CHAPTER 10

The Activity-Based Costing System

REVIEW QUESTIONS:

10.1 Both the activity-based costing (ABC) and the traditional volume-based costing system use a conventional two-stage process for assigning overhead costs. These two costing methods differ, however, in that ABC uses activity cost pools for assignment of costs, instead of just allocating costs to various internal departments. Another difference is that the second stage cost drivers for ABC systems are based on activity drivers instead of predetermined overhead rates based on direct labor hours, direct labor dollars, machine hours, or materials dollars.

Let's Talk

There are some who would disagree with the last sentence of Problem 10.1, arguing that although many traditional volume-based costing systems are designed to satisfy financial accounting purposes, that is not a requirement of the traditional systems. Granted, that this may be true. Possible class discussion questions are–Why is this true? and How can ABC systems change this?.

10.2 The two main purposes of ABC are: 1) providing information for effective cost management through activity-based management, and 2) costing the enterprise's cost objects.

10.3 There are six components of an activity-based costing system:

- *Resource categories* — They represent the sources of costs that support activities including: procurement and various material handling and storage, office space, equipment, utilities, salaries and benefits, buildings, accounting, engineering, and insurance, licenses, and taxes
- *First-stage resource drivers* — They assign resource costs to activities by establishing a relationship between resource costs and activity cost pools based on some measure of usage.
- *Activities and activity cost pools* — An activity is what an organization does to convert inputs to outputs. An activity cost pool is the result of assigning resource costs to an activity.
- *Second-stage activity drivers* — They assign costs in activity pools to cost objects and are measures of the consumption of the activity cost pools by cost objects.
- *Cost objects* — They are the point at which activity costs are assigned and can include: products, services, units, batches, contracts, cases, jobs, projects, customers, customer groups, distribution channels, and sales territories.
- *Direct cost inputs* — They are cost elements that are easily traced to cost objects such as direct materials, direct labor, direct technology (equipment).

10.4 The assignment of resource costs to activities forms activity cost pools that contain their proper share of resource costs.

10.5 Different levels of an object refers to the various ways that cost objects can be grouped. A low-level cost object could be a *unit* of some manufactured product. A higher-level cost object would then be the *batch*, with the *product line* being the highest-level cost object of the three.

10.6 Cost objects are not always necessarily related to a single product, or customer. Because of the nature of the activity costs, they can be assigned to various levels of an object. As costs vary in response to different factors, there is motivation to assign costs at different levels to keep the activities at different levels separate. For example, setup activity costs vary with each batch, whereas product engineering changes can be assigned to each product line. Therefore, different cost objects (setup and engineering changes) would be used.

10.7 Two other ways that costs can be assigned to cost objects are: 1) all costs except direct materials costs are assigned to activity cost pools, and 2) all costs except direct materials and direct labor costs are assigned to activity costs pools.

10.8 Direct technology (equipment) is a direct cost element when the technology (equipment) can be directly traced to the product, service, or job. Examples are computer and computer component manufacturers, and some automobile plants, among others.

10.9 Activities in ABC systems are assumed to be variable to easily facilitate the assignment of resource costs to the activity cost pools. Even though in most organizations the activity costs are actually step functions, these costs are assumed to be continuously variable.

10.10 In some situations, activity cost pools can be aggregated into activity centers to facilitate the assignment of responsibility. Responsibility centers are where a particular manager is responsible for all the activity cost pools aggregated in that activity center.

10.11 The four types of cost drivers are:

- *transaction-based* — These drivers are based on the number of transactions generated by an activity.
- *time-based* — These drivers are based on the duration of an activity and are appropriate when activities take varying amounts of time.
- *dollar-based* — These drivers are based on the dollar amount of each activity.
- *percentage-based* — These drivers are based on the percentage of the total activities, each activity consumes.

10.12 A transaction-based cost driver can be preferable in some cases because the information is readily available, it is easy to understand, measure, and apply, and it can induce beneficial behavior. Transaction-based cost drivers are not always appropriate, however, especially in circumstances when activities take varying amounts of resources (time, paper, etc.).

Let's Talk

The following three review questions ask the student to give examples of various points explained in the text. The following examples from the textbook are but just a few of the possible examples students might provide. The key for each student is to demonstrate, through the examples, a grasp of how differences in ABC systems affect behavior.

10.13 A time-based cost driver might be appropriate for any activity that takes varying amounts of time, such as inspections, rework and repair, etc.

10.14 A beneficial cost driver is one that induces behavior that will help the enterprise to achieve its goals. A harmful cost driver is one that induces behavior that does not help the enterprise achieve its goals. For example, if a company wants to reduce the number of unique parts in a process, since a large number of unique parts costs directly corresponds to higher overhead, a beneficial cost driver would be the "number of part numbers." Care must be taken however, since extreme behavior to reduce part numbers, and thus overhead, might adversely impact the functionality and quality of the product. The cost driver would then have to be seen as causing harmful behavior.

10.15 A volume-based costing system can distort costs when the overhead allocation for various product lines is not inline with the actual costs incurred by each product line. For example, Product A and B both have the same total sales volume, thus a volume-based costing system would allocate equal overhead amounts, say $1.00 per unit for product A and B. If product A's and B's contribution margin are $0.95 and $1.05, respectively, a decision to eliminate product A would be made. On the other hand, if through an activity-based costing system the overhead allocation is $0.90 and $1.08, respectively for A and B; product A is profitable, and B is not. Therefore, the volume-based costing system distorted the actual overhead allocation costs for each product, resulting in a poor product mix decision.

Let's Talk

Note that the definition of contribution margin in the text is "sales price less materials costs." This may cause some confusion with students who are familiar with other, more commonly used definitions. The point here is not how contribution margin is defined, but the potential differences between traditional volume-based costing and ABC.

10.16 Cross-subsidizing between product lines can occur when the overhead allocation is not based on the real costs of the overhead activity, and one product is charged less than it actually consumes. For example, if product X actually consumes 30% of the purchasing activity but is charged for 50% because of a non-activity-based costing system, product X is actually cross-subsidizing other products that use the purchasing activity.

10.17 ABC systems are especially appropriate in companies where:

- Competition is high.
- Product mix is diverse due to differences in the batch sizes, the physical sizes of the products, the degree of complexity of the products, and the raw materials used in each product.
- Product life cycles are short.
- An integrated computer-based information system is used for collection and manipulation of the costing data.

10.18 The three strategic goals of ABC systems are:

- make appropriate pricing decisions based on good cost information
- make appropriate product mix calculations based on good profitability decisions
- have overall good cost management by focusing on activities and cost drivers.

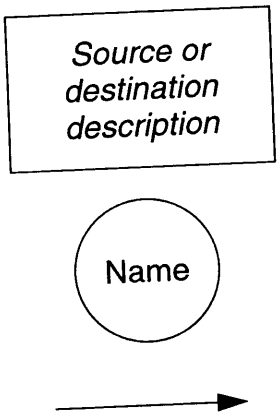
10.19 The five phases of the activity-based costing development life cycle are:

- *Phase 1* — *Plan the system:* Involve the entire organization in planning the ABC system to assure there is common understanding and agreement.
- *Phase 2* — *Analyze and define resource categories:* Ascertain whether certain ledger accounts and budgetary items can be combined into a single resource category, or whether the ledger accounts and budgetary items need to be split.
- *Phase 3* — *Analyze and define activities:* Establish a basis for determining each activity cost and performance. Decompose an organization into elemental activities that are understandable and easy to manage.
- *Phase 4* — *Determine first-stage resource drivers and establish activity cost pools:* Assign the resource costs (Phase 2) to the activities (Phase 3).
- *Phase 5* — *Determine second-stage activity drivers and assign costs to cost objects:* Apply the costs of the activity cost pool to each product or service (or other cost object).

10.20 Active involvement should be encouraged throughout the organization to establish an understanding how the ABC system will serve the enterprise. Several JAD sessions that involve a large number of participants from all parts of the organization can assist in addressing the ABC system planning issues.

10.21 By fostering active involvement among all levels in an organization, some of the mistrust and bickering that might otherwise occur between various managers, workers, and management accountants is reduced if not eliminated. Ideally, the ABC system will become both the worker's and manager's system. Another important reason for multidisciplinary involvement is the resulting education that all parties will receive about the other's work.

10.22 The purpose of an activity flow diagram is to describe the activities that are performed in an organization and to show their interdependencies. The diagram consists of the rectangle, the circle, and the arrow:



- The *rectangle* represents the source or destination of the initial or final inputs or outputs of the system under analysis. They can be persons, companies, departments, or other systems.
- The *circle* represents the activity that transforms inputs to outputs. By convention, the name consists of a verb and an object or object clause (e.g., purchasing materials).
- The *arrow* represents the flow between inputs and outputs of sources, destinations, and activities.

Let's Talk

Think Tank Problem 10.36 is the only problem in the text that requires the student to draw an activity flow diagram. You might also want the student to draw simple activity flow diagrams for various activities such as customer sales, materials accounting, or distribution of goods.

10.23 The purpose of the cause-and-effect (fishbone) diagram is to assist in defining activities. The fishbone diagram consists of an activity (the head) and the tasks related to that activity (the bones).

10.24 The process of combining tasks into a homogeneous groups to form a function-specific activity is called an aggregation. The process of breaking down groups of dissimilar tasks into several function-specific activities is called decomposition. The purpose in either case is to determine proper function-specific activities. The rules of thumb for decomposition and aggregation of tasks are:

- Strive for two to ten well-defined, function-specific activities per traditional organizational unit.
- Do not aggregate activities which are the responsibility of two or more persons.
- No more than five to fifteen well-defined, highly-related tasks should be included in one activity.
- Consider activities with only one task to be over-decomposed.
- Decompose activities with unrelated tasks.
- Activities with only one input and output have been decomposed completely.
- Consider for decomposition, activities with more than one input and output, but decomposition may not always be necessary for these activities.

10.25 The appropriate activity drivers are usually the outputs designated on the activity flow diagram. The rules of thumb for determining activity drivers can be summarized as:

- Consider any activity that has more than one input and output for decomposition into more than one activity. If an activity with more than one input and output is truly function-specific, then the primary output should be used as the activity driver.
- Aggregate two or more activities that have the same primary output measure, as long as the activities are under one person.

Let's Talk

A good class discussion topic is the effect of aggregating activities of different workers on responsibility and accountability.

10.26 The bill of activities is used to list the activities and associated costs required by a cost object.

10.27 Four types of market-driven cost objects are customers, customer groups, distribution channels, and sales territories. If costs cannot be assigned to individual customers, the higher-level cost object of a customer group, such as distributors and retailers, will need to be used.

10.28 ABC systems can be used by service organizations. Two examples of organizations with successful ABC systems are hospitals and the railroad industry.

Let's Talk

Since most students might be familiar with computing systems and the various charges for computing resources, discussing the use of an ABC system for computing services might help the students understand how ABC systems can be used for service organizations. You might want to include in the discussion students' experiences with computer charges, and how those charges influenced their computing behavior. Then, have the students consider the impact of an ABC system for computing charges. What would be the activity cost pools or the first- and second-stage activity drivers? Finally, discuss how an ABC system would affect their computing behavior. What potential beneficial and harmful behaviors would be exhibited?

CHAPTER-SPECIFIC PROBLEMS:

10.29 Volume-based approach:

Setup costs per direct labor hours = $3,000 ÷ 2,100 DLhr
= $1.43

Setup costs per unit = $1.43 x 2 DLhr
= $2.86 for either A or B

Activity-based approach:

A => $1,000 setup cost ÷ 50 batch size = $20.00 per unit
B => $1,000 setup cost ÷ 500 batch size = $2.00 per unit

or equivalently:

A => $1,000 total setup cost ÷ 50 units = $20.00 per unit
B => $2,000 total setup cost ÷ 1,000 units = $2.00 per unit

10.30 Engineering change cost (ECC) per DLhr:

ECC per DLhr = $12,000 ÷ 4,000 DLhr
= $3.00 per DLhr

Overhead cost per unit based on DLhr (volume-based approach):

Product C: $3.00 per DLhr x 3 DLhr = $9.00 per unit
Product D: $3.00 per DLhr x 2 DLhr = $6.00 per unit

Overhead costs per unit based on consumption of the engineering change activity (activity-based approach):

Product C: $2,000 ÷ 1,000 units = $2.00 per unit
Product D: $10,000 ÷ 500 units = $20.00 per unit

10.31 Daily cost for care for person at acuteness level 3:

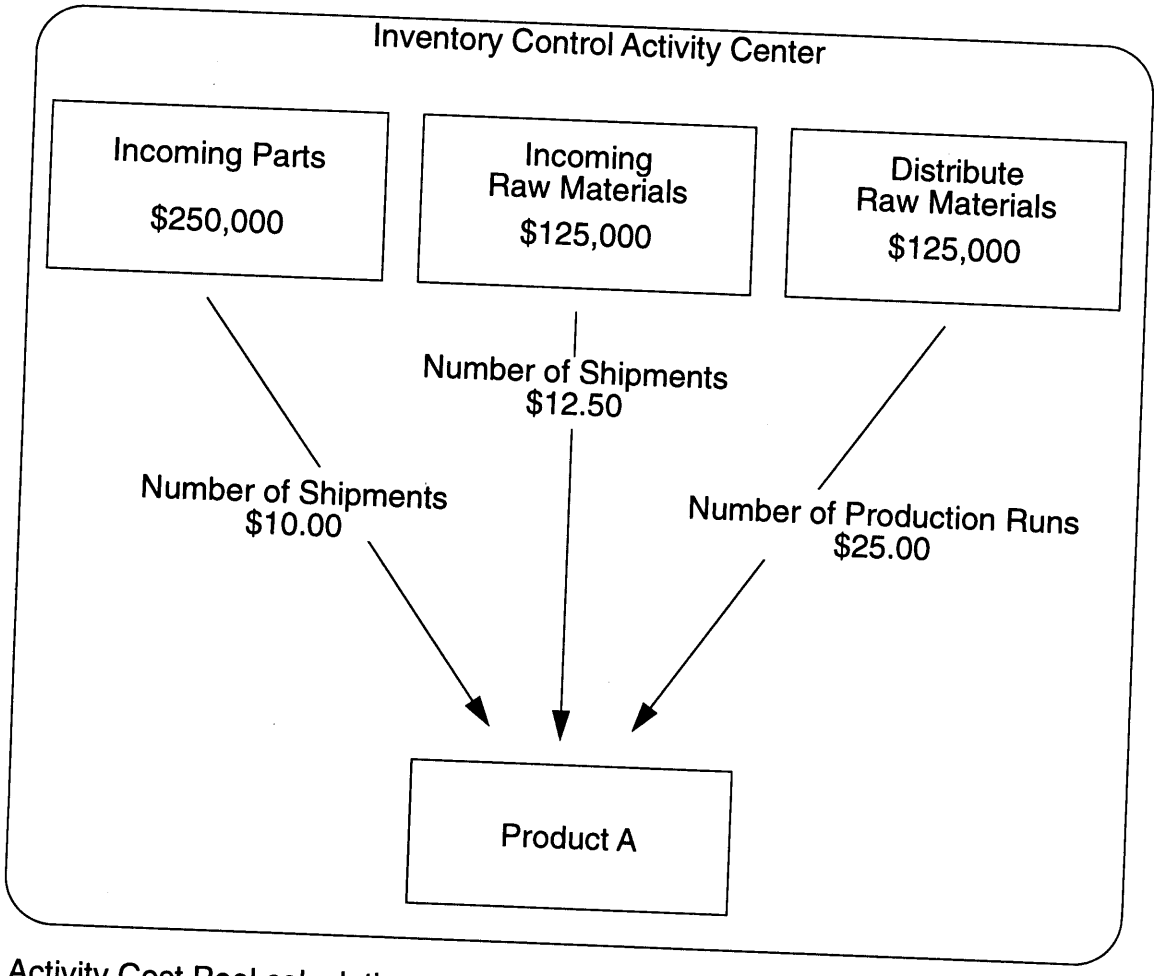
Nursing care for activity level of 3:	$240 per day
Occupancy and feeding:	100 per day
Total cost of care:	$340 per day

10.32 Cost for a one-ton railroad shipment:

Moving: ($0.60 per gross ton mile x 200 miles x 1 gross ton load)	= $120
Switching ($100 per minute x 1 minute)	= 100
Handling: ($0.20 per freight car mile x 200 miles x 1 gross ton load)	= 40
Loading and unloading: ($20 per gross ton x 1 gross ton load)	= 20
Total cost of shipment:	$280

THINK-TANK PROBLEMS:

10.33 a.



Activity Cost Pool calculations:

Incoming Parts:

(6 workers ÷ 12 workers) x $500,000 personnel costs = $250,000

Incoming Raw Materials:

(3 workers ÷ 12 workers) x $500,000 personnel costs = $125,000

Distribute Raw Materials:

(3 workers ÷ 12 workers) x $500,000 personnel costs = $125,000

Cost driver calculations:

Incoming Parts (IP) cost per shipment:

$250,000 total cost ÷ 25,000 shipments = $10.00

Incoming Raw Materials (IRM) cost per shipment:

$125,000 total cost ÷ 10,000 shipments = $12.50

Distribute Raw Materials (DRM) cost per production run:

$125,000 total cost ÷ 5,000 production runs = $25.00

b. Inventory control cost calculations:

Activity-based costing:

IP: $10.00 [drive]r x 200 parts shipments	=	$2,000.00
IRM: $12.50 [driver] x 50 materials shipments	=	$625.00
DRM: $25.00 [driver] x 10 production runs	=	$250.00
Total costs		$2,875.00

Direct labor costing:

Percentage of DLhr for product A:		
1,000 Product A hours ÷ 400,000 total DLhr	=	0.0025
Total costs: $500,000 x 0.0025	=	$1,250.00

c. The cost difference between the ABC approach and the Direct Labor (DL) approach is $1,625 ($2,875 - $1,250). The two approaches are fundamentally different. The ABC costing is based on activity drivers that, in theory, should more accurately reflect the true costs of the inventory control function (activities). Which of the two approaches would I have more faith in? If the inventory control department head has reported a reasonably accurate activity description, then the ABC approach should give a more accurate cost. In this case, the inventory control costing from the ABC approach gives a significantly higher value. If profitability calculations for product A were made with the lower direct labor approach value, incorrect management decisions might occur.

10.34 a. The traditional costing system, developed to value inventory, distorts product cost information because the costing system:

- was designed to value inventory in the aggregate and not to relate to product cost information.
- uses a common departmental or factory-wide measure of activity, such as direct labor hours or dollars (now a small portion of overall production costs) to apply manufacturing overhead to products.
- deemphasizes long-term product analysis (when fixed costs become variable costs).
- causes managers who are aware of distortions in the traditional system to make intuitive, imprecise adjustments to the traditional cost information without understanding the complete impact.

b. Outlined below are the purpose and several characteristics of the three noted costing systems:

- Inventory Valuation
  - Meeting external reporting requirements for aggregate balance sheet valuation and income determination.
  - Providing monthly and quarterly reporting.
- Operational Control
  - Evaluating operations in order to quickly detect problems to allow implementation of corrective action.
  - Comparing actual costs against standards and budgets for monitoring variances.
- Activity-based costing
  - Differentiates costs between value-adding and nonvalue-adding activities.
  - Costs products according to activities involved in the production process.

c(1). The benefits that management can expect from activity-based costing include the following:

- Leads to a more competitive position by evaluating cost drivers, i.e., costs associated with the complexity of the transaction rather than the production volume.
- Streamlines production processes by reducing nonvalue-added activities, e.g., reduced setup times, optimal plant layout, and improved quality.
- Provides management with a more thorough understanding of product costs and product profitability for strategies and pricing decisions.

c(2). The steps that a company, using a traditional cost system, would take to implement activity-based costing include:

- Evaluation of the existing system to assess how well the system supports the objective of an activity-based cost system.
- Identification of the activities for which cost information is needed with differentiation between value-added and nonvalue-added activities.

10.35 a. Overhead Costs Reported by a Conventional Cost System

Product	Direct Labor Hours Consumed	Overhead Rate[a]	Costs Allocated	Reported Unit Cost
P1	5	$45.11	$225.55	$45.11
P2	50	$45.11	$2,255.50	$45.11
P3	15	$45.11	$676.65	$45.11
P4	150	$45.11	$6,766.50	$45.11
	220		$9,924.20	

[a]Calculation of overhead rate:
Total overhead costs ÷ Total direct labor hours = $9,924.00 ÷ 220 DLhr
Overhead rate = $45.11

b. Overhead Costs Reported by an ABC System

	Costs Related to		
	Direct Labor	Setups	Part Numbers
Total overhead costs	$5,764.00	$2,160.00	$2,000.00
Total cost driver units	÷ 220	÷ 8	÷ 4
Activity cost drivers	$26.20	$270.00	$500.00

Costs Related to Direct Labor			
Product	Direct Labor Hours	Activity Cost Drivers	Allocated Costs per Unit
P1	5	$26.20	$131.00
P2	50	$26.20	$1,310.00
P3	15	$26.20	$393.00
P4	150	$26.20	$3,930.00

Costs Related to Setups

Product	Direct Labor Hours	Activity Cost Drivers	Allocated Costs per Unit
P1	1	$270.00	$270.00
P2	3	$270.00	$810.00
P3	1	$270.00	$270.00
P4	3	$270.00	$810.00

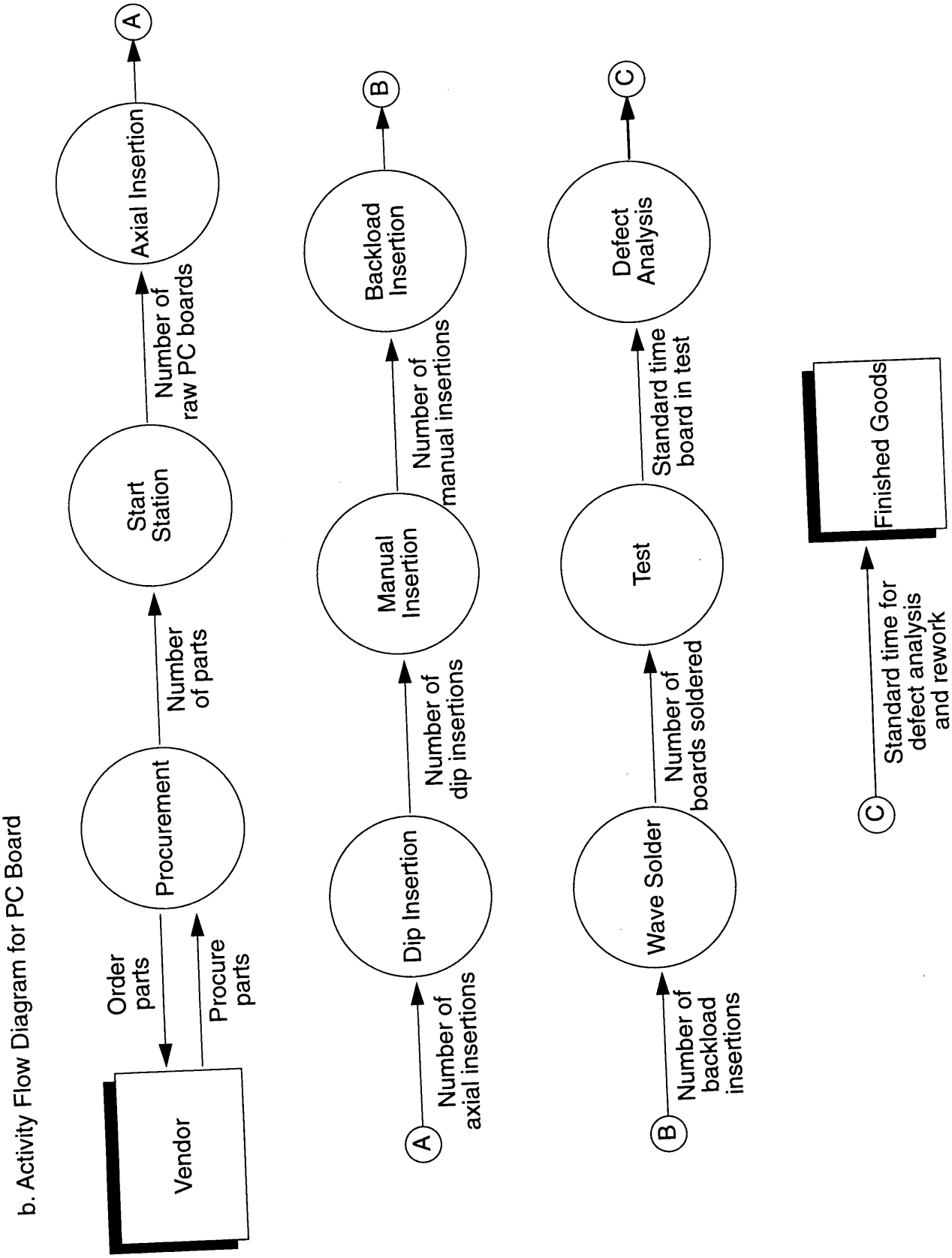
Costs Related to Part Numbers

Product	Number of Parts	Activity Cost Drivers	Allocated Costs per Unit
P1	1	$500.00	$500.00
P2	1	$500.00	$500.00
P3	1	$500.00	$500.00
P4	1	$500.00	$500.00

Total Overhead Costs Reported by ABC System

Product	Costs Related to Direct Labor	Costs Related to Setups	Costs Related to Part Numbers	Overhead Costs per Units
P1	$131.00	$270.00	$500.00	$901.00
P2	$1,310.00	$810.00	$500.00	$2,620.00
P3	$393.00	$270.00	$500.00	$1,163.00
P4	$3,930.00	$810.00	$500.00	$5,240.00

10.36 a. Measuring direct labor and using it for overhead application is not only a nonvalue-added activity, it is likely to distort costs! It should be eliminated as a cost element, which should be pooled in production activity costs. It could, for example, be allocated among the productive activities using headcount as a cost driver.


b. Activity Flow Diagram for PC Board
Vendor
Order parts
Procure parts
Procurement
Number of parts
Start Station
Number of raw PC boards
Axial Insertion
A
Number of axial insertions
Dip Insertion
Number of dip insertions
Manual Insertion
Number of manual insertions
Backload Insertion
B
Number of backload insertions
Wave Solder
Number of boards soldered
Test
Standard time board in test
Defect Analysis
C
Standard time for defect analysis and rework
Finished Goods

c.

Procurement:	94 parts x $.10	=	$9.40
Production activity cost:			
Start station:	1 raw PC board x $0.90	=	$0.90
Axial insertion:	43 axial insertions x $0.06	=	2.58
Dip insertions:	30 dip insertions x $0.17	=	5.10
Manual insertions:	13 manual insertions x $0.35	=	4.55
Backload insertion:	6 backload insertions x $0.58	=	3.48
Wave solder:	1 board soldered x $2.50	=	2.50
Test:	.20 hours in test x $70.00	=	14.00
Perfect:	.08 hours for defect analysis and rework x $62.00	=	4.96
Total production activity cost			$38.07

d. The new activity-based accounting system allows people, such as engineers, production personnel, procurement workers and managers, to think in more physical terms, which is how they normally think. When the system was allocating overhead costs by direct labor dollars, which itself was less than two percent of total manufacturing costs, it was hard for anyone to see what exactly was contributing to the product's costs. Under the new costing system, people can see the process of physically assembling products using resources. They understand that every time a board goes through the start station, it costs ninety cents. They understand that every time the axial insertion machine "kerplunks," it costs six cents.

Engineers, production people, procurement managers and accountants may still argue, but it will be over different things. They may argue over whether something should cost more or less, but how the costs come together is no longer an issue. They all speak the same language and the emotional level is lowered. Even the very precise lab engineers, who may not accept the exactness of the cost-driver rates, believe that the relative differences help them make sensible trade-offs between different types of parts and processes. Various people will probably suggest ways to improve the costing system. Maybe existing activity cost pools require further decomposition, but such improvements can be made incrementally without causing major disruptions. The overall point is this: the people at Thortec have a costing system that they can believe in.

10.37 Bill of Activities

Bill of Activities
Product A and Product B
For the period ending December 31, 19X5

		Product A (100,000 Units)			Product B (200,000 Units)		
Activity Cost Pool	**Activity Driver Rate**	**Activity Driver Quantity**	**Activity Cost**	**Unit Cost**	**Activity Driver Quantity**	**Activity Cost**	**Unit Cost**
Purchasing	$10 per purchase order	$10 x 1,000	$10,000	$.100	$10 x 1,500	$15,000	$.075
Quality control	$20 per quality test hour	$20 x 1,000	20,000	.200	$20 x 500	10,000	.050
Maintenance	$40 per maintenance hour	$40 x 50	2,000	.020	$40 x 75	3,000	.015
Warehousing	$10 per pallet	$10 x 2,500	25,000	.250	$10 x 5,000	50,000	.250
Expediting	$0.10 per unit	$0.10 x 100,000	10,000	.100	$0.10 x 200,000	20,000	.100
	Total activity costs assigned to products		$67,000			$98,000	
Activity costs per case:				$0.670			$0.490
Direct technology costs per unit:							
Product A =>	($16 x 1,250 MH) = $20,000 ÷ 100,000 cases			0.200			
Product B =>	($16 x 5,000 MH) = $80,000 ÷ 200,000 cases						0.400
	Total costs per case			$0.870			$0.890

Activity cost driver calculations:

Purchasing: We need 10 purchase orders per 1,000 Product A units and 7.5 purchase orders per 1,000 Product B units. Since there are 100,000 Product A units and 200,000 Product B units, we will need a total of 2,500 purchase orders (100 x 10 + 200 x 7.5). Therefore, the cost per purchase order is $10.00 ($25,000 ÷ 2,500 purchase orders).

Quality Control: We need 10 hours of test time per 1,000 Product A units and 2.5 hours of test time per 1,000 Product B units. Since there are 100,000 Product A units and 200,000 Product B units, we will need a total of 1,500 (100 x 10 + 200 x 2.5) test time hours. Therefore, the cost per test time hour is $20.00 ($30,000 ÷ 1,500 hours).

Maintenance: We need 4 hours of maintenance time per 100 hours of Product A machine time and 1.5 hours of maintenance time per 100 hours of Product B machine time. Since there are 1,250 Product A machine hours and 5,000 Product B machine hours, we will need a total of 125 (12.5 x 4 + 50 x 1.5) maintenance hours. Therefore, the cost per maintenance hour is $40 ($5,000 ÷ 125).

Warehousing: We have 40 Product A or Product B units per pallet. Since there are 100,000 Product A units and 200,000 Product B units, we will need a total of 7,500 (300,000 ÷ 40) pallets. Therefore, the cost per pallet is $10 (75,000 ÷ 7,500).

Expediting: The expediting cost is on a per unit basis. Therefore the expediting cost per unit is $0.10 ($30,000 ÷ 300,000).

Bill of Activities
Product A
For the period ended December 31, 19X5
Standard Production Costs ($0.87 x 110,000 units) = $95,700

Cost Elements	Standard - Actual	Variances		
Direct technology	$30,000 - ($0.20 x 110,000 units)	$8,000	U	
Purchasing	12,000 - ($0.10 x 110,000 units)	1,000	U	
Quality control	21,000 - ($0.20 x 110,000 units)	1,000	F	
Maintenance	2,400 - ($0.02 x 110,000 units)	200	U	
Warehousing	27,000 - ($0.25 x 110,000 units)	500	F	
Expediting	13,200 - ($0.10 x 110,000 units)	2,200	U	9,900.00 (U)
Actual production costs				$105,600.00
Costs per unit	($105,600 ÷ 110,000 units)			$0.96

Bill of Activities
Product B
For the period ended December 31, 19X5
Standard Production Costs ($0.89 x 180,000 units) = $160,200

Cost Elements	Actual - Standard	Variances		
Direct technology	$62,000 - ($.40 x 180,000 units)	$10,000	F	
Purchasing	14,000 - ($.075 x 180,000 units)	500	U	
Quality control	11,000 - ($.050 x 180,000 units)	2,000	U	
Maintenance	2,200 - ($.015 x 180,000 units)	500	F	
Warehousing	44,000 - ($.25 x 180,000 units)	1,000	F	
Expediting	18,000 - ($.10 x 180,000 units)	-0-		9,000.00F
Actual production costs				$151,200.00
Costs per unit	($151,200 ÷ 180,000 units)			$0.84

c. The traditional standard costing approach aggregates overhead costs and reports variances against the totals. The activity-based costing approach reports variances against each activity. Both approaches will account for the total $256,800 actually spent during the period. The traditional standard costing approach will consolidate overhead costs and report spending, efficiency, and production volume variances. Under the ABC approach, a spending variance is computed for each activity cost pool. (An efficiency variance can also be computed.) The variances computed under ABC may have more meaning for supervisors and workers in the purchasing, quality control, maintenance, warehousing and expediting activities. Costs from work done in these activities can be traced directly to the Bill of Activities reports, rather than being buried in aggregated overhead numbers.

10.38 Spending Variance:

= Actual Move Materials transactions performed x
(Standard price per transaction - Actual price per transaction)
= 10,500 x ($2.00 - $2.20)
= 10,500 x $0.20
= $2,100.00 U

Efficiency Variance:

= Standard price per transaction x
(Standard quantity allowed - Actual quantity used)
= $2.00 x (10,200 - 10,500)
= $2.00 x 300
= $600.00 U

What it should have cost to move 102,000 Doohickeys:
102,000 Doohickeys x $2.00 = $20,400
What it actually cost to move 102,000 Doohickeys: = $23,100
Total variance $2,700 U

10.39 a. Costing market-driven activities and determining operating income by sales territory

Teco Corporation
Operating Income Statement
By Sales Territory
For the Period Ended December 31, 19X5

	East	West	Total
Sales revenue	$688,000	$492,000	$1,180,000
Less cost of goods sold	(542,000)	(388,000)	(930,000)
Gross margin	$146,000	$104,000	$250,000
Activity costs:			
Selling (5.0% of sales)	$34,400	$24,600	$59,000
Advertising ($0.30 per unit)	21,000	15,000	36,000
Warehousing ($0.10 per lb)	28,800	20,200	49,000
Packing and shipping ($0.25 per unit)	17,500	12,500	30,000
Administration ($50 per sales order)	14,500	8,000	22,500
Total activity costs	($116,200)	($80,300)	($196,500)
Operating income	$29,800	$23,700	$53,500

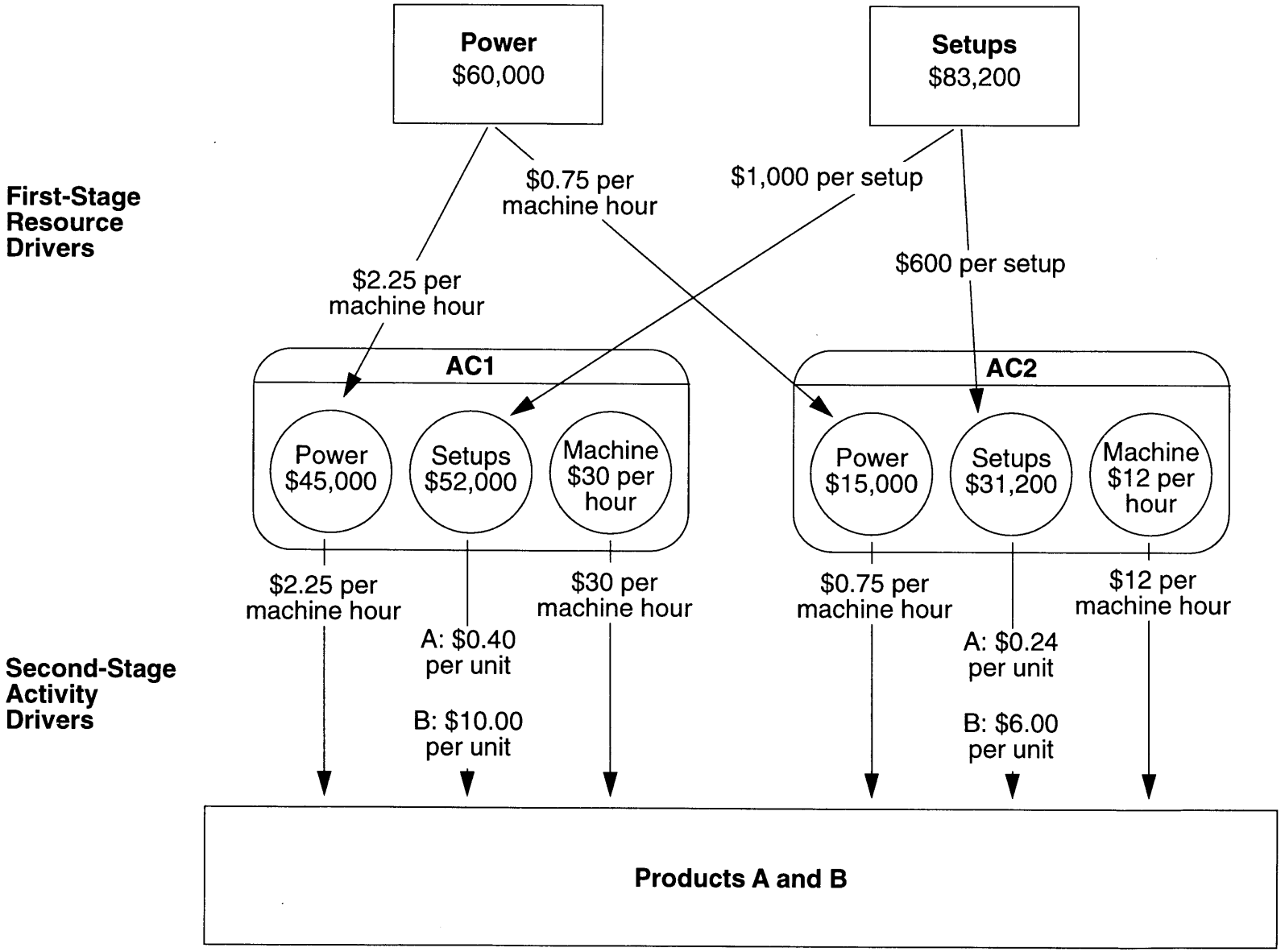
Teco Corporation
Operating Income Statement
By Product Line
For the Period Ended December 31, 19X5

	Total	Product Line A	Product Line B	Product Line C
Sales revenue	$1,180,000	$500,000	$320,000	$360,000
Less costs of goods sold	(930,000)	(400,000)	(200,000)	(330,000)
Gross margin	$250,000	$100,000	$120,000	$30,000
Activity costs:				
Selling (5% of sales)	$59,000	$25,000	$16,000	$18,000
Advertising ($0.30 per unit)	36,000	15,000	12,000	9,000
Warehousing ($0.10 per lb)	49,000	15,000	16,000	18,000
Packing and shipping ($0.25 per unit)	30,000	12,500	10,000	7,500
Administration ($50 per sales order)	22,500	10,000	7,500	5,000
Total activity costs	($196,500)	($77,500)	($61,500)	($57,500)
Operating income (loss)	$53,500	$22,500	$58,500	($27,500)

b. The operating income statement by sales territory reveals that both territories show an operating income of $29,800 for the East sales territory and $23,700 for the West sales territory. The operating income statement by product line reveals additional information for management. Product lines A and B are profitable, whereas product line C shows an operating loss of $27,500. This statement shows that although the overall company enjoys a profit of $53,500 and that both sales territories are profitable, product line C requires further analysis and could very well be a candidate for discontinuance.

c. Operating income statements could be prepared by product line within each sales territory which would assist managers with individual product line decisions.

10.40 a. Diamond Industries Problem



b. Diamond actually produced 5,000 units of product A and 5,000 units of product B during the period. The costs assigned to each product are presented as follows according to the ABC system:

Product A			
AC1:			
Power: 10,000 machine hours x $2.25	=	$22,500	
Setups: 5,000 units x $.40	=	2,000	
Machine: 10,000 machine hours x $30.00	=	300,000	$324,500
AC2:			
Power: 10,000 machine hours x $.75	=	$7,500	
Setups: 5,000 units x $.24	=	1,200	
Machine: 10,000 machine hours x $12.00	=	120,000	128,700
Total costs for the period			$453,200
Total cost per unit ($453,200 ÷ 5,000 units)	=		$90.64
Product B			
AC1:			
Power: 10,000 machine hours x $2.25	=	$22,500	
Setups: 5,000 units x $10.00	=	50,000	
Machine: 10,000 machine hours x $30.00	=	300,000	$372,500
AC2:			
Power: 10,000 machine hours x $.75	=	$7,500	
Setups: 5,000 units x $6.00	=	30,000	
Machine: 10,000 machine hours x $12.00	=	120,000	157,500
Total costs for the period			$530,000
Total cost per unit ($530,000 ÷ 5,000 units)	=		$106.00

Because of Product B's complex design it requires $16.00 per unit in setup costs to manufacture. Product A, a much simpler product, requires $0.64 per unit in setup costs. Thus the costs per unit in setup costs for Product B are $15.36 ($16.00 - $0.64) greater than for product A.

c. If the total costs are combined and applied to each product on the basis of machine hour, then the total costs per unit of the products would be equal at $98.32 [($453,200 + $530,000) ÷ 10,000 units)]. Additionally, the total costs do not change, but how these costs are applied to cost objects can substantially change the unit costs of the cost objects.

d. The sales price for Product A is $96.00; the sales price for Product B is $100.00. Which product is more profitable? It depends on what kind of costing system is used. If setup costs are lumped together with machine costs (requirement c), the following figures will result:

	Product A	Product B
Sales price per unit	$96.00	$100.00
Less cost per unit	(98.32)	(98.32)
Profit (loss) per unit	($2.32)	$1.68

Alternatively, if the setup costs are applied directly to the products that are causing such costs (requirement b), the following figures will result:

	Product A	Product B
Sales price per unit	$96.00	$100.00
Less cost per unit	(90.64)	(106.00)
Profit (loss) per unit	$5.36	($6.00)

If products are costed in accordance with the first approach, management may decide to eliminate Product A and produce more of Product B. Under the second approach, management's decision will be just the reverse.

Combining the setup costs with machine and power costs results in overcosting Product A by $7.68 ($98.32 - 90.64) per unit and undercosting Product B by $7.68 ($106.00 - $98.32) per unit.