ESERCIZI

1 ACTIVITY-BASED CUSTOMER COSTING

Underwood Company produces sofas for 20 retail outlets. Of the 20 retail outlets, 19 are small, separately owned furniture stores and one is a retail chain. The retail chain buys 60 percent of the sofas produced. The 19 smaller customers purchase sofas in approximately

	Large Retailer	Smaller
Units purchased	24,000	16,000
Orders placed	8	800
Number of sales calls	4	196
Manufacturing costs	$14,400,000	$9,600,000
Order filling costs allocated*	$484,800	$323,200
Sales force costs allocated*	$240,000	$160,000

* Allocated based on sales

Currently, customer-driven costs are assigned to customers based on units sold, a unit-level driver.

Required:

Assign costs to customers by using an ABC approach.

2 ACTIVITY-BASED SUPPLIER COSTING

Webb Computers uses Alpha Electronics and La Paz Company to buy two electronic components used in the manufacture of its computers: Component 125X and Component 30Y. Consider two activities: testing and reordering components. After the two components are inserted, testing is done to ensure that the two components in the computer are working properly. Reordering occurs because one or both of the components have failed the test and it is necessary to replenish component inventories. Activity cost information and other data needed for supplier costing are as follows:

I. Activity Costs Caused by Suppliers (testing failures and reordering as a result)

	Activity Costs ($)
Testing components	600,000
Reordering components	150,000

II. Supplier Data

	Alpha Electronics		**La Paz Company**	
	125X	**30Y**	**125X**	**30Y**
Unit purchase price	$10	$26	$12	$28
Units purchased Failed	60,000	30,000	7,500	7,500
tests Number of	600	390	5	5
reorders	30	20	0	0

Required:

Determine the cost of each supplier by using ABC.

3 ACTIVITY RATES

Johanssen Company uses activity-based costing (ABC). Johansson manufactures outdoor water toys using two activities: plastic injection molding and decal application. Johansson's 2009 total budgeted overhead costs for these two activities are $250,000 (70 percent for injection molding and 30 percent for decal application). Molding overhead costs are driven by the number of pounds of plastic that are molded together. Decal application overhead costs are driven by the number of decals applied to toys. The budgeted activity data for 2008 are as follows:

Pounds of plastic molded	1,750,000
Number of decals applied	187,500

Required:

1. Calculate the activity rate for the plastic injection molding activity.
2. Calculate the activity rate for the decal application activity.

4 ACTIVITY-BASED CUSTOMER-DRIVEN COSTS

Suppose that Stillwater Designs has two classes of distributors: JIT distributors and non-JIT distributors. The JIT distributor places small, frequent orders, and the non-JIT distributor tends to place larger, less frequent orders. Both types of distributors are buying the same product. Stillwater Designs provides the following information about customer-related activities and costs for the most recent quarter:

	JIT Distributors	Non-JIT Distributors
Sales orders	200	20
Sales calls	20	20
Service calls	100	50
Average order	500	5,000
Manufacturing cost/unit	$100	$100
Customer costs:		
Processing sales orders	$ 880,000	
Selling goods	320,000	
Servicing goods	300,000	
Total	$1,500,000	

Required:

1. Calculate the total revenues per distributor category, and assign the customer costs to each distributor type by using revenues as the allocation base. Selling price for one unit is $125.
2. Calculate the customer cost per distributor type using activity-based cost assignments. Discuss the merits of offering the non-JIT distributors a $3 price decrease (assume that they are agitating for a price concession).
3. Assume that the JIT distributors are simply imposing the frequent orders on Still-water Designs. No formal discussion has taken place between JIT customers and Stillwater Designs regarding the supply of goods on a JIT basis. The sales pattern has evolved over time. As an independent consultant, what would you suggest to Stillwater Designs' management?

5 ACTIVITY-BASED SUPPLIER COSTING

Hepworth Company manufactures heating systems. Hepworth produces all the parts necessary for its product except for one electronic component, which is purchased from two local suppliers: Wood Inc. and Hardy Company. Both suppliers are reliable and seldom deliver late; however, Wood sells the component for $48 per unit, while Hardy sells the same

component for $43. Hepworth purchases 80 percent of its components from Hardy because of its lower price. The total annual demand is 2,000,000 components.

To help assess the cost effect of the two components, the following data were collected for supplier-related activities and suppliers:

I. Activity Data

	Activity Cost ($)
Inspecting components (sampling only)	240,000
Reworking products (due to failed component)	3,042,000
Warranty work (due to failed component)	4,800,000

II. Supplier Data

	Wood Inc.	Hardy Company
Unit purchase price	$48	$43
Units purchased	400,000	1,600,000
Sampling hours*	40	1,960
Rework hours	180	2,820
Warranty hours	400	7,600

* Sampling inspection for Wood's product has been reduced because the reject rate is so low.

Required:

1. Calculate the cost per component for each supplier, taking into consideration the costs of the supplier-related activities and using the current prices and sales volume. Round the unit cost to two decimal places.
2. Suppose that Hepworth loses $2,000,000 in sales per year because of the reputation effect of defective units attributable to failed components. Using warranty hours, assign the cost of lost sales to each supplier. By how much would this change the cost of each supplier's component?

6 NONVALUE-ADDED COSTS

The following six situations are independent.

a. A manual insertion process takes 30 minutes and 8 pounds of material to produce a product. Automating the insertion process requires 15 minutes of machine time and 7.5 pounds of material. The cost per labor hour is $12, the cost per machine hour is $8, and the cost per pound of materials is $10.
b. With its original design, a gear requires eight hours of setup time. By redesigning the gear so that the number of different groves needed is reduced by 50 percent, the setup time is reduced by 75 percent. The cost per setup hour is $50.
c. A product currently requires six moves. By redesigning the manufacturing lay out, the number of moves can be reduced from six to zero. The cost per move is $20.
d. Inspection time for a plant is 16,000 hours per year. The cost of inspection consists of salaries of eight inspectors, totaling $320,000. Inspection also uses supplies costing $5 per inspection hour. The company eliminated most defective components by eliminating low-quality suppliers. The number of production errors was reduced dramatically by installing a system of statistical process control. Further quality improvements were realized by redesigning the products, making them easier to manufacture. The net effect was to achieve a close to zero-defect state and eliminate the need for any inspection activity.
e. Each unit of a product requires six components. The average number of components is 6.5 due to

component failure, requiring rework and extra components.
Developing relations with the right suppliers and increasing the quality of the purchased component can reduce the average number of components to six components per unit. The cost per component is $500.

f. A plant produces 100 different electronic products. Each product requires an average of eight components that are purchased externally. The components are different for each part. By redesigning the products, it is possible to produce the 100 products so that they all have four components in common. This will reduce the demand for purchasing, receiving, and paying bills. Estimated savings from the reduced demand are $900,000 per year.

Required:

Estimate the nonvalue-added cost for each situation.

7 DRIVER ANALYSIS

Refer to the six situations in **Exercise 18-44.**

Required:

For each situation, identify the possible root cause(s) of the activity cost (such as plant layout, process design, and product design).

8 TYPE OF ACTIVITY MANAGEMENT

Refer to the six situations in **Exercise 18-44.**

Required:

For each situation, identify the cost reduction measure: activity elimination, activity reduction, activity sharing, or activity selection.

9 CYCLE TIME AND VELOCITY

A manufacturing cell produces 90,000 stereo speakers per quarter. A total of 15,000 production hours are used within the cell per quarter.

Required:

1. Compute the velocity (per hour).
2. Compute the cycle time (minutes per unit produced).

10 PRODUCT-COSTING ACCURACY, CONSUMPTION RATIOS

Plata Company produces two products: a mostly handcrafted soft leather briefcase sold under the label Maletin Elegant and a leather briefcase produced largely through automation and sold under the label Maletin Fina. The two products use two overhead activities, with the following costs:

Setting up equipment	$ 3,000
Machining	18,000

The controller has collected the expected annual prime costs for each briefcase, the machine hours, the setup hours,

and the expected production.

	Elegant	Fina
Direct labor	$9,000	$3,000
Direct materials	$3,000	$3,000
Units	3,000	3,000
Machine hours	500	4,500
Setup hours	100	100

Required:

1. Do you think that the direct labor costs and direct materials costs are accurately traced to each briefcase? Explain.
2. Calculate the consumption ratios for each activity.
3. Calculate the overhead cost per unit for each briefcase by using a plantwide rate based on direct labor costs. Comment on this approach to assigning overhead.
4. Calculate the overhead cost per unit for each briefcase by using overhead rates based on machine hours and setup hours. Explain why these assignments are more accurate than using the direct labor costs.

11 FORMATION OF AN ACTIVITY DICTIONARY

A hospital is in the process of implementing an ABC system. A pilot study is being done to assess the effects of the costing changes on specific products. Of particular interest is the cost of caring for patients who receive in-patient recovery treatment for illness, surgery (noncardiac), and injury. These patients are housed on the third and fourth floors of the hospital (the floors are dedicated to patient care and have only nursing stations and patient rooms). A partial transcript of an interview with the hospital's nursing supervisor is as follows:

1. How many nurses are in the hospital? *There are 101 nurses, including me.*
2. Of these 100 nurses, how many are assigned to the third and fourth floors? *Fifty nurses are assigned to these two floors.*
3. What do these nurses do (please describe)?
   Provide nursing care for patients, which, as you know, means answering questions, changing bandages, administering medicine, changing clothes, etc.
4. And what do you do?
   I supervise and coordinate all the nursing activity in the hospital. This includes surgery, maternity, the emergency room, and the two floors you mentioned.
5. What other lodging and care activities are done for the third and fourth floors by persons other than the nurses?
   The patients must be fed. The hospital cafeteria delivers meals. The laundry department picks up dirty clothing and bedding once each shift. The floors also have a physical therapist assigned to provide care on a physician-directed basis.
6. Do patients use any equipment? *Yes. Mostly monitoring equipment.*
7. Who or what uses the activity output?
   Patients. But there are different kinds of patients. On these two floors, we classify patients into three categories according to severity: intensive care, intermediate care, and normal care. The more severe the illness, the more activity is used. Nurses spend much more time with intermediate care patients than with normal care. The more severe patients tend to use more of the laundry service as well. Their clothing and bedding need to be changed more frequently. On the other hand, severe patients use less food. They eat fewer meals. Typically, we measure each patient type by the number of days of hospital stay. And you have to realize that the same patient contributes to each type of product.

Required:

Prepare an activity dictionary with three categories: activity name, activity description, and activity driver.

12 FUNCTIONAL-BASED VERSUS ACTIVITY-BASED COSTING

For years, Tamarindo Company produced only one product: backpacks. Recently, the company decided to add a line of duffel bags. With this addition, the company began assigning overhead costs by using departmental rates. (Prior to this, the company used a predetermined plantwide rate based on units produced.) Departmental rates meant that overhead costs had to be assigned to each producing department in order to create overhead pools so that predetermined departmental rates could be calculated. Surprisingly, after the addition of the duffel-bag line and the switch to departmental rates, the costs to produce the backpacks increased, and their profitability dropped.

The marketing manager and the production manager both complained about the increase in the production cost of backpacks. The marketing manager was concerned because the increase in unit costs led to pressure to increase the unit price of backpacks. She was resisting this pressure because she was certain that the increase would harm the company's market share. The production manager was receiving pressure to cut costs also, yet he was convinced that nothing different was being done in the way the backpacks were produced. He was also convinced that further efficiency in the manufacture of the backpacks was unlikely. After some discussion, the two managers decided that the problem had to be connected to the addition of the duffel-bag line.

Upon investigation, they were informed that the only real change in product costing procedures was in the way overhead costs are assigned. A two-stage procedure was now in use. First, overhead costs are assigned to the two producing departments, Patterns and Finishing. Some overhead costs are assigned to the producing departments by using direct tracing, and some are assigned by using driver tracing. For example, the salaries of the producing department's supervisors are assigned by using direct tracing, whereas the costs of the factory's accounting department are assigned by using driver tracing (the driver being the number of transactions processed for each department). Second, the costs accumulated in the producing departments are assigned to the two products by using direct labor hours as a driver (the rate in each department is based on direct labor hours). The managers were assured that great care was taken to associate overhead costs with individual products. So that they could construct their own example of overhead cost assignment, the controller provided them with the information necessary to show how accounting costs are assigned to products:

	Department		
	Patterns	**Finishing**	**Total**
Accounting cost	$48,000	$72,000	$120,000
Transactions processed	32,000	48,000	80,000
Total direct labor hours	10,000	20,000	30,000
Direct labor hours per backpack*	0.10	0.20	0.30
Direct labor hours per duffel bag*	0.40	0.80	1.20

* Hours required to produce one unit

The controller remarked that the cost of operating the accounting department had doubled with the addition of the new product line. The increase came because of the need to process additional transactions, which had also doubled in number.

During the first year of producing duffel bags, the company produced and sold 100,000 backpacks and 25,000 duffel bags. The 100,000 backpacks matched the prior year's output for that product.

Required:

1. Compute the amount of accounting cost assigned to a backpack before the duffel-bag line was added by using a plantwide rate approach based on units produced. Is this assignment accurate? Explain.
2. Suppose that the company decided to assign the accounting costs directly to the product lines by using the number of transactions as the activity driver. What is the accounting cost per unit of backpacks? Per unit of duffel bags?
3. Compute the amount of accounting cost assigned to each backpack and duffel bag by using departmental rates based on direct labor hours.

4. Which way of assigning overhead does the best job—the functional-based approach by using departmental rates or the activity-based approach by using transactions processed for each product? Explain. Discuss the value of ABC before the duffel-bag line was added.

13 PRODUCTION-BASED COSTING VERSUS ACTIVITY-BASED COSTING, ASSIGNING COSTS TO ACTIVITIES, RESOURCE DRIVERS

Willow Company produces lawn mowers. One of its plants produces two versions of mowers: a basic model and a deluxe model. The deluxe model has a sturdier frame, a higher horsepower engine, a wider blade, and mulching capability. At the beginning of the year, the following data were prepared for this plant:

	Basic Model	**Deluxe Model**
Expected quantity	40,000	20,000
Selling price	$180	$360
Prime costs	$80	$160
Machine hours	5,000	5,000
Direct labor hours	10,000	10,000
Engineering support	1,500	4,500
Receiving (orders	250	500
Materials handling (number	1,200	4,800
Purchasing (number of	100	200
Maintenance (hours used)	1,000	3,000
Paying suppliers (invoices	250	500
Setting up equipment	16	64

Additionally, the following overhead activity costs are

Maintaining equipment	$114,000
Engineering support	120,000
Materials handling	?
Setting up equipment	96,000
Purchasing materials	60,000
Receiving goods	40,000
Paying suppliers	30,000
Providing space	20,000
Total	$?

Facility-level costs are allocated in proportion to machine hours (provides a measure of time the facility is used by each product). Materials handling uses three inputs: two forklifts, gasoline to operate the forklift, and three operators. The three operators are paid a salary of $40,000 each. The operators spend 25 percent of their time on the receiving activity and 75 percent on moving goods (materials handling). Gasoline costs $3 per move. Depreciation amounts to $6,000 per forklift per year.

Required:
Round answers to two decimal places.

1. Calculate the cost of the materials handling activity. Label the cost assignments as driver tracing or direct tracing. Identify the resource drivers.
2. Calculate the cost per unit for each product by using direct labor hours to assign all overhead costs.
3. Calculate activity rates, and assign costs to each product. Calculate a unit cost for each product, and compare these costs with those calculated in Requirement 2.
4. Calculate consumption ratios for each activity.
5. Explain how the consumption ratios calculated in Requirement 4 can be used to reduce the number of rates. Calculate the rates that would apply under this approach.

14 ACTIVITY COSTING, ASSIGNING RESOURCE COSTS, PRIMARY AND SECONDARY ACTIVITIES

Trinity Clinic has identified three activities for daily maternity care: occupancy and feeding, nursing, and nursing supervision. The nursing supervisor oversees 150 nurses, 25 of whom are maternity nurses (the other nurses are located in other care areas such as the emergency room and intensive care). The nursing supervisor has three assistants, a secretary, several offices, computers, phones, and furniture. The three assistants spend 75 percent of their time on the supervising activity and 25 percent of their time as surgical nurses. They each receive a salary of $48,000. The nursing supervisor has a salary of $70,000. She spends 100 percent of her time supervising. The secretary receives a salary of $22,000 per year. Other costs directly traceable to the supervisory activity (depreciation, utilities, phone, etc.) average $100,000 per year.
Daily care output is measured as ‘‘patient days.’’ The clinic has traditionally assigned the cost of daily care by using a daily rate (a rate per patient day). Different kinds of daily care are provided, and rates are structured to reflect these differences. For example, a higher daily rate is charged for an intensive care unit than for a maternity care unit.

Within units, however, the daily rates are the same for all patients. Under the traditional, functional approach, the daily rate is computed by dividing the annual costs of occupancy and feeding, nursing, and a share of supervision by the unit’s capacity expressed in patient days. The cost of supervision is assigned to each care area based on the number of nurses. A single driver (patient days) is used to assign the costs of daily care to each patient.
A pilot study has revealed that the demands for nursing care vary within the maternity unit, depending on the severity of a patient’s case. Specifically, demand for nursing services per day increases with severity. Assume that the maternity unit has three levels of increasing severity: normal patients, cesarean patients, and patients with complications. The pilot study provided the following activity and cost information.

Activity	Annual Cost ($)	Activity Driver	Annual Quantity
Occupancy and feeding	1,000,000	Patient days	10,000
Nursing care (maternity)	950,000	Hours of nursing care	50,000
Nursing supervision	?	Number of nurses	150

The pilot study also revealed the following information concerning the three types of patients and their annual demands:

Patient Type	Patient Days Demanded	Nursing Hours Demanded
Normal	7,000	17,500

Cesarean	2,000	12,500
Complications	1,000	20,000
Total	10,000	50,000

Required:

1. Calculate the cost per patient day by using a functional-based approach.
2. Calculate the cost per patient day by using an activity-based approach.
3. The hospital processes 1,000,000 pounds of laundry per year. The cost for the laundering activity is $500,000 per year. In a functional-based cost system, the cost of the laundry department is assigned to each user department in proportion to the pounds of laundry produced. Typically, maternity produces 200,000 pounds per year. How much would this change the cost per patient day calculated in Requirement 1? Now, describe what information you would need to modify the calculation made in Requirement 2. Under what conditions would this activity calculation provide a more accurate cost assignment?

15 CUSTOMERS AS A COST OBJECT

Oaklawn National Bank has requested an analysis of checking account profitability by customer type. Customers are categorized according to the size of their account: low balances, medium balances, and high balances. The activities associated with the three different customer categories and their associated annual costs are as follows:

Opening and closing accounts	$ 200,000
Issuing monthly statements	300,000
Processing transactions	2,050,000
Customer inquiries	400,000
Providing automatic teller machine (ATM) services	1,120,000
Total cost	$4,070,000

Additional data concerning the usage of the activities by the various customers are also provided:

	Account Balance		
	Low	**Medium**	**High**
Number of accounts opened/closed	15,000	3,000	2,000
Number of statements issued	450,000	100,000	50,000
Processing transactions	18,000,000	2,000,000	500,000
Number of telephone minutes	1,000,000	600,000	400,000
Number of ATM transactions	1,350,000	200,000	50,000
Number of checking accounts	38,000	8,000	4,000

Required:

Round answers to two decimal places.

1. Calculate a cost per account per year by dividing the total cost of processing and maintaining checking accounts by the total number of accounts. What is the average fee per month that the bank should charge to cover the costs incurred because of checking accounts?

2. Calculate a cost per account by customer category by using activity rates.
3. Currently, the bank offers free checking to all of its customers. The interest revenues average $90 per account; however, the interest revenues earned per account by category are $80, $100, and $165 for the low-, medium-, and high-balance accounts, respectively. Calculate the average profit per account (average revenue less average cost from Requirement 1). Then calculate the profit per account by using the revenue per customer type and the unit cost per customer type calculated in Requirement 2.
4. After the analysis in Requirement 3, a vice president recommended eliminating the free checking feature for low-balance customers. The bank president expressed reluctance to do so, arguing that the low-balance customers more than made up for the loss through cross-sales. He presented a survey that showed that 50 percent of the customers would switch banks if a checking fee were imposed. Explain how you could verify the president's argument by using ABC.

16 ACTIVITY-BASED COSTING AND CUSTOMER-DRIVEN COSTS

Sorensen Manufacturing produces several types of bolts used in aircrafts. The bolts are produced in batches according to customer orders. Although there are a variety of bolts, they can be grouped into three product families. Because the product families are used in different kinds of aircraft, customers also can be grouped into three categories, corresponding to the product family that they purchase. The number of units sold to each customer class is the same. The selling prices for the three product families range from $0.50 to $0.80 per unit. Historically, the costs of order entry, processing, and handling were expensed and not traced to individual customer groups. These costs are not trivial and totaled $4,500,000 for the most recent year. Furthermore, these costs had been increasing over time. Recently, the company started emphasizing a cost reduction strategy; however, any cost reduction decisions had to contribute to the creation of a competitive advantage.

Because of the magnitude and growth of order-filling costs, management decided to explore the causes of these costs. They discovered that order-filling costs were driven by the number of customer orders processed. Further investigation revealed the following cost behavior for the order-filling activity:

Step-fixed cost component: $50,000 per step (2,000 orders define a step)*
Variable cost component: $20 per order
* Sorensen currently has sufficient steps to process 100,000 orders.

The expected customer orders for the year total 100,000. The expected usage of the order-filling activity and the average size of an order by customer category follow:

	Category I	Category II	Category III
Number of orders	50,000	30,000	20,000
Average order size	600	1,000	1,500

As a result of cost behavior analysis, the marketing manager recommended the imposition of a charge per customer order. The president of the company concurred. The charge was implemented by adding the cost per order to the price of each order (computed by using the projected ordering costs and expected orders). This ordering cost was then reduced as the size of the order increased and was eliminated as the order size reached 2,000 units (the marketing manager indicated that any penalties imposed for orders greater than this size would lose sales from some of the smaller customers). Within a short period of communicating this new price information to customers, the average order size for all three product families increased to 2,000 units.

Required:

1. Sorensen traditionally has expensed order-filling costs. What is the most likely reason for this practice?
2. Calculate the cost per order for each customer category. Round to two decimal places.
3. Calculate the reduction in order-filling costs produced by the change in pricing strategy (assume that resource spending is reduced as much as possible and that the total units sold remain unchanged). Explain how exploiting customer activity information produced this cost reduction. Would any other internal activities benefit from this pricing strategy?

17 ACTIVITY-BASED MANAGEMENT, NONVALUE-ADDED COSTS

Danna Martin, president of Mays Electronics, was concerned about the end-of-the year marketing report that she had just received. According to Larry Savage, marketing manager, a price decrease for the coming year was again needed to maintain the company's annual sales volume of integrated circuit boards (CBs). This would make a bad situation worse. The current selling price of $18 per unit was producing a $2-per-unit profit—half the customary $4-per-unit profit. Foreign competitors kept reducing their prices. To match the latest reduction would reduce the price from $18 to $14. This would put the price below the cost to produce and sell it. How could these firms sell for such a low price? Determined to find out if there were problems with the company's operations, Danna decided to hire a consultant to evaluate the way in which the CBs were produced and sold. After two weeks, the consultant had identified the following activities and costs:

Setting up equipment	$ 125,000
Materials handling	180,000
Inspecting products	122,000
Engineering support	120,000
Handling customer complaints	100,000
Filling warranties	170,000
Storing goods	80,000
Expediting goods	75,000
Using materials	500,000
Using power	48,000
Manual insertion labor[a]	250,000
Other direct labor	150,000
Total costs	$1,920,000[b]

[a] Diodes, resistors, and integrated circuits are inserted manually into the circuit board.

[b] This total cost produces a unit cost of $16 for last year's sales volume.

The consultant indicated that some preliminary activity analysis shows that per-unit costs can be reduced by at least $7. Since the marketing manager had indicated that the market share (sales volume) for the boards could be increased by 50 percent if the price could be reduced to $12, Danna became quite excited.

Required:

1. What is activity-based management? What phases of activity analysis did the consultant provide? What else remains to be done?
2. Identify as many nonvalue-added costs as possible. Compute the cost savings per unit that would be realized if these costs were eliminated. Was the consultant correct in his preliminary cost reduction assessment? Discuss actions that the company can take to reduce or eliminate the nonvalue-added activities.
3. Compute the unit cost required to maintain current market share, while earning a profit of $4 per unit. Now compute the unit cost required to expand sales by 50 percent. How much cost reduction would be required to achieve each unit cost?
4. Assume that further activity analysis revealed the following: switching to automated insertion would save $60,000 of engineering support and $90,000 of direct labor.

Now, what is the total potential cost reduction per unit available from activity analysis? With these additional reductions, can Mays achieve the unit cost to maintain current sales? To increase it by 50 percent? What form of activity analysis is this: reduction, sharing, elimination, or selection?

5. Calculate income based on current sales, prices, and costs. Then calculate the income by using a $14 price and a $12 price, assuming that the maximum cost reduction possible is achieved (including Requirement 4's reduction). What price should be selected?

18 NONVALUE-ADDED COSTS, ACTIVITY COSTS, ACTIVITY COST REDUCTION

John Thomas, vice president of Mallett Company (a producer of a variety of plastic products), has been supervising the implementation of an ABC management system. One of John's objectives is to improve process efficiency by improving the activities that define the processes. To illustrate the potential of the new system to the president, John has decided to focus on two processes: production and customer service.
Within each process, one activity will be selected for improvement: materials usage for production and sustaining engineering for customer service (sustaining engineers are responsible for redesigning products based on customer needs and feedback). Value-added standards are identified for each activity (the level of efficiency so that no waste exists). For materials usage, the value-added standard calls for six pounds per unit of output (although the plastic products differ in shape and function, their size— as measured by weight—is uniform). The value-added standard is based on the elimination of all waste due to defective molds. The standard price of materials is $5 per pound. For sustaining engineering, the standard is 58 percent of current practical activity capacity. This standard is based on the fact that about 42 percent of the complaints have to do with design features that could have been avoided or anticipated by the company.
Current practical capacity (at the end of 2007) is defined by the following requirements: 6,000 engineering hours for each product group that has been on the market or in development for five years or less and 2,400 hours per product group of more than five years. Four product groups have less than five years' experience, and 10 product groups have more. Each of the 24 engineers is paid a salary of $60,000. Each engineer can provide 2,000 hours of service per year. No other significant costs are incurred for the engineering activity.
Actual materials usage for 2008 was 25 percent above the level called for by the value-added standard; engineering usage was 46,000 hours. A total of 80,000 units of output were produced. John and the operational managers have selected some improvement measures that promise to reduce nonvalue-added activity usage by 40 percent in 2009. Selected actual results achieved for 2007 are as follows:

Units produced	80,000
Materials used	584,800
Engineering hours	35,400

The actual prices paid for materials and engineering hours are identical to the standard or budgeted prices.

Required:

1. For 2008, calculate the nonvalue-added usage and costs for materials usage and sustaining engineering.
2. Using the budgeted improvements, calculate the expected activity usage levels for 2009. Now, compute the 2009 usage variances (the difference between the expected and actual values), expressed in both physical and financial measures, for materials and engineering. Comment on the company's ability to achieve its targeted reductions. In particular, discuss what measures the company must take to capture any realized reductions in resource usage.

19 CYCLE TIME, VELOCITY, PRODUCT COSTING

Goldman Company has a JIT system in place. Each manufacturing cell is dedicated to the production of a single product or major subassembly. One cell, dedicated to the production of telescopes, has four operations: machining, finishing, assembly, and qualifying (testing).
For the coming year, the telescope cell has the following budgeted costs and cell time (both at theoretical capacity):
Budgeted conversion costs $7,500,000
Budgeted raw materials $9,000,000
Cell time 12,000 hours
Theoretical output 90,000 telescopes

During the year, the following actual results were obtained:

Actual conversion costs $7,500,000
Actual materials $7,800,000
Actual cell time 12,000 hours
Actual output 75,000 telescopes

Required (Round answers to two decimal places):

1. Compute the velocity (number of telescopes per hour) that the cell can theoretically achieve. Now, compute the theoretical cycle time (number of hours or minutes per telescope) that it takes to produce one telescope.
2. Compute the actual velocity and the actual cycle time.

Compute the budgeted conversion costs per minute. Using this rate, compute the conversion costs per telescope if theoretical output is achieved. Using this measure, compute the conversion costs per telescope for actual output. Does this product costing approach provide an incentive for the cell manager to reduce cycle time? Explain

20 ACTIVITY-BASED COSTING, DISTORTED PRODUCT COSTS

Sharp Paper Inc. has three paper mills, one of which is located in Memphis, Tennessee. The Memphis mill produces 300 different types of coated and uncoated specialty printing papers. This large variety of products was the result of a full-line marketing strategy adopted by Sharp's management. Management was convinced that the value of variety more than offset the extra costs of the increased complexity.
During 2008, the Memphis mill produced 120,000 tons of coated paper and 80,000 tons of uncoated paper. Of the 200,000 tons produced, 180,000 were sold. Sixty products account for 80 percent of the tons sold. Thus, 240 products are classified as low-volume products.
Lightweight lime hopsack in cartons (LLHC) is one of the low-volume products. LLHC is produced in rolls, converted into sheets of paper, and then sold in cartons. In 2006, the cost to produce and sell one ton of LLHC was as follows:

Direct materials:		
Furnish (3 different pulps)	2,225 pounds	$ 450
Additives (11 different items)	200 pounds	500
Tub size	75 pounds	10
Recycled scrap paper	(296 pounds)	(20)
Total direct materials		$ 940
Direct labor		$ 450
Overhead:		
Paper machine ($100 per ton x 2,500		$ 125
Finishing machine ($120 per ton x 2,500		150
Total overhead		$ 275
Shipping and warehousing		$ 30
Total manufacturing and selling cost		$1,695

Overhead is applied by using a two-stage process. First, overhead is allocated to the paper and finishing machines by using the direct method of allocation with carefully selected cost drivers. Second, the overhead assigned to each machine is divided by the budgeted tons of output. These rates are then multiplied by the number of pounds required to produce one good ton.

In 2008, LLHC sold for $2,400 per ton, making it one of the most profitable products. A similar examination of some of the other low-volume products revealed that they also had very respectable profit margins. Unfortunately, the performance of the high volume products was less impressive, with many showing losses or very low profit margins. This situation led Ryan Chesser to call a meeting with his marketing vice president, Jennifer Woodruff, and his controller, Kaylin Penn

Ryan: The above-average profitability of our low-volume specialty products and the poor profit

performance of our high-volume products make me believe that we should switch our marketing emphasis to the low-volume line. Perhaps we should drop some of our high-volume products, particularly those showing a loss.

Jennifer: I'm not convinced that the solution you are proposing is the right one. I know our high-volume products are of high quality, and I am convinced that we are as efficient in our production as other firms. I think that somehow our costs are not being assigned correctly. For example, the shipping and warehousing costs are assigned by dividing these costs by the total tons of paper sold. Yet . . .

Kaylin: Jennifer, I hate to disagree, but the $30-per-ton charge for shipping and warehousing seems reasonable. I know that our method to assign these costs is identical to a number of other paper companies.

Jennifer: Well, that may be true, but do these other companies have the variety of products that we have? Our low-volume products require special handling and processing, but when we assign shipping and warehousing costs, we average these special costs across our entire product line. Every ton produced in our mill passes through our mill shipping department and is either sent directly to the customer or to our distribution center and then eventually to customers. My records indicate quite clearly that virtually all of the high-volume products are sent directly to customers, whereas most of the low-volume products are sent to the distribution center. Now, all of the products passing through the mill shipping department should receive a share of the $2,000,000 annual shipping costs. I am not convinced, however, that all products should receive a share of the receiving and shipping costs of the distribution center as currently practiced.

Ryan: Kaylin, is this true? Does our system allocate our shipping and warehousing costs in this way?

Kaylin: Yes, I'm afraid it does. Jennifer may have a point. Perhaps we need to reevaluate our method to assign these costs to the product lines.

Ryan: Jennifer, do you have any suggestions concerning how the shipping and warehousing costs should be assigned?

Jennifer: It seems reasonable to make a distinction between products that spend time in the distribution center and those that do not. We should also distinguish between the receiving and shipping activities at the distribution center. All incoming shipments are packed on pallets and weigh one ton each (there are 14 cartons of paper per pallet). In 2008, the receiving department processed 56,000 tons of paper. Receiving employs 15 people at an annual cost of $600,000. Other receiving costs total about $500,000. I would recommend that these costs be assigned by using tons processed.

Shipping, however, is different. There are two activities associated with shipping: picking the order from inventory and loading the paper. We employ 30 people for picking and 10 for loading, at an annual cost of $1,200,000. Other shipping costs total $1,100,000. Picking and loading are more concerned with the number of shipping items than with tonnage. That is, a shipping item may consist of two or three cartons instead of pallets. Accordingly, the shipping costs of the distribution center should be assigned by using the number of items shipped. In 2008, for example, we handled 190,000 shipping items.

Ryan: These suggestions have merit. Kaylin, I would like to see what effect Jennifer's suggestions have on the per-unit assignment of shipping and warehousing for LLHC. If the effect is significant, then we will expand the analysis to include all products.

Kaylin: I'm willing to compute the effect, but I'd like to suggest one additional feature. Currently, we have a policy to carry about 25 tons of LLHC in inventory. Our current costing system totally ignores the cost of carrying this inventory. Since it costs us $1,665 to produce each ton of this product, we are tying up a lot of money in inventory—money that could be invested in other productive opportunities. In fact, the return lost is about 16 percent per year. This cost should also be assigned to the units sold.

Ryan: Kaylin, this also sounds good to me. Go ahead and include the carrying cost in your computation.
To help in the analysis, Kaylin gathered the following data for LLHC for 2008:

Tons sold	10
Average cartons per shipment	2
Average shipments per ton	7

Required:

1. Identify the flaws associated with the current method of assigning shipping and warehousing costs to

Sharp's products.
2. Compute the shipping and warehousing cost per ton of LLHC sold by using the new method suggested by Jennifer and Kaylin.
3. Using the new costs computed in Requirement 2, compute the profit per ton of LLHC. Compare this with the profit per ton computed by using the old method. Do you think that this same effect would be realized for other low-volume products? Explain.
4. Comment on Ryan's proposal to drop some high-volume products and place more emphasis on low-volume products. Discuss the role of the accounting system in supporting this type of decision making.
5. After receiving the analysis of LLHC, Ryan decided to expand the analysis to all products. He also had Kaylin reevaluate the way in which mill overhead was assigned to products. After the restructuring was completed, Ryan took the following actions: (a) the prices of most low-volume products were increased, (b) the prices of several high-volume products were decreased, and (c) some low-volume products were dropped. Explain why his strategy changed so dramatically.

21 ACTIVITY-BASED PRODUCT COSTING AND ETHICAL BEHAVIOR

Consider the following conversation between Leonard Bryner, president and manager of a firm engaged in job manufacturing, and Chuck Davis, certified management accountant, the firm's controller.

Leonard: Chuck, as you know, our firm has been losing market share over the past three years. We have been losing more and more bids, and I don't understand why. At first, I thought that other firms were undercutting simply to gain business, but after examining some of the public financial reports, I believe that they are making a reasonable rate of return. I am beginning to believe that our costs and costing methods are at fault.

Chuck: I can't agree with that. We have good control over our costs. Like most firms in our industry, we use a normal job-costing system. I really don't see any significant waste in the plant.

Leonard: After talking with some other managers at a recent industrial convention, I'm not so sure that waste by itself is the issue. They talked about activity-based management, activity-based costing, and continuous improvement. They mentioned the use of something called ''activity drivers'' to assign overhead. They claimed that these new procedures can help to produce more efficiency in manufacturing, better control of overhead, and more accurate product costing. A big deal was made of eliminating activities that added no value. Maybe our bids are too high because these other firms have found ways to decrease their overhead costs and to increase the accuracy of their product costing.

Chuck: I doubt it. For one thing, I don't see how we can increase product costing accuracy. So many of our costs are indirect costs. Furthermore, everyone uses some measure of production activity to assign overhead costs. I imagine that what they are calling ''activity drivers'' is just some new buzzword for measures of production volume. Fads in costing come and go. I wouldn't worry about it. I'll bet that our problems with decreasing sales are temporary. You might recall that we experienced a similar problem about 12 years ago—it was 2 years before it straightened out.

Required:

1. Do you agree or disagree with Chuck Davis and the advice that he gave Leonard Bryner? Explain.
2. Was there anything wrong or unethical in the behavior that Chuck Davis displayed? Explain your reasoning.
3. Do you think that Chuck was well informed—that he was aware of the accounting implications of ABC and that he knew what was meant by cost drivers? Should he have been well informed? Review the Institute of Management Accountants ''Statement of Ethical Professional Practice'' found at https://www.imanet.org/about_ethics_statement.asp. Do any of the standards of ethical conduct for management accountants apply?

SOLUZIONI

Esercizio 1

Order filling rate = $\frac{\$484{,}800 + \$323{,}200}{808 \text{ orders}}$ = $1,000 per order

Selling call rate = $\frac{\$240{,}000 + \$160{,}000}{200}$ = $2,000 per sales call

Cost assignment:

	Large Retailer	Smaller Retailers
Ordering		
$1,000 × 8	$ 8,000	
$1,000 × 800		$ 800,000
Sales calls		
$2,000 × 4	8,000	
$2,000 × 196		392,000
Total	$ 16,000	$ 1,192,000

Esercizio 2

Test rate = $\frac{\$600{,}000}{1{,}000 *}$ = $600 per failed part

Reorder rate = $\frac{\$150{,}000}{50 * *}$ = $3,000 per reorder

*(600 + 390 + 5 + 5).

**(30 + 20).

Using these rates and the activity data, the total purchasing cost per unit of each component is computed:

	Alpha Electronics		La Paz Company	
	125X	30Y	125X	30Y
Purchase cost:				
$10 × 60,000	$ 600,000			

$26 × 30,000		$ 780,000		
$12 × 7,500			$ 90,000	
$28 × 7,500				$210,000
Testing products:				
$600 × 600	360,000			
$600 × 390	234,000			
$600 × 5			3,000	
$600 × 5				3,000
Reordering components:				
$3,000 × 30	90,000			
$3,000 × 20	60,000			
$3,000 × 0		0		
$3,000 × 0				0
Total	$ 1,050,000	$ 1,074,000	$ 93,000	$213,000
Units	÷ 60,000	÷ 30,000	÷ 7,500	÷ 7,500
Unit cost	$ 17.50	$ 35.80	$ 12.40	$ 28.40

Esercizio 3

1. Molding activity overhead cost = $250,000 × 0.7 = $175,000

$$\text{Activity rate (molding)} = \frac{\textbf{Molding activity costs}}{\textbf{Pounds of plastic molded}}$$

$$= \frac{\textbf{\$175,000}}{\textbf{1,750,000}}$$

= $0.10 per pound molded

2. Decal application overhead cost = $250,000 × 0.3 = $75,000

$$\text{Activity rate (application)} = \frac{\textbf{Decal application activity costs}}{\textbf{Number of decals applied}}$$

$$= \frac{\textbf{\$75,000}}{\textbf{187,500}}$$

= $0.40 per decal applied

Esercizio 4

1.

	JIT	Non-JIT
Sales[a]	$12,500,000	$12,500,000
Allocation[b]	750,000	750,000

[a]$125 × 100,000, where $125 = $100 + ($100 × 0.25) and 100,000 is the average order size times the number of orders.
[b]0.50 × $1,500,000.

2. Activity rates:

$$\text{Ordering rate} = \frac{\$880,000}{220} = \$4,000 \text{ per sales order}$$

$$\text{Selling rate} = \frac{\$320,000}{40} = \$8,000 \text{ per sales call}$$

$$\text{Service rate} = \frac{\$300,000}{150} = \$2,000 \text{ per service call}$$

	JIT	Non-JIT
Ordering costs:		
$4,000 × 200	$ 800,000	
$4,000 × 20		$ 80,000
Selling costs:		
$8,000 × 20	160,000	
$8,000 × 20		160,000
Service costs:		
$2,000 × 100	200,000	
$2,000 × 50		100,000
Total	$1,160,000	$340,000

For the non-JIT distributors, the customer costs amount to $750,000/20 = $37,500 per order under the original allocation. Using activity assignments, this drops to $340,000/20 = $17,000 per order, a difference of $20,500 per order. For an order of 5,000 units, the order price can be decreased by $4.10 per unit without affecting customer profitability. Overall profitability will decrease, however, unless the price for orders is increased to JIT distributors.

3. It sounds like the JIT buyers are switching their inventory carrying costs to Stillwater Designs without any significant benefit to Stillwater Designs. Stillwater
Designs needs to increase prices to reflect the additional demands on customer-support activities. Furthermore, additional price increases may be needed to
reflect the increased number of setups, purchases, and so on that are likely occurring inside the plant. Stillwater Designs should also immediately initiate discussions with its JIT customers to begin negotiations for achieving some of the benefits that a JIT supplier should have, such as long-term contracts. The benefits of long-term contracting may offset most or all of the increased costs from the additional demands made on other activities.

Esercizio 5

1. Supplier cost:

First, calculate the activity rates for assigning costs to suppliers:

Inspecting components: $\frac{\$240,000}{2,000}$ = $120 per sampling hour

Reworking products: $\frac{\$3,042,000}{3,000}$ = $1,014 per rework hour

Warranty work: $\frac{\$4,800,000}{8,000}$ = $600 per warranty hour

Next, calculate the cost per component by supplier:

Supplier cost:

	Wood	Hardy
Purchase cost:		
$48.00 × 400,000	$ 19,200,000	
$43.00 × 1,600,000		$68,800,000
Inspecting components:		
$120 × 40	4,800	
$120 × 1,960		235,200
Reworking products:		
$1,014 × 180	182,520	
$1,014 × 2,820		2,859,480
Warranty work:		
$600 × 400	240,000	
$600 × 7,600		4,560,000
Total supplier cost	$ 19,627,320	$76,454,680
Units supplied	÷ 400,000	÷ 1,600,000
Unit cost	$ 49.07	$ 47.78

2. Using warranty hours, the rate is $\frac{\$2,000,000}{8,000}$ = $250 per warranty hour. The cost assigned to each component would be:

	Wood	Hardy
Lost sales:		
$250 × 400	$ 100,000	
$250 × 7,600		$ 1,900,000
	$ 100,000	$ 1,900,000
Units supplied	÷ 400,000	÷ 1,600,000
Increase in unit cost	$ 0.25	$ 1.19

Esercizio 6

Case	Nonvalue-Added Cost
a.	$9 per unit[1]
b.	$300 per setup[2]
c.	$120 per unit[3]
d.	$400,000 per year[4]
e.	$250 per unit[5]

f. $900,000[6]

[1](0.5)$12 – (0.25)$8 + (8 – 7.5)$10.
[2](8 – 2)$50.
[3](6 – 0)$20.
[4]$320,000 + (16,000)$5.
[5](6.5 – 6)$500.
[6]As given.

Esercizio 7

Case	Root Cause
a.	Process design
b.	Product design
c.	Plant layout
d.	Multiple*
e.	Suppliers
f.	Product design

*For example, process design, product design, and quality approach or philosophy.

Esercizio 8

Case	Cost Reduction
a.	Activity selection
b.	Activity reduction
c.	Activity elimination
d.	Activity elimination
e.	Activity selection
f.	Activity sharing

Esercizio 9

1. Velocity = $\frac{\mathbf{90,000}}{\mathbf{15,000}}$ = 6 units per hour

2. Cycle time = $\frac{\mathbf{15,000}}{\mathbf{90,000}}$ = 1/6 hour per unit = 10 minutes per unit.

Esercizio 10

1. Yes. Because direct materials and direct labor are directly traceable to each product, their cost assignment should be accurate.

2. The consumption ratios for each activity (using machine hours and setup hours as the activity drivers) are as follows:

	Elegant	Fina	
Machining	0.10	0.90	$\left(\frac{500}{5{,}000} \text{ and } \frac{4{,}500}{5{,}000}\right)$
Setups	0.50	0.50	$\left(\frac{100}{200} \text{ and } \frac{100}{200}\right)$

3. Elegant: $\frac{1.75^* \times \$9{,}000}{3{,}000} = \$5.25$ per briefcase

   Fina: $\frac{1.75^* \times \$3{,}000}{3{,}000} = \$1.75$ per briefcase

   *Overhead rate = $\frac{\$21{,}000}{\$12{,}000} = \$1.75$ per direct labor dollar (or 175% of direct labor cost).

   More machine and setup costs are assigned to Elegant than Fina. This is clearly a distortion because the production of Fina is automated and uses the machine resources much more than the handcrafted Elegant. In fact, the consumption ratios for machining are 0.10 and 0.90 (using machine hours as the measure of usage). Thus, Fina uses 9 times the machining resources that Elegant does. Setup costs are similarly distorted. The products use an equal number of setup hours. Yet, if direct labor dollars are used, then the Elegant briefcase receives three times more machining costs than the Fina briefcase.

4. Products tend to make different demands on overhead activities, and this should be reflected in overhead cost assignments. Usually, this means the use of both unit- and nonunit-level activity drivers. In this example, there is a unit-level activity (machining) and a nonunit-level activity (setting up equipment).

   Machine rate: $\frac{\$18{,}000}{5{,}000} = \$3.60$ per machine hour

   Setup rate: $\frac{\$3{,}000}{200} = \$15$ per setup hour

   Costs assigned to each product:

Machining:	Elegant	Fina
$3.60 × 500	$ 1,800	
$3.60 × 4,500		$ 16,200
Setups:		
$15 × 100	1,500	1,500
Total	$ 3,300	$ 17,700
Units	÷ 3,000	÷ 3,000
Unit overhead cost	$ 1.10	$ 5.90

Esercizio 11

Activity Dictionary:

Activity Name	Activity Description	Activity Driver
Providing nursing care	Satisfying patient needs	Nursing hours
Supervising nurses	Coordinating nursing Activities	Number of nurses
Feeding patients	Providing meals to Patients	Number of meals
Laundering bedding and clothes	Cleaning and delivering clothes and bedding	Pounds of laundry
Providing physical Therapy	Therapy treatments directed by physician	Hours of therapy
Monitoring patients	Using equipment to monitor patient conditions	Monitoring hours

Esercizio 12

1. Cost before addition of duffel bags:

$$\frac{\$60{,}000\ *}{100{,}000} = \$0.60 \text{ per unit}$$

$$\frac{*\ \$120{,}000}{2} \text{ (costs doubled with addition of new product)}$$

The assignment is accurate because all costs belong to the one product.

2. Activity-based cost assignment:

Stage 1:

$$\text{Activity rate} = \frac{\$120{,}000}{80{,}000} = \$1.50 \text{ per transaction}$$

Stage 2:

Overhead applied:

Backpacks: $1.50 × 40,000* = $60,000

Duffel bags: $1.50 × 40,000 = $60,000

$$\frac{*80{,}000 \text{ transactions}}{2} = 40{,}000 \text{ (number of transactions had doubled)}$$

Unit cost:

Backpacks: $\frac{\$60{,}000}{100{,}000}$ = $0.60 per unit

Duffel bags: $\frac{\$60{,}000}{25{,}000}$ = $2.40 per unit

3. Product cost assignment:

   Overhead rates:

   Patterns: $\frac{\$48{,}000}{10{,}000}$ = $4.80 per direct labor hour

   Finishing: $\frac{\$72{,}000}{20{,}000}$ = $3.60 per direct labor hour

   Unit cost computation:

	Backpacks	Duffel Bags
Patterns:		
$4.80 × 0.1	$0.48	
$4.80 × 0.4		$1.92
Finishing:		
$3.60 × 0.2	0.72	
$3.60 × 0.8		2.88
Total per unit	$1.20	$4.80

4. This problem allows us to see what the accounting cost per unit should be by providing the ability to calculate the cost with and without the duffel bags. With this perspective, it becomes easy to see the benefits of the activity-based approach over those of the functional-based approach. The activity-based approach provides the same cost per unit as the single-product setting. The functional-based approach used transactions to allocate accounting costs to each producing department, and this allocation probably reflects quite well the consumption of accounting costs by each producing department. The problem is the second-stage allocation. Direct labor hours do not capture the consumption pattern of the individual products as they pass through the departments. The distortion occurs, not in using transactions to assign accounting costs to departments, but in using direct labor hours to assign these costs to the two products.

   In a single-product environment, ABC offers no improvement in product-costing accuracy. However, even in a single-product environment, it may be possible to increase the accuracy of cost assignments to other cost objects such as customers.

Esercizio 13

1. Labor and gasoline are driver tracing.

Labor (0.75 × $120,000)	$ 90,000	Time = Resource driver
Gasoline ($3 × 6,000 moves)	18,000	Moves = Resource driver
Depreciation	12,000	Direct tracing
Total cost	$120,000	

2. Plantwide rate $= \frac{\$600{,}000}{20{,}000}$

$= \$30$ per DLH

Unit cost:

	Basic	Deluxe
Prime costs	$80.00	$160
Overhead:		
$\$30 \times \frac{10{,}000}{40{,}000}$	7.50	
$\$30 \times \frac{10{,}000}{20{,}000}$		15
	$87.50	$175

3. Activity rates:

Maintenance: $\frac{\$114{,}000}{4{,}000} = \$28.50$ per maintenance hour

Engineering: $\frac{\$120{,}000}{6{,}000} = \$20$ per engineering hour

Materials handling: $\frac{\$120{,}000}{6{,}000} = \$20$ per move

Setting up: $\frac{\$96{,}000}{80} = \$1{,}200$ per move

Purchasing: $\frac{\$60{,}000}{300} = \$200$ per requisition

Receiving: $\frac{\$40{,}000}{750} = \$53.33$ per order

Paying suppliers: $\frac{\$30{,}000}{750} = \$40$ per invoice

Providing space: $\frac{\$20{,}000}{10{,}000} = \$2.00$ per machine hour

	Unit cost: Basic	Deluxe
Prime costs	$ 3,200,000	$ 3,200,000
Overhead:		
Maintenance:		
$28.50 × 1,000	28,500	
$28.50 × 3,000		85,500
Engineering:		
$20 × 1,500	30,000	
$20 × 4,500		90,000
Materials handling:		
$20 × 1,200	24,000	
$20 × 4,800		96,000
Setting up:		
$1,200 × 16	19,200	
$1,200 × 64		76,800
Purchasing:		
$200 × 100	20,000	
$200 × 200		40,000
Receiving:		
$53.33 × 250	13,333	
$53.33 × 500		26,665
Paying suppliers:		
$40 × 250	10,000	
$40 × 500		20,000
Providing space:		
$2 × 5,000	10,000	
$2 × 5,000		10,000
Total	$ 3,355,033	$ 3,644,965
Units produced	÷ 40,000	÷ 20,000
Unit cost (ABC)	$ 83.88	$ 182.25
Unit cost (traditional)	$ 87.50	$ 175.00

The ABC costs are more accurate (better tracing—closer representation of actual resource consumption). This shows that the basic model was overcosted and the deluxe model undercosted when the plantwide overhead rate was used.

4. Consumption ratios:

	Basic	Deluxe
Maintenance	0.25	0.75
Engineering	0.25	0.75
Materials handling	0.20	0.80
Setups 0.20	0.80	
Purchasing	0.33	0.67
Receiving	0.33	0.67
Paying suppliers	0.33	0.67
Providing space	0.50	0.50

5. When products consume activities in the same proportion, the activities with the same proportions can be combined into one pool. This is so because the pooled costs will be assigned in the same proportion as the individual activity costs. Using these consumption ratios as a guide, we create four pools, reducing the number of rates from 8 to 4.

Pool 1:

Maintenance	$114,000
Engineering	120,000
Total	$234,000
Maintenance hours	÷ 4,000
Pool rate	$ 58.50

Note: Engineering hours could also be used as a driver. The activities are grouped together because they have the same consumption ratios: (0.25, 0.75).

Pool 2:

Materials handling	$120,000
Setting up	96,000
Total	$216,000
Number of moves	÷ 6,000
Pool rate	$ 36

Note: Materials handling and setups have the same consumption ratios: (0.20, 0.80). The number of setups could also be used as the pool driver.

Pool 3:

Purchasing	$ 60,000
Receiving	40,000
Paying suppliers	30,000
Total	$130,000
Orders processed	÷ 750
Pool rate	$ 173.33

Note: The three activities are all product-level activities and have the same consumption ratios: (0.33, 0.67).

Pool 4:

Providing space	$ 20,000
Machine hours	÷ 10,000
Pool rate	$ 2

Note: This is the only facility-level activity.

Esercizio 15

1. The total cost of care is $1,950,000 plus a $50,000 share of the cost of supervision (25/150 × $300,000). The cost of supervision is computed as follows:

Salary of supervisor (Direct)	$ 70,000
Salary of secretary (Direct)	22,000
Other costs (Direct)	100,000
Assistants (3 × 0.75 × $48,000)	108,000
Total	$300,000

Thus, the cost per patient day is computed as follows:

$$\frac{\$2{,}000{,}000}{10{,}000} = \$200 \text{ per patient day}$$

(The total cost of care divided by patient days.) Notice that every maternity patient—regardless of type—would pay the daily rate of $200.

2. First, the cost of the secondary activity (supervision) must be assigned to the primary activities (various nursing care activities) that consume it (the driver is the number of nurses):

   Maternity nursing care assignment:

   $$\frac{25}{150} \times \$300{,}000 = \$50{,}000$$

   Thus, the total cost of nursing care is $950,000 + $50,000 = $1,000,000.

   Next, calculate the activity rates for the two primary activities:

   Occupancy and feeding: $\frac{\$1{,}000{,}000}{10{,}000} = \$100$ per day

   Nursing care: $\frac{\$1{,}000{,}000}{50{,}000} = \$20$ per nursing hour

   Finally, the cost per patient day type can be computed:

Patient	Daily Rate
Normal	$150[a]
Cesarean	225[b]
Complications	500[c]

   [a] $\frac{(\$100 \times 7{,}000) + (20 \times 17{,}500)}{7{,}000}$

   [b] $\frac{(\$100 \times 2{,}000) + (\$20 \times 12{,}500)}{2{,}000}$

   [c] $\frac{(\$100 \times 1{,}000) + (\$20 \times 20{,}000)}{1{,}000}$

   This example illustrates that activity-based costing can produce significant product-costing improvements in service organizations that experience product diversity.

3. The laundry department cost would increase the total cost of the maternity department by $100,000 (200,000/1,000,000 × $500,000). This would increase the cost per patient day by $10 ($100,000/10/000). The activity approach would need more detailed information—specifically, the amount of pounds of laundry caused by each patient type. The activity approach will increase the accuracy of the cost assignment if patient types produce a disproportionate share of laundry. For example, if patients with complications produce 40 percent of the pounds with only 10 percent of the patient days, then the $10 charge per day is not a fair assignment.

Esercizio 16

1. Cost per account = $\frac{\$4{,}070{,}000}{50{,}000} = \$81.40$

Average fee per month = $\frac{\$81.40}{12}$ = $6.78

2. Activity rates:

Opening and closing accounts: $\frac{\$200,000}{20,000}$ = $10 per account

Issuing monthly statements: $\frac{\$300,000}{600,000}$ = $0.50 per statement

Processing transactions: $\frac{\$2,050,000}{20,500,000}$ = $0.10 per transaction

Customer inquiries: $\frac{\$400,000}{2,000,000}$ = $0.20 per minute

Providing ATM services: $\frac{\$1,120,000}{1,600,000}$ = $0.70 per transaction

Costs assigned:

	Low	Medium	High
Opening and closing:			
$10 × 15,000	$ 150,000		
$10 × 3,000		$ 30,000	
$10 × 2,000			$ 20,000
Issuing monthly statements:			
$0.50 × 450,000	225,000		
$0.50 × 100,000		50,000	
$0.50 × 50,000			25,000
Processing transactions:			
$0.10 × 18,000,000	1,800,000		
$0.10 × 2,000,000		200,000	
$0.10 × 500,000			50,000
Customer inquiries:			
$0.20 × 1,000,000	200,000		
$0.20 × 600,000		120,000	
$0.20 × 400,000			80,000
Providing ATM services:			
$0.70 × 1,350,000	945,000		
$0.70 × 200,000		140,000	
$0.70 × 50,000			35,000
Total cost	$ 3,320,000	$540,000	$210,000
Number of accounts	÷ 38,000	÷ 8,000	÷ 4,000
Cost per account	$ 87.37	$ 67.50	$ 52.50

3. Average profit per account: $90.00 – $81.40 = $8.60

ABC profit measure:

Low-balance customers:	$80 – $87.37 = ($7.37)
Medium-balance customers:	$100 – $67.50 = $32.50
High-balance customers:	$165 – $52.50 = $112.50

4. First, calculate the profits from loans, credit cards, and other products by customer category (using ABC data). Next, compare 50 percent of the cross-sales profits from low-balance customers with the total loss from the low-balance checking accounts. If the cross-sales profits are greater than the loss, the president's argument has merit.

Esercizio 17

1. Supplier cost:

   First, calculate the activity rates for assigning costs to suppliers:

   Replacing engines: $\frac{\$800{,}000}{2{,}000}$ = \$400 per engine

   Expediting orders: $\frac{\$1{,}000{,}000}{200}$ = \$5,000 per late shipment

   Repairing engines: $\frac{\$1{,}800{,}000}{2{,}500}$ = \$720 per engine

   Next, calculate the cost per engine by supplier:

   Supplier cost:

	Watson	Johnson
Purchase cost:		
\$900 × 18,000	\$ 16,200,000	
\$1,000 × 4,000		\$ 4,000,000
Replacing engines:		
\$400 × 1,980	792,000	
\$400 × 20		8,000
Expediting orders:		
\$5,000 × 198	990,000	
\$5,000 × 2		10,000
Repairing engines:		
\$720 × 2,440	1,756,800	
\$720 × 60		43,200
Total supplier cost	\$ 19,738,800	\$ 4,061,200
Units supplied	÷ 18,000	÷ 4,000
Unit cost	\$ 1,096.60	\$ 1,015.30

   The Johnson engine costs less when the full supplier effects are considered. This is a better assessment of cost because it considers the costs that are *caused* by the supplier due to poor quality, poor reliability, and poor delivery performance.

2. In the short run, buy 20,000 from Johnson and 2,000 from Watson. In the long run, one possibility is to encourage Watson to increase its quality and maintain purchases from both sources (lowers source risk by having two suppliers).

Esercizio 18

1. Activity-based management is a system-wide, integrated approach that focuses management's attention on activities. It involves two dimensions: a cost dimension and a process dimension. Key elements in activity management are identifying activities, assessing their value, and retaining only value-adding activities. The consultant identified the activities but did not formally classify the activities as value-added or nonvalue-added. Nor did the consultant offer any suggestions for increasing efficiency—at least not formally. The consultant apparently had tentatively identified potential savings through eliminating nonvalue-added activities. Management must still decide how to reduce, eliminate, share, and select activities to achieve cost reductions.

2.

Setup	$125,000
Materials handling	180,000
Inspection	122,000
Customer complaints	100,000
Warranties	170,000
Storing	80,000
Expediting	75,000
Total	$852,000
Units produced and sold	120,000*
Potential unit cost reduction	$7.10

* $\frac{\$1{,}920{,}000}{\$16}$ (Total cost divided by unit cost).

The consultant's estimate of cost reduction was on target. Per-unit costs can be reduced by at least $7, and further reductions may be possible if improvements in value-added activities are possible.

3.

Unit cost to maintain sales	= $14 – $4 = $10
Unit cost to expand sales	= $12 – $4 = $8
Current cost	= $16
Cost reduction to maintain	= $16 – $10 = $6
Cost reduction to expand	= $16 – $8 = $8

4. Total potential reduction:

	$ 852,000	(from Requirement 2)
	150,000	(by automating)
	$ 1,002,000	
Units	÷ 120,000	
Unit savings	$ 8.35	

Costs can be reduced by at least $7, enabling the company to maintain current market share. Further, if all the nonvalue-added costs are eliminated, then the cost reduction needed to increase market share is also possible. Activity selection is the form of activity management used here.

5. Current:

Sales	$ 2,160,000	($18 × 120,000 units)
Costs	(1,920,000)	
Income	$ 240,000	

$14 price (assumes that current market share is maintained):

Sales	$ 1,680,000	($14 × 120,000 units)
Costs	(918,000)	($7.65* × 120,000 units)
Income	$ 762,000	

$12 price:

Sales	$ 2,160,000	($12 × 180,000 units)
Costs	(1,377,000)	($7.65* × 180,000 units)
Income	$ 783,000	

*$16 – $8.35 = $7.65.

The $12 price produces the greatest benefit.

Esercizio 19

1. Nonvalue-added usage and costs, 2008:

	AQ*	SQ**	Nonvalue Usage AQ – SQ	Nonvalue Cost (AQ – SQ)SP
Materials	600,000	480,000	120,000	$ 600,000
Engineering	48,000	27,840	20,160	604,800
				$1,204,800

*1.25 × 6 × 80,000; (4 × 6,000) + (10 × 2,400) (AQ for engineering represents the actual practical capacity acquired).
**6 × 80,000; (0.58 × 24,000) + (0.58 × 24,000).

Note: SP = Price of activity quantity; SP for materials is $5; SP for engineering is $30 ($1,440,000/48,000).

2. Expected values for the coming year (2009):

Materials: SQ = 480,000 + 0.6(120,000) = 552,000 pounds
Engineering: SQ = 27,840 + 0.6(20,160) = 39,936 engineering hours

	AQ*	SQ	AQ – SQ	SP(AQ – SQ)
Materials	584,800	552,000	32,800	$164,000 U
Engineering	35,400	39,936	(4,536)	136,080 F

*For engineering, the expected value is a measure of how much resource usage is needed (this year), and so progress is measured by comparing with actual usage, not activity availability.

The company failed to meet the materials standard but beat the engineering standard. The engineering outcome is of particular interest. The actual usage of the engineering resource is 35,400 hours, and activity availability is 48,000. Thus, the company has created 12,600 hours of unused engineering capacity. Each engineer brings a capacity of 2,000 hours. Since engineers come in whole units, the company now has six too many! Thus, to realize the savings for the engineering activity, the company must decide how to best use these available resources. One possibility is to simply lay off six engineers, thereby increasing total profits by the salaries saved ($360,000). Other possibilities include reassignment to activities that have insufficient resources (assuming they could use engineers, e.g., perhaps new product development could use six engineers). The critical point is that resource usage reductions must be converted into reductions in resource spending, or the efforts have been in vain.

Esercizio 20

1. Theoretical velocity = $\frac{\textbf{90,000}}{\textbf{12,000}}$ = 7.5 telescopes per hour

   Theoretical cycle time = $\frac{\textbf{60}}{\textbf{7.5}}$ = 8 minutes per telescope

2. Actual velocity = $\frac{\textbf{75,000}}{\textbf{12,000}}$ = 6.25 telescopes per hour

   Actual cycle time = $\frac{\textbf{60}}{\textbf{6.25}}$ = 9.6 minutes per telescope

3. Budgeted conversion costs $= \frac{\textbf{\$7,500,000}}{\textbf{(12,000 × 60)}}$

   = $10.42 per minute

   Theoretical conversion costs per telescope = $10.42 × 8 = $83.36

   Actual conversion costs per telescope = $10.42 × 9.6 = $100.03

   Yes. By reducing cycle time, the cost per unit can be reduced. The potential reduction is as follows:

   $100.03 – $83.36 = $16.67 per telescope

Esercizio 21

1. Shipping and warehousing costs are currently assigned using tons of paper produced, a unit-based measure. Many of these costs, however, are not driven by quantity produced. Many products have special handling and shipping requirements involving extra costs. These costs should not be assigned to those products that are shipped directly to customers.

2. The new method proposes assigning the costs of shipping and warehousing separately for the low-volume products. To do so requires three cost assignments: receiving, shipping, and carrying. The cost drivers for each cost are tons processed, items shipped, and tons sold.

   Pool rate, receiving costs:

   $$\frac{\textbf{Receiving cost}}{\textbf{Tons processed}} = \frac{\textbf{\$1,100,000}}{\textbf{56,000 tons}}$$

   = $19.64 per ton processed*

   Pool rate, shipping costs:

   Shipping cost per shipping item $= \frac{\textbf{\$2,300,000}}{\textbf{190,000}}$

   = $12.11 per shipping item*

Pool rate, carrying cost (an opportunity cost):

Carrying cost per year (LLHC) $= 25 \times \$1{,}665 \times 0.16$

$= \$6{,}660$

$$\text{Carrying cost per ton sold} = \frac{\$6{,}660}{10} = \$666$$

Shipping and warehousing cost per ton sold:

Receiving	$ 19.64
Shipping ($12.11 × 7)	84.77
Carrying	666.00
Total	$770.41

*Rounded

3. Profit analysis:

Revised profit per ton (LLHC):

Selling price	$ 2,400.00
Less manufacturing cost	1,665.00
Gross profit	$ 735.00
Less shipping and warehousing	770.41
Loss	$ (35.41)

Original profit per ton:

Selling price	$ 2,400.00
Less manufacturing costs	1,665.00
Gross profit	$ 735.00
Less shipping and warehousing	30.00
Profit	$ 705.00

The revised profit, reflecting a more accurate assignment of shipping and warehousing costs, presents a much different picture of LLHC. The product is, in reality, losing money for the company. Its earlier apparent profitability was attributable to a subsidy being received from the high-volume products (by spreading the special shipping and handling costs over all products, using tons produced as the cost driver). The same effect is also true for the other low-volume products. Essentially, the system is understating the handling costs for low-volume products and overstating the cost for high-volume products.

4. The decision to drop some high-volume products and emphasize low-volume products could clearly be erroneous. As LLHC has demonstrated, its apparent profitability is attributable to distorted cost assignments. A significant change in the image of LLHC was achieved by simply improving the accuracy of shipping and handling costs. Further improvements in accuracy in the overhead assignments may cause the view of LLHC to deteriorate even more. Conversely, the profitability of high-volume products may improve significantly with increased costing accuracy. This example underscores the importance of having accurate and reliable accounting information. The accounting system must bear the responsibility of providing reliable information.

5. Ryan's strategy changed because his information concerning the individual products changed. Apparently, the accounting system was undercosting the low-volume products and overcosting the high-

volume products. Once better information was available, Ryan was able to respond better to competitive conditions.

Esercizio 22

1. Disagree. Chuck is expressing an uninformed opinion. He has not spent the effort to find out exactly what activity-based management and costing are attempting to do; therefore, he has no real ability to offer any constructive criticism of the possible benefits of these two approaches.

2. and 3.

At first glance, it may seem strange to even ask if Chuck's behavior is unethical. After all, what is unethical about expressing an opinion, albeit uninformed? While offering uninformed opinions or recommendations may be of little consequence in many settings, a serious issue arises when a person's expertise is relied upon by others to make decisions or take actions that could be wrong or harmful to themselves or their organizations. This very well may be the case for Chuck's setting, and his behavior may be labeled professionally unethical.

Chuck's lack of knowledge about activity-based systems is a signal of his failure to maintain his professional competence. Standard I-1 of the IMA ethical standards indicates that management accountants have a responsibility to continually develop their knowledge and skills. Failure to do so is unethical.