CHAPTER 12

COVERAGE OF LEARNING OBJECTIVES

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **LEARNING OBJECTIVE** | **FUNDA-**  **MENTAL**  **ASSIGN-MENT**  **MATERIAL** | **CRITICAL THINKING EXERCISES, AND EXERCISES** | **PROBLEMS** | **CASES, NIKE 10K, EXCEL, COLLAB. & INTERNET EXERCISES** |
| **LO1: Describe the general framework for cost allocation.** | **A1, B1** |  | **37, 39, 44** |  |
| **LO2: Allocate the variable and fixed costs of service departments to other organizational units.** | **A1,B1** | **25, 27, 28, 29** | **37, 38, 39, 44** | **54, 56** |
| **LO3: Use the direct and step-down methods to allocate service department costs to user departments.** | **A1, B1** | **31, 32** | **37, 40, 45, 46** | **54** |
| **LO4: Allocate costs from producing departments to products or services using the traditional and ABC approaches.** |  | **30, 31** | **37, 40, 47, 48** | **51, 55** |
| **LO5: Allocate costs associated with customer actions to customers.** | **A2, B2** | **33** | **37, 41, 42, 43** | **51, 53, 55** |
| **LO6: Allocate the central corporate costs of an organization.** |  | **26, 30** | **49** | **52** |
| **LO7: Allocate joint costs to products using the physical-units and relative-sales-value methods** | **A3, B3** | **34, 35, 36** | **50** |  |

**CHAPTER 12**

***Cost Allocation***

12-A1 (30-50 min.) The numerical answers for requirements 1 and 2 are in Exhibit 12-A1. Most students will favor the direct method because the final allocations are not affected significantly.

3. The allocation types from Exhibit 12-1 are 3 and 4. Each of the allocations to the engineering and cafeteria departments from general factory administration are from one service department to another service department (type 3). Each of the allocations to the three producing departments from the three service departments are type 4 allocations.

12-A2 (40-50 min.)

 1. Product

  A B C Total

Sales $5,000 $6,000 $25,000 $36,000

Cost Of Sales 4,500 4,800 15,000 24,300

Gross Profit Margin $ 500 $1,200 $10,000 $11,700

Gross Profit Margin

Percentage 10.0% 20.0% 40.0% 32.5%

Product C is the most profitable based on gross margin and gross margin percentage.

 2. Product

  A B C Total

Customer Type 1

Sales $500 $1,000 $13,000 $14,500

Gross Margin 50 200 5,200 5,450

Gross Margin Percentage of Sales      37.6%

Customer Type 2

Sales $4,500 $5,000 $12,000 $21,500

Gross Margin 450 1,000 4,800 6,250

Gross Margin Percentage of Sales      29.1%

EXHIBIT 12-A1 General Finishing

Factory Engi- and

Total Administration Cafeteria neering Machining Assembly Painting

Total labor hours 1,296,000 - 36,000 120,000 300,000 720,000 120,000

Employees 780 - - 60 120 540 60

Engineering hours 80,000 - - - 50,000 20,000 10,000

Total Engineering Finishing

Cost Drivers Labor Hours Employees Hours Machining Assembly & Painting

Method 1, Direct Method

Total department overhead before allocation $950,000 $150,000 $1,600,000 - - - - - - - - - - Not Given - - - - - - - - - - -

General factory administration (950,000) - - $ 250,000 1 $ 600,000 $100,000

Cafeteria (150,000) - 25,0002 112,500 12,500

Engineering (1,600,000) 1,000,000 3 400,000 200,000

Totals $1,275,000 $1,112,500 $312,500

Method 2, Step-Down Method

Total department overhead before allocation $950,000 $150,000 $1,600,000 - -- - - - - - - - Not Given - - - - - - - - - - -

General factory administration (950,000) 26,389 4 87,963 $219,907 $527,778 $ 87,963

Cafeteria (176,389) 13,568 5 27,137 122,115 13,568

Engineering (1,701,531) 1,063,457 6 425,383 212,691

Totals $1,310,501 $1,075,276 $314,222

1 300 + 720 + 120 = 1,140; (300÷1,140) × 950,000 = 250,000; (720÷1,140) × 950,000 = 600,000; etc.

2 120 + 540 + 60 = 720; (120÷720) × 150,000 = 25,000; (540÷720) × 150,000 = 112,500; etc.

3 50 + 20 + 10 = 80; 50/80 × 1,600,000 = 1,000,000; 20/80 × 1,600,000 = 400,000; etc.

4 36+120+300+720+120 =1,296 ; (36÷1,296)×950,000 =26,389 ; (120÷1,296)×950,000 =87,963 ; (300÷1,296)×950,000 =219,907 ; etc.

5 60+120+540+60 =780 ; (60÷780)×176,389 =13,568 ; (120÷780)×176,389 =27,137 ; (540÷780)×176,389 =122,115 ; etc.

6 5+20+10 = 80; 50/80 × 1,701,531 = 1,063,457; 20/80 × 1,701,531 = 425,383; etc.

3. Cost to Serve $12,000

Cost to Serve per Visit $12,000 ÷ (4 + 16) = $600

Customer Type 1

Sales $14,500

Manager Visits 4

Cost to Serve $2,400

Cost to Serve Percentage of Sales 16.6%

Customer Type 2

Sales $21,500

Manager Visits 16

Cost to Serve $9,600

Cost to Serve Percentage of Sales 44.7%

4. Customer Type 1

Sales $14,500

Operating Income $3,050

Operating Income Percent of Sales 21.0%

Customer Type 2

Sales $21,500

Operating Income ($3,350)

Operating Income Percent of Sales (15.6%)

5. Most Profitable

Profitability Measure Customer Type

Gross Margin 2

Gross Margin Percentage of Sales 1

Operating Income 1

Operating Income Percentage of Sales 1

12-A3 (20-30 min.)

Note that total joint costs are $11 × 1,000,000 + $4 × 1,000,000 = $15,000,000.

1. Physical units method:

Allocation of

Pounds Weighting Joint Costs

A 200,000 (200 ÷ 1,000) × $15,000,000 $ 3,000,000

B 800,000 (800 ÷ 1,000) × $15,000,000 12,000,000

1,000,000 $15,000,000

2. Relative sales value method:

Relative Sales Value Allocation of

at Split-off Weighting Joint Costs

A $30.00 × 200,000 = $ 6,000,000 (6 ÷ 18) × $15,000,000 $ 5,000,000

B $15.00 × 800,000 = 12,000,000 (12 ÷ 18) × $15,000,000 10,000,000

$18,000,000 $15,000,000

3. The sales value of B at the split-off point must be approximated:

Sales value of B = Final sales value - Separable costs

= ($18.75 × 800,000) - [$200,000 + ($1 × 800,000)]

= $15,000,000 - $1,000,000

= $14,000,000

Relative Sales Value Allocation of

at Split-off Weighting Joint Costs

A $ 6,000,000 (6 ÷ 20) × $15,000,000 $ 4,500,000

B 14,000,000 (14 ÷ 20) × $15,000,000 10,500,000

$20,000,000 $15,000,000

12-B1 (30-40 min.)

1. Direct method:

Personnel Administrative Residential Commercial

Direct departmental

costs before allocation $ 70,000 $ 100,000 $240,000 $400,000

Personnel (70,000) 28,000 42,000

Administrative (100,000) 37,500 62,500

Total costs after allocation $305,500 $504,500

Calculations:

12 + 18 = 30

(12 ÷ 30) × $70,000 = $28,000

(18 ÷ 30) × $70,000 = $42,000

240,000 + 400,000 = 640,000

(240,000 ÷ 640,000) × $100,000 = $37,500

(400,000 ÷ 640,000) × $100,000 = $62,500

2. Step-down method:

Personnel Administrative Residential Commercial

Direct departmental

cost before allocation $ 70,000 $ 100,000 $240,000 $400,000

Personnel (70,000) 10,000 24,000 36,000

Administrative $(110,000) 41,250 68,750

Total cost after allocation $305,250 $504,750

Calculations:

5 + 12 + 18 = 35

(5 ÷ 35) × $70,000 = $10,000

(12 ÷ 35) × $70,000 = $24,000

(18 ÷ 35) × $70,000 = $36,000

240,000 + 400,000 = 640,000

(240,000 ÷ 640,000) × $110,000 = $41,250

(400,000 ÷ 640,000) × $110,000 = $68,750

3. (a) Residential: $305,250 ÷ 24,000 hours = $12.72 per direct-labor hr

(b) Commercial: $504,750 ÷ 9,970,000 sq. ft. = $.05 per square foot

4. Allocations from the personnel to the administrative departments are type 3 allocations. Allocations from the administrative to the residential and commercial operating departments are type 4 allocations.

12-B2 (40-50 min.)

1.

  Product

  Alpha Beta Gamma Total

Sales $4,000 $8,000 $20,000 $32,000

Cost Of Sales 2,000 2,000 14,000 18,000

Gross Profit Margin $2,000 $6,000 $ 6,000 $14,000

Gross Profit Margin

Percentage 50.0% 75.0% 30.0% 43.8%

Beta has the largest gross profit margin percentage and Bets and Gamma have the largest dollar amount of gross profit.

2.

  Product

  Alpha Beta Gamma Total

Customer Type 1

Sales $2,000 $5,000 $1,000 $8,000

Gross Margin 1,000 3,750 300 5,050

Gross Margin Percentage of Sales     63.1%

Customer Type 2

Sales $2,000 $3,000 $19,000 $24,000

Gross Margin 1,000 2,250 5,700 8,950

Gross Margin Percentage of Sales     37.3%

3. Cost to Serve $10,000

Cost to Serve per Visit $10,000 ÷ (6 + 4) = $1,000

Customer Type 1

Sales $8,000

Manager Visits 6

Cost to Serve $6,000

Cost to Serve Percentage of Sales 75.0%

Customer Type 2

Sales $24,000

Manager Visits 4

Cost to Serve $4,000

Cost to Serve Percentage of Sales 16.7%

4. Customer Type 1

Sales $8,000

Operating Income ($950)

Operating Income Percent of Sales (11.9)%

Customer Type 2

Sales $24,000

Operating Income $4,950

Operating Income Percent of Sales 20.6%

5. Most Profitable

Profitability Measure Customer Type

Gross Margin 2

Gross Margin Percentage of Sales 1

Operating Income 2

Operating Income Percentage of Sales 2

12-B3 (15 min.)

The joint costs include the purchase cost of $1,000,000 × $.80 = $800,000 and the processing cost before the split-off point of $.40 × 1,000,000 = $400,000, a total of $1,200,000.

1. Allocation of

Pounds Weighting Joint Costs

Oat flour 800,000 800/1,000 × $1,200,000 $ 960,000

Oat bran 200,000 200/1,000 × $1,200,000 240,000

1,000,000 $1,200,000

2. Relative Sales Allocation of

Value at Split-off\* Weighting Joint Costs

Oat flour $1,200,000 1,200/1,600 × $1,200,000 $ 900,000

Oat bran 400,000 400/1,600 × $1,200,000 300,000

$1,600,000 $1,200,000

\*$1.50 × 800,000 and $2.00 × 200,000

3. Estimated value of oat flour at split-off:

Sales value of oat flakes, $2.90 × 800,000 pounds $2,320,000

- Processing cost after split-off point, ($.60 × 800,000

pounds) + $240,000 720,000

$1,600,000

Relative Sales Allocation of

Value at Split-off Weighting Joint Costs

Oat flakes $1,600,000 1,600/2,000 × $1,200,000 $ 960,000

Oat bran 400,000 400/2,000 × $1,200,000 240,000

$2,000,000 $1,200,000

12-1 For most companies, accountants can directly trace less than 60% of operating costs to products, services, and customers. For the rest of a company’s costs, accountants must either apply cost-allocation methods or leave costs unallocated. Most managers prefer to allocate these indirect costs.

12-2 Exhibit 12-1 shows the ten types of cost assignments.

1. Directly traced costs to departments
2. Indirect costs allocated to departments
3. Service department costs allocated to other service departments
4. Service department costs allocated to producing departments
5. Producing department costs allocated to other producing departments
6. Directly traced costs to producing departments that an organization can also trace directly to products and services
7. Producing department costs that an organization allocates to products or services
8. Directly traced costs to service departments that an organization can also trace directly to customers
9. Service department costs allocated to customers

10. Product/service costs assigned to customers

12-3 Costs often remain unallocated if there is no logical basis for allocating them. That means that there is no cost-allocation base that causes the costs in question.

12-4 The preferred guidelines for allocating service department costs are:

a. Evaluate performance using budgets for each service (staff) department, just as they are used for each production or operating (line) department. When feasible, maintain distinctions between variable-cost pools and fixed-cost pools.

b. Allocate variable- and fixed-cost pools separately. This is sometimes called the dual method of allocation. Note that one service department (such as a computer department) can contain a variable-cost pool and a fixed-cost pool. That is, costs may be pooled within and among departments if desired.

c. Establish part or all of the details regarding cost allocation in advance of rendering the service rather than after the fact.

12-5 The distinction between direct and indirect depends on the cost object. A cost such as the salaries of service department personnel are a direct cost when the cost object is the service department. However, when the cost object is outside the service department, such as a producing department that uses the services of the service department, the salaries of the service department must be allocated to the producing departments and hence are indirect.

12-6 Using budgeted rather than actual cost rates protects the using departments from inefficiencies in the service departments and from intervening price fluctuations.

12-7 The motivation to underestimate long-run usage is a common problem with allocation methods using lump-sums based on long-range plans. To counteract this tendency, management can evaluate predictions of long-run usage and provide rewards for accurate predictions.

12-8 It would be ideal if every cost pool would contain only fixed or only variable costs. This should be the goal. In practice, there are many reasons why this goal may not be achieved. For example, the identification of fixed and variable costs is not perfect; most costs have some fixed and some variable cost characteristics. Perfect separation into fixed and variable cost categories may not be possible. In addition, it may not be economically feasible to have separate cost pools for fixed and variable costs if most (but not all) of the cost fits into one of the categories. For example, if 90% of a cost is variable and 10% is fixed, it may be best to treat the entire cost as variable.

12-9 Two methods of allocating service department costs are the *direct method* and the *step-down* method. The direct method ignores other service departments when any given service department's costs are allocated. No costs are allocated from one service department to another. The step-down method recognizes that some service departments provide services to other service departments as well as to producing departments. The costs of the first service department are allocated to all other service departments and the producing departments. Then the second service department's costs are allocated to *the* *remaining* service departments (i.e., all service departments *except* those whose costs have already been allocated) and the producing departments. Once a service department's costs have been allocated, no subsequent service department's costs are allocated back to it. This procedure continues until all service department costs have been allocated.

12-10 The direct method of allocating service department costs ignores services that one service department provides to another service department. The method is easier to apply and easier to understand, and often it leads to almost the same cost as more sophisticated methods, especially if there are only small services provided by service departments for other service departments. Companies may decide that the cost of a more sophisticated system is greater than the added accuracy it provides.

12-11 No. Both the direct and step-down methods allocate the same total amount of costs to the producing departments.

12-12 The four steps are as follows:

1. </inst><para>Divide the costs in each producing department into direct costs and indirect costs.

<listitem><inst>2. </inst><para>Trace the direct costs to the appropriate products or services. <listitem><inst>

3. </inst><para>Select cost pools and related cost-allocation bases in each production department, and assign all the indirect departmental costs to the appropriate cost pool.

<listitem><inst>4. </inst><para>Allocate (apply) the costs in each cost pool to the products or services in proportion to their usage of the related cost-allocation base.

12-13 First, managers identify the key activities in the organization, and they collect overhead costs for each activity. Cost drivers are then selected for each activity, and those cost drivers are used to allocate the costs to the products, services, or customers.

12-14 Some possible activities and cost drivers are:

Activity Cost driver

Group of machines Machine hours

Set-up costs Number of set-ups

Quality inspection Units passing inspection point

Personnel department Number of employees

12-15 Step 1: Determine the key components of the system.

Step 2: Develop the relationships between resources, activities, and cost objects.

Step 3: Collect relevant data concerning costs and the physical flow of cost-allocation base units among resources and activities.

Step 4: Calculate and interpret the new ABC information.

12-16 The simplest answer is to recommend a traditional costing system for the Youngstown plant and an ABC costing system for the Salem plant. Why? Because one of the primary purposes of any costing system is to provide as accurate cost information as possible subject to the cost-benefit criterion. There is always a tradeoff between the accuracy of a system and the costs to implement and maintain it. Generally, as the operations of a company become more complex, the diversity of demands upon resources increases across products (services). In order to accurately track resource costs in such a diverse operating environment, many cost pools are needed for the various activities -- that is, an ABC system. Because the Youngstown plant operations are not complex, a simple (traditional) costing system probably provides sufficiently accurate cost information. Due to the complexity and diversity of the Salem plant operations, an ABC costing system should be considered.

12-17 When the cost objective is customers, allocating customer-related service-department costs to products causes customer-cost distortion because the customer costs-to-serve are allocated based on production-related cost-allocation bases and product mix percentages rather than allocation bases with a causal relationship to customer actions.

12-18 Suppose that not only are all of a company’s products profitable (that is, gross profit is positive), its average gross profit margin percentage is 30%. What if the total costs of the distribution and customer service value-chain functions is 35% of sales? In such a case, even without considering unallocated costs associated with R & D, design, and corporate support, the company is operating at a loss.

The costs associated with customer actions, costs to serve, can often be either directly traced or allocated to customers. Identifying those customers whose costs to serve are greater than the gross profit they generate will help the company develop a strategy for profit improvement.

12-19 Low Cost to Serve High Cost to Serve

Large order quantity Small order quantity

Few order changes Many order changes

Little pre-sales support Large amount of pre-sales support

Little post-sales support Large amount of post-sales support

Regular scheduling Expedited scheduling

Standard delivery Special delivery requirements

Few returns Frequent returns

12-20 If allocations are based on actual rather than forecasted sales, the allocation to a particular unit are affected by the actual sales results in other units. A unit may achieve exactly its expected level of sales but still have more allocated central corporate costs if other units fail to achieve their budgeted level of sales.

12-21 What is worse, no allocation or inaccurate allocation based on either implausible or unreliable cost drivers? Most cost accountants would opt for no allocation. This would preserve both the plausibility and reliability of allocation bases and the accuracy of the allocated cost. Managers who are held responsible for costs are motivated to exert cost control when they see a clear cause-effect relationship between actions that they take to manage cost drivers and the resulting costs incurred.

12-22 Joint costs are allocated to products or services for purposes of inventory valuation and income determination. They may also be allocated for cost-reimbursement contracts.

12-23 The *physical units* method allocates joint costs in proportion to some physical property of the products (e.g., weight or volume) at the split-off point. The *relative sales value* method allocates joint costs in proportion to the amounts for which the products can be sold at the split-off point.

12-24 By-products, like joint products, are not separately identifiable before the split-off point. However, by-products have relatively insignificant sales values compared to main products. Only separable costs are applied to by-products; no joint costs are allocated to them. Revenues from by-products, less separable costs, are deducted from the cost of the main product.

12-25 Fixed costs are often allocated separately from variable costs because they are caused by different activities. Fixed costs are affected primarily by long-range decisions about the overall level of service. In contrast, variable costs depend on short-run fluctuations in actual usage.

12-26 Sales dollars are often a poor basis for allocation of costs because they reflect efficiency of sales effort and variations in pricing margins, neither of which is related to costs. Further, if actual sales is used as the allocation base, changes of sales in one department can affect costs allocated to the other departments.

12-27 One way to allocate national advertising costs to territories is on the basis of *expected* sales in each territory, computed by some formula combining population, income, appeal, competition, and supply capability.

12-28 (10-15 min.)

1. Business Engineering

Fixed costs per month:

30% of $100,000 $30,000

70% of $100,000 $ 70,000

Variable costs @ $200 per hour:

210 hours 42,000

400 hours 80,000

Total costs $72,000 $150,000

2. Business Engineering

Fixed costs per month:

210/610 × $100,000 $34,426

400/610 × $100,000 $ 65,574

Variable costs, as before 42,000 80,000

Total costs $76,426 $145,574

The dean of Business would probably be unhappy. The Business School has operated exactly in accordance with the long-range plan. Nevertheless, Business is bearing an extra $4,426 of fixed costs because of what *another* consumer is using. The dean would prefer the method in Requirement 1 because it insulates Business from short-run fluctuations in costs caused by the actions of other users.

12-29 (10-15 min.)

1. Rate = [$3,000 + ($.05 × 100,000)] ÷ 100,000 = $.08 per copy

Cost allocated to City Planning in August = $.08 × 42,000 = $3,360.

2. Fixed cost pool allocated as a lump sum depending on predicted usage:

To City Planning: (36,000 ÷ 100,000) × $3,000 = $1,080 per month

Variable cost pool allocated on the basis of actual usage:

$.05 × number of copies

Cost allocated to City Planning in August: $1,080 + ($.05 × 42,000) = $3,180.

3. The second method, the one that allocated fixed- and variable-cost pools separately, is preferable. It better recognizes the causes of the costs. The fixed cost depends on the size of the photocopy machine, which is based on predicted usage and is independent of actual usage. Variable costs, in contrast are caused by actual usage.

12-30 (10 - 15 min.)

Bellevue Richfield Hightower

1. Allocation based on budgeted sales\* $108,000 $180,000 $72,000

2. Allocation based on actual sales\*\* 120,000 140,000 100,000

\*$360,000 × (600/2,000); $360,000 × (1,000/2,000); $360,000 × (400/2,000)

\*\* $360,000 × (600/1,800); $360,000 × (700/1,800); $360,000 × (500/1,800)

3. The major argument against using actual sales as a cost driver for cost allocation is that a department's allocation depends on the success of other departments. Here, Bellevue is allocated an extra $12,000 because sales in the Richfield store are below budget, even though Bellevue's sales came in right on target. Further, stores with poor sales results probably do not cause reduced central office costs. If anything, a department with poor performance requires more central attention. Also, using budgeted sales reduces surprises; managers know what amount of allocated cost to expect. Often managers are more upset by unexpected changes in allocated amounts than by the size of the allocation itself.

12-31 (25-30 min.)

1. See Exhibit 12-31. Calculations for the exhibit follow:

3 + 12 + 18 + 8 = 41

(3 ÷ 41) × $92,000 = $6,732

(12 ÷ 41) × $92,000 = $26,927

(18 ÷ 41) × $92,000 = $40,390

(8 ÷ 41) × $92,000 = $17,951

$240,000 + $400,000 = $640,000

($240,000 ÷ $640,000) × $170,000 = $63,750

($400,000 ÷ $640,000) × $170,000 = $106,250

2. See Exhibit 12-31. Calculations for the exhibit follow:

5 + 3 + 12 + 18 + 8 = 46

(5 ÷ 46) × $92,000 = $10,000

(3 ÷ 46) × $92,000 = $6,000

(12 ÷ 46) × $92,000 = $24,000

(18 ÷ 46) × $92,000 = $36,000

(8 ÷ 46) × $92,000 = $16,000

$240,000 + $400,000 = $640,000

($240,000 ÷ $640,000) × $180,000 = $67,500

($400,000 ÷ $640,000) × $180,000 = $112,500

Exhibit 12-31

Direct method:

Residential Division Commercial Division

Personnel Admin. Activity 1 Activity 2 Total Activity 3 Activity 4 Activity 5 Total

Direct costs $92,000 $170,000 $60,000 $240,000 $300,000 $400,000 $90,000 $110,000 $600,000

Personnel (92,000) 6,732 26,927 33,659 40,390 0 17,951 58,341

Administrative (170,000) 0 63,750 63,750 106,250 0 0 106,250

Total costs after

allocation $ 0 $ 0 $66,732 $330,677 $397,409 $546,640 $90,000 $127,951 $764,591

Step-down method:

Residential Division Commercial Division

Personnel Admin. Activity 1 Activity 2 Total Activity 3 Activity 4 Activity 5 Total

Direct costs $92,000 $170,000 $60,000 $240,000 $300,000 $400,000 $90,000 $110,000 $600,000

Personnel (92,000) 10,000 6,000 24,000 30,000 36,000 0 16,000 52,000

Administrative (180,000) 0 67,500 67,500 112,500 0 0 112,500

Total costs after

allocation $ 0 $ 0 $66,000 $331,50 $397,500 $548,500 $90,000 $126,000 $764,500

12-32 (15-20 min.)

1. Direct method:

Personnel Custodial Machining Assembly

Direct department costs

before allocation $45,000 $70,000 $600,000 $800,000

Personnel\* (45,000) 20,000 25,000

Custodial\*\* (70,000) 20,000 50,000

Total cost after allocation $ 0 $ 0 $640,000 $875,000

\* (200 ÷ 450) × $45,000; (250 ÷ 450) × $45,000

\*\*(10 ÷ 35) × $70,000; (25 ÷ 35) × $70,000

2. Step-down method:

Personnel Custodial Machining Assembly

Direct department costs

before allocation $45,000 $70,000 $600,000 $800,000

Personnel\* (45,000) 2,812 18,750 23,438

Custodial\*\* (72,812) 20,803 52,009

Total cost after allocation $ 0 $ 0 $639,553 $875,447

\* (30 ÷ 480) × $45,000; (200 ÷ 480) × $45,000; (250 ÷ 480) × $45,000

\*\*(10 ÷ 35) × $72,812; (25 ÷ 35) × $72,812

12-33 (30-40 min.)

1. Product A Product B Product C Product D

Sales $32,000 $88,000 $280,000 $143,000

Cost of sales 20,000 70,400 224,000 81,000

Gross profit margin $12,000 $17,600 $ 56,000 $ 62,000

Units sold 2,900 4,300 5,450 1,600

Gross profit margin per unit $4.14 $4.09 $10.28 $38.75

Gross profit margin percentage 37.5% 20.0% 20.0% 43.4%

Product D is the most profitable with a gross profit margin percentage of 43.4%.

2. – 4.

Exhibit 12-33 shows calculations for requirements 2 – 4.

The most profitable customer type depends on the measure of profitability used. In this case customer type 1 has the greatest operating income percentage (40.5% - 17.3% = 23.2%) as well as the largest dollar contribution to operating income ($17,251 - $7,368 = $9,883).

Exhibit 12-33

Customer Type 1 Customer Type 2 Customer Type 3

Sales Gross

price profit

per margin Gross Gross Gross

Product unit per unit Units Revenue profit Units Revenue profit Units Revenue profit

A $11.031 $ 4.14 200 $ 2,206 $ 828 2,200 $ 24,266 $ 9,108 500 $ 5,515 $ 2,070

B 20.47 4.09 100 2,047 409 1,200 24,564 4,908 3,000 61,410 12,270

C 51.38 10.28 50 2,569 514 400 20,552 4,112 5,000 256,900 51,400

D 89.38 38.75 400 35,752 15,500 800 71,504 31,000 400 35,752 15,500

Total 750 $42,574 17,251 4,600 $140,886 49,128 8,900 $359,577 81,240

Cost to serve 7,368 45,193 87,439

Operating income $9,883 $ 3,935 ($6,199)

Customer gross margin percentage 40.5% 34.9% 22.6%

Cost to serve percentage 17.3% 32.1% 24.3%

Customer operating income percentage 23.2% 2.8% (1.7%)

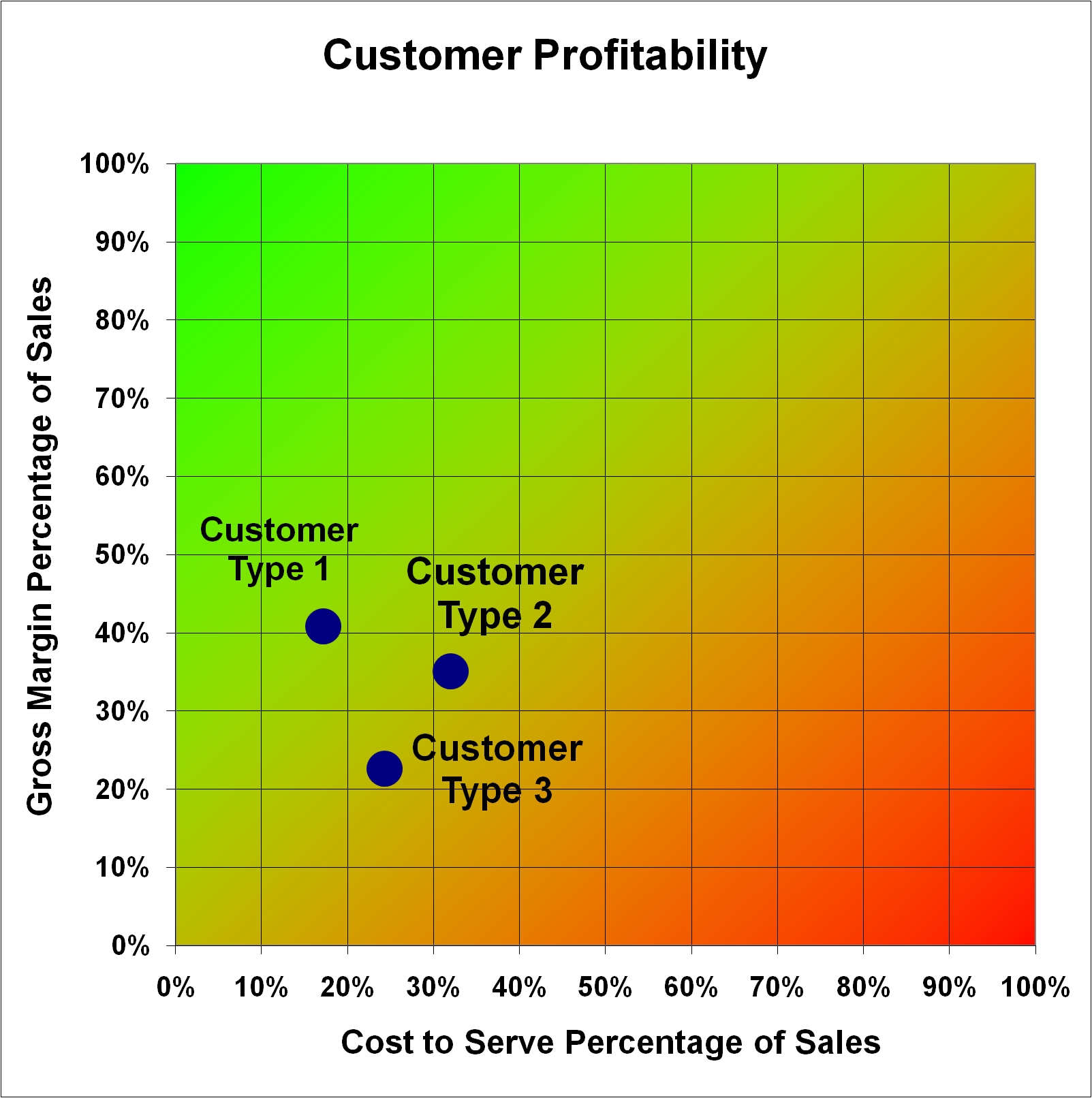
1 $32,000 ÷ 2,900 units; etc. The rounded numbers from the first two columns are used in subsequent calculations.

5. The chart below shows customer profitability for the three customer types and suggested strategies for profit improvement.

Work with customers to change their ordering patterns, focusing more on the more profitable products. Also, these customers may be able to lower the cost to serve. Seek internal process improvements to lower those elements of the cost to serve controllable by the company.

Work with customers to lower the cost to serve. Seek internal process improvements to lower those elements of the cost to serve controllable by the company.

Grow business with this customer type by focused sales efforts and quantity discounts.



12-34 (15-20 min.)

1. Allocation of

Gallons Weighting Joint Costs

Solvent A 9,000 9/15 × $100,000 $ 60,000

Solvent B 6,000 6/15 × $100,000 40,000

15,000 $100,000

2. Relative Sales Allocation of

Value at Split-off\* Weighting Joint Costs

Solvent A $ 90,000 9/18 × $100,000 $ 50,000

Solvent B 90,000 9/18 × $100,000 50,000

$180,000 $100,000

\* $10 × 9,000 and $15 × 6,000

12-35 (10 min.)

1. Allocation of

Gallons Weighting Joint Costs

Rexon 15,000 15/20 × $500,000 $375,000

Texon 5,000 5/20 × $500,000 125,000

20,000 $500,000

2. Relative Sales Allocation of

Value at Split-off\* Weighting Joint Costs

Rexon $375,000 375/625 × $500,000 $300,000

Texon 250,000 250/625 × $500,000 200,000

$625,000 $500,000

\* $25 × 15,000 and $50 × 5,000

12-36 (10-15 min.)

1. *None*. The entire joint cost is allocated to the main product.

2. $40,000. The total inventory cost of the pulp is the separable cost, that is, the cost incurred after the split-off point.

3. Inventory cost of grape juice:

Direct materials (grapes) $1,000,000

Pressing cost 130,000

Filter, pasteurize, pack, and ship cost 150,000

Total $1,280,000

Less: Revenue less separable

costs of by-product

($50,000 - $40,000) (10,000)

Net cost of grape juice $1,270,000

12-37 (30-40 min.)

1. To properly classify a cost, it is necessary to specify the cost object. For example, power cost is a direct cost if the cost object is the power department but an indirect cost if the cost objective is the maintenance department, assembly department, or display types.

|  |  |
| --- | --- |
| Type of Cost Assignment per Exhibit 12-1 | Example from Exhibit 12-21 |
| 1. Directly traced cost to departments | Power cost in power department (power department is the cost object); $90,000 of direct costs of the maintenance department (maintenance department is the cost object); parts and direct labor costs in the assembly department (the cost object is the assembly department). |
| 2. Indirect costs allocated to departments | General costs such as occupancy allocated to the maintenance and the assembly departments. |
| 3. Service department costs allocated to other service departments | Power department costs allocated to the maintenance department. |
| 4. Service department costs allocated to producing departments | Power costs allocated to the assembly departments; maintenance department costs allocated to the assembly department. |
| 5. Producing department costs allocated to other producing departments | Since there is only one producing department, no example exists. |
| 6. Directly traced costs to departments that an organization can also trace directly to products and services | Parts and direct labor costs in the assembly department. |
| 7. Producing department costs that an organization allocates to products or services | All assigned costs of setup and assembly activities, including assembly supervisor salaries, machine depreciation, power, maintenance, and occupancy. |
| 8. Directly traced costs to service departments that an organization can also trace directly to customers | In this problem requirement, we assume that Darling does not determine customer costs. |
| 9. Service department costs allocated to customers | In this problem requirement, we assume that Darling does not determine customer costs. |
| 10. Product/service costs assigned to customers | In this problem requirement, we assume that Darling does not determine customer costs. |

2. The assembly facility uses the step-down method. Power department costs are first allocated to the maintenance service department and the assembly department before allocating the maintenance department costs to the two major activities in the assembly department.

3.

Power General Maintenance Setup Assembly

Department Costs Department Activity Activity

Direct costs $ 60,000\* $ 600,000 $ 90,000

Allocated general

costs\*\* $(600,000) 60,000 $120,000 $420,000

Allocated power

department costs\*\*\* $(60,000) 6,000 6,000 48,000

Allocated maintenance

department costs\*\*\*\* $(156,000) 52,000 104,000

Total $178,000 $572,000

\* 10 × $600 + 10 × $600 + 80 × $600

\*\* 10 + 20 + 70 = 100; (10 ÷ 100) × $600,000; etc.

\*\*\* 10 + 10 + 80 = 100; (10 ÷ 100) × $60,000; etc.

\*\*\*\* 2,000 + 4,000 = 6,000; (2,000 ÷ 6,000) × $156,000; etc.

4.

Cost Display Display Display

per Type X Type Y Type Z

Driver Driver Driver Driver

Unit Units Cost Units Cost Units Cost

Parts $1,053,800 $ 575,000 $239,700

Direct labor 344,000 303,000 123,000

Setup activity $1,310 20 26,200 60 78,600 120 157,200

Assembly activity 203 1,000 203,000 1,800 365,400 1,200 243,600

Total $1,627,000 $1,322,000 $763,500

Displays 100,000 50,000 15,000

Cost per display $16.27 $26.44 $50.90

12-38 (20-25 min.)

1. Annual costs for 24,000 miles: Fixed $ 4,800

Variable ($.30 × 24,000) 7,200

$12,000

Cost per mile = $12,000 ÷ 24,000 miles = $.50 per mile

2. Two factors caused the April allocation of $.90 per mile to exceed the average of $.50 per mile:

(1) The motor pool's operating inefficiencies are passed on to the user departments. The cost of 50,000 miles in April should have been [($4,800 ÷ 12 months) × 50 autos] + ($.30 × 50,000 miles) = $20,000 + $15,000 = $35,000. Therefore, ($45,000 - $35,000) = $10,000 of "unnecessary" cost was assigned to user departments, which is $10,000 ÷ 50,000 miles = $.20 per mile.

(2) April was a month of low general usage. In an average month, 100,000 miles are driven (2,000 miles per auto), and the fixed cost per mile is ($4,800 ÷ 12 months) ÷ 2,000 miles = $400 ÷ 2,000 miles = $.20 per mile. In April the $400 fixed cost of each auto was spread over only 1,000 miles, so fixed cost per mile was $400 ÷ 1,000 = $.40 per mile. This factor accounts for an extra $.20 per mile.

3. Undesirable behavioral effects include:

(a) The total actual motor pool cost is allocated. The manager is not motivated to control these costs.

(b) Allocated costs are affected by auto usage in other departments. A department is better off if its auto usage happens to fall in a month when other departments have high mileage.

(c) Decisions about whether driving another mile is worth its cost are not appropriately made. The city incurs only $.30 more expense for an additional mile, but departments are charged more.

(d) The cost allocation is affected only by miles driven, not number of autos assigned to a department. A department with two autos each being driven 15,000 miles per year is allocated the same cost as one with one auto driven 30,000 miles per year. But each auto causes the same average fixed costs, so fixed costs should be allocated on the basis of number of autos rather than miles driven. This may be the reason the city planner was continually concerned with her auto costs. Her department's autos were driven an average of 3,000 miles per month, but the city's average was only 2,000 miles. Because both fixed and variable costs are allocated on a per-mile basis, her department's autos are allocated more fixed cost than the average auto in the city. If fixed costs were allocated on the basis of number of autos, each auto would be charged $400 per month. This becomes ($400 ÷ 3,000) = $.13 per mile for the city planner's autos compared to ($400 ÷ 2,000) = $.20 for the average auto in the city.

4. Two basic principles should be applied:

(a) Allocate budgeted, not actual, costs. Inefficiencies of the motor pool should not be passed on to user departments.

(b) Separate costs into fixed and variable cost pools. The fixed costs should be allocated on the basis of number of autos assigned to a department or long-run predicted use of autos. Variable costs are appropriately assigned on a per-mile-driven basis.

This cost-allocation method illustrates why the city planner has a legitimate complaint. In April she paid $.20 per mile extra because of motor pool inefficiency, $.13 per mile extra because other departments had light usage in April, and $.07 per mile extra because fixed costs are charged on a per-mile basis rather than a per-auto basis.

12-39 (20-30 min.)

1. Actual costs $750,000 + $.80(500,000) = $1,150,000

### Rate per thousand ton-miles\* $1,125,000 ÷ 500,000 = $2.30

### To East 250,000 × $2.30 = $575,000

### To West 250,000 × $2.30 = $575,000

\*Rate is per thousand net ton-miles

### 2. Actual costs $750,000 + $.80(400,000) = $1,070,000

### Rate per thousand ton-miles $1,070,000 ÷ 400,000 = $2.675

### To East 150,000 × $2.675 = $401,250

### To West 250,000 × $2.675 = $668,750

Note that West’s costs increased from $575,000 to $668,750 or 16.3%, solely because East’s volume declined.

3. Rate per thousand ton-miles $1,250,000 ÷ 500,000 = $2.50

To East 250,000 × $2.50 = $625,000

To West 250,000 × $2.50 = $625,000

Such allocation seems unjustified because the operating departments have to bear another department’s cost of inefficiency. Note that the use of a predetermined or budgeted total amount geared to the various levels of activity of the operating departments would eliminate this difficulty. For example, the $2.30 rate of part (1) would be used here despite the excess of actual costs over budgeted costs.

4. Basic maximum capacity:

360,000 + 240,000 = 600,000 ton miles.

Fixed costs: East West

To East, 36/60 × $750,000 $450,000 -

To West, 24/60 × $750,000 - $300,000

Variable costs:

To East, $.80 × 150,000 120,000 -

To West, $.80 × 250,000 - 200,000

Total costs $570,000 $500,000

Note that East’s costs are $570,000 rather than the $401,250 in part (2).

This method has the following advantages:

a. The use of a predetermined unit rate for variable costs prevents the total charges from being affected by the efficiency of price changes of the service department.

b. The use of a predetermined lump-sum for fixed costs prevents the total charges from being affected by the consumption of service or the activity levels of other operating departments or the activity level of the service department.

12-40 (25-30 min.)

There a several ways to organize an analysis that provides product costs. We like to focus first on determining total activity-cost pools and activity cost per driver unit. Then, an analysis similar to the one shown in Exhibit 12-8 on page 494 can be used.

Schedule a: Activity center cost pools

Resources Supporting the Allocated

Setup/Maintenance Activity Center Allocation Calculation Cost

Assembly supervisors $90,000 × 3% $ 2,700

Assembly machines $247,000 × (400 ÷ 1,900) 52,000

Facilities management $95,000 × (400 ÷ 1,900) 20,000

Power $54,000 × (10 ÷ 90) 6,000

Total assigned cost $80,700

Cost per driver unit (setup) $80,700 ÷ 40 $2,017.50

Resources Supporting the Allocated

Assembly Activity Center Allocation Calculation Cost

Assembly supervisors $90,000 × 97% $ 87,300

Assembly machines $247,000 × (1,500 ÷ 1,900) 195,000

Facilities management $95,000 × (1,500 ÷ 1,900) 75,000

Power $54,000 × (80 ÷ 90) 48,000

Total assigned cost $405,300

Cost per driver unit (machine hour) $405,300 ÷ 1,500 $ 270.20

Exhibit 12-40 Contribution to cover other value-chain costs by product

Schedule b: Gross profit Standard Deluxe Custom

Cost per

Driver unit Driver Driver Driver

Activity/Resource (Schedule a) Units Cost Units Cost Units Cost

Setup/Maintenance $2,017.50 20 $ 40,350 12 $ 24,210 8 $ 16,140

Assembly $ 270.20 1,000 270,200 400 108,080 100 27,020

Parts 1,003,800 115,080 15,980

Direct labor 298,000 72,000 68,000

Total $1,612,350 $319,370 $127,140

Units 100,000 10,000 1,000

Cost per display $16.1235 $31.937 $127.14

Selling price 20.0000 50.000 250.00

Unit gross profit $ 3.8765 $18.063 $122.86

Total gross profit $387,650 $180,630 $122,860

The total contribution of these products is $387,650 + $180,630 + $122,86 = $691,140.

12-41 (10-15 min.)

Customer Type 1 Customer Type 2

Gross Profit Units Units

per Unit Sold Gross Profit Sold Gross Profit

Standard display $ 3.8765 75,000 $290,738 25,000 $ 96,912

Deluxe display 18.063 5,000 90,315 5,000 90,315

Custom display 122.860 0 0 1,000 122,860

Total $381,053 $310,087

12-42 (15-20 min.)

1.

Footwear Equipment

Sales ($460 × 2,800; $800 × 2,000) $1,288,000 $1,600,000

Cost of sales:

Purchase cost ($70 × 2,800; $120 × 2,000) 196,000 240,000

Indirect cost 630,000 1 750,000 2

826,000 990,000

Gross product margin $ 462,000 $ 610,000

1 $1,380,000 ÷ (18.75 × 2,800 + 31.25 × 2,000) = $12.00 per pound. The allocation to footwear is $12 × 2,800 × 18.75 = $630,000.

2 $12 per pound × 31.25 × 2,000 = $750,000

2. Gross margin per case:

Footwear, $462,000 ÷ 2,800 = $165

Equipment, $610,000 ÷ 2,000 = $305

Specialty Stores Department Stores

Gross Margin, Footwear\* $198,000 $264,000

Gross margin, Equipment \*\* 122,000 488,000

Total gross margin $320,000 $752,000

\*$165 × 1,200 = $198,000; $165 × 1,600 = $264,000

\*\*$305 × 400 = $122,000; $305 × 1,600 = $488,000

3. The gross margin per case of equipment is much larger so more emphasis should be placed on equipment sales, especially at specialty stores.

12-43 (25-30 min.)

1. Footwear Equipment

Sales ($460 × 2,800; $800 × 2,000) $1,288,000 $1,600,000

Cost of sales

Purchase cost ($70 × 2,800; $120 × 2,000) 196,000 240,000

Indirect cost 378,000 1 450,000 2

574,000 690,000

Product gross margin $ 714,000 $ 910,000

1 ($1,380,000 - $552,000) ÷ (18.75 × 2,800 + 31.25 × 2,000) = $7.20 per pound. The allocation to footwear is $7.20 × 2,800 × 18.75 = $378,000.

2 $7.20 per pound × 31.25 × 2,000 = $450,000

2.

Specialty Stores Department Stores

Footwear Equipment Footwear Equipment

Gross margin per case $255 1 $455 2 $255 $455

Cases 1,200 400 1600 1600

Product gross margin $306,000 $182,000 $408,000 $728,000

Customer gross margin $488,000 $1,136,000

Cost to serve 384,000 3 168,000 4

Customer profit margin $104,000 $968,000

Revenue $872,000 $2,016,000

Gross margin percentage 56.0% 56.3%

Cost-to-serve percentage 44.0% 8.3%

Customer profit percentage 11.9%5 48.0%

1 $714,000 ÷ 2,800

2 $910,000 ÷ 2,000

3 The cost per order = $552,000 ÷ (160 + 70) = $2,400. The allocation to specialty stores is 160 × $2,400 = $384,000.

4 $2,400 × 70 = $168,000

556.0% - 44.0% = 12.0%, which differs from 11.9% due to rounding error.Exhibit 12-43



3. Exhibit 12-43 depicts the profitability of both customer types as a function of product gross margin and the cost to serve. Note that both customers have about the same product profitability based on the mix of products they purchase. However, the cost to serve is dramatically different, resulting in significant differences in overall profitability. Specialty stores order 1,600 ÷ 160 = 10 cases per order compared to 3,200 ÷ 70 ≈ 46 cases per order by department stores.

Suggested strategies for profit improvement:

* Department stores are clearly generating most of the profit for TCS. The company should both protect this customer from inroads by competitors through its pricing strategy (discounts) and profile this customer type to see if it is possible to apply actions to specialty stores that would reduce their cost to serve.
* The cost to serve of specialty stores needs to be reduced. If there is a cause-effect relationship between number of orders and the cost to serve, actions should be taken to increase the order size.

4. A comparison of customer profitability based on the two treatments of the costs to serve is shown in the table below.

Treatment of Cost to Serve

As Product Cost As Customer Cost

(Problem 12-42) (Problem 12-43)

Specialty store profit $ 320,000 $ 104,000

Department store profit 752,000 968,000

Total TCS profit $1,072,000 $1,072,000

The difference in profitability is due to the use of orders rather than pounds purchased to allocate the $552,000 costs of the order-processing and customer-service activities. To the extent that orders is a more plausible and reliable cost driver (cost-allocation base), management should carefully evaluate their customer mix strategy. For example, the table below gives some food for thought.

Specialty Stores Department Stores

Percent of profit 19.9% 80.1%

Percent of cases sold 33.3 66.7

Percent of weight shipped (purchased) 30.4 69.6

Percent of orders 69.6 30.4

The percent of overall TCS profit for specialty stores is significantly lower than each of the non-financial metrics that drive costs.

12-44 (20-30 min.)

1. Basic long-run usage:

75 + 50 = 125 X-rays per month

Total costs incurred:

$14,000 + 100 X-rays ($30) = $17,000

Orthopedic Rehabilitation

Department Department

Fixed costs:

75/125 × $14,000 $ 8,400

50/125 × $14,000 $5,600

Variable costs:

50 × $30 1,500

50 × $30 1,500

Total allocated costs $9,900 $7,100

2. For budgetary control and motivation purposes, it is best not to allocate the $1,500 efficiency variance ($18,500 minus the $17,000 computed above). For cost recovery purposes, if reimbursement is based on actual costs, it should be allocated.

3. Orthopedic Rehabilitation

Department Department

Total costs incurred, $17,000:

50/100 × $17,000 $8,500

50/100 × $17,000 $8,500

The Rehabilitation Department bears $1,400 more costs than in part (1) despite the fact that its volume was exactly in accordance with its long-run average usage. In short, the Rehabilitation Department's costs have increased *solely* because of a fellow consumer's actions, not its own actions. The Orthopedic Department's failure to reach its predicted usage results in shifting $1,400 more fixed costs to the Rehabilitation Department.

A behavioral effect of this method would be toward more erratic scheduling (to the extent this discretion exists). For instance, if the Orthopedic Department had a relatively light month, it would be motivated toward not scheduling procedures during the final week and bunching them in the first week of the second month. In this way, its unit costs of the second month would be lowered.

4. Both the Orthopedic Department and the Rehabilitation Department would be induced to underestimate usage. Of course, if both play the same game, the final fraction borne by each would be little changed. One way to counteract these tendencies is to exert higher arbitrary cost allocations to both the Orthopedic and Rehabilitation Departments if they consistently exceed their predicted usage. Also, first priority on scarce resources can be extended to those consumers who are committed to the higher fractions.

12-45 (20-30 min.)

1. Materials

Receiving

Building and Traditional Electronic

Services Handling Pianos Pianos

Direct department costs

before allocation $1,500,000 $1,200,000 $6,800,000 $5,480,000

Building services (1,500,000) 1,000,000 500,000

Materials receiving

and handling (1,200,000) 400,000 800,000

Total costs after allocation $8,200,000 $6,780,000

Calculations:

50,000 + 25,000 = 75,000

(50,000 ÷ 75,000) × $1,500,000 = $1,000,000

(25,000 ÷ 75,000) × $1,500,000 = $500,000

No. of components: 100 × 8,000 = 800,000; 160 × 10,000 = 1,600,000

800,000 + 1,600,000 = 2,400,000

(800,000 ÷ 2,400,000) × $1,200,000 = $400,000

(1,600,000 ÷ 2,400,000) × $1,200,000 = $800,000

2. Traditional pianos:

$8,200,000 ÷ 30,000 hours = $273.333 per direct-labor hour

Electronic pianos:

$6,780,000 ÷ 1,600,000 components = $4.24 per component

3. Total cost = direct materials cost + manufacturing cost:

M1: $740 + ($273.333 × 3) = $740 + $1,093.32 = $1,560

M2: $860 + ($273.333 × 6) = $860 + 2,186.64 = $2,500

E1: $630 + ($ 4.24 × 100) = $630 + 424.00 = $1,054

E2: $910 + ($ 4.24 × 200) = $910 + 636.00 = $1,758

12-46 (20-30 min.)

1. Materials

Receiving

Building and Traditional Electronic

Services Handling Pianos Pianos

Direct department costs

before allocation $1,500,000 $ 1,200,000 $6,800,000 $5,480,000

Building services (1,500,000) 93,750 937,500 468,750

Materials receiving

and handling $(1,293,750) 431,250 862,500

Total costs after allocation $ 0 $ 0 $8,168,750 $6,811,250

Calculations:

5,000 + 50,000 + 25,000 = 80,000

(5 ÷ 80) × $1,500,000 = $93,750

(50 ÷ 80) × $1,500,000 = $937,500

(25 ÷ 80) × $1,500,000 = $468,750

No. of components: 100 × 8,000 = 800,000; 160 × 10,000 = 1,600,000

800,000 + 1,600,000 = 240,000

(800 ÷ 2,400) × $1,293,750 = $431,250

(1,600 ÷ 2,400) × $1,293,750 = $862,500

1. Traditional pianos:

$8,168,750 ÷ 30,000 hours = $272.29 per direct-labor hour

Electronic pianos:

$6,811,250 ÷ 1,600,000 components = $4.26 per component

3. Total cost = direct materials cost + manufacturing cost

M1: $740 + ($272.29 × 3) = $740 + $1,089.16 = $1,556.87

M2: $860 + ($272.29 × 6) = $860 + $2,178.32 = $2,493.74

E1: $630 + ($ 4.26 × 100) = $630 + $ 426.00 = $1,056.00

E2: $910 + ($ 4.26 × 200) = $910 + $ 639.00 = $1,762.00

12-47 (15-25 min.)

1. See Exhibit 12-47, Part 1.

2. See Exhibit 12-47, Part 2. Only the first column is required. However, the other two columns verify the following discussion.

The cost of the model 1 circuit boards decreases from ¥961,600 to ¥886,921, a decrease of ¥74,679. But because the decrease is due to a lower allocation and this is from fixed costs that do not change, the decrease is now allocated to models 2 and 3. The costs of models 2 and 3 increase to absorb the decrease in model 1 cost. So, why would Tokuga’s management want to implement this process improvement? Because the improved efficiencies will free up processing capacity in resources used for these two activities. The freed up capacity can be deployed to meet other needs such as an increase in demand. The total cost (¥6,120,000) of all three models does not change.

12-48 (25 min.)

1. Recording and record-keeping cost: $20.00 × 500 = $ 10,000

Labor cost: ($32,200 / 460,000) × 80,000 = 5,600

Inspection cost: $3.75 × 4,000 = 15,000

Total cost $30,600

2. Recording and record-keeping cost saving: $20.00 × 300 = $ 6,000

Labor cost saving: No savings; fixed cost \* 0

Inspection cost saving: $3.75 × 1,000 = 3,750

Total cost saving $9,750

\* Capacity is made available. If there is a profitable use of that capacity (that is, if the opportunity cost is not zero) a savings would result equal to the benefit from the use of the capacity.

3. Receiving cost per pound: $30,600 ÷ 80,000 = $.3825

Estimated cost saved from 20,000 pounds = $.3825 × 20,000 = $7,650

The company would have underestimated the savings by $9,750 - $7,650 = $2,100, and they may have continued to purchase and stock small-sales-level brands that are actually unprofitable.

Exhibit 12-47, Part 1

Model 1 Model 2 Model 3

Direct materials:

Model 1: ¥4,000 × 80 boards ¥320,000

Model 2: ¥6,000 × 160 boards ¥960,000

Model 3: ¥8,000 × 300 boards ¥2,400,000

Material handling activity1:

Model 1: ¥26 × 20 × 80 41,600

Model 2: ¥26 × 15 × 160 62,400

Model 3: ¥26 × 10 × 300 78,000

Assembly activity2:

Model 1: ¥67 × 40 × 80 214,400

Model 2: ¥67 × 30 × 160 321,600

Model 3: ¥67 × 16 × 300 321,600

Soldering activity3:

Model 1: ¥47 × 60 × 80 225,600

Model 2: ¥47 × 40 × 160 300,800

Model 3: ¥47 × 20 × 300 282,000

Quality assurance activity4:

Model 1: ¥400 × 5 × 80 160,000

Model 2: ¥400 × 3 × 160 192,000

Model 3: ¥400 × 2 × 300 240,000

Total cost for circuit boards ¥961,600 ¥1,836,800 ¥3,321,600

Cost per circuit board ¥ 12,020 ¥11,480 ¥11,072

1 ¥182,000 ÷ (80 × 20 + 160 × 15 + 300 × 10) = ¥26 per distinct part

2 ¥857,600 ÷ (80 × 40 + 160 × 30 + 300 × 16) = ¥67 per automatic insertion

3 ¥808,400 ÷ (80 × 60 + 160 × 40 + 300 × 20) = ¥47 per part

4 ¥592,000 ÷ (80 × 5 + 160 × 3 + 300 × 2) = ¥400 per minute

Exhibit 12-47, Part 2

Model 1 Model 2 Model 3

Direct materials:

Model 1: ¥4,000 × 80 boards ¥320,000

Model 2: ¥6,000 × 160 boards ¥960,000

Model 3: ¥8,000 × 300 boards ¥2,400,000

Material handling activity1:

Model 1: ¥30.13245 × 8 × 80 19,285

Model 2: ¥30.13245 × 15 × 160 72,318

Model 3: ¥30.13245 × 10 × 300 90,397

Assembly activity2

Model 1: ¥67 × 40 × 80 214,400

Model 2: ¥67 × 30 × 160 321,600

Model 3: ¥67 × 16 × 300 321,600

Soldering activity3:

Model 1: ¥47 × 60 × 80 225,600

Model 2: ¥47 × 40 × 160 300,800

Model 3: ¥47 × 20 × 300 282,000

Quality assurance activity4:

Model 1: ¥448.48485 × 3 × 80 107,636

Model 2: ¥448.48485 × 3 × 160 215,273

Model 3: ¥448.48485 × 2 × 300 269,091

Total cost for circuit boards ¥886,921 ¥1,869,991 ¥3,363,088

Cost per circuit board ¥11,087 ¥ 11,687 ¥11,210

1 ¥182,000÷ (80 × 8 + 160 × 15 + 300 × 10) = ¥30.13245 per distinct part

2 ¥857,600÷ (80 × 40 + 160 × 30 + 300 × 16) = ¥67 per automatic insertion

3 ¥808,400÷ (60 × 80 + 40 × 160 + 20 × 300) = ¥47 per part

4 ¥592,000÷ ( 3 × 80 + 3 × 160 + 2 × 300) = ¥448.48485 per minute

12-49 (20 min.)

1. Allocations are in millions:

Actual Allocated

Revenue Costs

Divisions:

Northeast $120 [(120 ÷ 600) × $30] = $ 6

Mid-Atlantic 220 [(220 ÷ 600) × $30] = 11

Southeast 260 [(260 ÷ 600) × $30] = 13

Total $600 $30

2. Northeast’s manager would probably be indifferent, Mid-Atlantic’s would be pleased, and Southeast’s would be displeased.

The major weakness of using revenue as a basis for cost allocation is that it often fails to portray underlying cause-and-effect relationships. The major point of this problem is to show how strange results occur when the costs being allocated to *a given* segment are dependent on the activity of some *other* segment. The Southeast Division may have done the most to reduce the unit cost of central services, but it is being charged with a heavier dose of common costs. Indeed, Mid-Atlantic may have received more rather than less attention because of its current competitive troubles.

Most of the central costs are discretionary. Pinpointing cause-and-effect relationships is hard. Such costs are usually predetermined by management fiat or by *budgeted* revenue.

Serious consideration should be given to one or more of the following:

a. No allocation, because no convincing allocation base is available.

b. Dividing the services into sub-categories and allocating by the use of several different cost drivers.

c. Using budgeted revenues rather than actual revenues as a cost driver for allocation. Of course, the use of budgeted revenues may induce more "gamesmanship" than is typically encountered during the budgetary process. There is a tendency to "under-budget" whenever a lower cost allocation will result.

3. Allocations are in millions:

Budgeted Allocated

Revenue Costs

Divisions:

Northeast $120 [(120 ÷ 640) × $30] = $ 5.625

Mid-Atlantic 240 [(240 ÷ 640) × $30] = 11.250

Southeast 280 [(280 ÷ 640) × $30] = 13.125

Total $640 $30.000

Many managers prefer this method because it portrays causes and effects somewhat better than in requirement (1). That is, at least the overall level of costs tend to be planned rather than just happen after the fact.

In requirement (1), the allocated costs were each 5% of *actual* revenue. However, in requirement (3), the allocation is predetermined, and therefore the percentages of actual revenue vary:

(1) (2) (3)

Actual Allocated Percentage

Revenue Costs (2) ÷ (1)

Divisions:

Northeast $120 $ 5.625 4.7%

Mid-Atlantic 220 11.250 5.1%

Southeast 260 13.125 5.0%

Total $600 $30.000

Note that Mid-Atlantic 's budgeted percentage would have been $11.25 ÷ $240 = 4.7%. The resultant deviation of the actual percentage (5.1%) from the budgeted percentage (4.7%) would highlight the effects of Mid-Atlantic's troubles.

4. Many accountants and managers oppose allocating any central costs when no convincing causes and effects can be established in any economically feasible way. The opponents of cost allocation feel that the managers of subunits will have better attitudes and will make better decisions if no allocation occurs.

12-50 (20-40 min.)

1. (a) The allocation of joint costs would be in a 1:5 ratio:

Product Product

A B Total

Sales value $2,000 $2,000 $4,000

Joint costs $400 $2,000 $2,400

Separable costs 700 400 1,100

Total costs $1,100 $2,400 $3,500

Operating profit $ 900 $ (400) $ 500

(b) No. Joint costs are not relevant for this decision because you cannot stop incurring that part allocated to one product and still continue to incur only the other part. If the total process is profitable, you should process any product that shows a positive contribution after the split-off point. Although Product B shows a book loss of $400, it has a contribution after the split-off point of $2,000 - $400, or $1,600.

2. (a) The relative sales value method deducts separable costs to arrive at an imputed sales value at split-off point:

A B Total

Sales value $2,000 $2,000 $4,000

Separable costs 700 400 1,100

Sales value imputed at split-off point $1,300 $1,600 $2,900

Allocation of joint cost, 1,300/2,900

and 1,600/2,900, respectively 1,076 1,324 2,400

Operating profit $ 224 $ 276 $ 500

(b) No. Product B does have the greater book profit and contribution after the split-off point, but Product A has the greatest contribution per pound, which is the scarce resource in this case. If, for example, the engineer changes the process by 40 pounds, so that we end up with 440 pounds of B and 40 pounds of A, separable costs would become $350 for A and $440 for B, totaling $790 (assuming separable costs are all variable). Sales values would become $1,000 for A and $2,200 for B, and total of $3,200. Total contribution after the split-off would drop from $2,900 to $2,410 and total profit would drop from $500 to $10.

A B Total

Pounds 40 440 480

Sales value $1,000 $2,200 $3,200

Separable costs 350 440 790

Contribution to joint costs $ 650 $1,760 $2,410

Joint costs 2,400

Operating profit $ 10

12-51 (100 – 200 min.)

1. Exhibits 12-51A and 12-51B show the calculation of customer gross margin percentage and customer cost-to-serve percentage for the 4 customer types. Exhibit 12-51C shows a plot of customer gross margin percentage versus customer cost-to-serve percentage for the 4 customer types.

2. Suggested strategies for profit improvement for the 4 customer types follow.

* Customer type 1 - Mega stores. These stores have the lowest cost-to-serve. Profitability can be improved by focusing on a better product mix. A quarter of the sales (cases) to these stores are from bulk and singles products – both of which have a negative gross margin. A shift in mix towards more regular and fragile product types would improve profitability.
* Customer type 2 – Local small stores. These stores have a product mix that contains a substantial amount (32%) of the negative gross margin products. The same change in sales focus that applies to mega stores can be applied to local small stores.

But unlike mega stores, small stores are very costly to serve. From Exhibit 12-51 B, the largest single cost to serve local small stores is truck deliveries. The average number of cases per order (the same as per truck delivery) is 6,000,000 ÷ 80,000 = 75. Compare this to mega stores that average 7,680,000 ÷ 32,000 = 240 cases per order (delivery). This is a significant factor causing the high cost-to-serve.

For example, suppose that the average order size could be increased from 75,000 to 150,000 cases. If the total annual cases sold is unchanged (6,000,000), a total of 40 orders, a 50% reduction, would be made. An estimate of the cost savings and the impact on the cost-to-serve percentage can be made as follows:

Cost per Driver Unit Reduction in Driver Cost Savings

(Exhibit 12-51B) Units of 50% (000)

Truck delivery $167.55 34,000 $5,696.70

Order processing 27.49 40,000 1,099.60

Regular scheduling 5.83 36,000 209.88

Expedited scheduling 19.44 4,000 77.76

Total cost savings (000) $7,083.94

Cost savings as a percent of revenue 24.9%

New cost-to-serve as a percent of revenue 60.1%

In addition to the above savings, other activities would also be impacted by the reduction in orders such as customer service. So while the total impact of focusing on increasing order size can only be estimated, it is reasonable to expect dramatic cost savings from the current 85% of revenue.

Other factors that should be investigated include the high level of corporate support and customer service.

* Customer type 3 – Local large stores. Local large stores generate $68,400 ÷ $136,230 = 50% of DSI’s total revenue and with a net margin of 58% - 47% = 11%. The key to local large store profitability is sales of a large percentage (80%) of regular product. The cost-to-serve percentage is 47%. This could be reduced as for customer type 2 by increasing the order size from the current level of 14,400,000 ÷ 120,000 = 120 cases per order. But a dramatic improvement should not be expected. In general, local large stores are sustaining DSI’s business and their loyalty should be cultivated.
* Customer type 4 – Specialty stores. Specialty stores have a low gross margin of 22% coupled with a very large cost-to-serve percent of 106%! Although these stores do not account for a significant portion of DSI’s revenue the company should rationalize their business. Several actions could be suggested. One is to charge a premium for all high-security products. The vast majority of these products are sold to specialty stores with only marginal sales to mega and local small stores. Another action is to adopt a customer loyalty program based on volume of sales. The list price of $7.25 per case would apply to customers with sales volumes less than a specified level. Most of DSI’s customers would qualify for discounts (similar to those currently existing) so prices would not be significantly different. For specialty stores, prices would increase dramatically. This may result in losing specialty-store business so DSI needs to decide is this is a direction they wish to consider.

Exhibit 12-51A (Units and dollars are in thousands.)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Customer Type |  | | | | | | | | |
| Product | Regular | Short | Fragile | Bulk | High Security | Singles | Total | Gross Profit Percentage |
| 1 | Product mix percentage | 60% | 5% | 5% | 20% | 5% | 5% | 100% | 35% |
| Cases sold | 4,608 | 384 | 384 | 1,536 | 384 | 384 | 7,680 |
| Total Revenue @ 4.75/case | $ 21,888 | $ 1,824 | $ 1,824 | $7,296 | $ 1,824 | $ 1,824 | $36,480 |
| Gross Profit per Case | $ 3.28 | $ 1.58 | $ 2.74 | $(1.44) | $ 0.54 | $ (5.30) |  |
| Total Gross Profit | $ 15,114 | $ 607 | $ 1,052 | $(2,212) | $ 207 | $(2,035) | $12,733 |
| 2 | Product mix percentage | 50% | 5% | 5% | 30% | 8% | 2% | 100% | 29% |
| Cases sold | 3,000 | 300 | 300 | 1,800 | 480 | 120 | 6,000 |
| Total Revenue @ 4.75/case | $ 14,250 | $ 1,425 | $ 1,425 | $ 8,550 | $ 2,280 | $ 570 | $28,500 |
| Gross Profit per Case | $ 3.28 | $ 1.58 | $ 2.74 | $ (1.44) | $ 0.54 | $ (5.30) |  |
| Total Gross Profit | $ 9,840 | $ 474 | $ 822 | $(2,592) | $ 259 | $ (636) | $ 8,167 |
| 3 | Product mix percentage | 80% | 0% | 10% | 10% | 0% | 0% | 100% | 58% |
| Cases sold | 11,520 | - | 1,440 | 1,440 | - | - | 14,400 |
| Total Revenue @ 4.75/case | $ 54,720 | $ - | $ 6,840 | $ 6,840 | $ - | $ - | $68,400 |
| Gross Profit per Case | $ 3.28 | $ 1.58 | $ 2.74 | $ (1.44) | $ 0.54 | $ (5.30) |  |
| Total Gross Profit | $ 37,786 | $ - | $ 3,946 | $(2,074) | $ - | $ - | $39,658 |
| 4 | Product mix percentage | 10% | 20% | 0% | 0% | 70% | 0% | 100% | 22% |
| Cases sold | 60 | 120 | - | - | 420 | - | 600 |
| Total Revenue @ 4.75/case | $ 285 | $ 570 | $ - | $ - | $ 1,995 | $ - | $ 2,850 |
| Gross Profit per Case | $ 3.28 | $ 1.58 | $ 2.74 | $ (1.44) | $ 0.54 | $ (5.30) |  |
| Total Gross Profit | $ 197 | $ 190 | $ - | $ - | $ 227 | $ - | $ 613 |

Exhibit 12-51B (Units and dollars are in thousands.)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Customer Type | Activity | Order Processing | Customer Service | Order  Changes | Corporate Support | Regular Scheduling | Expedited Scheduling | Shipping | Truck  Delivery | Parcel Delivery | Total |
| Cost Driver | Orders | Labor Hours | Number of Changes | Labor Hours | Orders | Orders | Pallets | Deliveries | Deliveries |
| Cost/Driver Unit | $27.49 | $43.34 | $32.63 | $51.66 | $5.83 | $19.44 | $6.60 | $167.55 | $23.89 |
| 1 | Driver Units | 32 | 18.7 | 3.2 | - | 29 | 3 | 416 | 25.6 | 1.6 |  |
| Cost to Serve | $879.68 | $810.46 | $104.42 | - | $169.07 | $58.32 | $2,745.6 | $4,289.28 | $38.22 | $9,095.05 |
| Revenue (See Exhibit 12-51A) | | | | | | | | | | $36,480.00 |
| Cost-to-Serve Percentage | | | | | | | | | | 24.9% |
| 2 | Driver Units | 80 | 100 | 8 | 20 | 72 | 8 | 640 | 68 | 8 |  |
| Cost to Serve | $2,199.2 | $4,334 | $261.04 | $1,033.2 | $419.76 | $155.52 | $4,224 | $11,393.4 | $191.12 | $24,211.24 |
| Revenue (See Exhibit 12-51A) | | | | | | | | | | $28,500.00 |
| Cost-to-Serve Percentage | | | | | | | | | | 85.0% |

Exhibit 12-51B (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Customer Type | Activity | Order Processing | Customer Service | Order  Changes | Corporate Support | Regular Scheduling | Expedited Scheduling | Shipping | Truck  Delivery | Parcel Delivery | Total |
| Cost Driver | Orders | Labor Hours | Number of Changes | Labor Hours | Orders | Orders | Pallets | Deliveries | Deliveries |
| Cost/Driver Unit | $27.49 | $43.34 | $32.63 | $51.66 | $5.83 | $19.44 | $6.60 | $167.55 | $23.89 |
| 3 | Driver Units | 120 | 70 | 2.4 | 80 | 108 | 12 | 840 | 90 | 6 |  |
| Cost to Serve | $3,298.8 | $3,033.8 | $78.31 | $4,132.8 | $629.64 | $233.28 | $5,544 | $15,079.5 | $143.34 | $32,173.47 |
| Revenue (See Exhibit 12-51A) | | | | | | | | | | $68,400.00 |
| Cost-to-Serve Percentage | | | | | | | | | | 47.0% |
| 4 | Driver Units | 12 | 30 | 1.2 | 0 | 10 | 2 | 60 | 4.8 | 2.4 |  |
| Cost to Serve | $329.88 | $1,300.2 | $39.16 | - | $58.3 | $38.88 | $396 | $804.24 | $57.34 | $3,023.99 |
| Revenue (See Exhibit 12-51A) | | | | | | | | | | $2,850.00 |
| Cost-to-Serve Percentage | | | | | | | | | | 106.1% |

Exhibit 12-51C



12-52 (50-60 min.)

1. Systems Claims

Department Claims Department

First Department First

Quarter Historical Quarter

Budget Usage Budget

Hardware and other

capacity-related costs $150,000 50% $ 75,000

Software development 141,750 40 56,700

Computer-related operations 189,000 15 28,350

Input/output-related operations 75,600 75 56,700

$556,350 $216,750

2. Solution is in Exhibit 12-52.

3. a. The new charging system should improve cost control in the Systems Department (if the rates are valid) because inefficiencies can no longer be passed on to the user departments. Thus, the Systems Department would be forced to watch its costs closely.

b. The recommended system for charging costs to user departments should improve planning and cost control in the user departments. Decisions that affect capacity-related costs will affect the allocation of those costs, while decisions affecting only short-run operating costs will affect the allocation of only the operating costs.

EXHIBIT 12-52

Total

First Quarter

Systems Allocated

Department Not Department

Costs Allocated Total Records Claims Finance Outside

Hardware and other capacity-

related costs $155,000 $ 5,000 $150,000 $ 37,500 (1) $ 75,000 (2) $ 30,000 (3) $ 7,500 (4)

Software development 130,000 2,500 127,500 13,500 (5) 54,000 (6) 48,000 (7) 12,000 (8)

Computer-related operations 187,000 3,000 184,000 108,000 (9) 38,800 (10) 25,200 (11) 12,000 (12)

Input-output-related operations 78,000 (1,000) 79,000 15,400 (13) 55,400 (14) 4,100 (15) 4,100 (16)

$550,000 $ 9,500 $540,500 $174,400 $223,200 $107,300 $35,600

(1) $150,000 × .25 (5) $30 × 450 (9) $200 × 540 (13) $10 × 1,540

(2) $150,000 × .50 (6) $30 × 1,800 (10) $200 × 194 (14) $10 × 5,540

(3) $150,000 × .20 (7) $30 × 1,600 (11) $200 × 126 (15) $10 × 410

(4) $150,000 × .05 (8) $30 × 400 (12) $200 × 60 (16) $10 × 410

12-53 (15-20 min.) Amounts are in millions.

Earnings

Earnings Allocation After

Before of Allocation of

Corporate Corporate Corporate

Region Revenues Expenses Expenses Expenses

North America $ 7,578 $1,750 $325 $1,425

Western Europe 3,810 721 163 558

Central & Eastern Europe 1,031 233 44 189

Greater China 2,060 777 88 689

Japan 766 114 33 81

Emerging Economies 2,736 688 117 571

Total $17,981 $4,284 $771 $3,512

Allocating corporate expenses based on revenues is an allocation based on ability-to-bear, not cause-and-effect. Such allocations are not generally useful for decisions. If the allocation had made the earnings after allocation of corporate expenses negative, that still would not indicate that Nike would be better without selling to the region.

12-54 (40-35 min.) For the solution to this Excel Application Exercise, follow the step-by-step instructions provided in the textbook chapter.

1. Residential = $305,500

Commercial = $504,500

2. Residential = $305,250

3. Commercial = $504,750

4. In this case there is little difference between the two methods, so the less costly direct method may be preferred. In general, if there is a difference in the allocations, the step-down method tends to be more accurate.

12-55 (100 min. or more)

The purposes of this exercise are to conduct library research in the current management accounting literature and to gain a better understanding of activity-based costing and activity-based management. Students must find their own article on ABC or ABM, and this will test their skills with library searches. Using electronic search procedures is likely to be a time-saver, but names of journals are given so that someone could just browse the library holdings of one of the journals to find an appropriate article.

Textbooks are limited in the space they can devote to stories about actual cost-accounting systems. This exercise requires students to deal with real-world issues relating to ABC or ABM. All applications of ABC or ABM are not successful, either because it was not an appropriate techniques where applied or because of mistakes in implementation. Although the literature will be dominated by success stories (companies do not often advertise their failures), by looking at several companies who have implemented ABC or ABM, students should be able to make some of the generalizations called for in requirement 2. By sharing information among group members, students should get a broader perspective on ABC and ABM than they would get from reading a single article.

12-56 (30-40 min.) NOTE TO INSTRUCTOR: This solution is based on the web site as it was in late 2012. Be sure to examine the current web site before assigning this problem, as the information there may have changed.

1. Sears Holdings consists of Kmart and Sears stores. Sears and Kmart operate over 2,600 stores in the United States and Canada. The number of these companies listed in an area will be specific to the location of the school but in most cases both companies should operate close to the student.

2. In footnote 17 to the financial statement in the 10K report for 2011, the company reports revenue, operating costs and expenses, operating profits (loss), total assets, and capital expenditures for three segments: Kmart, Sears Domestic, and Sears Canada. All three segments had an operating loss in 2011, and the sum of the operating losses was $1,501 million. The operating loss on the 2011 income statement is also $1,501 million. Because these amounts are the same, for financial reporting purposes the company must allocate 100% of its operating expenses to segments – including 100% of the company-wide operating expenses and 100% selling and administrative expenses.

3. The percent of selling and administrative costs allocated to segments with different cost-allocation bases is:

Cost-Allocation Base Kmart Sears Domestic Sears Canada

Actual “bases” used3,371 ÷ 10,664 = 32% 6,042 ÷ 10,664 = 57% 1,251 ÷ 10,664 = 12%

Revenue 15,285 ÷ 41,567 = 37% 21,649 ÷ 41,567 = 52% 4,633 ÷ 41,567 = 11%

Total assets 4,548 ÷ 21,381 = 21% 13,913 ÷ 21,381 = 65% 2,920 ÷ 21,381 = 14%

Yes, allocations based on revenue and total assets differ from the actual bases used. Sears Holdings uses more than one cost-allocation base, so we have imputed the average allocation rate from the amount of the allocations given. Allocations based on revenue would allocate more selling and administrative costs to Kmart and less to Sears Domestic. Allocations based on total assets would be the opposite – Sears Domestic would be allocated more selling and administrative costs and Kmart would be allocated less. The allocations to Sears Canada would vary slightly, but not as much as those to Kmart and Sears Domestic.