Chapter 8
Activity-Based Costing: A Tool to Aid Decision-Making

Solutions to Questions

8-1 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 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. Finally, the activity rates differ from typical predetermined overhead rates in that they should be based on activity at capacity rather than on the budgeted level of activity.

8-2 When direct labor is used as an allocation base for overhead, it is 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 last hundred years while overhead has been increasing. This suggests that there is not a direct link between the level of direct labor and overhead anymore. 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. Moreover, while the empirical evidence is not entirely clear, it appears that overhead cost may 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.

8-3 When an overhead rate is based on the budgeted level of activity, products are implicitly charged for the costs of the capacity they don't use as well as for the costs of capacity that they do use. This is because all of the costs of capacity—whether utilized or not—are spread across the budgeted production. Since the costs of capacity are largely fixed, this results in higher unit product costs when the level of activity declines.

If an overhead rate is based on the level of activity at capacity, a product is charged only for the costs of capacity that it actually uses. The costs of unused capacity are not charged to products and are instead charged to the current period as expenses of the period (see Appendix 3A). As a result, unit product costs are more stable and costs do not appear to increase as the level of budgeted activity decreases.

8-4 Activity-based costing may be resisted because it changes the "rules of the game." It changes some of the key measures such as product costs used in making decisions and may impact how individuals are evaluated. Without top management support, there may be little interest in making these changes. In addition, if top managers continue to make decisions based on the numbers generated by the traditional costing system, subordinates will quickly conclude that the activity-based costing system can be ignored.

8-5 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.

8-6 Organization-sustaining costs and the costs of idle capacity should not be assigned to products. These costs represent resources that are not consumed by the products.

8-7 There are two stages of allocation in activity-based costing. Costs must first be allocated to activity cost pools and then are allocated from the activity cost pools to products, customers, and other cost objects.

8-8 Since people are often involved in more than one activity, some way must be found to estimate how much time they spend on each. The most practical approach is often to ask employees what percentage of time they spend on each activity. 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.

8-9 In traditional cost systems, product-level costs are indiscriminately spread across all products using direct labor-hours or some other allocation base that is tied 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.)

8-10 Activity rates tell managers the average cost of resources consumed in carrying 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.

8-11 The activity-based costing method 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.

8-12 While an activity analysis such as in Exhibit 8-9 can yield insights, it should not be used for decision-making. The conventional activity analysis contains no indication of what costs can actually be adjusted nor is there any indication of who would be responsible for adjusting the costs after a decision has been made. It would be dangerous, for example, to drop a product based solely on the activity analysis. Most of the costs do not automatically disappear if a product is dropped; managers must take explicit actions to eliminate resources or to transfer resources to other uses. Managers may be reluctant to take these actions—particularly if it involves firing or transferring people. The action analysis has the advantage of making it clearer where savings have to come from and hence which managers will have to take action.

Exercise 8-1 (10 minutes)

	Activity	*Level*
a.	The purchasing department orders the specific color of paint specified by the customer from the company's supplier	Batch-level
b.	A steering wheel is installed in a golf cart	Unit-level
c.	An outside attorney draws up a new generic sales contract for the company limiting Green Glider's liability in the case of accidents that involve its golf carts	Organization-sustaining
d.	The company's paint shop makes a stencil for a customer's logo	Batch-level
e.	A sales representative visits an old customer to check on how the company's golf carts are working out and to try to make a new sale	Customer-level
f.	The accounts receivable department prepares the bill for a completed order	Batch-level
g.	Electricity is used to heat and light the factory and the administrative offices	Organization-sustaining
h.	A golf cart is painted	Unit-level
i.	The company's engineer modifies the design of a model to eliminate a potential safety problem	Product-level
j.	The marketing department has a catalogue printed and then mails them to golf course managers	Customer-level
k.	Completed golf carts are each tested on the company's test track	Unit-level
l.	A new model golf cart is shipped to the leading golfing trade magazine to be evaluated for the magazine's annual rating of golf carts	Product-level

Exercise 8-2 (10 minutes)

	Activity	*Activity Classification*	*Examples of Activity Measures*
a.	Materials are moved from the receiving dock to the assembly area by a material-handling crew	Batch-level	Number of materials moves; time spent moving materials
b.	Direct labor workers assemble various products	Unit-level	Time spent assembling products
c.	Diversity training is provided to all employees in the company	Organization -sustaining	Number of employees taking diversity training; Time spent in training
d.	A product is designed by a cross-functional team	Product-level	Number of new products designed; time spent developing new products
e.	Equipment is set up to process a batch	Batch-level	Number of batches run; time spent setting up
f.	A customer is billed for all products delivered during the month	Customer-level	Number of customer bills prepared; time spent preparing bills

Notes:

1. In all cases except for direct labor in part (b), 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 provide for more accurate measures of the consumption of resources than transaction drivers, but they take more effort to record.
2. Activity measures should be assigned to organization-sustaining activities and costs only when they will be allocated. In this case, the costs of diversity training may be allocated to departments and for that purpose the number of employees taking the training or the amount of time they spend in the training may be recorded. However, these costs should not be allocated beyond departments to products or customers.

Exercise 8-3 (15 minutes)

1. & 2.

	Activity	*Activity Classification*	*Examples of Activity Measures*
a.	Preventive maintenance is performed on general-purpose production equipment.	Organization-sustaining	Not applicable; these costs probably should not be assigned to products or customers.
b.	Products are assembled by hand.	Unit-level	Time spent assembling products.
c.	Reminder notices are sent to customers who are late in making payments.	Customer-level	Number of reminders; time spent preparing reminders.
d.	Purchase orders are issued for materials to be used in production.	Batch-level	Number of purchase orders; time spent preparing purchase orders
e.	Modifications are made to product designs.	Product-level	Number of modifications made; time spent making modifications
f.	New employees are hired by the personnel office.	Organization-sustaining	Not applicable; these costs probably should not be assigned to products or customers.
g.	Machine settings are changed between batches of different products.	Batch-level	Number of batch setups; time spent making setups
h.	Parts inventories are maintained in the storeroom. (Each product requires its own unique parts.)	Product-level	Number of products; number of parts; time spent maintaining inventories of parts
i.	Insurance costs are incurred on the company's facilities.	Organization-sustaining	Not applicable; these costs probably should not be assigned to products or customers.

Exercise 8-4 (10 minutes)

Teller wages	$150,000
Assistant branch manager salary	$70,000
Branch manager salary	$85,000

	Distribution of Resource Consumption Across Activities				
	Opening Accounts	*Processing Deposits and Withdrawals*	*Processing Other Customer Transactions*	*Other Activities*	*Totals*
Teller wages	0%	75%	15%	10%	100%
Assistant branch manager salary	10%	15%	25%	50%	100%
Branch manager salary	0%	0%	20%	80%	100%

	Opening Accounts	*Processing Deposits and Withdrawals*	*Processing Other Customer Transactions*	*Other Activities*	*Totals*
Teller wages.....	$ 0	$112,500	$22,500	$ 15,000	$150,000
Assistant branch manager salary.....	7,000	10,500	17,500	35,000	70,000
Branch manager salary.....	0	0	17,000	68,000	85,000
Total cost.....	$7,000	$123,000	$57,000	$118,000	$305,000

Teller wages are $150,000 and 75% of the tellers' time is spent processing deposits and withdrawals:

$150,000 × 75% = $112,500

Other entries in the table are similarly determined.

Exercise 8-5 (20 minutes)

1. Computation of activity rates:

Activity Cost Pools	*(a) Total Cost*	*(b) Total Activity*	*(a) ÷ (b) Activity Rate*
Opening accounts.....	$7,000	200 accounts opened	$35.00 per account opened
Processing deposits and withdrawals	$123,000	50,000 deposits and withdrawals	$2.46 per deposit or withdrawal
Processing other customer transactions .	$57,000	1,000 other customer transactions	$57.00 per other customer transaction

Exercise 8-5 (continued)

2. The cost of opening an account at the Avon branch is apparently much higher than at the lowest cost branch ($35.00 versus $24.35). On the other hand, the cost of processing deposits and withdrawals is lower than at the lowest cost branch ($2.46 versus $2.72). And the cost of processing other customer transactions is somewhat higher at the Avon branch ($57.00 versus $48.90). This suggests that the other branches may have something to learn from Avon concerning processing deposits and withdrawals and Avon 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 Avon apparently high because of the involvement of the assistant branch manager in this activity? Perhaps tellers open new accounts at other branches.

   It should be mentioned that the apparent differences in the costs of the activities at the various branches could 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 Avon branch may purposely spend more time with new customers to win their loyalty. The higher cost of opening new accounts at the Avon 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 8-6 (10 minutes)

Activity Cost Pool	*(a)* *Activity Rate*	*(b)* *Activity*	*(a) × (b)* *ABC Cost*
Order size	R 17.60 per direct labor-hour	150 direct labor-hours	R 2,640.00
Customer orders ...	R 360.00 per customer order	1 customer order	R 360.00
Product testing	R 79.00 per product testing hour	18 product testing hours	R 1,422.00
Selling	R 1,494.00 per sales call	3 sales calls	R 4,482.00
Total			R 8,904.00

According to these calculations, the total overhead cost of the order is R 8,904.

Exercise 8-7 (30 minutes)

1.

	Order Size	*Customer Orders*	*Product Testing*	*Selling*	*Total*
Total activity for the order	150 direct labor-hours	1 customer order	18 product testing hours	3 sales calls	
Manufacturing:					
Indirect labor	R 1,440	R 231	R 648	R 0	R 2,319
Factory depreciation	1,050	0	324	0	1,374
Factory utilities	30	0	18	0	48
Factory administration	0	46	432	36	514
General selling & administrative:					
Wages and salaries	120	72	0	2,895	3,087
Depreciation	0	11	0	108	119
Taxes and insurance	0	0	0	147	147
Selling expenses	0	0	0	1,296	1,296
Total overhead cost	R 2,640	R 360	R 1,422	R 4,482	R 8,904

Example: R 9.60 per direct labor-hour × 150 direct labor-hours = R 1,440

According to these calculations, the overhead cost of the order was R 8,904. This agrees with the computations in Exercise 8-6.

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Exercise 8-7 (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 to satisfy your craving *for* chocolate. Both perspectives are important. To control costs, it is necessary both to know 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:	
Indirect labor	R 2,319
Factory depreciation	1,374
Factory utilities	48
Factory administration	514
General selling & administrative:	
Wages and salaries	3,087
Depreciation	119
Taxes and insurance	147
Selling expenses	1,296
Total overhead cost	R 8,904

   What the overhead costs were incurred *for*:

Order size	R 2,640
Customer orders	360
Product testing	1,422
Selling	4,482
Total overhead cost	R 8,904

Exercise 8-8 (15 minutes)

The overhead costs assigned to the order and the customer are computed as follows:

Activity Cost Pool	*(a) Activity Rate*	*(b) Activity*	*(a) × (b) ABC Cost*
Volume	$12 per direct labor-hour	1,920 direct labor-hours	$23,040
Batch processing	$96 per batch	4 batches	$384
Order processing	$284 per order	1 order	$284
Customer service	$2,620 per customer	1 customer	$2,620

1. The profitability of the order would be computed as follows:

Product Profitability Analysis		
Sales (2,400 seats × $137.95 per seat)		$331,080
Costs:		
Direct materials (2,400 seats × $112 per seat)	$268,800	
Direct labor (2,400 seats × 0.8 DLH per seat × $18 per DLH)	34,560	
Volume	23,040	
Batch processing	384	
Order processing	284	327,068
Product margin		$ 4,012

2. The profitability of the customer (CineMax Entertainment), would be computed as follows:

Customer Profitability Analysis	
Product margin of order	$4,012
Less: Customer service overhead	2,620
Customer margin	$1,392

Exercise 8-9 (45 minutes)

1. The overhead costs for the order from CineMax Entertainment are computed below:

	Volume	*Batch Processing*	*Order Processing*	*Total*
Total activity for the order	1,920 direct labor-hours	4 batches	1 order	
Production overhead:				
Indirect labor	$ 3,456	$288	$ 18	$ 3,762
Factory equipment depreciation	14,112	13	0	14,125
Factory administration	4,032	28	28	4,088
General selling & administrative overhead:				
Wages and salaries	960	52	153	1,165
Depreciation	0	3	6	9
Marketing expenses	480	0	79	559
Total overhead cost	$23,040	$384	$284	$23,708

Example: $1.80 per direct labor-hour × 1,920 direct labor-hours = $3,456

Exercise 8-9 (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 (2,400 seats × $137.95 per seat)		$331,080
Green costs:		
Direct materials (2,400 seats × $112 per seat)	$268,800	268,800
Green margin		62,280
Yellow costs:		
Direct labor (2,400 seats × 0.8 DLH per seat × $18 per DLH)	34,560	
Indirect labor	3,762	
Marketing expenses	559	38,881
Yellow margin		23,399
Red costs:		
Factory equipment depreciation	14,125	
Factory administration	4,088	
Selling and administrative wages and salaries	1,165	
Selling and administrative depreciation	9	19,387
Red margin		$ 4,012

Exercise 8-9 (continued)

2. An action analysis report for the customer can be prepared by including the customer service costs in the overhead analysis.

	Volume	*Batch Processing*	*Order Processing*	*Customer Service*	*Total*
Total activity for the order	1,920 direct labor-hours	4 batches	1 order	1 customer	
Production overhead:					
Indirect labor	$ 3,456	$288	$ 18	$ 0	$ 3,762
Factory equipment depreciation	14,112	13	0	0	14,125
Factory administration	4,032	28	28	268	4,356
General selling & administrative overhead:					
Wages and salaries	960	52	153	1,864	3,029
Depreciation	0	3	6	26	35
Marketing expenses	480	0	79	462	1,021
Total overhead cost	$23,040	$384	$284	$2,620	$26,328

Exercise 8-9 (continued)

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

Sales (2,400 seats × $137.95 per seat)		$331,080
Green costs:		
Direct materials (2,400 seats × $112 per seat)	$268,800	268,800
Green margin		62,280
Yellow costs:		
Direct labor (2,400 seats × 0.8 DLH per seat × $18 per DLH)	34,560	
Indirect labor	3,762	
Marketing expenses	1,021	39,343
Yellow margin		22,937
Red costs:		
Factory equipment depreciation	14,125	
Factory administration	4,356	
Selling and administrative wages and salaries	3,029	
Selling and administrative depreciation	35	21,545
Red margin		$ 1,392

Exercise 8-10 (30 minutes)

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

	Distribution of Resource Consumption Across Activity Cost Pools				
	Volume	*Order Processing*	*Customer Support*	*Other*	*Totals*
Wages and salaries.....	30%	35%	25%	10%	100%
Other overhead costs	25%	15%	20%	40%	100%

	Volume	*Order Processing*	*Customer Support*	*Other*	*Totals*
Wages and salaries.....	$105,000	$122,500	$ 87,500	$ 35,000	$350,000
Other overhead costs	50,000	30,000	40,000	80,000	200,000
Total cost.....	$155,000	$152,500	$127,500	$115,000	$550,000

Example: 30% of $350,000 is $105,000.

2. Computation of activity rates:

Activity Cost Pools	*(a) Total Cost*	*(b) Total Activity*	*(a) ÷ (b) Activity Rate*
Volume.....	$155,000	10,000 DLHs	$15.50 per DLH
Order processing.....	$152,500	500 orders	$305 per order
Customer support.....	$127,500	100 customers	$1,275 per customer

Exercise 8-10 (continued)

3. Computation of the overhead costs for the Indus Telecom order:

Activity Cost Pool	*(a) Activity Rate*	*(b) Activity*	*(a) × (b) ABC Cost*
Volume	$15.50 per DLH	50 DLHs*	$ 775
Order processing	$305 per order	1 orders	305
Customer support	$1,275 per customer		
Total			$1,080

*0.5 DLH per unit × 100 units = 50 DLHs

4. The margins for the order and for the customer follow:

Product Profitability Analysis

Sales (100 units × $295 per unit)		$29,500
Costs:		
Direct materials (100 units × $264 per unit)	$26,400	
Direct labor (100 units × 0.5 DLH per unit × $25 per DLH)	1,250	
Volume overhead	775	
Order processing overhead	305	28,730
Product margin		$ 770

Customer Profitability Analysis

Product margin of order	$ 770
Less: Customer support overhead	1,275
Customer margin	$ (505)

Exercise 8-11 (60 minutes)

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

	Distribution of Resource Consumption Across Activity Cost Pools				
	Volume	*Order Processing*	*Customer Support*	*Other*	*Totals*
Wages and salaries.....	30%	35%	25%	10%	100%
Other overhead costs	25%	15%	20%	40%	100%

	Volume	*Order Processing*	*Customer Support*	*Other*	*Totals*
Wages and salaries.....	$105,000	$122,500	$ 87,500	$ 35,000	$350,000
Other overhead costs	50,000	30,000	40,000	80,000	200,000
Total cost.....	$155,000	$152,500	$127,500	$115,000	$550,000

Example: 30% of $350,000 is $105,000.

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

Exercise 8-11 (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.

	Volume	*Order Processing*	*Customer Support*
Total activity	10,000 DLHs	500 orders	100 customers
Wages and salaries	$10.50	$245.00	$ 875.00
Other overhead costs ..	5.00	60.00	400.00
Total cost	$15.50	$305.00	$1,275.00

Example: $105,000 ÷ 10,000 DLHs = $10.50 per DLH

Volume-related wages and salaries from the first-stage allocation above.

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

	Volume	*Order Processing*	*Total*
Activity	50 DLHs	1 order	
Wages and salaries	$525	$245	$ 770
Other overhead costs	250	60	310
Total cost	$775	$305	$1,080

Example: 50 DLHs × $10.50 per DLH = $525

Activity rate for volume-related wages and salaries from part (2) above.

Exercise 8-11 (continued)

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

Product Profitability Analysis		
Sales (100 units × $295 per unit)		$29,500
Costs:		
Direct materials (100 units × $264 per unit)	$26,400	
Direct labor (100 units × 0.5 DLH per unit × $25 per DLH)	1,250	
Volume overhead	775	
Customer support overhead	305	28,730
Product margin		$ 770

Customer Profitability Analysis	
Product margin of order	$ 770
Less: Customer support overhead	1,275
Customer margin	$ (505)

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 (100 units × $295 per unit)		$29,500
Green costs:		
Direct materials (100 units × $264 per unit)	$26,400	26,400
Green margin		3,100
Yellow costs:		
Direct labor (100 units × 0.5 DLH per unit × $25 per DLH)	1,250	
Wages and salaries (see part (3) above)	770	2,020
Yellow margin		1,080
Red costs:		
Other overhead costs (see part (3) above)	310	310
Red margin		$ 770

Exercise 8-11 (continued)

6. The first step is to include the customer support costs in the overhead cost analysis as follows:

	Volume	*Order Processing*	*Customer Support*	*Total*
Activity	50 DLHs	1 order	1 customer	
Wages and salaries	$525	$245	$ 875	$1,645
Other overhead costs	250	60	400	710
Total cost	$775	$305	$1,275	$2,355

The action analysis report can then be easily constructed as follows:

Sales (100 units × $295 per unit)		$29,500
Green costs:		
Direct materials (100 units × $264 per unit)	$26,400	26,400
Green margin		3,100
Yellow costs:		
Direct labor (100 units × 0.5 DLH per unit × $25 per DLH)	1,250	
Wages and salaries (see above)	1,645	2,895
Yellow margin		205
Red costs:		
Other overhead costs (see above)	710	710
Red margin		$ (505)

Exercise 8-11 (continued)

7. While the company apparently incurred a loss on its business with Indus Telecom, caution must be exercised. The green margin on the business was $3,100. Silicon Optics really incurred a loss on this business only if at least $3,100 of the yellow and red costs would have been avoided if the Indus Telecom 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 Indus Telecom order had not been accepted.

   Suppose that Indus Telecom 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-run, may be avoided in the long-run through the budgeting process or in some other manner. However, if the Indus Telecom business is turned down, management must make sure that at least $3,100 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 the Indus Telecom business in the future.

Exercise 8-12 (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.....	$12,000	5,000 parties	$2.40 per party
Serving diners.....	$90,000	12,000 diners	$7.50 per diner
Serving drinks.....	$26,000	10,000 drinks	$2.60 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.....	$2.40 per party	1 party	$ 2.40
Serving diners.....	$7.50 per diner	4 diners	30.00
Serving drinks.....	$2.60 per drink	3 drinks	7.80
Total			$40.20

b. Party of 2 persons who order no drinks:

Activity Cost Pool	*(a) Activity Rate*	*(b) Activity*	*(a) × (b) ABC Cost*
Serving parties.....	$2.40 per party	1 party	$ 2.40
Serving diners.....	$7.50 per diner	2 diners	15.00
Serving drinks.....	$2.60 per drink	0 drinks	0
Total			$17.40

c. Party of 1 person who orders 2 drinks:

Activity Cost Pool	*(a) Activity Rate*	*(b) Activity*	*(a) × (b) ABC Cost*
Serving parties.....	$2.40 per party	1 party	$ 2.40
Serving diners.....	$7.50 per diner	1 diner	7.50
Serving drinks.....	$2.60 per drink	2 drinks	5.20
Total			$15.10

Exercise 8-12 (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. $40.20 ÷ 4 diners = $10.05 per diner
   b. $17.40 ÷ 2 diners = $8.70 per diner
   c. $15.10 ÷ 1 diner = $15.10 per diner

3. The average cost per diner differs from party to party under the activity-based costing system for two reasons. First, the $2.40 cost of serving a party does not depend upon 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 $2.40. With two diners, the average cost per diner is cut in half to $1.20. With six diners, the average cost per diner would be only $0.40. 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 $15 per diner for several reasons. First, the average cost of $15 per diner includes organization-sustaining costs that are excluded from the computations in the activity-based costing system. Second, the $15 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 that there are some 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, the costs of preparing the various meals on the menu surely differ. 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.

Problem 8-13 (45 minutes)

1. a. When direct labor-hours are used to apply overhead cost to products, the company's predetermined overhead rate would be:

$$\text{Predetermined overhead rate} = \frac{\text{Manufacturing overhead cost}}{\text{Direct labor hours}}$$

$$= \frac{\$1{,}480{,}000}{20{,}000 \text{ DLHs}} = \$74 \text{ per DLH}$$

b.

	Model	
	XR7	*ZD5*
Direct materials	$35.00	$25.00
Direct labor:		
$20 per hour × 0.2 DLH, 0.4 DLH	4.00	8.00
Manufacturing overhead:		
$74 per hour × 0.2 DLH, 0.4 DLH	14.80	29.60
Total unit product cost	$53.80	$62.60

2. a. Predetermined overhead rates for the activity cost pools:

Activity Cost Pool	*(a) Total Cost*	*(b) Total Activity*	*(a) ÷ (b) Activity Rate*
Machine setups	$180,000	250 setups	$720 per setup
Special milling	$300,000	1,000 MHs	$300 per MH
General factory	$1,000,000	20,000 DLHs	$50 per DLH

The manufacturing overhead cost that would be applied to each model can be computed as follows:

	Model	
	XR7	*ZD5*
Machine setups:		
$720 per setup × 150 setups, 100 setups	$108,000	$ 72,000
Special milling:		
$300 per MH × 1,000 MHs, 0 MHs	300,000	0
General factory:		
$50 per DLH × 4,000 DLHs, 16,000 DLHs	200,000	800,000
Total manufacturing overhead cost applied	$608,000	$872,000

Problem 8-13 (continued)

b. Before we can determine the unit product cost under activity-based costing, we must first take the overhead costs applied to each model in part 2(a) above and express them on a per-unit basis:

	Model	
	XR7	*ZD5*
Total overhead cost applied (a)	$608,000	$872,000
Number of units produced (b)	20,000	40,000
Manufacturing overhead cost per unit (a) ÷ (b)	$30.40	$21.80

With this information, the unit product cost of each model under activity-based costing would be computed as follows:

	Model	
	XR7	*ZD5*
Direct materials	$35.00	$25.00
Direct labor:		
$20 per hour × 0.2 DLH, 04.DLH	4.00	8.00
Manufacturing overhead (above)	30.40	21.80
Total unit product cost	$69.40	$54.80

Comparing these unit cost figures with the unit costs in Part 1(b), we find that the unit product cost for Model XR7 has increased from $53.80 to $69.40, and the unit product cost for Model ZD5 has decreased from $62.60 to $54.80.

3. It is especially important to note that, even under activity-based costing, 68% of the company's overhead costs continue to be applied to products on the basis of direct labor-hours:

Machine setups (number of setups)	$ 180,000	12%
Special milling (machine-hours)	300,000	20
General factory (direct labor-hours)	1,000,000	68
Total overhead cost	$1,480,000	100%

Thus, the shift in overhead cost from the high-volume product (Model ZD5) to the low-volume product (Model XR7) occurred as a result of reassigning only 32% of the company's overhead costs.

Problem 8-13 (continued)

The increase in unit product cost for Model XR7 can be explained as follows: First, where possible, overhead costs have been traced to the products rather than being lumped together and spread uniformly over production. Therefore, the special milling costs, which are traceable to Model XR7, have all been assigned to Model XR7 and none assigned to Model ZD5 under the activity-based costing approach. It is common in industry to have some products that require special handling or special milling of some type. This is especially true in modern factories that produce a variety of products. Activity-based costing provides a vehicle for assigning these costs to the appropriate products.

Second, the costs associated with the batch-level activity (machine setups) have also been assigned to the specific products to which they relate. These costs have been assigned according to the number of setups completed for each product. However, since a batch-level activity is involved, another factor affecting unit costs comes into play. That factor is batch size. Some products are produced in large batches and some are produced in small batches. *The smaller the batch, the higher the per unit cost of the batch activity.* In the case at hand, the data can be analyzed as shown below.

Model XR7:		
Cost to complete one setup [see 2(a)]	$720	(a)
Number of units processed per setup (20,000 units ÷ 150 setups)	133.33	(b)
Setup cost per unit (a) ÷ (b)	$5.40	
Model ZD5:		
Cost to complete one setup (above)	$720	(a)
Number of units processed per setup (40,000 units ÷ 100 setups)	400	(b)
Setup cost per unit (a) ÷ (b)	$1.80	

Problem 8-13 (continued)

Thus, the cost per unit for setups is three times as great for Model XR7, the low-volume product, as it is for Model ZD5, the high-volume product. Such differences in cost are obscured when direct labor-hours (or any other volume measure) is used as a basis for applying overhead cost to products.

In sum, overhead cost has shifted from the high-volume product to the low-volume product as a result of more appropriately assigning some costs to the products on the basis of the activities involved, rather than on the basis of direct labor-hours.

Problem 8-14 (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	$ 80,000	$ 20,000	$ 70,000	$ 30,000	$ 200,000
Disposal fees.....	420,000	0	180,000	0	600,000
Equipment depreciation	40,000	0	32,000	8,000	80,000
On-site supplies	33,000	9,000	12,000	6,000	60,000
Office expenses.....	19,000	76,000	57,000	38,000	190,000
Licensing and insurance....	185,000	0	148,000	37,000	370,000
Total cost	$777,000	$105,000	$499,000	$119,000	$1,500,000

According to the data in the problem, 40% of the wages and salaries cost of $200,000 is attributable to activities related to job size.

$200,000 × 40% = $80,000

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.....	$777,000	500 thousand square feet	$1,554 per thousand square feet
Estimating and job setup.....	$105,000	200 jobs	$525 per job
Working on nonroutine jobs....	$499,000	25 nonroutine jobs	$19,960 per nonroutine job

Problem 8-14 (continued)

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

a. *Routine two thousand square foot job:*

Job size (2 thousand square feet @ $1,554 per thousand square feet)	$3,108
Estimating and job setup (1 job @ $525 per job)	525
Nonroutine job (not applicable)	0
Total cost of the job	$3,633
Average cost per thousand square feet ($3,633 ÷ 2 thousand square feet)	$1,816.50

b. *Routine four thousand square foot job:*

Job size (4 thousand square feet @ $1,554 per thousand square feet)	$6,216
Estimating and job setup (1 job @ $525 per job)	525
Nonroutine job (not applicable)	0
Total cost of the job	$6,741
Cost per thousand square feet ($6,741 ÷ 4 thousand square feet)	$1,685.25

c. *Nonroutine two thousand square foot job:*

Job size (2 thousand square feet @ $1,554 per thousand square feet)	$ 3,108
Estimating and job setup (1 job @ $525 per job)	525
Nonroutine job (1 nonroutine job @ $19,960 per nonroutine job)	19,960
Total cost of the job	$23,593
Cost per thousand square feet ($23,593 ÷ 2 thousand square feet)	$11,796.50

Problem 8-14 (continued)

4. The objectivity of the interview data can be questioned since 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 $4,000 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 $19,960 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 $4,000 per thousand square feet on routine work and substantially more than $4,000 per thousand square feet on nonroutine work. Consequently, Denny 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 disastrous effect on the company's profits.

Problem 8-15 (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.....	$6,000 per proposal	20 proposals	$120,000
Animation production.....	$7,700 per minute of animation	12 minutes	92,400
Contract administration....	$6,600 per contract	8 contracts	52,800
			$265,200

2. The product margin of the local commercial market is negative, as shown below:

Product Profitability Analysis		
Sales		$240,000
Costs:		
Animation concept.....	$120,000	
Animation production.....	92,400	
Contract administration.....	52,800	265,200
Product margin.....		($25,200)

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 Problem 8-16, not all of the costs included above may be avoidable. If more than $25,200 of the total costs of $265,200 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 8-16 (30 minutes)

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

	Activity Rates		
	Animation Concept	*Animation Production*	*Contract Administration*
Technical staff salaries	$3,500	$5,000	$1,800
Animation equipment depreciation	600	1,500	0
Administrative wages and salaries	1,400	200	4,600
Supplies costs	300	600	100
Facility costs	200	400	100
Total	$6,000	$7,700	$6,600

	Animation Concept	*Animation Production*	*Contract Administration*	*Total*
Activity level	20 proposals	12 minutes	8 contracts	
Technical staff salaries	$ 70,000	$60,000	$14,400	$144,400
Animation equipment depreciation	12,000	18,000	0	30,000
Administrative wages and salaries	28,000	2,400	36,800	67,200
Supplies costs	6,000	7,200	800	14,000
Facility costs	4,000	4,800	800	9,600
Total cost	$120,000	$92,400	$52,800	$265,200

Example: $3,500 per proposal × 20 proposals = $70,000

Problem 8-16 (continued)

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

Sales		$240,000
Green costs:		
Supplies costs	$ 14,000	14,000
Green margin		226,000
Yellow costs:		
Administrative wages and salaries	67,200	67,200
Yellow margin		158,800
Red costs:		
Technical staff salaries	144,400	
Animation equipment depreciation	30,000	
Facility costs	9,600	184,000
Red margin		($ 25,200)

Problem 8-16 (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 since it makes up the bulk of the costs. Management has suggested that the company's most valuable asset is the technical staff and that they 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.

Problem 8-17 (45 minutes)

1. The company's estimated direct labor-hours (DLHs) can be computed as follows:

Deluxe model: 15,000 units × 1.6 DLH per unit	24,000
Regular model: 120,000 units × 0.8 DLH per unit	96,000
Total direct labor-hours	120,000

Using direct labor-hours as the base, the predetermined overhead rate would be:

$$\frac{\text{Estimated overhead cost}}{\text{Estimated direct labor-hours}} = \frac{\$6{,}000{,}000}{120{,}000 \text{ DLHs}} = \$50 \text{ per DLH}$$

The unit product cost of each model using the company's traditional costing system would be:

	Deluxe	*Regular*
Direct materials	$154	$112
Direct labor	16	8
Manufacturing overhead:		
$50 per DLH × 1.6 DLHs	80	
$50 per DLH × 0.8 DLHs		40
Total unit product cost	$250	$160

2. Overhead rates are computed below:

Activity Cost Pool	*(a) Estimated Overhead Cost*	*(b) Expected Activity*	*(a) ÷ (b) Predetermined Overhead Rate*
Purchase orders	$252,000	1,200 purchase orders	$210 per purchase order
Scrap/rework orders	$648,000	900 scrap/ rework orders	$720 per scrap/ rework order
Product testing	$1,350,000	15,000 tests	$90 per test
Machine related	$3,750,000	50,000 MHs	$75 per MH

Problem 8-17 (continued)

3. a. The overhead applied to each product can be determined as follows:

The Deluxe Model

Activity Cost Pool	*(a) Predetermined Overhead Rate*	*(b) Activity*	*(a) × (b) Overhead Applied*
Purchase orders	$210 per PO	400 POs	$ 84,000
Scrap/rework orders	$720 per order	500 orders	360,000
Product testing	$90 per test	6,000 tests	540,000
Machine related	$75 per MH	20,000 MHs	1,500,000
Total overhead cost (a)			$2,484,000
Number of units produced (b)			15,000
Overhead cost per unit (a) ÷ (b)			$165.60

The Regular Model

Activity Cost Pool	*(a) Predetermined Overhead Rate*	*(b) Activity*	*(a) × (b) Overhead Applied*
Purchase orders	$210 per PO	800 POs	$ 168,000
Scrap/rework orders	$720 per order	400 orders	288,000
Product testing	$90 per test	9,000 tests	810,000
Machine related	$75 per MH	30,000 MHs	2,250,000
Total overhead cost (a)			$3,516,000
Number of units produced (b)			120,000
Overhead cost per unit (a) ÷ (b)			$29.30

Problem 8-17 (continued)

b. Using activity-based costing, the unit product cost of each model would be:

	Deluxe	*Regular*
Direct materials	$154.00	$112.00
Direct labor	16.00	8.00
Manufacturing overhead (above)	165.60	29.30
Total unit product cost	$335.60	$149.30

4. It is risky to draw any definite conclusions based on the above analysis. The activity-based costing system used in this company is not completely suitable for making decisions. Product costs probably include the costs of idle capacity and organization-sustaining costs. They also exclude nonmanufacturing costs that may be caused by the products. Nevertheless, the above analysis is suggestive. Unit costs appear to be distorted as a result of using direct labor-hours as the base for assigning overhead cost to products. Although the deluxe model requires twice as much labor time as the regular model, it still is not being assigned enough overhead cost, as shown in the analysis in part 3(a).

   When the company's overhead costs are analyzed on an activities basis, it appears that the deluxe model is more expensive to manufacture than the company realizes. Note that the deluxe model accounts for 40% of the machine-hours, although it represents a small part of the company's total production. Also, it consumes a disproportionately large amount of the activities.

   When activity-based costing is used in place of direct labor as the basis for assigning overhead cost to products, the unit product cost of the deluxe model jumps from $250 to $335.60. If the $250 cost figure is being used as the basis for pricing, then the selling price for the deluxe model may be too low. This may be one reason why profits have been declining over the last several years. It may also be the reason why sales of the deluxe model have been increasing rapidly.

Problem 8-18 (45 minutes)

1. The first-stage allocation of costs to activity cost pools for the CDG operation appears below.

	Meal Preparation	*Flight-Related*	*Customer Service*	*Other*	*Totals*
Cooks and delivery personnel wages	€ 1,260,000	€ 450,000	€ 0	€ 90,000	€ 1,800,000
Kitchen supplies	90,000	0	0	10,000	100,000
Chef salaries	70,000	30,000	80,000	20,000	200,000
Equipment depreciation	35,000	0	0	15,000	50,000
Administrative wages and salaries	0	45,000	81,000	54,000	180,000
Building costs	0	0	0	320,000	320,000
Total cost	€ 1,455,000	€ 525,000	€ 161,000	€ 509,000	€ 2,650,000

According to the data in the problem, 70% of the cooks and delivery personnel wages of € 1,800,000 is attributable to meal preparation activities.

70% of € 1,800,000 = € 1,260,000

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

Problem 8-18 (continued)

2. The activity rates at the CDG operation are:

	Meal Preparation	*Flight-related*	*Customer Service*
Activity at CDG	500,000 meals	4,000 flights	8 airlines
Cooks and delivery personnel wages.....	€ 2.52	€ 112.50	€ 0
Kitchen supplies	0.18	0.00	0
Chef salaries	0.14	7.50	10,000
Equipment depreciation	0.07	0.00	0
Administrative wages and salaries.....	0.00	11.25	10,125
Building costs.....	0.00	0.00	0
Total cost	€ 2.91	€ 131.25	€ 20,125

Example: € 1,260,000 ÷ 500,000 meals = € 2.52 per meal

Cooks and delivery personnel wages attributable to meal preparation from the first-stage allocation.

Problem 8-18 (continued)

3. Managers should be cautious when comparing operations using activity-based costing data—particularly when the activity-based costing data rely on interviews. Nevertheless, comparisons of the data can provide insights and may suggest where it would be fruitful to investigate further. In this case, side-by-side comparison of the Orly and CDG activity rates reveals that the cost per meal and cost per flight is less at CDG than at Orly, but the cost per airline for customer service activities is higher at CDG than at Orly. This suggests that Orly might have something to learn from CDG concerning meal preparation and flight-related activities, but CDG may be able to learn from Orly concerning customer service activities.

   Overall, CDG seems to be more efficient than Orly by about € 166,720 as shown in the table below.

	Meal Preparation	*Flight-Related*	*Customer Service*	*Total*
Cost per unit of activity at CDG	€ 2.91	€ 131.25	€ 20,125	
Cost per unit of activity at Orly.....	€ 3.05	€ 157.15	€ 19,265	
Difference in cost per unit of activity (a).....	(€ 0.14)	(€ 25.90)	€ 860	
Activity at CDG (b)	500,000	4,000	8	
Economic impact of the difference (a) × (b) ..	(€ 70,000)	(€ 103,600)	€ 6,880	(€ 166,720)

Examination of the detailed listing of activity rates may reveal more insights. For example, the cost of chef salaries is much lower at CDG than at Orly for all three activities. Why is this? Are more senior, and higher-paid, chefs at Orly? Is the head chef for the entire company stationed at Orly and included in the Orly figures? Are there too many chefs at Orly? We would need more information to pin down the real reason, but the point is that comparisons of the detailed activity rates may lead to interesting questions for managers to pursue.

Problem 8-19 (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	75%	15%	0%	10%	100%
Cleaning supplies	100%	0%	0%	0%	100%
Cleaning equipment depreciation	70%	0%	0%	30%	100%
Vehicle expenses	0%	80%	0%	20%	100%
Office expenses	0%	0%	60%	40%	100%
President's compensation	0%	0%	30%	70%	100%

	Cleaning Carpets	*Travel to Jobs*	*Job Support*	*Other*	*Total*
Wages	$105,000	$21,000	$ 0	$14,000	$140,000
Cleaning supplies	25,000	0	0	0	25,000
Cleaning equipment depreciation	7,000	0	0	3,000	10,000
Vehicle expenses	0	24,000	0	6,000	30,000
Office expenses	0	0	36,000	24,000	60,000
President's compensation	0	0	22,500	52,500	75,000
Total cost	$137,000	$45,000	$58,500	$99,500	$340,000

75% of $140,000 = $105,000

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

Problem 8-19 (continued)

2. The activity rates are computed as follows:

Activity Cost Pool	*(a) Total Cost*	*(b) Total Activity*	*(a) ÷ (b) Activity Rate*
Cleaning carpets	$137,000	10,000 hundred square feet	$13.70 per hundred square feet
Travel to jobs	$45,000	50,000 miles	$0.90 per mile
Job support	$58,500	1,800 jobs	$32.50 per job

3. The cost for the Lazy Bee Ranch job is computed as follows:

Activity Cost Pool	*(a) Activity Rate*	*(b) Activity*	*(a) × (b) ABC Cost*
Cleaning carpets	$13.70 per hundred square feet	6 hundred square feet	$ 82.20
Travel to jobs	$0.90 per mile	52 miles	46.80
Job support	$32.50 per job	1 job	32.50
Total			$161.50

4. The product margin can be easily computed below from an activity view by using the costs calculated in part (3) above.

Sales		$137.70
Costs:		
Cleaning carpets	$82.20	
Travel to jobs	46.80	
Job support	32.50	161.50
Product margin		$(23.80)

Problem 8-19 (continued)

5. Gore Range Carpet Cleaning appears to be losing money on the Lazy Bee Ranch job. However, caution is advised. Some of the costs may not be avoidable and hence would have been incurred even if the Lazy Bee Ranch job had not been accepted. An action analysis (discussed in Appendix 8A) 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 Eagle-Vail. (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.)

Problem 8-20 (75 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	75%	15%	0%	10%	100%
Cleaning supplies	100%	0%	0%	0%	100%
Cleaning equipment depreciation	70%	0%	0%	30%	100%
Vehicle expenses	0%	80%	0%	20%	100%
Office expenses	0%	0%	60%	40%	100%
President's compensation	0%	0%	30%	70%	100%

	Cleaning Carpets	*Travel to Jobs*	*Job Support*	*Other*	*Total*
Wages	$105,000	$21,000	$ 0	$14,000	$140,000
Cleaning supplies	25,000	0	0	0	25,000
Cleaning equipment depreciation	7,000	0	0	3,000	10,000
Vehicle expenses	0	24,000	0	6,000	30,000
Office expenses	0	0	36,000	24,000	60,000
President's compensation	0	0	22,500	52,500	75,000
Total cost	$137,000	$45,000	$58,500	$99,500	$340,000

75% of $140,000 = $105,000

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

Problem 8-20 (continued)

2. The activity rates are computed as follows:

	Cleaning Carpets	*Travel to Jobs*	*Job Support*
Total activity	10,000 hundred square feet	50,000 miles driven	1,800 jobs
Wages	$10.50	$0.42	$ 0.00
Cleaning supplies	2.50	0.00	0.00
Cleaning equipment depreciation	0.70	0.00	0.00
Vehicle expenses	0.00	0.48	0.00
Office expenses	0.00	0.00	20.00
President's compensation	0.00	0.00	12.50
Total cost	$13.70	$0.90	$32.50

Example: $105,000 ÷ 10,000 hundred square feet = $10.50 per hundred square feet

Wages attributable to cleaning carpets from the first-stage allocation above.

Problem 8-20 (continued)

3. The cost for the Lazy Bee Ranch job is computed as follows:

	Cleaning Carpets	*Travel to Jobs*	*Job Support*	*Total*
Activity for the Lazy Bee job.....	6 hundred square feet	52 miles driven	1 job	
Wages.....	$63.00	$21.84	$ 0.00	$ 84.84
Cleaning supplies	15.00	0.00	0.00	15.00
Cleaning equipment depreciation...	4.20	0.00	0.00	4.20
Vehicle expenses.....	0.00	24.96	0.00	24.96
Office expenses.....	0.00	0.00	20.00	20.00
President's compensation.....	0.00	0.00	12.50	12.50
Total cost	$82.20	$46.80	$32.50	$161.50

Example: $10.50 per hundred square feet × 6 hundred square feet = $63.00

Activity rate for wages and cleaning carpets.

Problem 8-20 (continued)

4. The product margin can also be easily computed for the action analysis. In this case, the costs along the right-most column of the cost table prepared in part (3) above are used.

Sales		$137.70
Green costs:		
Wages	$84.84	
Cleaning supplies	15.00	
Cleaning equipment depreciation	4.20	
Vehicle expenses	24.96	129.00
Green margin		8.70
Yellow costs:		
Office expenses	20.00	20.00
Yellow margin		(11.30)
Red costs:		
President's compensation	12.50	12.50
Red margin		$(23.80)

5. At most, Gore Range Carpet Cleaning is making only $8.70 on the Lazy Bee Ranch job. If more than $8.70 of the $20.00 in Office Expenses are actually avoidable if the job were not accepted, then the job is actually losing money.

   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?)

Problem 8-20 (continued)

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 Eagle-Vail. (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.)

   Before making such a radical change, the data should be carefully reviewed. For example, the wage cost of $21.84 for a 52-mile trip seems rather high. Are two people sent out on jobs? Can the remote jobs be done with one person?

Problem 8-21 (45 minutes)

1. The company expects to work 60,000 direct labor-hours during the year, computed as follows:

Mono-circuit: 40,000 units × 1 DLH per unit	40,000
Bi-circuit: 10,000 units × 2 DLH per unit	20,000
Total direct labor-hours	60,000

   Using direct labor-hours as the base, the predetermined manufacturing overhead rate would be:

$$\frac{\text{Estimated overhead cost}}{\text{Estimated direct labor-hours}} = \frac{\$3{,}000{,}000}{60{,}000 \text{ DLHs}} = \$50 \text{ per DLH}$$

   The unit product cost of each product would be:

	Mono-circuit	*Bi-circuit*
Direct materials (given)	$ 40	$ 80
Direct labor (given)	18	36
Manufacturing overhead:		
$50 per DLH × 1 DLH and 2 DLHs	50	100
Total unit product cost	$108	$216

2. The predetermined overhead rates would be computed as follows:

Activity Center	*(a) Estimated Overhead Costs*	*(b) Expected Activity*	*(a) ÷ (b) Predetermined Overhead Rate*
Maintaining parts inventory	$360,000	900 part types	$400 per part type
Processing purchase orders	$540,000	3,000 orders	$180 per order
Quality control	$600,000	8,000 tests	$75 per test
Machine-related	$1,500,000	50,000 MHs	$30 per MH

Problem 8-21 (continued)

3. a.

	Mono-circuit		*Bi-circuit*	
	Expected Activity	*Amount*	*Expected Activity*	*Amount*
Maintaining parts inventory, at $400 per part type	300	$ 120,000	600	$ 240,000
Processing purchase orders, at $180 per order	2,000	360,000	1,000	180,000
Quality control, at $75 per test	2,000	150,000	6,000	450,000
Machine-related, at $30 per machine-hour	20,000	600,000	30,000	900,000
Total manufacturing overhead cost (a)		$1,230,000		$1,770,000
Number of units (b)		40,000		10,000
Manufacturing overhead cost per unit (a) ÷ (b)		$30.75		$177.00

b. Using activity-based costing, the unit product cost of each product would be:

	Mono-circuit	*Bi-circuit*
Direct materials	$40.00	$ 80.00
Direct labor	18.00	36.00
Manufacturing overhead (above)	30.75	177.00
Total unit product cost	$88.75	$293.00

Problem 8-21 (continued)

4. Although the bi-circuit accounts for only 20% of the company's total production, it is responsible for two-thirds of the part types carried in inventory and 60% of the machine-hours. It is also responsible for one-third of the purchase orders and three-fourths of the quality control tests. These factors have been concealed as a result of using direct labor-hours as the base for assigning overhead cost to products. Since the bi-circuit is responsible for a majority of the activity in the company, under activity-based costing it is assigned a larger amount of overhead cost.

   Managers should be cautious about drawing firm conclusions about the profitability of products from the above activity-based cost analysis. The ABC system used in this company is not completely suitable for making decisions. Product costs probably include costs of idle capacity and organization-sustaining costs. They also exclude nonmanufacturing costs that may be caused by the products. Nevertheless, the above analysis is suggestive. The bi-circuit may not be as profitable as management believes, and this may be the reason for the company's declining profits. Note that from part (1), the unit product cost of the bi-circuit is $216. In part (3), however, the activity-based costing system sets the unit product cost of the bi-circuit at $293. This is a difference of $77 per unit. If the unit product cost of $216 is being used to set the selling price for the bi-circuit, the selling price may not be high enough to cover the company's costs.

Case 8-22 (90 minutes)

1.

	(a) Estimated Overhead Costs	*(b) Expected Activity*	*(a) ÷ (b) Predetermined Overhead Rate*
Purchasing	$15,000	300 orders[1]	$50 per order
Material handling	16,000	400 receipts[2]	$40 per receipt
Production orders and equipment setup	6,000	60 setup-hours[3]	$100 per setup-hour
Inspection	18,000	600 inspection-hours	$30 per inspection-hour
Frame assembly	12,000	1,500 assembly-hours	$8 per assembly-hour
Machine related	32,000	8,000 machine-hours[4]	$4 per machine-hour

[1] 60 + 90 + 150 = 300

[2] 80 + 105 + 215 = 400

[3] Standard: 10 setups × 1 hour per setup	10 hours
Specialty: 25 setups × 2 hours per setup	50 hours
Total setup hours	60 hours
[4] Standard: 10,000 units × 0.5 hours per unit	5,000 hours
Specialty: 2,500 units × 1.2 hours unit	3,000 hours
Total machine-hours	8,000 hours

Case 8-22 (continued)

Overhead cost charged to each product:

	Standard		*Specialty*	
	Activity	*Amount*	*Activity*	*Amount*
Purchasing, at $50 per order:				
Leather	50	$ 2,500	10	$ 500
Fabric	70	3,500	20	1,000
Synthetic	0	0	150	7,500
Material handling, at $40 per receipt:				
Leather	70	2,800	10	400
Fabric	85	3,400	20	800
Synthetic	0	0	215	8,600
Production orders and equipment setup, at $100 per hour	10	1,000	50	5,000
Inspection, at $30 per hour	200	6,000	400	12,000
Frame assembly, at $8 per hour	700	5,600	800	6,400
Machine related, at $4 per hour	5,000	20,000	3,000	12,000
Total manufacturing overhead cost		$44,800		$54,200

Manufacturing overhead cost per unit of product:
Standard: $44,800 ÷ 10,000 units = $4.48 per unit
Specialty: $54,200 ÷ 2,500 units = $21.68 per unit

Case 8-22 (continued)

2. The unit product cost of each product under activity-based costing is given below. For comparison, the costs computed by the company's accounting department using conventional costing are also provided.

	Activity-Based Costing		*Direct Labor-Hour Base*	
	Standard	*Specialty*	*Standard*	*Specialty*
Direct materials	$10.00	$20.00	$10.00	$20.00
Direct labor	6.00	4.80	6.00	4.80
Manufacturing overhead	4.48	21.68	8.25	6.60
Total unit product cost	$20.48	$46.48	$24.25	$31.40

3. The president was probably correct in being concerned about the profitability of the products, but the problem is apparently with the specialty product rather than the standard. Traditional overhead cost assignment using a volume-based measure has resulted in the high-volume product subsidizing the low-volume product. Thus, unit costs for both products are badly distorted. These distorted costs have had a major impact on management's pricing policies and on management's perception of the margin being realized on each product. The specialty briefcases are apparently being sold at a loss even without considering nonmanufacturing costs:

	Standard Briefcases	*Specialty Briefcases*
Selling price per unit	$26.25	$42.50
Unit product cost	20.48	46.48
Gross margin (loss) per unit	$ 5.77	$(3.98)

Based on these data, the company should not shift its resources entirely to the production of specialty briefcases. Whether or not the specialty briefcases can be made profitable depends on a number of factors including the sensitivity of the market to an increase in the selling price of the specialty briefcase.

Case 8-22 (continued)

Note to the Instructor: You may wish to mention to your class that before any decision can be made regarding dropping a product line, a careful analysis will have to be made of the potential avoidable costs. The unit product costs probably include some idle capacity costs and organization-sustaining costs that are not relevant in such a decision.

4. Perhaps the competition hasn't been able to touch FirstLine Case's price because the company has been selling its specialty briefcases at a price that is below its cost. Thus, rather than "gouging" its customers, FirstLine Case's competitor is probably just pricing its specialty items at a normal markup over their cost. Indeed, according to the activity-based costing system, if FirstLine Case is to realize a profit on its specialty items it may need to charge a price more in line with its competitor's price (over $50 per unit).

   When a company sells a product at a price substantially below that of its competitors, the company's management should take a careful look at the costing system to be sure that the product is being assigned all the costs that it causes.

Case 8-23 (120 minutes)

1. a. The predetermined overhead rate is computed as follows:

$$\text{Predetermined overhead rate} = \frac{\text{Estimated manufacturing overhead cost}}{\text{Estimated direct labor-hours}}$$

$$= \frac{\$600{,}000}{80{,}000\text{DLHs}} = \$7.50 \text{ per DLH}$$

b. The margins for the windows ordered by the two customers are computed as follows under the traditional costing system:

	Avon Construction		*Lynx Builders*	
Sales		$9,995		$54,995
Costs:				
Direct materials	$3,400		$17,200	
Direct labor	4,500		27,000	
Manufacturing overhead (@ $7.50 per DLH)	1,875	9,775	11,250	55,450
Margin		$ 220		$(455)

Case 8-23 (continued)

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

	Making Windows	*Processing Orders*	*Customer Relations*	*Other*	*Totals*
Indirect factory wages	$ 60,000	$120,000	$ 24,000	$ 36,000	$ 240,000
Production equipment depreciation	200,000	0	0	50,000	250,000
Other factory costs	44,000	0	0	66,000	110,000
Administrative wages and salaries	0	60,000	84,000	96,000	240,000
Office expenses	0	12,000	18,000	30,000	60,000
Marketing expenses	0	0	210,000	70,000	280,000
Total cost	$304,000	$192,000	$336,000	$348,000	$1,180,000

According to the data in the problem, 25% of the indirect factory wages are attributable to the activity of making windows.

25% of $240,000 = $60,000

The other entries in the table are determined in a similar manner.

Case 8-23 (continued)

2. b. The activity rates are computed as follows:

	Making Windows	*Processing Orders*	*Customer Relations*
Total activity	80,000 DLHs	1,000 orders	200 customers
Indirect factory wages	$0.75	$120	$ 120
Production equipment depreciation	2.50	0	0
Other factory costs	0.55	0	0
Administrative wages and salaries	0.00	60	420
Office expenses	0.00	12	90
Marketing expenses	0.00	0	1,050
Total cost	$3.80	$192	$1,680

Example: $60,000 ÷ 80,000 DLHs = $0.75 per DLH

Indirect factory wages attributable to the activity of making windows from the first-stage allocation above.

Case 8-23 (continued)

2. c. The overhead cost of serving Avon Construction is computed as follows:

	Making Windows	*Processing Orders*	*Customer Relations*	*Total*
Activity for Avon Construction	250 DLHs	2 orders	1 customer	
Indirect factory wages	$187.50	$240.00	$ 120.00	$ 547.50
Production equipment depreciation	625.00	0.00	0.00	625.00
Other factory costs	137.50	0.00	0.00	137.50
Administrative wages and salaries	0.00	120.00	420.00	540.00
Office expenses	0.00	24.00	90.00	114.00
Marketing expenses	0.00	0.00	1,050.00	1,050.00
Total cost	$950.00	$384.00	$1,680.00	$3,014.00

Example: $0.75 per DLH × 250 DLHs = $187.50

Activity rate for indirect wages for the activity making windows.

Case 8-23 (continued)

The overhead cost of serving Lynx Builders is computed as follows:

	Making Windows	*Processing Orders*	*Customer Relations*	*Total*
Activity for Lynx Builders	1,500 DLHs	3 orders	1 customer	
Indirect factory wages	$1,125.00	$360.00	$ 120.00	$1,605.00
Production equipment depreciation	3,750.00	0.00	0.00	3,750.00
Other factory costs	825.00	0.00	0.00	825.00
Administrative wages and salaries	0.00	180.00	420.00	600.00
Office expenses	0.00	36.00	90.00	126.00
Marketing expenses	0.00	0.00	1,050.00	1,050.00
Total cost	$5,700.00	$576.00	$1,680.00	$7,956.00

Example: $0.75 per DLH × 1,500 DLHs = $1,125.00

Activity rate for indirect wages for the activity of making windows.

Case 8-23 (continued)

2. d. The action analyses can be constructed using the row totals from the overhead cost analysis in part (2c) above.

Avon Construction

Sales		$9,995.00
Green costs:		
Direct materials	$3,400.00	3,400.00
Green margin		6,595.00
Yellow costs:		
Direct labor	4,500.00	
Indirect factory wages	547.50	
Production equipment depreciation	625.00	
Other factory costs	137.50	
Office expenses	114.00	
Marketing expenses	1,050.00	6,974.00
Yellow margin		(379.00)
Red costs:		
Administrative wages and salaries	540.00	540.00
Red margin		$(919.00)

Case 8-23 (continued)

Lynx Builders		
Sales		$54,995
Green costs:		
Direct materials	$17,200	17,200
Green margin		37,795
Yellow costs:		
Direct labor	27,000	
Indirect factory wages	1,605	
Production equipment depreciation	3,750	
Other factory costs	825	
Office expenses	126	
Marketing expenses	1,050	34,356
Yellow margin		3,439
Red costs:		
Administrative wages and salaries	600	600
Red margin		$ 2,839

Case 8-23 (continued)

3. According to the activity-based costing analysis, Victorian Windows may be losing money dealing with Avon Construction. Both the red and yellow margins are negative. This means that if Victorian Windows could actually avoid the yellow costs (or redeploy those resources to more profitable uses) by dropping Avon Construction as a customer, the company would be better off without this customer.

   The activity-based costing and traditional costing systems do not agree concerning the profitability of these two customers. The traditional costing system regards Avon Construction as a profitable customer and Lynx Builders as a money-losing customer. The activity-based costing system comes to exactly the opposite conclusion. The activity-based costing system provides more useful data for decision making for several reasons. First, the traditional costing system assigns all manufacturing costs to products—even costs that are not actually caused by the products such as costs of idle capacity and organization-sustaining costs. Second, the traditional costing system excludes all nonmanufacturing costs from product costs—even those that are caused by the product such as some office expenses. Third, the traditional costing system spreads manufacturing overhead uniformly among products based on direct labor-hours. This penalizes high-volume products with large amounts of direct labor-hours. Low-volume products with relatively small amounts of direct labor-hours benefit since the costs of batch-level activities like processing orders are pushed onto the high-volume products.

Case 8-24 (90 minutes)

1. a. The predetermined overhead rate would be computed as follows:

$$\frac{\text{Expected manufacturing overhead cost}}{\text{Estimated direct labor-hours}} = \frac{\$3{,}000{,}000}{50{,}000 \text{ DLHs}}$$

$$= \$60 \text{ per DLH}$$

b. The unit product cost per pound, using the company's present costing system, would be:

	Mona Loa	*Malaysian*
Direct materials (given)	$4.20	$3.20
Direct labor (given)	0.30	0.30
Manufacturing overhead:		
0.025 DLH × $60 per DLH	1.50	1.50
Total unit product cost	$6.00	$5.00

c. The selling price per pound of each coffee would be:

	Mona Loa	*Malaysian*
Manufacturing cost per pound	$6.00	$5.00
Add markup at 30%	1.80	1.50
Selling price per pound	$7.80	$6.50

2. a. Overhead rates by activity center:

Activity Center	*(a) Estimated Overhead Costs*	*(b) Expected Activity*	*(a) ÷ (b) Predetermined Overhead Rate*
Purchasing	$513,000	1,710 orders	$300 per order
Material handling	$720,000	1,800 setups	$400 per setup
Quality control	$144,000	600 batches	$240 per batch
Roasting	$961,000	96,100 hours	$10 per hour
Blending	$402,000	33,500 hours	$12 per hour
Packaging	$260,000	26,000 hours	$10 per hour

Case 8-24 (continued)

Before we can determine the amount of overhead cost to assign to the products we must first determine the activity for each of the products in the six activity centers. The necessary computations follow:

Number of purchase orders:
Mona Loa: 100,000 pounds ÷ 20,000 pounds per order = 5 orders
Malaysian: 2,000 pounds ÷ 500 pounds per order = 4 orders

Number of batches:
Mona Loa: 100,000 pounds ÷ 10,000 pounds per batch = 10 batches
Malaysian: 2,000 pounds ÷ 500 pounds per batch = 4 batches

Number of setups:
Mona Loa: 10 batches × 3 setups per batch = 30 setups
Malaysian: 4 batches × 3 setups per batch = 12 setups

Roasting hours:
Mona Loa: 1 hour × (100,000 pounds ÷ 100 pounds) = 1,000 hours
Malaysian: 1 hour × (2,000 pounds ÷ 100 pounds) = 20 hours

Blending hours:
Mona Loa: 0.5 hour × (100,000 pounds ÷ 100 pounds) = 500 hours
Malaysian: 0.5 hour × (2,000 pounds ÷ 100 pounds) = 10 hours

Packaging hours:
Mona Loa: 0.1 hour × (100,000 pounds ÷ 100 pounds) = 100 hours
Malaysian: 0.1 hour × (2,000 pounds ÷ 100 pounds) = 2 hours

Case 8-24 (continued)

Using the activity figures, manufacturing overhead costs can be assigned to the two products as follows:

	Mona Loa		*Malaysian*	
	Expected Activity	*Amount*	*Expected Activity*	*Amount*
Purchasing, at $300 per order	5 orders	$ 1,500	4 orders	$1,200
Material handling, at $400 per setup	30 setups	12,000	12 setups	4,800
Quality control, at $240 per batch	10 batches	2,400	4 batches	960
Roasting, at $10 per roasting hour	1,000 hours	10,000	20 hours	200
Blending, at $12 per blending hour	500 hours	6,000	10 hours	120
Packaging, at $10 per packaging hour	100 hours	1,000	2 hours	20
Total overhead cost		$32,900		$7,300

b. According to the activity-based costing system, the manufacturing overhead cost per pound is:

	Mona Loa	*Malaysian*
Total overhead cost assigned (above) (a)	$32,900	$7,300
Number of pounds manufactured (b)	100,000	2,000
Cost per pound (a) ÷ (b)	$0.33	$3.65

c. The unit product costs according to the activity-based costing system are:

	Mona Loa	*Malaysian*
Direct materials (given)	$4.20	$3.20
Direct labor (given)	0.30	0.30
Manufacturing overhead	0.33	3.65
Total unit product cost	$4.83	$7.15

Case 8-24 (continued)

3. MEMO TO THE PRESIDENT: Analysis of CBI's data shows that several activities other than direct labor drive the company's manufacturing overhead costs. These activities include purchase orders issued, number of setups for material processing, and number of batches processed. The company's present costing system, which relies on direct labor time as the sole basis for assigning overhead cost to products, significantly undercosts low-volume products, such as the Malaysian coffee, and significantly overcosts high-volume products, such as our Mona Loa coffee.

   An implication of the activity-based costing analysis is that our low-volume products may not be covering the costs of the manufacturing resources they use. For example, Malaysian coffee is currently priced at $6.50 per pound, but this price is significantly below its activity-based cost of $7.15 per pound. Under our present costing and pricing system, our high-volume products, such as our Mona Loa coffee, may be subsidizing our low-volume products. Some adjustments in prices may be required. However, before taking such an action, an action analysis report (discussed in Appendix 8A) should be prepared.

Case 8-24 (continued)

ALTERNATIVE SOLUTION:

Most students will compute the manufacturing overhead cost per pound of the two coffees as shown above. However, the per pound cost can also be computed as shown below. *This alternative approach provides additional insight into the data and facilitates emphasis of some points made in the chapter.*

	Mona Loa		*Malaysian*	
	Total	*Per Pound (÷ 100,000)*	*Total*	*Per Pound (÷ 2,000)*
Purchasing	$ 1,500	$0.015	$1,200	$0.600
Material handling	12,000	0.120	4,800	2.400
Quality control	2,400	0.024	960	0.480
Roasting	10,000	0.100	200	0.100
Blending	6,000	0.060	120	0.060
Packaging	1,000	0.010	20	0.010
Total	$32,900	$0.329	$7,300	$3.650

Note particularly how batch size impacts unit cost data. For example, the cost to the company to process a purchase order is $300, regardless of how many pounds of coffee are contained in the order. Twenty thousand pounds of the Mona Loa coffee are purchased per order (with five orders per year), and just 500 pounds of the Malaysian coffee are purchased per order (with four orders per year). Thus, the purchase order cost *per pound* for the Mona Loa coffee is just 1.5 cents, whereas the purchase order cost *per pound* for the Malaysian coffee is 40 times as much, or 60 cents. As stated in the text, this is one reason why unit costs of low-volume products, such as the Malaysian coffee, increase so dramatically when activity-based costing is used.

Case 8-25 (90 minutes)

1. The total direct labor-hours worked for the year would be:

B-10:	60,000 units × 1 DLH per unit	60,000
C-20:	10,000 units × 1.5 DLH per unit.....	15,000
	Total DLHs.....	75,000

   The predetermined overhead rate for the year would therefore be:

$$\frac{\text{Manufacturing overhead cost}}{\text{Direct labor-hours}} = \frac{\$3{,}600{,}000}{75{,}000 \text{ DLHs}}$$

$$= \$48 \text{ per DLH}$$

2. The unit product costs would be:

	B-10	*C-20*
Direct materials (given)	$ 60	$ 90
Direct labor (given)	12	18
Manufacturing overhead:		
$48 per DLH × 1 DLH per unit, 1.5 DLH per unit	48	72
Total unit product cost.....	$120	$180

3. This part of the case is open-ended, but students should provide data such as given below.

   Overhead rates for the activities are:

Activity	*(a) Estimated Overhead Costs*	*(b) Expected Activity*	*(a) ÷ (b) Predetermined Overhead Rate*
Machine setups	$416,000	3,200 setups	$130 per setup
Quality control	$720,000	18,000 inspections	$40 per inspection
Purchase orders ...	$180,000	2,400 orders	$75 per order
Soldering	$900,000	400,000 joints	$2.25 per joint
Shipments	$264,000	1,200 shipments	$220 per shipment
Machine related....	$1,120,000	140,000 MHs	$8 per MH

Case 8-25 (continued)

Overhead cost assigned to each product:

	B-10		*C-20*	
	Expected Activity	*Amount*	*Expected Activity*	*Amount*
Machine setups, at $130 per setup	2,000	$ 260,000	1,200	$ 156,000
Quality inspections, at $40 per inspection	8,000	320,000	10,000	400,000
Purchase orders, at $75 per order	1,680	126,000	720	54,000
Soldering, at $2.25 per joint	120,000	270,000	280,000	630,000
Shipments, at $220 per shipment	800	176,000	400	88,000
Machine related, at $8 per MH	60,000	480,000	80,000	640,000
Total overhead cost (a)		$1,632,000		$1,968,000
Number of units produced (b)		60,000		10,000
Overhead cost per unit (a) ÷ (b)		$27.20		$196.80

The unit product cost of each product under activity-based costing is given below. For comparison, the costs computed in Part 2 above are also provided.

	Activity-Based Costing		*Direct Labor-Hour Base*	
	B-10	*C-20*	*B-10*	*C-20*
Direct materials	$60.00	$ 90.00	$ 60.00	$ 90.00
Direct labor	12.00	18.00	12.00	18.00
Manufacturing overhead	27.20	196.80	48.00	72.00
Total unit product cost	$99.20	$304.80	$120.00	$180.00

Case 8-25 (continued)

As shown by the above analysis, unit product costs may have been distorted as a result of using direct labor-hours as the base for assigning overhead costs to products. These distorted costs may have had a major impact on management's pricing policies and on management's perception of the margin being realized on each product. According to the activity-based costing approach, Model C-20 is being sold at a loss:

	Activity-Based Costing		*Direct Labor-Hour Base*	
	B-10	*C-20*	*B-10*	*C-20*
Selling price per unit*	$200.00	$250.00	$200.00	$250.00
Less unit product cost (above)	99.20	304.80	120.00	180.00
Gross margin (loss)	$100.80	$(54.80)	$ 80.00	$ 70.00

*Total sales ÷ the number of units sold.

4. It is not surprising that the C-20 "sells itself" since the company is selling it at an apparent loss of $54.80. This probably explains why Borst Company couldn't meet Hammer Products' price.

   In addition, Hammer Products' distorted unit costs explains why Borst Company is able to undercut Hammer's price on the B-10 units. Hammer's management *thinks* that the B-10 costs $120 per unit to manufacture, whereas it costs just $99.20 according to the more accurate activity-based costing approach.

5. Students may suggest many possible strategies—there is no single "right" answer. Two possible strategies are: (a) raise the selling price of the C-20 enough to provide a satisfactory margin; and (b) discontinue the C-20 and focus all available resources on the B-10. The price of the B-10 might even be decreased to increase the volume of sales, if the company has adequate capacity to do so. Before taking any action, an action analysis report should be prepared as discussed in Appendix 8A.

Group Exercise 8-26

1. Many tasks that used to be accomplished by hand are now done with automated equipment, which is a component of overhead. Also, manufacturers have increased the variety of products they make. Managing and sustaining such product diversity requires more overhead resources such as production schedulers and product design engineers. These overhead resources have no obvious connection with direct labor—the traditional allocation base for overhead costs.

2. Traditional product costing systems assign all manufacturing overhead costs on the basis of direct labor-hours. All that matters in this system is how many direct labor-hours a product requires. If a product requires an hour of direct labor time, it will be assigned exactly the same manufacturing overhead cost regardless of how many units are processed in a batch, how complex the product is to design and to manufacture, or how many units are produced in a year. Traditional costing systems assume that all manufacturing overhead costs are directly proportional to direct labor-hours incurred. However, many overhead costs vary with the number of batches run, the number of products on the company's list of active products, the complexity of the products, and so on.

Group Exercise 8-27

An activity-based costing system typically reduces the amount of overhead cost that is allocated based on direct labor-hours—shifting the overhead to other cost pools. Under an activity-based costing system, some of the overhead will be allocated based on the number of batches run, the number of products in the company's active list, and so on. This results in shifting costs from high-volume products produced in large batches to low-volume products produced in small batches. Once this is understood, the answers to the questions posed in the group exercise can be easily answered.

1. The unit product cost of a low-volume product made in small batches will typically increase in an activity-based costing system. The batch-level and product-level costs are spread across a small number of units, increasing the average unit cost.

2. The unit product cost of a high-volume product made in large batches with automated equipment and few direct labor-hours will typically go up under activity-based costing. Because of the low direct labor-hour requirement for the product, the unit product cost under a traditional direct labor-based costing system would be artificially low. Under an activity-based costing system, the product would be charged for its use of automated equipment and for batch-level and product-level costs.

3. The unit product cost of a high-volume product that requires little machine work but a lot of direct labor typically will decrease under activity-based costing. Because of the high direct labor-hour requirement for the product, the unit product cost under a traditional direct labor-based costing system would be artificially high. The activity-based costing system would shift some of the overhead costs that had been assigned to this product to other products that are made in smaller volumes.

Group Exercise 8-28

The most equitable way to divide the dinner bill among a group of friends is probably to figure out the cost of what each individual consumed and divide up the bill accordingly. However, it would be easier to simply divide the total bill by the number of individuals. Everyone would then pay exactly the same amount. This issue relates to material in the chapter because the former method of charging individuals for the costs of what they consume is similar to ABC and the method of just dividing the bill equally is similar to traditional costing methods. Figuring out the cost of what each individual consumes is the most accurate method, but it may take too much time and energy to be worth the bother.