Cost allocation II

We will use the costing of a deluxe refrigerator model buitl by Consumenr Appliances Inc.(CAI). CAI assembles this refrigerator, along with eight other products, at its Windsor, Ontario plant. It uses its own sales force so sell refrigerators to retail department stores. Using the six-step approach.

- Step 1: *Identify the product that is the chosen cost object.* The cost object in this example is a deluxe refrigerator model called the Arctic.
- Step 2: *Identify the direct costs for the product.* CAI identifies three categories of direct costs. At CAI's Windsor manufacturing plant, there are two direct manufacturing costs—direct materials and direct manufacturing labour. CAI subcontracts customer service to a separate electrical goods repair company. It pays this company $75 per Arctic unit sold. The repair company handles all customer requests for service during the 24-month warranty period. Amounts traced to each Arctic unit are:

Direct materials	$140
Direct manufacturing labour	35
Customer service	75
Total direct costs	$250

- Step 3: *Identify the indirect cost pools associated with the product.* CAI identifies six indirect cost pools associated with the manufacturing and sale of the Arctic. These six pools are listed in step 5.
- Step 4: *Select the cost allocation base to use in allocating each indirect cost pool to the product.* The chosen cost allocation bases are also listed in step 5.
- Step 5: *Develop the rate per unit of the cost allocation base used to allocate indirect costs to the product.* The allocation base and rate for each indirect cost pool in the January to June 19_8 period are:

Indirect Cost Pool	Allocation Base	Allocation Rate
Procurement	Number of parts	$0.50 per part
Production:		
Labour-paced assembly	Direct manufacturing labour-hours	$20 per hour
Machine-paced assembly	Machine-hours	$16 per hour
Quality testing	Testing-hours	$30 per hour
Distribution	Cubic metres	$2 per cubic metre
Marketing	Units sold	$70 per unit

These allocation rates are used in the costing of all products assembled at the Windsor plant. The rates are revised every six months. The allocation rate for each indirect cost pool is calculated as:

$$\text{Budgeted indirect cost rate} = \frac{\text{Budgeted total costs in indirect cost pool}}{\text{Budgeted total quantity of cost allocation base}}$$

Department	Cost allocation base	Artic refrigerator model
Labour-paced assembly	Direct manufacturing labour-hours	0,6 hours
Machine-paced assembly	machine-hours	4,0 hours
Quality testing	testing-hours	3,0 hours

For example, the procurement allocation rate of $0.50 per part in each product assembled at the Windsor plant is computed as follows:

$$\frac{\$2{,}000{,}000}{4{,}000{,}000 \text{ parts}} = \$0.50 \text{ per part}$$

The budgeted total costs for procurement at the Windsor plant in the January to June 19_8 period are $2 million. This amount includes costs for labour in the procurement department, for the equipment (for example, computers), and for the handling and inspection of incoming materials. The budgeted total quantity of the allocation base is 4 million parts. This figure is the budgeted number of parts for all products assembled at the Windsor plant in the January to June 19_8 period. It includes a budget of 252,000 parts for the deluxe refrigerator model (84 parts per refrigerator × 3,000 budgeted production units of refrigerators). The remaining 3,748,000 parts included in the denominator are for other products.

- Step 6: *Assign the costs to the product by adding all direct costs and all indirect costs.* Exhibit 14-1 presents the product cost buildup for the Arctic refrigerator model. The full product costs are $608, consisting of $250 direct costs and $358 indirect costs. The $358 amount includes $150 indirect costs for distribution and marketing. Only manufacturing costs are included when computing the inventoriable product costs (for financial reporting to external parties). The inventoriable product costs are $383 per Arctic model.

  Exhibit 14-1 reinforces the *different costs for different purposes* notion. The $608 figure captures the full set of business function costs that CAI must cover in its pricing if it is to remain a profitable organization. For financial reporting, however, generally accepted accounting principles prohibit the inclusion of nonmanufacturing costs (distribution, marketing, and customer service) in the inventoriable product-cost figure. Note that this exclusion pertains to both direct costs and indirect nonmanufacturing costs.

EXHIBIT 14-1
Costing of the Arctic Refrigerator Model

	Manufacturing Costs	Non-manufacturing Costs	Total Costs
Direct product costs:			
Direct materials costs	$140	—	$140
Direct manufacturing labour	35	—	35
Customer service	—	$ 75	75
	$175	$ 75	$250
Indirect product costs:			
Procurement, 84 × $0.50	$ 42	—	42
Production: labour-paced, 0.6 × $20	12	—	12
Production: machine-paced, 4.0 × $16	64	—	64
Production: quality testing, 3.0 × $30	90	—	90
Distribution, 40 × $2	—	$ 80	80
Marketing, 1 × $70	—	70	70
	208	150	358
Full product costs	$383	$225	$608

PROBLEM

In 19_7, Medical Instruments changed the costing system at its manufacturing plant. The prior system had two direct product cost categories (direct materials and direct manufacturing labour) and one indirect cost category (manufacturing overhead). Indirect costs were allocated to products on the basis of direct labour manufacturing costs.

The new costing system retains the same two direct product cost categories. Now, however, indirect manufacturing costs are collected into two cost pools:

1. Materials-handling overhead allocated on the basis of the budgeted number of parts in a product. (When the individual parts in a product are all different, the number of parts and the number of individual parts in the product will be equal. When the same part number is used multiple times in a product, the number of parts will exceed the number of separate parts in that product.)
2. Production overhead allocated on the basis of the budgeted manufacturing lead time for each product. Manufacturing lead time is the time from when a product is ready to start on the production line to when it becomes a finished good.

Management made the following assumptions in developing the 19_7 budgeted indirect cost allocation rates:

Materials-Handling Overhead

Budgeted total materials-handling overhead costs	$8,000,000
Budgeted number of separate part numbers	5,000
Budgeted average usage per separate part number	800
Budgeted total number of parts (5,000×800)	4,000,000

$$\text{Budgeted materials-handling overhead cost allocation rate} = \frac{\$8,000,000}{4,000,000 \text{ parts}}$$

$$= \$2 \text{ per part}$$

Production Overhead

Budgeted total production overhead costs	$12,000,000
Budgeted number of individual products	400
Budgeted average production output per product	100 units
Budgeted average manufacturing lead time per product	6 hours
Budgeted total manufacturing lead time (400×100×6 hours)	240,000 hours

$$\text{Budgeted production overhead cost allocation rate} = \frac{\$12,000,000}{240,000 \text{ hours}}$$

$$= \$50 \text{ per hour}$$

Curt Henning is examining how the new costing system affects the reported costs of three products. Details of these products in 19_7 are as follows:

	Product A	Product B	Product C
Direct materials costs	$1,680	$1,250	$2,070
Direct manufacturing labour-hours	7.2	4.3	6.1
Number of parts	128	86	260
Manufacturing lead time in hours	4.8	3.9	18.5

The direct manufacturing labour rate in 19_7 is $30 per hour. Under the prior product costing system (with one indirect cost category), an indirect cost allocation rate of 300% of direct manufacturing labour costs would have been used in 19_7.

REQUIRED

1. What characteristics of a product will lead to its having a much higher cost under the 19_7 costing system than it would have had under the prior costing system?
2. Compute the manufacturing costs of products A, B, and C using (a) the prior product costing system and (b) the product costing system introduced in 19_7.
3. Why might there be a cause-and-effect relationship between actual manufacturing lead time and production overhead costs?

SOLUTION

1. The characteristics of a product that will lead to its having a much higher cost under the new costing system are (a) low direct manufacturing labour cost content, (b) high number of parts, and (c) long manufacturing lead time.

2. a.

	Product A	Product B	Product C
Direct manufacturing unit cost			
Direct materials	$1,680	$1,250	$2,070
Direct manufacturing labour (7.2; 4.3; 6.1×$30)	216	129	183
	$1,896	$1,379	$2,253
Indirect manufacturing unit costs ($216; $129; $183×300%)	648	387	549
Total manufacturing unit costs	$2,544	$1,766	$2,802

2. b.

	Product A	Product B	Product C
Direct manufacturing unit cost			
Direct materials	$1,680	$1,250	$2,070
Direct manufacturing labour (7.2; 4.3; 6.1×$30)	216	129	183
	$1,896	$1,379	$2,253
Indirect manufacturing unit cost			
Materials-handling (128; 86; 260×$2)	$ 256	$ 172	$ 520
Production (4.8; 3.9; 18.5×$50)	240	195	925
	496	367	1,445
Total manufacturing unit cost	$2,392	$1,746	$3,698

Plantwide indirect cost rates. Automotive Products (AP) designs, manufactures, and sells automotive parts. It has three main operating departments: design, engineering, and production.

- **Design.** The design of parts, using state of the art, computer-aided design (CAD) equipment
- **Engineering.** The prototyping of parts and testing of their specifications
- **Production.** The manufacture of parts

For many years, AP had long-term contracts with major automobile assembly companies. These contracts had large production runs. AP's costing system allocates variable manufacturing overhead on the basis of machine-hours. Actual variable manufacturing overhead costs for 19_7 were $308,600. AP had three contracts in 19_7, and its machine-hours used in 19_7 were assigned as follows:

United Motors	120
Holden Motors	2,800
Leland Vehicle	1,080
Total	4,000

REQUIRED

1. Compute the plantwide variable manufacturing overhead rate for 19_7.
2. Compute the variable manufacturing overhead allocated to each contract in 19_7.
3. What conditions must hold for machine-hours to provide an accurate estimate of the variable manufacturing overhead incurred on each individual contract at AP in 19_7?

14,19

Cost allocation, use of a separate machining cost pool category. Mahitsu Motors is a manufacturer of motorcycles. Production and cost data for 19_7 are as follows:

	500 cc Brand	1,000 cc Brand
Units produced	10,000	20,000
Direct manufacturing labour-hours per unit	2	4
Machine-hours per unit	8	8

A single cost pool is used for manufacturing overhead. For 19_7, manufacturing overhead was $6.4 million. Mahitsu allocates manufacturing overhead costs to products on the basis of direct manufacturing labour-hours per unit.

Mahitsu's accountant now proposes that two separate pools be used for manufacturing overhead costs:

- Machining cost pool ($3.6 million in 19_7)
- General plant overhead cost pool ($2.8 million in 19_7)

Machining costs are to be allocated using machine-hours per unit. General plant overhead costs are to be allocated using direct manufacturing labour-hours per unit.

REQUIRED

1. Compute the overhead costs allocated per unit to each brand of motorcycle in 19_7 using the current single-cost-pool approach of Mahitsu.
2. Compute the machining costs and general plant overhead costs allocated per unit to each brand of motorcycle assuming that the accountant's proposal for two separate cost pools is used in 19_7.
3. What benefits might arise from the accountant's proposal for separate pools for machining costs and general plant costs?

14,21

Manufacturing cost allocation, use of a conversion cost pool category, automation. Medical Technology Products manufactures a wide range of medical instruments. Two testing instruments (101 and 201) are produced at its highly automated Quebec City plant. Data for December 19_7 are as follows:

	Instrument 101	Instrument 201
Direct materials	$100,000	$300,000
Direct manufacturing labour	$ 20,000	$ 10,000
Units produced	5,000	20,000
Actual direct labour-hours	1,000	500

Manufacturing overhead is allocated to each instrument product on the basis of actual direct manufacturing labour-hours per unit for that month. Manufacturing overhead cost for December 19_7 is $270,000. The production line at the Quebec City plant is a machine-paced one. Direct manufacturing labour is made up of costs paid to workers minimizing machine problems rather than actually operating the machines. The machines in this plant are operated by computer specialists and industrial engineers.

REQUIRED

1. Compute the cost per unit in December 19_7 for instrument 101 and instrument 201 under the existing cost accounting system.
2. The accountant at Medical Technology proposes combining direct manufacturing labour costs and manufacturing overhead costs into a single conversion costs pool. These conversion costs would be allocated to each unit of product on the basis of direct materials costs. Compute the cost per unit in December 19_7 for instrument 101 and instrument 201 under the accountant's proposal.