

**CHAPTER 5
ACTIVITY-BASED COSTING AND ACTIVITY-BASED MANAGEMENT**

5-23 (30 min.) **ABC, retail product-line profitability.**

1. The previous costing system (Panel A of Solution Exhibit 5-23) reports the following:

	Baked Goods	Milk & Fruit Juice	Frozen Products	Total
Revenues	\$57,000	\$63,000	\$52,000	\$172,000
Costs				
Cost of goods sold	38,000	47,000	35,000	120,000
Store support (30% of COGS)	11,400	14,100	10,500	36,000
Total costs	49,400	61,100	45,500	156,000
Operating income	\$ 7,600	\$ 1,900	\$ 6,500	\$ 16,000
Operating income ÷ Revenues	13.33%	3.02%	12.50%	9.30%

2. The ABC system (Panel B of Solution Exhibit 5-23) reports the following:

	Baked Goods	Milk & Fruit Juice	Frozen Products	Total
Revenues	\$57,000	\$63,000	\$52,000	\$172,000
Costs				
Cost of goods sold	38,000	47,000	35,000	120,000
Ordering	3,000	2,500	1,300	6,800
Delivery	7,840	2,880	2,240	12,960
Shelfstocking	3,660	3,320	480	7,460
Customer support	3,100	4,100	1,580	8,780
Total costs	55,600	59,800	40,600	156,000
Operating income	\$ 1,400	\$ 3,200	\$11,400	\$ 16,000
Operating income ÷ Revenues	2.46%	5.08%	21.92%	9.30%

These activity costs are based on the following:

Activity	Cost Allocation Rate	Baked Goods	Milk & Fruit Juice	Frozen Products
Ordering	\$100 per purchase order	30	25	13
Delivery	\$80 per delivery	98	36	28
Shelfstocking	\$20 per hour	183	166	24
Customer support	\$0.20 per item sold	15,500	20,500	7,900

The rankings of products in terms of relative profitability are:

	Previous Costing System		ABC System	
1.	Baked goods	13.33%	Frozen products	21.92%
2.	Frozen products	12.50	Milk & fruit juice	5.08
3.	Milk & fruit juice	3.02	Baked goods	2.46

The percentage revenue, COGS, and activity costs for each product line are:

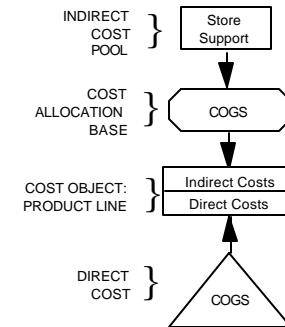
	Baked Goods	Milk & Fruit Juice	Frozen Products	Total
Revenues	33.14	36.63	30.23	100.00
COGS	31.67	39.17	29.16	100.00
Activity areas:				
Ordering	44.12	36.76	19.12	100.00
Delivery	60.49	22.22	17.29	100.00
Shelfstocking	49.06	44.50	6.44	100.00
Customer support	35.31	46.70	17.99	100.00

3. The baked goods line drops sizably in profitability when the ABC is used. Although it constitutes 31.67% of COGS, it uses a higher percentage of total resources in each activity area, especially the high cost delivery activity area. In contrast, frozen products draws a much lower percentage of total resources used in each activity area than its percentage of total COGS. Hence, under ABC, frozen products is much more profitable.

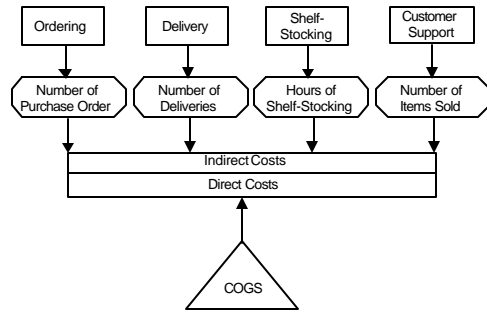
Family Supermarkets may want to explore ways to increase sales of frozen products. It may also want to explore price increases on baked goods.

Product-Costing Overviews of Family Supermarkets

PANEL A: PREVIOUS COSTING SYSTEM



PANEL B: ABC COSTING SYSTEM



5-24 (30 min.) ABC, product-costing at banks, cross-subsidization.

	Robinson	Skerrett	Farrel	Total
Revenues				
Spread revenue on annual basis (3% × \$1,100, \$800, \$25,000)	\$ 33	\$ 24	\$750.0	\$ 807.0
Monthly fee charges (\$20 × 0, 12, 0)	<u>0</u>	<u>240</u>	<u>0.0</u>	<u>240.0</u>
Total revenues	<u>33</u>	<u>264</u>	<u>750.0</u>	<u>1,047.0</u>
Costs				
Deposit/withdrawal with teller \$2.50 × 40; 50; 5	100	125	12.5	237.5
Deposit/withdrawal with ATM \$0.80 × 10; 20; 16	8	16	12.8	36.8
Deposit/withdrawal on prearranged basis: \$0.50 × 0; 12; 60	0	6	30.0	36.0
Bank checks written \$8.00 × 9; 3; 2	72	24	16.0	112.0
Foreign currency drafts \$12.00 × 4; 1; 6	48	12	72.0	132.0
Inquiries \$1.50 × 10; 18; 9	15	27	13.5	55.5
Total costs	<u>243</u>	<u>210</u>	<u>156.8</u>	<u>609.8</u>
Operating income	<u>\$(210)</u>	<u>\$ 54</u>	<u>\$593.2</u>	<u>\$ 437.2</u>

The assumption that the Robinson and Farrel accounts exceed \$1,000 every month and the Skerrett account is less than \$1,000 each month means the monthly charges apply only to Skerrett.

One student with a banking background noted that in this solution 100% of the spread is attributed to the "borrowing side of the bank." He noted that often the spread is divided between the "borrowing side" and the "lending side" of the bank.

2. Cross-subsidization across individual Premier Accounts occurs when profits made on some accounts are offset by losses on other accounts. The aggregate profitability on the three customers is \$437.20. The Farrel account is highly profitable (\$593.20), while the Robinson account is sizably unprofitable.

FIB should be very concerned about the cross-subsidization. Competition likely would "understand" that high-balance low-activity type accounts (such as Farrel) are highly profitable. Offering free services to these customers is not likely to retain these accounts if other banks offer higher interest rates. Competition likely will reduce the interest rate spread FIB can earn on the high-balance low-activity accounts they are able to retain.

3. Possible changes FIB could make are:
 - a. Offer higher interest rates on high-balance accounts to increase FIB's competitiveness in attracting and retaining these accounts.
 - b. Introduce charges for individual services. The ABC study reports the cost of each service. FIB has to decide if it wants to price each service at cost, below cost, or above cost. If it prices above cost, it may use advertising and other means to encourage additional use of those services by customers.

5-27 (20–30 min.) Activity-based job-costing system.

1a. Solution Exhibit 5-27 presents costing overviews of the previous job-costing system and the refined activity-based job-costing system.

1b. Direct manufacturing costs per machine:	
Direct materials	\$3,000
Indirect manufacturing costs per machine:	
\$100 × 15 assembly -hours	1,500
Total manufacturing costs per machine	<u>\$4,500</u>
Total manufacturing costs = \$4,500 × 50 machines =	\$225,000
Direct manufacturing costs per machine:	
Direct materials	\$3,000
Indirect manufacturing costs per machine:	
Materials handling, \$8 × 50	\$ 400
Machining, \$68 × 12	816
Assembly, \$75 × 15	1,125
Inspection, \$104 × 4	<u>416</u>
Total manufacturing costs per machine	<u>\$5,757</u>
Total manufacturing costs = \$5,757 × 50 machines =	\$287,850

2. A direct cost is a cost that is related to the particular cost object and that can be traced to it in an economically feasible way. Denver may differ from its competitor in several ways.

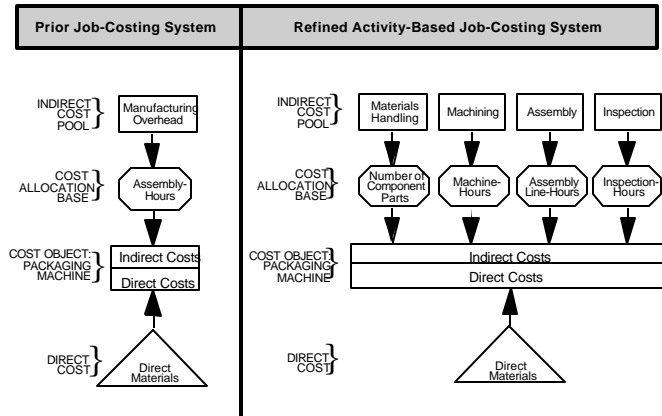
- a. Denver uses a more automated production approach with the result that manufacturing labor provides support to the machines.
- b. Denver uses a less sophisticated information tracking system for manufacturing labor than its competitors.

Manufacturing labor costs are included in the individual indirect manufacturing (overhead) cost pools.

3. The refined activity-based costing system can provide information to:
- Product designers—the indirect cost rates in each of the four indirect cost areas can guide decisions about how much, say, machine-hours to use versus assembly-line-hours when designing packaging machines.
 - Manufacturing personnel—decisions about productivity and cost management can focus on ways to reduce the indirect cost rates (such as decisions on how to make more efficient use of machines).
 - Marketing personnel—the ABC approach can help guide pricing decisions and negotiations with potential customers on ways to manufacture a lower-cost packaging machine.

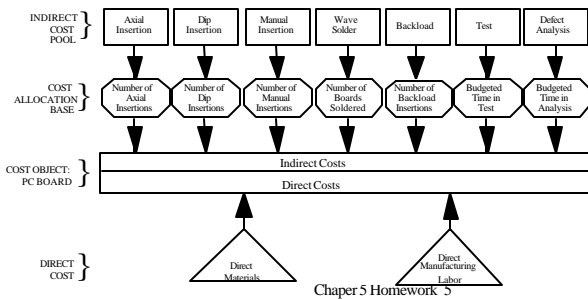
SOLUTION EXHIBIT 527

Job Costing System for Denver Company



5-28 (20–25 min.) Activity-based costing, job-costing system.

1. An overview of the activity-based job-costing system is:



Chaper 5 Homework 5

Activity Area	Indirect Manufacturing Costs Allocated	
1. Axial insertion	\$ 0.08	× 45 = \$ 3.60
2. Dip insertion	0.25	× 24 = 6.00
3. Manual insertion	0.50	× 11 = 5.50
4. Wave solder	3.50	× 1 = 3.50
5. Backload	0.70	× 6 = 4.20
6. Test	90.00	×.25 = 22.50
7. Defect analysis	80.00	×.10 = 8.00
Total		<u>\$53.30</u>

Direct manufacturing costs:		
Direct materials	\$75.00	
Direct manufacturing labor	15.00	\$ 90.00
Indirect manufacturing costs:		
Manufacturing overhead (see above)		53.30
Total manufacturing costs		<u>\$143.30</u>

3. The manufacturing manager likely would find the ABC job-costing system useful in cost management. The seven indirect cost pools are systematically linked to the activity areas at the plant. Productivity measures can be developed that directly link to the management accounting system. Marketing managers can use ABC information to price jobs as well as to advise customers about how selecting different product features will affect price.

5-32 (30-40 min.) Activity-based costing, merchandising.

	General Supermarket Chains	Drugstore Chains	Ma and Pa Single Stores	Total
Revenues ^a	\$3,708,000	\$3,150,000	\$1,980,000	\$8,838,000
Cost of goods sold ^b	<u>3,600,000</u>	<u>3,000,000</u>	<u>1,800,000</u>	<u>8,400,000</u>
Gross margin	<u>\$ 108,000</u>	<u>\$ 150,000</u>	<u>\$ 180,000</u>	438,000
Other operating costs				<u>301,080</u>
Operating income				\$ 136,920
Gross margin %	2.91%	4.76%	9.09%	

^a(\$30,900 × 120); (\$10,500 × 300); (\$1,980 × 1,000)
^b(\$30,000 × 120); (\$10,000 × 300); (\$1,800 × 1,000)

The gross margin of Figure Four Inc. was 4.96% (\$438,000 ÷ \$8,838,000). The operating income margin of Figure Four Inc. was 1.55% (\$136,920 ÷ \$8,838,000).

2. The per-unit cost driver rates are:

- Customer purchase order processing, \$80,000 ÷ 2,000 = \$40 per order
- Line item ordering, \$63,840 ÷ 21,280 = \$ 3 per line item

3. Store delivery, $\$71,000 \div 1,420$ = \$50 per delivery
 4. Cartons shipped, $\$76,000 \div 76,000$ = \$ 1 per carton
 5. Shelfstocking, $\$10,240 \div 640$ = \$16 per hour
3. The activity-based costing of each distribution market for August 1999 is:

	General Supermarket Chains	Drugstore Chains	Ma and Pa Single Stores
1. Customer purchase order processing, (\$40 × 140; 360; 1,500)	\$ 5,600	\$14,400	\$ 60,000
2. Line item ordering, (\$3 × (140 × 14; 360 × 12; 1,500 × 10))	5,880	12,960	45,000
3. Store delivery, (\$50 × 120, 300, 1,000)	6,000	15,000	50,000
4. Cartons shipped, (\$1 × (120 × 300; 300 × 80; 1,000 × 16))	36,000	24,000	16,000
5. Shelfstocking, (\$16 × (120 × 3; 300 × 0.6; 1,000 × 0.1))	<u>5,760</u>	<u>2,880</u>	<u>1,600</u>
	<u>\$59,240</u>	<u>\$69,240</u>	<u>\$172,600</u>

The revised operating income statement is:

	General Supermarket Chains	Drugstore Chains	Ma and Pa Single Stores	Total
Revenues	\$3,708,000	\$3,150,000	\$1,980,000	\$8,838,000
Cost of goods sold	3,600,000	3,000,000	1,800,000	8,400,000
Gross margin	108,000	150,000	180,000	438,000
Operating costs	<u>59,240</u>	<u>69,240</u>	<u>172,600</u>	<u>301,080</u>
Operating income	<u>\$ 48,760</u>	<u>\$ 80,760</u>	<u>\$ 7,400</u>	<u>\$ 136,920</u>
Operating income margin	1.31%	2.56%	0.37%	1.55%

The ranking of the three markets are:

Using Gross Margin		Using Operating Income	
1. Ma and Pa Single Stores	9.09%	1. Drugstore Chains	2.56%
2. Drugstore Chains	4.76%	2. General Supermarket Chains	1.31%
3. General Supermarket Chains	2.91%	3. Ma and Pa Single Stores	0.37%

The activity-based analysis of costs highlights how the Ma and Pa Single Stores use a larger amount of Figure Four resources per revenue dollar than do the other two markets. The ratio of the operating costs to revenues across the three markets is:

General Supermarket Chains	1.60%	(\$59,240 ÷ \$3,708,000)
Drugstore Chains	2.20%	(\$69,240 ÷ \$3,150,000)
Ma and Pa Single Stores	8.72%	(\$172,600 ÷ \$1,980,000)

This is a classic illustration of the maxim that "all revenue dollars are not created equal."

4. a. *Choosing the appropriate cost drivers for each area.* The case gives a cost driver for each chosen activity area. However, it is likely that over time further refinements in cost drivers would occur. For example, not all store deliveries are equally easy to make, depending on parking availability, accessibility of the storage/shelf space to the delivery point, etc. Similarly, not all cartons are equally easy to deliver—their weight, size, or likely breakage component are factors that can vary across carton types.
- b. *Developing a reliable data base on the chosen cost drivers.* For some items, such as the number of orders and the number of line items, this information likely would be available in machine readable form at a high level of accuracy. Unless the delivery personnel have hand-held computers that they use in a systematic way, estimates of shelfstocking time are likely to be unreliable. Advances in information technology likely will reduce problems in this area over time.
- c. *Deciding how to handle costs that may be common across several activities.* For example, (3) store delivery and (4) cartons shipped to stores have the common cost of the same trip. Some organizations may treat (3) as the primary activity and attribute to (4) only incremental costs. Similarly, (1) order processing and (2) line item ordering may have common costs.
- d. *Choice of the time period to compute cost rates per cost driver.* Flair calculates driver rates on a monthly basis (August 1999). He may want to consider using longer time periods that may be less affected by seasonal or random variations in demand.
- e. *Behavioral factors are likely to be a challenge to Flair.* He must now tell those salespeople who specialize in Ma and Pa accounts that they have been less profitable than previously thought.

5-36 (30–40 min.) Activity-based costing, product-cost cross-subsidization.

The motivation for Problem 5-36 came from "ABC Minicase: Let them Eat Cake," *Cost Management Update* (Issue No. 31).

1. Budgeted MOH rate in 2001 = $\frac{\$210,800}{200,000 \text{ units}}$ = \$1.054 per one-pound unit of cake

	Raisin Cake		Layered Carrot Cake	
Unit direct manufacturing cost				
Direct materials	\$0.600		\$0.900	
Direct manufacturing labor	0.140	\$0.740	0.200	\$1.100
Unit indirect manufacturing cost				
Manufacturing overhead (\$1.054 × 1, 1)	\$1.054	1.054	\$1.054	1.054
Unit total manufacturing cost		<u>\$1,794</u>		<u>\$2,154</u>

2. ABC costs for 120,000 pounds of raisin cake and 80,000 pounds of layered carrot cake in 2001 follow:

	Raisin Cake		Layered Carrot Cake	
	Total Costs (1)	Per Unit Cost (2) = (1) ÷ 120,000	Total Costs (3)	Per Unit Cost (4) = (3) ÷ 80,000
Direct costs				
Direct materials	\$ 72,000	\$0.60	\$ 72,000	\$0.90

Direct manufacturing labor	<u>16,800</u>	<u>0.14</u>	<u>16,000</u>	<u>0.20</u>
Total direct costs	<u>88,800</u>	<u>0.74</u>	<u>88,000</u>	<u>1.10</u>
Indirect costs				
Mixing				
\$0.04 × 600,000	24,000	0.20		
\$0.04 × 640,000			25,600	0.32
Cooking				
\$0.14 × 240,000	33,600	0.28		
\$0.14 × 240,000			33,600	0.42
Cooling				
\$0.02 × 360,000	7,200	0.06		
\$0.02 × 400,000			8,000	0.10
Creaming/Icing				
\$0.25 × 0	0	0		
\$0.25 × 240,000			60,000	0.75
Packaging				
\$0.08 × 360,000	28,800	0.24		
\$0.08 × 560,000			<u>44,800</u>	<u>0.56</u>
Total indirect costs	<u>93,600</u>	<u>0.78</u>	<u>172,000</u>	<u>2.15</u>
Total costs	<u>\$182,400</u>	<u>\$1.52</u>	<u>\$260,000</u>	<u>\$3.25</u>

Note that the significant shift in product mix will cause absorbed costs (based on budgeted rates and actual quantities of the cost-allocation base) to be different from the budgeted manufacturing overhead costs.

3. The unit product costs in requirements 1 and 2 differ only in the assignment of indirect costs to individual products.

The ABC system recognizes that indirect resources used per pound of layered carrot cake is 2.76 ($\$2.15 \div \0.78) times the indirect resources used per pound of raisin cake. The existing costing system erroneously assumes equal usage of activity areas by a pound of raisin cake and a pound of layered carrot cake.

4. Uses of activity-based cost numbers include:

a. Pricing decisions. BD can use the ABC data to decide preliminary prices for negotiating with its customers. Raisin cake is currently overcosted, while layered carrot cake is undercosted. Actual production of layered carrot cake is 100% more than budgeted. One explanation could be the underpricing of layered carrot cake.

b. Product emphasis. BD has more accurate product margins with ABC. BD can use this information for deciding which products to push (especially if there are production constraints).

c. Product design. ABC provides a road map on how a change in product design can reduce costs. The percentage breakdown of total indirect costs for each product is:

	<u>Raisin Cake</u>	<u>Layered Carrot Cake</u>
Mixing	25.6% ($\$0.20/\0.78)	14.9% ($\$0.32/\2.15)
Cooking	35.9	19.5
Cooling	7.7	4.7

Chaper 5 Homework 9

Creaming/Icing	0.0	34.9
Packaging	<u>30.8</u>	<u>26.0</u>
	<u>100.0%</u>	<u>100.0%</u>

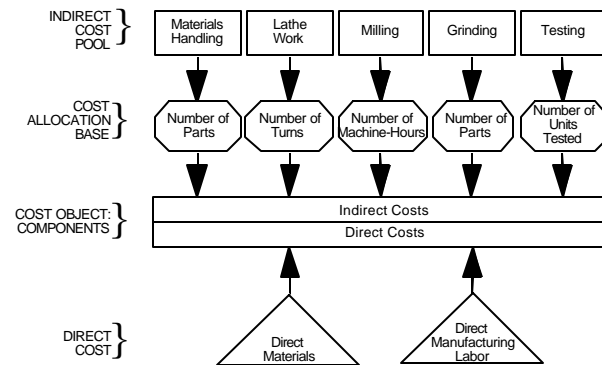
BD can reduce the cost of either cake by reducing its usage of each activity area. For example, BD can reduce raisin cake's cost by sizably reducing its cooking time or packaging time. Similarly, a sizable reduction in creaming/icing will have a marked reduction in layered carrot cake costs. Of course, BD must seek efficiency improvements without compromising quality.

d. Process improvements. Improvements in how activity areas are configured will cause a reduction in the costs of products that use those activity areas.

e. Cost planning and flexible budgeting. ABC provides a more refined model to forecast costs of BD and to explain why actual costs differ from budgeted costs.

5-38 (40–50 min.) Activity-based job costing, unit-cost comparisons.

An overview of the product-costing system is:



	<u>Job Order 410</u>	<u>Job Order 411</u>
1. Direct manufacturing costs:		
Direct materials	\$9,700	\$59,900
Direct manufacturing labor,		
\$30 × 25; 375	<u>750</u>	<u>11,250</u>
Indirect manufacturing costs,		
\$115 × 25; 375	<u>2,875</u>	<u>43,125</u>
Total manufacturing costs	\$13,325	\$114,275
Number of units	÷ 10	÷ 200
Manufacturing costs per unit	\$ 1,332.50	\$ 571.375

Chaper 5 Homework 10

5-38 (Cont'd.)

	<u>Job Order 410</u>		<u>Job Order 411</u>	
2. Direct manufacturing costs:				
Direct materials	\$9,700		\$59,900	
Direct manufacturing labor, \$30 × 25; 375	750	\$10,450	11,250	\$ 71,150
Indirect manufacturing costs:				
Materials handling, \$0.40 × 500; 2,000	200		800	
Lathe work, \$0.20 × 20,000; 60,000	4,000		12,000	
Milling, \$20.00 × 150; 1,050	3,000		21,000	
Grinding, \$0.80 × 500; 2,000	400		1,600	
Testing, \$15.00 × 10; 200	<u>150</u>	<u>7,750</u>	<u>3,000</u>	<u>38,400</u>
Total manufacturing costs		<u>\$18,200</u>		\$109,550
Number of units per job		<u>÷ 10</u>		÷ 200
Unit manufacturing cost per job		<u>\$ 1,820</u>		<u>\$ 547.75</u>

	<u>Job Order 410</u>	<u>Job Order 411</u>
3. Number of units in job	10	200
Costs per unit with prior costing system	\$1,332.50	\$571.375
Costs per unit with activity-based costing	1,820.00	547.75

Job order 410 has an increase in reported unit cost of 36.6% [(\$1,820 – \$1,332.50) ÷ \$1,332.50], while job order 411 has a decrease in reported unit cost of 4.1% [(\$547.75 – \$571.375) ÷ \$571.375].

A common finding when activity-based costing is implemented is that low-volume products have increases in their reported costs while high-volume products have decreases in their reported cost. This result is also found in requirements 1 and 2 of this problem. Costs such as materials-handling costs vary with the number of parts handled (a function of batches and complexity of products) rather than with direct manufacturing labor-hours, an output-unit level cost driver, which was the only cost driver in the previous jobcosting system.

The product costs figures computed in requirements 1 and 2 differ because:

- the job orders differ in the way they use each of five activity areas, and
- the activity areas differ in their indirect cost allocation bases (specifically, each area does not use the direct labor-hours indirect cost allocation base).

The following table documents how the two job orders differ in the way they use each of the five activity areas included in indirect manufacturing costs:

Activity Area	Usage Based on Analysis of Activity Area Cost Drivers		Usage Assumed with Direct Labor-Hours as Application Base	
	Job Order 410	Job Order 411	Job Order 410	Job Order 411
Materials handling	20.0%	80.0%	6.25%	93.75%
Lathe work	25.0	75.0	6.25	93.75

Milling	12.5	87.5	6.25	93.75
Grinding	20.0	80.0	6.25	93.75
Testing	4.8	95.2	6.25	93.75

The differences in product cost figures might be important to Tracy Corporation for product pricing and product emphasis decisions. The activity-based accounting approach indicates that job order 410 is being undercosted while job order 411 is being overcosted. Tracy Corporation may erroneously push job order 410 and deemphasize job order 411. Moreover, by its actions, Tracy Corporation may encourage a competitor to enter the market for job order 411 and take market share away from it.

4. Information from the ABC system can also help Tracy manage its business better in several ways.

- Product design.* Product designers at Tracy Corporation likely will find the numbers in the activity-based costing approach more believable and credible than those in the existing system. In a machine-paced manufacturing environment, it is unlikely that direct labor-hours would be the major cost driver. Activity-based costing provides more credible signals to product designers about the ways the costs of a product can be reduced—for example, use fewer parts, require fewer turns on the lathe, and reduce the number of machine-hours in the milling area.
- Cost management.* Tracy can reduce the cost of jobs both by making process improvements that reduce the activities that need to be done to complete jobs and by reducing the costs of doing the activities.
- Cost planning.* ABC provides a more refined model to forecast costs and to explain why actual costs differ from budgeted costs.