposal fees | 420,000 | 0 | 280,000 | 0 | 700,000 |
|  | Equipment depreciation | 36,000 | 4,500 | 18,000 | 31,500 | 90,000 |
|  | On-site supplies | 30,000 | 15,000 | 5,000 | 0 | 50,000 |
|  | Office expenses | 20,000 | 70,000 | 50,000 | 60,000 | 200,000 |
|  | Licensing and insurance | 120,000 | 0 | 200,000 | 80,000 | 400,000 |
|  | Total cost | $776,000 | $119,500 | $643,000 | $201,500 | $1,740,000 |

According to the data in the problem, 50% of the wages and salaries cost of $300,000 is attributable to activities related to job size.

$300,000 × 50% = $150,000.

Other entries in the table are determined in a similar manner.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2. | Activity Cost Pool | (a) Total Cost | (b) Total Activity | | (a) ÷ (b) Activity Rate | |
|  | Job size | $776,000 | 800 | thousand square feet | $970 | per thousand square feet |
|  | Estimating and job setup | $119,500 | 500 | jobs | $239 | per job |
|  | Working on nonroutine jobs | $643,000 | 100 | nonroutine jobs | $6,430 | per nonroutine job |

**Problem 7-18** (continued)

3. The costs of each of the jobs can be computed as follows using the activity rates computed above:

|  |  |  |  |
| --- | --- | --- | --- |
|  | a. | *Routine one thousand square foot job:* |  |
|  |  | Job size (1 thousand square feet @ $970 per thousand square feet) | $   970.00 |
|  |  | Estimating and job setup (1 job @ $239 per job) | 239.00 |
|  |  | Nonroutine job (not applicable) | 0 |
|  |  | Total cost of the job | $1,209.00 |
|  |  | Cost per thousand square feet ($1,209 ÷ 1 thousand square feet) | $1,209.00 |
|  |  |  |  |
|  | b. | *Routine two thousand square foot job:* |  |
|  |  | Job size (2 thousand square feet @ $970 per thousand square feet) | $1,940.00 |
|  |  | Estimating and job setup (1 job @ $239 per job) | 239.00 |
|  |  | Nonroutine job (not applicable) | 0 |
|  |  | Total cost of the job | $2,179.00 |
|  |  | Cost per thousand square feet ($2,179 ÷ 2 thousand square feet) | $1,089.50 |
|  |  |  |  |
|  | c. | *Nonroutine two thousand square foot job:* |  |
|  |  | Job size (2 thousand square feet @ $970 per thousand square feet) | $1,940.00 |
|  |  | Estimating and job setup (1 job @ $239 per job) | 239.00 |
|  |  | Nonroutine job | 6,430.00 |
|  |  | Total cost of the job | $8,609.00 |
|  |  | Cost per thousand square feet ($8,609 ÷ 2 thousand square feet) | $4,304.50 |

**Problem 7-18** (continued)

4. The objectivity of the interview data can be questioned because the on-site work supervisors were undoubtedly trying to prove their case about the cost of nonroutine jobs. Nevertheless, the activity-based costing data certainly suggest that dramatic differences exist in the costs of jobs. While some of the costs may be difficult to adjust in response to changes in activity, it does appear that the standard bid of $2,500 per thousand square feet may be substantially under the company’s cost for nonroutine jobs. Even though it may be difficult to detect nonroutine situations before work begins, the average additional cost of $6,430 for nonroutine work suggests that the estimator should try. And if a nonroutine situation is spotted, this should be reflected in the bid price.

Savvy competitors are likely to bid less than $2,500 per thousand square feet on routine work and substantially more than $2,500 per thousand square feet on nonroutine work. Consequently, Mercer Asbestos Removal may find that its product mix shifts toward nonroutine work and away from routine work as customers accept bids on nonroutine work from the company and go to competitors for routine work. This may have a negative effect on the company’s profits.

**Problem 7-19** (20 minutes)

1. The cost of serving the local commercial market according to the ABC model can be determined as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Animation concept | $6,040 | per proposal | 25 | proposals | $151,000 |
|  | Animation production | $7,725 | per minute of animation | 5 | minutes | 38,625 |
|  | Contract administration | $6,800 | per contract | 10 | contracts | 68,000 |
|  |  |  |  |  |  | $257,625 |

2. The margin earned serving the local commercial market is negative, as shown below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Profitability Analysis* |  |  |
|  | Sales |  | $180,000 |
|  | Costs: |  |  |
|  | Animation concept | $151,000 |  |
|  | Animation production | 38,625 |  |
|  | Contract administration | 68,000 | 257,625 |
|  | Margin |  | $(77,625) |

3. It appears that the local commercial market is losing money and the company would be better off dropping this market segment. However, as discussed in the previous problem, not all of the costs included above may be avoidable. If more than $77,625 of the total costs of $257,625 is not avoidable, then the company really isn’t losing money on the local commercial market and the segment should not be dropped. These issues will be discussed in more depth in Chapters 12 and 13.

**Problem 7-20** (45 minutes)

1. The first-stage allocation of costs to activity cost pools appears below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Distribution of Resource Consumption Across Activity Cost Pools | | | |  |
|  |  | Cleaning Carpets | Travel to Jobs | Job Support | Other | Total |
|  | Wages | 70% | 20% | 0% | 10% | 100% |
|  | Cleaning supplies | 100% | 0% | 0% | 0% | 100% |
|  | Cleaning equipment depreciation | 80% | 0% | 0% | 20% | 100% |
|  | Vehicle expenses | 0% | 60% | 0% | 40% | 100% |
|  | Office expenses | 0% | 0% | 45% | 55% | 100% |
|  | President’s compensation | 0% | 0% | 40% | 60% | 100% |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Cleaning Carpets | Travel  to Jobs | Job  Support | Other | Total |
|  | Wages | $105,000 | $30,000 | $        0 | $ 15,000 | $150,000 |
|  | Cleaning supplies | 40,000 | 0 | 0 | 0 | 40,000 |
|  | Cleaning equipment depreciation | 16,000 | 0 | 0 | 4,000 | 20,000 |
|  | Vehicle expenses | 0 | 48,000 | 0 | 32,000 | 80,000 |
|  | Office expenses | 0 | 0 | 27,000 | 33,000 | 60,000 |
|  | President’s compensation | 0 | 0 | 32,000 | 48,000 | 80,000 |
|  | Total cost | $161,000 | $78,000 | $59,000 | $132,000 | $430,000 |

Example: 70% of $150,000 = $105,000

Other entries in the table are determined in a similar manner.

**Problem 7-20** (continued)

2. The activity rates are computed as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Total Cost | (b) Total Activity | | (a) ÷ (b) Activity Rate | |
|  | Cleaning carpets | $161,000 | 20,000 | hundred square feet | $8.05 | per hundred square feet |
|  | Travel to jobs | $78,000 | 60,000 | miles | $1.30 | per mile |
|  | Job support | $59,000 | 2,000 | jobs | $29.50 | per job |

3. The cost for the Flying N Ranch job is computed as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Activity Cost Pool | (a) Activity Rate | | (b) Activity | | (a) × (b) ABC Cost |
|  | Cleaning carpets | $8.05 | per hundred square feet | 5 | hundred square feet | $ 40.25 |
|  | Travel to jobs | $1.30 | per mile | 75 | miles | 97.50 |
|  | Job support | $29.50 | per job | 1 | job | 29.50 |
|  | Total |  |  |  |  | $167.25 |

4. The margin earned on the job can be easily computed by using the costs calculated in part (3) above.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Sales |  | $140.00 | |
|  | Costs: |  |  | |
|  | Cleaning carpets | $40.25 |  | |
|  | Travel to jobs | 97.50 |  | |
|  | Job support | 29.50 | 167.25 | |
|  | Margin |  | $(27.25) |

**Problem 7-20** (continued)

5. Gallatin Carpet Cleaning appears to be losing money on the Flying N Ranch job. However, caution is advised. Some of the costs may not be avoidable and hence would have been incurred even if the Flying N Ranch job had not been accepted. An action analysis (discussed in Appendix 7A) is a more appropriate starting point for analysis than the simple report in part (4) above.

Nevertheless, there is a point at which travel costs eat up all of the profit from a job. With the company’s current policy of charging a flat fee for carpet cleaning irrespective of how far away the client is from the office, there clearly is some point at which jobs should be turned down. (What if a potential customer is located in Florida?)

6. The company should consider charging a fee for travel to outlying customers based on the distance traveled and a flat fee per job. At present, close-in customers are in essence subsidizing service to outlying customers and large-volume customers are subsidizing service to low-volume customers. With fees for travel and for job support, the fee per hundred square feet can be dropped substantially. This may result in losing some low-volume jobs in outlying areas, but the lower fee per hundred square feet may result in substantially more business close to Bozeman. (If the fee is low enough, the added business may not even have to come at the expense of competitors. Some customers may choose to clean their carpets more frequently if the price were more attractive.)

Appendix 7A

ABC Action Analysis

**Exercise 7A-1** (20 minutes)

|  |  |  |
| --- | --- | --- |
| Sales (100 clubs × $50 per club) |  | $5,000.00 |
| Green costs: |  |  |
| Direct materials (100 clubs × $29.50 per club) | $2,950.00 | 2,950.00 |
| Green margin |  | 2,050.00 |
| Yellow costs: |  |  |
| Direct labor (100 clubs × 0.3 hour per club × $20.50 per hour) | 615.00 |  |
| Indirect labor | 95.90 |  |
| Marketing expenses | 540.70 | 1,251.60 |
| Yellow margin |  | 798.40 |
| Red costs: |  |  |
| Factory equipment depreciation | 103.70 |  |
| Factory administration | 259.00 |  |
| Selling and administrative wages and salaries | 429.00 |  |
| Selling and administrative depreciation | 30.00 | 821.70 |
| Red margin |  | $   (23.30) |

While not required in the problem, the conventional ABC analysis would be:

|  |  |  |
| --- | --- | --- |
| Sales (100 clubs × $50 per club) |  | $5,000.00 |
| Costs: |  |  |
| Direct materials | $2,950.00 |  |
| Direct labor | 615.00 |  |
| Supporting direct labor | 285.40 |  |
| Batch processing | 55.10 |  |
| Order processing | 114.80 |  |
| Customer service | 1,003.00 | 5,023.30 |
| Customer margin |  | $  (23.30) |

**Exercise 7A-2** (30 minutes)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1. | Order Size | Customer Orders | Product Testing | Selling | Total |
| Activity level | 200 | 1 | 4 | 2 |  |
|  | direct labor- hours | customer order | product testing hours | sales calls |  |
|  |  |  |  |  |  |
| Manufacturing overhead: |  |  |  |  |  |
| Indirect labor | $1,650 | $180 | $120 | $      0 | $1,950 |
| Factory depreciation | 1,600 | 0 | 160 | 0 | 1,760 |
| Factory utilities | 20 | 0 | 4 | 0 | 24 |
| Factory administration | 0 | 48 | 72 | 60 | 180 |
| General selling & administrative: |  |  |  |  |  |
| Wages and salaries | 100 | 80 | 0 | 1,600 | 1,780 |
| Depreciation | 0 | 12 | 0 | 80 | 92 |
| Taxes and insurance | 0 | 0 | 0 | 40 | 40 |
| Selling expenses | 0 | 0 | 0 | 400 | 400 |
| Total overhead cost | $3,370 | $320 | $356 | $2,180 | $6,226 |

Example: $8.25 per direct labor-hour from the problem statement × 200 direct labor-hours = $1,650

According to these calculations, the overhead cost of the order was $6,226.

**Exercise 7A-2** (continued)

2. The table prepared in part (1) above allows two different perspectives on the overhead cost of the order. The column totals that appear in the last row of the table tell us the cost of the order in terms of the activities it required. The row totals that appear in the last column of the table tell us how much the order cost in terms of the overhead accounts in the underlying accounting system. Another way of saying this is that the column totals tell us what the costs were incurred *for*. The row totals tell us what the costs were incurred *on*. For example, you may spend money *on* a chocolate bar in order to satisfy your craving *for* chocolate. Both perspectives are important. To control costs, it is necessary to know both what the costs were incurred for and what actual costs would have to be adjusted (i.e., what the costs were incurred on).

The two different perspectives can be explicitly shown as follows:

What the overhead costs were incurred *on*:

|  |  |
| --- | --- |
| Manufacturing overhead: |  |
| Indirect labor | $1,950 |
| Factory depreciation | 1,760 |
| Factory utilities | 24 |
| Factory administration | 180 |
| General selling & administrative: |  |
| Wages and salaries | 1,780 |
| Depreciation | 92 |
| Taxes and insurance | 40 |
| Selling expenses | 400 |
| Total overhead cost | $6,226 |

What the overhead costs were incurred *for*:

|  |  |
| --- | --- |
| Order size | $3,370 |
| Customer orders | 320 |
| Product testing | 356 |
| Selling | 2,180 |
| Total overhead cost | $6,226 |

**Exercise 7A-3** (30 minutes)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Supporting Direct  Labor | Batch  Processing | Order Processing | Customer Service | Total |
| Total activity for the order | 250 | 2 | 1 | 1 |  |
|  | Direct labor-hours\* | Batches | Order | Customer |  |
| Manufacturing overhead: |  |  |  |  |  |
| Indirect labor | $  150.00 | $120.00 | $  20.00 | $          0 | $  290.00 | |
| Factory equipment depreciation | 1,000.00 | 34.00 | 0 | 0 | 1,034.00 | |
| Factory administration | 25.00 | 14.00 | 25.00 | 150.00 | 214.00 | |
| Selling and administrative: |  |  |  |  |  | |
| Wages and salaries | 100.00 | 40.00 | 160.00 | 1,600.00 | 1,900.00 | |
| Depreciation | 0.00 | 6.00 | 10.00 | 38.00 | 54.00 | |
| Marketing expenses | 112.50 | 0.00 | 60.00 | 675.00 | 847.50 | |
| Total overhead cost | $1,387.50 | $214.00 | $275.00 | $2,463.00 | $4,339.50 | |

Example: $0.60 per direct labor-hour × 250 direct labor-hours = $150.00.

\*250 direct labor-hours = 0.25 direct labor-hour per seat × 1,000 seats.

**Exercise 7A-3** (continued)

The action analysis report for the order can be constructed using the row totals from the activity rate table, organized according to the ease of adjustment codes:

|  |  |  |
| --- | --- | --- |
| Sales (1,000 units × $20 per unit) |  | $20,000.00 |
| Green costs: |  |  |
| Direct materials (1,000 units × $8.50 per unit) | $8,500.00 | 8,500.00 |
| Green margin |  | 11,500.00 |
| Yellow costs: |  |  |
| Direct labor (1,000 units × $6.00 per unit) | 6,000.00 |  |
| Indirect labor | 290.00 |  |
| Marketing expenses | 847.50 | 7,137.50 |
| Yellow margin |  | 4,362.50 |
| Red costs: |  |  |
| Factory equipment depreciation | 1,034.00 |  |
| Factory administration | 214.00 |  |
| Selling and administrative wages and salaries | 1,900.00 |  |
| Selling and administrative depreciation | 54.00 | 3,202.00 |
| Red margin |  | $  1,160.50 |

**Exercise 7A-4** (60 minutes)

1. First-stage allocations of overhead costs to the activity cost pools:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Distribution of Resource Consumption  Across Activity Cost Pools | | | |  |
|  | Direct Labor Support | Order Processing | Customer Support | Other | Totals |
| Wages and salaries | 40% | 30% | 20% | 10% | 100% |
| Other overhead costs | 30% | 10% | 20% | 40% | 100% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Direct Labor Support | Order Processing | Customer Support | Other | Totals |
| Wages and salaries | $120,000 | $ 90,000 | $60,000 | $30,000 | $300,000 |
| Other overhead costs | 30,000 | 10,000 | 20,000 | 40,000 | 100,000 |
| Total cost | $150,000 | $100,000 | $80,000 | $70,000 | $400,000 |

Example: 40% of $300,000 is $120,000.

Other entries in the table are determined in a similar manner.

**Exercise 7A-4** (continued)

2. The activity rates are computed by dividing the costs in the cells of the first-stage allocation above by the total activity from the top of the column.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Direct Labor Support | Order  Processing | Customer  Support |
|  | Total activity | 20,000 DLHs | 400 orders | 200 customers |
|  |  |  |  |  |
|  | Wages and salaries | $6.00 | $225.00 | $300.00 |
|  | Other overhead costs | 1.50 | 25.00 | 100.00 |
|  | Total cost | $7.50 | $250.00 | $400.00 |

Example: $120,000 ÷ 20,000 DLHs = $6.00 per DLH.

Direct labor support wages and salaries from the first-stage allocation above.

3. The overhead cost for the order is computed as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Direct Labor Support | Order Processing | Customer Support | Total |
|  | Activity | 20  DLHs | 1  order | 1  customer |  |
|  |  |  |  |  |  |
|  | Wages and salaries | $120.00 | $225.00 | $300.00 | $645.00 |
|  | Other overhead costs | 30.00 | 25.00 | 100.00 | 155.00 |
|  | Total cost | $150.00 | $250.00 | $400.00 | $800.00 |

Example: 20 DLHs × $6.00 per DLH = $120.

Activity rate for direct labor support wages and salaries from part (2) above.

**Exercise 7A-4** (continued)

4. The report can be constructed using the column totals at the bottom of the overhead cost analysis in part (3) above.

|  |  |  |
| --- | --- | --- |
| *Customer Margin—ABC Analysis* |  |  |
| Sales (10 units × $300 per unit) |  | $3,000 |
| Costs: |  |  |
| Direct materials ($180 per unit × 10 units) | $1,800 |  |
| Direct labor (10 units × $50 per unit) | 500 |  |
| Direct labor support overhead (see part 3 above) | 150 |  |
| Order processing overhead (see part 3 above) | 250 |  |
| Customer support overhead (see part 3 above) | 400 | 3,100 |
| Customer margin |  | $ (100) |

5. The action analysis report can be constructed using the row totals from the activity rate table, organized according to the ease of adjustment codes:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Sales ($300 per unit × 10 units) |  | $3,000 |
|  | Green costs: |  |  |
|  | Direct materials ($180 per unit × 10 units) | $1,800 | 1,800 |
|  | Green margin |  | 1,200 |
|  | Yellow costs: |  |  |
|  | Direct labor (10 units × $50 per unit) | 500 |  |
|  | Wages and salaries (see part 3 above) | 645 | 1,145 |
|  | Yellow margin |  | 55 |
|  | Red costs: |  |  |
|  | Other overhead costs (see part 3 above) | 155 | 155 |
|  | Red margin |  | $ (100) |

**Exercise 7A-4** (continued)

6. While the company appears to have incurred a loss on its business with Shenzhen Enterprises, caution must be exercised. The green margin on the business was $1,200. Advanced Products Corporation really incurred a loss on this business only if at least $1,200 of the yellow and red costs would have been avoided if the Shenzhen Enterprises order had been rejected. For example, we don’t know what specific costs are included in the “Other overhead” category. If these costs are committed fixed costs that cannot be avoided in the short run, then the company would been worse off if the Shenzhen Enterprises order had not been accepted.

Suppose that Shenzhen Enterprises will be submitting a similar order every year. As a general policy, the company might consider turning down this business in the future. Costs that cannot be avoided in the short term, may be avoided in the long term through the budgeting process or in some other manner. However, if the Shenzhen Enterprises business is turned down, management must make sure that at least $1,200 of the yellow and red costs are really eliminated or the resources represented by those costs are really redeployed to the constraint. If these costs remain unchanged, then the company would be better off accepting than rejecting business from the Shenzhen Enterprises in the future.

**Problem 7A-5** (30 minutes)

1. The detailed cost analysis of local commercials appears below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Activity Rates | | |
|  |  | Animation Concept | Animation Production | Contract Administration |
|  | Technical staff salaries | $4,000 | $6,000 | $1,600 |
|  | Animation equipment depreciation | 360 | 1,125 | 0 |
|  | Administrative wages and salaries | 1,440 | 150 | 4,800 |
|  | Supplies costs | 120 | 300 | 160 |
|  | Facility costs | 120 | 150 | 240 |
|  | Total | $6,040 | $7,725 | $6,800 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Animation Concept | Animation Production | Contract Administration | Total |
|  | Activity level | 25 proposals | 5 minutes | 10 contracts |  |
|  |  |  |  |  |  |
|  | Technical staff salaries | $100,000 | $30,000 | $16,000 | $146,000 |
|  | Animation equipment depreciation | 9,000 | 5,625 | 0 | 14,625 |
|  | Administrative wages and salaries | 36,000 | 750 | 48,000 | 84,750 |
|  | Supplies costs | 3,000 | 1,500 | 1,600 | 6,100 |
|  | Facility costs | 3,000 | 750 | 2,400 | 6,150 |
|  | Total cost | $151,000 | $38,625 | $68,000 | $257,625 |

Example: $4,000 per proposal × 25 proposals = $100,000.

**Problem 7A-5** (continued)

2. The action analysis report is constructed by using the row totals from the cost report in part (1) above:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Sales |  | $180,000 |
|  | Green costs: |  |  |
|  | Supplies costs | $  6,100 | 6,100 |
|  | Green margin |  | 173,900 |
|  | Yellow costs: |  |  |
|  | Administrative wages and salaries | 84,750 | 84,750 |
|  | Yellow margin |  | 89,150 |
|  | Red costs: |  |  |
|  | Technical staff salaries | 146,000 |  |
|  | Animation equipment depreciation | 14,625 |  |
|  | Facility costs | 6,150 | 166,775 |
|  | Red margin |  | $(77,625) |

**Problem 7A-5** (continued)

3. At first glance, it appears that the company is losing money on local commercials. However, the action analysis report indicates that if this market segment were dropped, most of the costs are likely to continue being incurred. The nature of the technical staff salaries is clearly critical because it makes up the bulk of the costs. Management has suggested that the technical staff is the company’s most valuable asset and that it would be the last to go in case of financial difficulties. Nevertheless, there are at least two situations in which these costs would be relevant. First, dropping the local commercial market segment may reduce future hiring of new technical staff. This would have the effect of reducing future spending and therefore would reduce the company’s costs. Second, if technical staff time is a constraint, dropping the local commercial market segment would allow managers to shift technical staff time to other, presumably more profitable work. However, if this is the case, there are better ways to determine which projects should get technical staff attention. This subject will be covered in Chapter 13 in the section on utilization of scarce resources.

Finally, the cost of the animation concept at the proposal stage is a major drag on the profitability of the local commercial market. The activity-based costing system, as currently designed, assumes that all project proposals require the same effort. This may not be the case. Proposals for local commercials may be far less elaborate than proposals for major special effects animation sequences for motion pictures. If management *has* been putting about the same amount of effort into every proposal, the above activity-based costing analysis suggests that this may be a mistake. Management may want to consider cutting back on the effort going into animation concepts for local commercials at the project proposal stage. Of course, this may lead to an even lower success rate on bids for local commercials.