

## **CHAPTER 14**

### **COST ALLOCATION**

**14-1** Disagree. Cost accounting data plays a key role in many management planning and control decisions. The division president will be able to make better operating and strategy decisions by being involved in key decisions about cost pools and cost allocation bases.

**14-2** The salary of a plant security guard would be a direct cost when the cost object is the security department of the plant. It would be an indirect cost when the cost object is a product.

**14-3** Exhibit 14-1 outlines four purposes for allocating costs:

1. To provide information for economic decisions.
2. To motivate managers and employees.
3. To justify costs or compute reimbursement.
4. To measure income and assets for reporting to external parties.

**14-4** Exhibit 14-2 lists four criteria used to guide cost allocation decisions:

1. Cause and effect.
2. Benefits received.
3. Fairness or equity.
4. Ability to bear.

Either the cause-and-effect criterion or the benefits-received criterion is the dominant one when the purpose of the allocation is related to the economic decision purpose or the motivation purpose.

**14-5** The cause-and-effect criterion is the primary one in activity-based costing (ABC) applications. ABC systems use the concept of a cost hierarchy to identify the cost drivers that best demonstrate the cause-and effect relationship between each activity and the costs in the related cost pool. The cost drivers are then chosen as cost-allocation bases.

**14-6** A cost-hierarchy approach results in a better understanding of the causes of costs being incurred. A cost-hierarchy also facilitates implementing a performance evaluation approach based on controllability.

**14-7** Three decisions managers face when designing the indirect cost-allocation component of an accounting system are:

- a. Which cost items should be included in the indirect cost pools?
- b. How many indirect cost pools should be used?
- c. Which allocation base should be used for each indirect cost pool?

**14-8** The chapter gives the following examples of bases used to allocate corporate cost pools to the operating divisions of an organization:

Treasury costs—allocated using cost of new assembly equipment.

Corporate human resource management costs—allocated using salary and labor costs of divisions.

Corporate administration costs—allocated using division administration costs.

**14-9** The use of budgeted indirect cost allocation rates rather than actual indirect rates has several attractive features to the manager of a user department:

- a. the user knows the costs in advance and can factor them into ongoing operating choices, and
- b. inefficiencies at the department providing the service do not affect the costs allocated to the user department.

**14-10** Disagree. Allocating costs on "the basis of estimated long-run use by user department managers" means department managers can lower their cost allocations by deliberately underestimating their long-run use.

**14-11** The three methods differ in how they recognize reciprocal services among support departments:

- a. The *direct allocation method* ignores any services rendered by one support department to another; it allocates each support department's costs directly to the operating departments.
- b. The *step-down allocation* method allows for partial recognition of services rendered by support departments to other support departments.
- c. The *reciprocal allocation method* allocates costs by explicitly including the mutual services provided among all support departments.

**14-12** The *reciprocal method* is theoretically the most defensible method because it explicitly recognizes the mutual services provided among all departments, irrespective of whether those departments are operating or support departments.

**14-13** The *stand-alone cost-allocation method* uses information pertaining to each user of a cost object as a separate entity to determine the cost-allocation weights.

The *incremental cost-allocation method* ranks the individual users of a cost object and then uses this ranking to allocate costs among those users. The first-ranked user of the cost object is termed the primary party and is allocated costs up to the costs it would have incurred as a stand-alone user.

**14-14** All contracts with U.S. government agencies must comply with cost accounting standards issued by the Cost Accounting Standards Board (CASB).

**14-15** Areas of dispute between contracting parties can be reduced by making the “rules of the game” explicit and in writing at the time the contract is signed.

**14-16** (15-20 min.) **Cost allocation in hospitals, alternative allocation criteria.**

1. Direct costs = \$2.40
- Indirect costs = \$11.52 – \$2.40 = \$9.12
- Overhead rate =  $\frac{\$9.12}{\$2.40} = 380\%$

2. The answers here are less than clear-cut in some cases.

<b>Overhead Cost Item</b>	<b>Allocation Criteria</b>
Processing of paperwork for purchase	Cause and effect
Supplies room management fee	Benefits received
Operating-room and patient-room handling charge	Cause and effect
Administrative hospital costs	Benefits received
University teaching-related costs	Ability to bear
Malpractice insurance costs	Ability to bear or benefits received
Costing of treating uninsured patients	Ability to bear
Profit component	None. This is not a cost.

3. Assuming that Meltzer's insurance company is responsible for paying the \$4,800 bill, Meltzer probably can only express outrage at the amount of the bill. The point of this question is to note that even if Meltzer objects strongly to one or more overhead items, it is his insurance company that likely has the greater incentive to challenge the bill. Individual patients have very little power in the medical arena. In contrast, insurance companies have considerable power and may decide that certain costs are not reimbursable—for example, the costs of treating uninsured patients.

One student commented that Meltzer is best advised to avoid subsequent visits to Sierra University Hospital by becoming a better skier.

**14-17** (15–20 min.) **Single-rate versus dual-rate cost-allocation methods.**

1. The total costs in the single-cost pool are fixed (\$1,000,000) and variable (\$2,000,000) = \$3,000,000. Carolina Power could use one of two allocation bases (budgeted usage or actual usage) given the information provided.

- Allocation to Charlotte based on budgeted usage:  $(60/200) \times \$3,000,000 = \$900,000$
- Allocation to Charlotte based on actual usage:  $(120/240) \times \$3,000,000 = \$1,500,000$

2. Using the dual-rate method (with separate fixed and variable cost pools), several combinations of the budgeted and actual usage allocation bases are possible:

Fixed Cost Pool: Total costs of \$1,000,000:

- Allocation to Charlotte based on budgeted usage:  $(60/200) \times \$1,000,000 = \$300,000$
  - Allocation to Charlotte based on actual usage:  $(120/240) \times \$1,000,000 = \$500,000$
- Variable-Cost Pool: Total costs of \$2,000,000:
- Allocation to Charlotte based on budgeted usage:  $(60/200) \times \$2,000,000 = \$600,000$
  - Allocation to Charlotte based on actual usage:  $(120/240) \times \$2,000,000 = \$1,000,000$

The combinations possible are:

<b>Combination</b>	<b>Fixed-Cost Pool</b>	<b>Variable-Cost Pool</b>	<b>Allocation Function</b>
I	Budgeted Usage	Budgeted Usage	= \$300,000 + \$600,000 = \$900,000
II	Budgeted Usage	Actual Usage	= \$300,000 + \$1,000,000 = \$1,300,000
III	Actual Usage	Budgeted Usage	= \$500,000 + \$600,000 = \$1,100,000
IV	Actual Usage	Actual Usage	= \$500,000 + \$1,000,000 = \$1,500,000

Combinations I and IV give the same cost allocations as in requirement 1. Combination II is a frequently used dual-rate method. The fixed costs are allocated using budgeted usage on the rationale that it better captures the cost of providing capacity. The variable costs are allocated using actual usage on a cause-and-effect rationale. Combination III is rarely encountered in practice.

**14-18** (20 min.) **Single-rate versus dual-rate allocation methods, support department.**

Bases available (kilowatt hours):

	<b>Rockford</b>	<b>Peoria</b>	<b>Hammond</b>	<b>Kankakee</b>	<b>Total</b>
Practical capacity	10,000	20,000	12,000	8,000	50,000
Expected monthly usage	8,000	9,000	7,000	6,000	30,000

1. a. Single-rate method based on practical capacity:

$$\begin{aligned}
 \text{Total costs in pool} &= \$6,000 + \$9,000 = \$15,000 \\
 \text{Practical capacity} &= 50,000 \text{ kilowatt hours} \\
 \text{Allocation rate} &= \$15,000 \div 50,000 = \$0.30 \text{ per hour of capacity}
 \end{aligned}$$

	<b>Rockford</b>	<b>Peoria</b>	<b>Hammond</b>	<b>Kankakee</b>	<b>Total</b>
Practical capacity in hours	10,000	20,000	12,000	8,000	50,000
Costs allocated at \$0.30 per hour	\$3,000	\$6,000	\$3,600	\$2,400	\$15,000

b. Single-rate method based on expected monthly usage:

$$\begin{aligned}
 \text{Total costs in pool} &= \$6,000 + \$9,000 = \$15,000 \\
 \text{Expected usage} &= 30,000 \text{ kilowatt hours} \\
 \text{Allocation rate} &= \$15,000 \div 30,000 = \$0.50 \text{ per hour of expected usage}
 \end{aligned}$$

	<b>Rockford</b>	<b>Peoria</b>	<b>Hammond</b>	<b>Kankakee</b>	<b>Total</b>
Expected monthly usage in hours	8,000	9,000	7,000	6,000	30,000
Costs allocated at \$0.50 per hour	\$4,000	\$4,500	\$3,500	\$3,000	\$15,000

**14-18 (Cont'd.)**

2. Variable-Cost Pool:

Total costs in pool	=	\$6,000
Expected usage	=	30,000 kilowatt hours
Allocation rate	=	\$0.20 per hour of expected usage

Fixed-Cost Pool:

Total costs in pool	=	\$9,000
Practical capacity	=	50,000 kilowatt hours
Allocation rate	=	\$0.18 per hour of capacity

	<b>Rockford</b>	<b>Peoria</b>	<b>Hammond</b>	<b>Kankakee</b>	<b>Total</b>
Variable-cost pool	\$1,600	\$1,800	\$1,400	\$1,200	\$ 6,000
Fixed-cost pool	<u>1,800</u>	<u>3,600</u>	<u>2,160</u>	<u>1,440</u>	<u>9,000</u>
Total	<u>\$3,400</u>	<u>\$5,400</u>	<u>\$3,560</u>	<u>\$2,640</u>	<u>\$15,000</u>

The dual-rate method permits a more refined allocation of the power department costs; it permits the use of different allocation bases for different cost pools. The fixed costs result from decisions most likely associated with the practical capacity level. The variable costs result from decisions most likely associated with monthly usage.

**14-19** (30 min.) **Cost allocation to divisions.**

1.

	<u>Hotel</u>	<u>Restaurant</u>	<u>Casino</u>	<u>Rembrandt</u>
Revenue	\$16,425,000	\$5,256,000	\$12,340,000	\$34,021,000
Direct costs	<u>9,819,260</u>	<u>3,749,172</u>	<u>4,284,768</u>	<u>17,853,200</u>
Segment margin	<u>\$ 6,605,740</u>	<u>\$1,506,828</u>	<u>\$ 8,055,232</u>	16,167,800
Indirect costs				<u>14,550,000</u>
Income before taxes				<u>\$ 1,617,800</u>
Segment margin %	40.22%	28.67%	65.28%	

2.

	<u>Hotel</u>	<u>Restaurant</u>	<u>Casino</u>	<u>Rembrandt</u>
Direct Costs	\$9,819,260	\$3,749,172	\$4,284,768	\$17,853,200
Direct cost %	55.00%	21.00%	24.00%	100.00%
Square Footage	80,000	16,000	64,000	160,000
Square Footage %	50.00%	10.00%	40.00%	100.00%
# of Employees	200	50	250	500
# of Employees %	40.00%	10.00%	50.00%	100.00%

A: Cost allocation based on direct costs:

	<u>Hotel</u>	<u>Restaurant</u>	<u>Casino</u>	<u>Rembrandt</u>
Revenue	\$16,425,000	\$5,256,000	\$12,340,000	\$34,021,000
Direct costs	<u>9,819,260</u>	<u>3,749,172</u>	<u>4,284,768</u>	<u>17,853,200</u>
Segment margin	<u>6,605,740</u>	<u>1,506,828</u>	<u>8,055,232</u>	<u>16,167,800</u>
Allocated indirect costs	<u>8,002,500</u>	<u>3,055,500</u>	<u>3,492,000</u>	<u>14,550,000</u>
Segment pre-tax income	<u>(\$1,396,760)</u>	<u>(\$1,548,672)</u>	<u>\$ 4,563,232</u>	<u>\$ 1,617,800</u>
Segment pre-tax income %	-8.50%	-29.46%	36.98%	4.76%

B: Cost allocation based on floor space:

	<u>Hotel</u>	<u>Restaurant</u>	<u>Casino</u>	<u>Rembrandt</u>
Allocated indirect costs	\$7,275,000	\$1,455,000	\$5,820,000	\$14,550,000
Segment pre-tax income	(\$669,260)	\$51,828	\$2,235,232	\$1,617,800
Segment pre-tax income %	-4.07%	0.99%	18.11%	4.76%

**14-19 (Cont'd.)**

C: Cost allocation based on # of employees

	<u>Hotel</u>	<u>Restaurant</u>	<u>Casino</u>	<u>Rembrandt</u>
Allocated indirect costs	\$5,820,000	\$1,455,000	\$7,275,000	\$14,550,000
Segment pre-tax income	\$785,740	\$51,828	\$780,232	\$1,617,800
Segment pre-tax income %	4.78%	0.99%	6.32%	4.76%

3. The segment fine-tax income percentages show the dramatic effect of choice of the cost allocation base on reported numbers:

<b>Denominator</b>	<u>Hotel</u>	<u>Restaurant</u>	<u>Casino</u>
Direct costs	-8.50%	-29.46%	36.98%
Floor space	-4.07	0.99	18.11
# of employees	4.78	0.99	6.32

The decision context should guide a. whether costs should be allocated, and b. the preferred cost allocation base. Decisions about, say, performance measurement may be made on a combination of financial and nonfinancial measures. It may well be that Rembrandt may prefer to exclude allocated costs from the financial measures to reduce areas of dispute.

Where cost allocation is required, the cause-and-effect and benefits-received criteria are recommended in Chapter 14. The \$14,550,000 is a fixed overhead costs. This means that on a short-run basis, the cause-and-effect criterion is not appropriate. Rembrandt should look at how the \$14,550,000 cost benefits the three divisions. This will help guide the choice of an allocation base.

4. The analysis in requirement 2 should not guide the decision on whether to shut down any of the divisions. Each division is not independent of the other two. A decision to shut down, say, the restaurant likely would negatively affect the attendance at the casino and possibly the hotel. Rembrandt should examine the future revenue and future cost implications of different resource investments in the three divisions. This is a future-oriented exercise, whereas the analysis in requirement 2 is an analysis of past costs.

**14-20** (10–15 min.) **Single-rate cost allocation method, budgeted versus actual costs and quantities.**

1. a. 
$$\frac{\text{Budgeted indirect costs}}{\text{Budgeted trips}} = \frac{\$575,000}{250 \text{ trips}}$$
$$= \$2,300 \text{ per round trip}$$

b. 
$$\frac{\text{Actual indirect costs}}{\text{Actual trips}} = \frac{\$645,000}{300 \text{ trips}}$$
$$= \$2,150 \text{ per round trip}$$

Charges With Single-Rate Method:

a. Budgeted indirect costs/Budgeted quantities using actual trips

$$\text{Orange Juice: } \$2,300 \times 200 = \$460,000$$

$$\text{Grapefruit Juice: } \$2,300 \times 100 = \$230,000$$

b. Actual indirect costs/Actual quantities using actual trips

$$\text{Orange Juice: } \$2,150 \times 200 = \$430,000$$

$$\text{Grapefruit Juice: } \$2,150 \times 100 = \$215,000$$

2. When budgeted costs/budgeted quantities are used, the Orange Juice Division knows at the start of 2001 that it will be charged a rate of \$2,300 per trip. This enables it to make operating decisions knowing the rate it will have to pay for transportation. In contrast, when actual costs/actual quantities are used, the Orange Juice Division must wait until year-end to know its transportation charges.

The use of actual costs/actual quantities makes the costs allocated to one user a function of the actual demand of other users. In 2001, the actual usage was 300 trips, which is 50 trips above the 250 trips budgeted. These extra trips are one explanation for the actual cost rate being less than the budgeted rate. In 2001, the Orange Juice Division would have had lower costs had the actual rate been used. However, the reverse also will occur when there is lower use than budgeted by other plants.

**14-21** (20 min.) **Dual-rate cost allocation method, budgeted versus actual costs and quantities (continuation of 14-20).**

1. Charges with Dual Rate Method

Variable indirect cost rate	=	\$1,500 per trip
Fixed indirect cost rate	=	$\frac{\$200,000 \text{ budgeted costs}}{250 \text{ budgeted trips}}$
	=	\$800 per budgeted trip

Orange Juice Division

Variable indirect costs, $\$1,500 \times 200$	\$300,000
Fixed indirect costs, $\$800 \times 150$	<u>120,000</u>
	<u>\$420,000</u>

Grapefruit Division

Variable indirect costs, $\$1,500 \times 100$	\$150,000
Fixed indirect costs, $\$800 \times 100$	<u>80,000</u>
	<u>\$230,000</u>

2.

	<b>Orange Juice Division</b>	<b>Grapefruit Juice Division</b>
Single Rate I (Exercise 14-20) (budgeted rate $\times$ actual use)	\$460,000	\$230,000
Single Rate II (Exercise 14-20) (Actual rate $\times$ actual use)	430,000	215,000
Dual rate (Exercise 14-21)	420,000	230,000

If the dual-rate method used actual trips made as the allocation base, it would give the same answer as Single Rate I. The dual rate changes how the fixed indirect cost component is treated. By using budgeted trips made, the Orange Juice Division is unaffected by changes from its own budgeted usage or that of other divisions.

**14-22** (30 min.) **Contracting, cost allocation.**

1.

Revenues: $450,000 \times \$5.60$	\$ 2,520,000
Variable costs: $450,000 \times \$2.80$	<u>1,260,000</u>
Contribution margin	1,260,000
Fixed costs	<u>1,350,000</u>
Operating income	<u>\$ (90,000)</u>

2.

$$\begin{aligned} \text{Fixed costs per baseball in 2000} &= \frac{\$1,350,000}{450,000} \\ &= \$3.00 \text{ per baseball} \end{aligned}$$

Total costs per baseball:

Variable costs	\$2.80
Fixed costs	<u>3.00</u>
Total costs	<u>\$5.80</u>

3.

Unit sales for 2001:  $450,000 \times 1.12 = 504,000$   
Variable costs per unit:  $\$2.80 \times 0.90 = \$2.52$   
Fixed costs =  $\$1,350,000 \times 0.75 = \$1,012,500$   
Unit fixed costs =  $\$1,012,500 \div 504,000 = \$2.01$   
Total unit costs per baseball =  $\$2.52 + \$2.01 = \$4.53$

Revenues: $504,000 \times \$5.60$	\$2,822,400
Variable costs: $504,000 \times \$2.52$	<u>1,270,080</u>
Contribution margin	1,552,320
Fixed costs	1,012,500
Operating income <sup>a</sup>	<u>\$ 539,820</u>

<sup>a</sup> Before payment to Sprout.

4. Remuneration is:

a. Fixed fee	\$ 50,000
b. 10% of cost savings	
$0.10 \times (\$5.80 - \$4.53) \times 450,000$	57,150
c. 0.10 on sales > 450,000	
$\$0.10 \times (504,000 - 450,000)$	<u>5,400</u>
	<u>\$112,550</u>

Operating income after full payment to Sprout is:  $\$539,820 - \$112,550 = \$427,270$

**14-23** (20–30 min.) **Allocation of common costs.**

1. The available criteria to guide cost allocations include:
  - a. Cause and effect. It is not possible to trace individual causes (either basic news or premium movies or premium sports) to individual effects (viewing by Sam or Sarah or Tony). The \$70 total package is a bundled product.
  - b. Benefits received. There are various ways of operationalizing the benefits received:
    - (i) Monthly service charge for their prime interest—basic news for Sam (\$32), premium movies for Sarah (\$25), and premium sports for Tony (\$30). This measure captures the services available to be used by each person.
    - (ii) Actual usage by each person. This would involve having a record of viewing by each person and then allocating the \$70 on a % viewing time basis. This measure captures the services actually used by each person.
  - c. Ability to pay. This criterion requires the three people to agree upon their relative ability to pay. One measure here would be their respective salaries with the New Orleans Fire Brigade.
  - d. Fairness or equity. This criterion is relatively nebulous. A straightforward approach would be to split the \$70 equally among the three parties.

**14-23 (Cont'd.)**

2. Three methods of allocating the \$70 are:

	<b>Sam</b>	<b>Sarah</b>	<b>Tony</b>
Stand-alone	\$25.76	\$20.09	\$24.15
Incremental	13.00	25.00	32.00
Equal	23.33	23.33	23.33

a. Stand-alone cost allocation method.

$$\text{Sam: } \frac{\$32}{\$32 + \$25 + \$30} \times \$70 = 36.8\% \times \$70 = \$25.76$$

$$\text{Sarah: } \frac{\$25}{\$32 + \$25 + \$30} \times \$70 = 28.7\% \times \$70 = \$20.09$$

$$\text{Tony: } \frac{\$30}{\$32 + \$25 + \$30} \times \$70 = 34.5\% \times \$70 = \$24.15$$

b. Incremental cost allocation method:

Assume Tony (the owner) is the primary person, Sarah is first incremental party, and Sam the second incremental party.

<b>Party</b>	<b>Cost Allocated</b>	<b>Cost Remaining to be Allocated to Other Parties</b>
Tony	\$32	\$38 (\$70 – \$32)
Sarah	25	13 (\$70 – \$32 – \$25)
Sam	<u>13</u>	0
<b>Total</b>	<b>\$70</b>	

This method is sure to generate disputes over the ranking of the three parties. Notice that Sam pays only \$13 despite his prime interest in the most expensive basic news package.

c. Equal sharing of the \$70 amount. Sam, Sarah, and Tony each pay \$23.33.

*Note:* One student suggested the owner of the apartment (Tony) should pay the \$70 and include the cable television service in the rental charge.

**14-24** (20 min.) **Allocation of travel costs.**

1. Allocation of the \$1,800 airfare: Alternative approaches include:

a. The stand-alone cost allocation method. This method would allocate the air fare on the basis of each user's percentage of the total of the individual stand-alone costs:

New York employer	$\frac{\$1,400}{(\$1,400 + \$1,100)} \times \$1,800 =$	\$1,008
Chicago employer	$\frac{\$1,100}{(\$1,400 + \$1,100)} \times \$1,800 =$	<u>792</u>
		<u>\$1,800</u>

Advocates of this method often emphasize an equity or fairness rationale.

b. The incremental cost allocation method. This requires the choice of a primary party and an incremental party.

If the New York employer is the primary party, the allocation would be:

New York employer	\$1,400
Chicago employer	<u>400</u>
	<u>\$1,800</u>

One rationale is Ernst was planning to make the New York trip, and the Chicago stop was added subsequently. Some students have suggested allocating as much as possible to the New York employer since Ernst was not joining them.

If the Chicago employer is the primary party, the allocation would be:

Chicago employer	\$1,100
New York employer	<u>700</u>
	<u>\$1,800</u>

One rationale is that the Chicago employer is the successful recruiter and presumably receives more benefits from the recruiting expenditures.

2. A simple approach is to split the \$60 equally between the two employers. The limousine costs at the San Francisco end are not a function of distance traveled on the plane.

**14-24 (Cont'd.)**

An alternative approach is to add the \$60 to the \$1,800 and repeat requirement 1:

a. Stand-alone cost allocation method:

$$\text{New York employer} \quad \frac{\$1,460}{(\$1,460 + \$1,160)} \times \$1,860 = \$1,036$$

$$\text{Chicago employer} \quad \frac{\$1,160}{(\$1,460 + \$1,160)} \times \$1,860 = \$824$$

b. Incremental cost allocation method. With New York employer as the primary party:

New York employer	\$1,460
Chicago employer	<u>400</u>
	<u>\$1,860</u>

With Chicago employer as the primary party:

Chicago employer	\$1,160
New York employer	<u>700</u>
	<u>\$1,860</u>

*Note:* Ask any students in the class how they handled this situation if they have faced it.

**14-25** (30 min.) **Support department cost allocation, direct and step-down methods.**

		<u>A/HR</u>	<u>IS</u>	<u>Govt.</u>	<u>Corp.</u>
1.	a.	Direct Method			
		Costs	\$600,000	\$2,400,000	
		Alloc. of A/HR (40/75, 35/75)	(600,000)	\$ 320,000	\$ 280,000
		Alloc. of I.S. (30/90, 60/90)	<u>          </u>	<u>800,000</u>	<u>1,600,000</u>
			<u>\$ 0</u>	<u>\$1,120,000</u>	<u>\$1,880,000</u>
	b.	Step-Down (A/HR first)			
		Costs	\$600,000	2,400,000	
		Alloc. of A/HR (0.25, 0.40, 0.35)	(600,000)	\$ 240,000	\$ 210,000
		Alloc. of I.S. (30/90, 60/90)	<u>          </u>	<u>850,000</u>	<u>1,700,000</u>
			<u>\$ 0</u>	<u>\$1,090,000</u>	<u>\$1,910,000</u>
	c.	Step-Down (I.S. first)			
		Costs	\$600,000	2,400,000	
		Alloc. of I.S. (0.10, 0.30, 0.60)	240,000	(2,400,000)	\$ 720,000
		Alloc. of A/HR (40/75, 35/75)	<u>(840,000)</u>	<u>448,000</u>	<u>392,000</u>
			<u>\$ 0</u>	<u>\$1,168,000</u>	<u>\$1,832,000</u>
2.				<u>Govt.</u>	<u>Corp.</u>
		Direct method		\$1,120,000	\$1,880,000
		Step-Down (A/HR first)		1,090,000	1,910,000
		Step-Down (I.S. first)		1,168,000	1,832,000

The direct method ignores any services to other support departments. The step-down method partially recognizes support to other service departments. The information systems support group (with total budget of \$2,400,000) provides 10% of its services to the A/HR group. The A/HR support group (with total budget of \$600,000) provides 25% of its services to the information systems support group.

**14-25** (Cont'd.)

3. Three criteria that could determine the sequence in the step-down method are:

- a. Allocate service departments on a ranking of the percentage of their total services provided to other service departments.
  - 1. Administrative/HR 25%
  - 2. Information Systems 10%
  
- b. Allocate service departments on a ranking of the total dollar amount in the service departments.
  - 1. Information Systems \$2,400,000
  - 2. Administrative/HR \$ 600,000
  
- c. Allocate service departments on a ranking of the dollar amounts of service provided to other service departments
  - 1. Information Systems  
(0.10 × \$2,400,000) = \$240,000
  - 2. Administrative/HR  
(0.25 × \$600,000) = \$150,000

The a. approach typically better approximates the theoretically preferred reciprocal method. It results in a higher percentage of support-department costs provided to other support departments being incorporated into the step-down process than does b. or c..

**14-26 (30 min.) Support department cost allocation, reciprocal method (continuation of 14-25).**

1.		<u>A/HR</u>	<u>IS</u>	<u>Govt.</u>	<u>Corp.</u>
	Costs	\$600,000	\$2,400,000		
	Alloc. of A/HR (0.25, 0.40, 0.35))	(861,538)	215,385	\$ 344,615	\$ 301,538
	Alloc. of I.S. (0.10, 0.30, 0.60)	261,538	(2,615,385)	<u>784,615</u>	<u>1,569,231</u>
				<u>\$1,129,230</u>	<u>\$1,870,769</u>

Reciprocal Method Computation

$$\begin{aligned}
 A &= \$600,000 + 0.10IS \\
 IS &= \$2,400,000 + 0.25A \\
 IS &= \$2,400,000 + 0.25(\$600,000 + 0.10IS) \\
 &= \$2,400,000 + \$150,000 + 0.025IS \\
 0.975IS &= \$2,550,000 \\
 IS &= \$2,550,000 \div 0.975 \\
 &= \$2,615,385 \\
 A &= \$600,000 + 0.10(\$2,615,385) \\
 &= \$600,000 + \$261,538 \\
 &= \$861,538
 \end{aligned}$$

2.

		<u>Govt. Consulting</u>	<u>Corp. Consulting</u>
a.	Direct	\$1,120,000	\$1,880,000
b.	Step-Down (Ad/HR first)	1,090,000	1,910,000
c.	Step-Down (IS first)	1,168,000	1,832,080
d.	Reciprocal	1,129,230	1,870,769

The four methods differ in the level of service department cost allocation across service departments. The level of reciprocal service department is material. Administrative/HR supplies 25% of its services to Information Systems. Information Systems supplies 10% of its services to Administrative/HR. The Information Department has a budget of \$2,400,000 which is 400% higher than Administrative/HR.

The reciprocal method recognizes all the interactions and is thus the most accurate.

**14-27** (40 min.) **Direct and step-down allocation.**

1.

	<u>Support Depts</u>		<u>Operating Depts</u>		<u>Total</u>
	<u>Admin.</u>	<u>Info. Systems</u>	<u>Corporate</u>	<u>Consumer</u>	
Costs Incurred	\$72,700	\$234,400	\$ 998,270	\$489,860	\$1,795,230
Alloc. of Admin. (42/70, 28/70)	(72,700)		43,620	29,080	
Alloc. of Info. Syst. (1,920/3,520, 1,600/3,520)		(234,400)	127,855	106,545	
	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$1,169,745</u>	<u>\$625,485</u>	<u>\$1,795,230</u>

2. Rank on percentage of services rendered to other support departments.

Step 1: Administrative provides 35% of its services to other departments to information systems:

$$\frac{21}{42 + 28 + 21} = \frac{21}{91} = 23.08\%$$

This 23.08% of \$72,700 administrative department costs is \$16,779.

Step 2: Information systems provides 6.897% of its services to other departments to administrative:

$$\frac{320}{1,920 + 1,600 + 320} = \frac{320}{3,840} = 8.33\%$$

This 8.33% of \$234,400 information systems department costs is \$19,526.

14-27 (Cont'd.)

	<u>Support Depts</u>		<u>Operating Depts</u>		<u>Total</u>
	<u>Admin.</u>	<u>Info. Systems</u>	<u>Corporate</u>	<u>Consumer</u>	
Costs Incurred	\$72,700	\$234,400	\$ 998,270	\$489,860	\$1,795,230
Alloc. of Admin. (21/91, 42/91, 28/91)	<u>(72,700)</u>	<u>16,777</u>	33,554	22,369	
	<u>\$ 0</u>	251,177			
Alloc. of Info. Syst. (1,920/3,520, 1600/3,520)		<u>(251,177)</u>	<u>137,006</u>	<u>114,171</u>	
		<u>\$ 0</u>	<u>\$1,168,830</u>	<u>\$626,400</u>	<u>\$1,795,230</u>

3. An alternative ranking is based on the dollar amount of services rendered to other support departments. Using numbers from requirement 2, this approach would use the following sequence:

Step 1: Allocate information systems first (\$19,526 provided to administrative).

Step 2: Allocate administrative second (\$16,779 provided to information systems).

**14-28 (30 min.) Reciprocal cost allocation.**

1. The reciprocal allocation method explicitly includes the mutual services provided among all support departments. Interdepartmental relationships are fully incorporated into the support department cost allocations.

$$\begin{aligned}
 2. \quad AD &= \$72,700 + .0833IS \\
 IS &= \$234,400 + .2308AD \\
 AD &= \$72,700 + [.0833(\$234,400 + .2308AD)] \\
 &= \$72,700 + [\$19,525.52 + 0.019226AD] \\
 0.980774AD &= \$92,225.52 \\
 AD &= \$92,225.52 \div 0.980774 \\
 &= \$94,033 \\
 IS &= \$234,400 + (0.2308 \times \$94,033) \\
 &= \$256,103
 \end{aligned}$$

14-28 (Cont'd)

	<u>Support Depts</u>		<u>Operating Depts</u>		<u>Total</u>
	<u>Administ.</u>	<u>Info. Systems</u>	<u>Corporate</u>	<u>Consumer</u>	
Costs Incurred	\$72,700	\$234,400	\$ 998,270	\$489,860	\$1,795,230
Alloc. of Admin. (21/91, 42/91, 28/91)	(94,033)	21,700	43,400	28,933	
Alloc. of Info. Syst. (320/3,840, 1,920/3,840, 1,600/3,840)	<u>21,342</u>	<u>(256,103)</u>	<u>128,051</u>	<u>106,710</u>	
	<u>\$ 9*</u>	<u>\$ (3)*</u>	<u>\$1,169,721</u>	<u>\$625,503</u>	<u>\$1,795,230</u>

\* Rounding causes not to be exactly \$0.

3. The reciprocal method is more accurate than the direct and step-down methods when there is reciprocal relationships among support departments.

A summary of the alternatives is:

	<u>Corporate Sales</u>	<u>Consumer Sales</u>
Direct method	\$1,169,745	\$625,485
Step-down method (Admin. first)	1,168,830	626,400
Reciprocal method	1,169,721	625,503

The reciprocal method is the preferred method, although for September 2001 the numbers do not appear materially different across the alternatives.

**14-29** (40 min.) **Allocation of central corporate costs to divisions.**

1. The purposes for allocating central corporate costs to each division include:
  - a. **To provide information for economic decisions.** Allocations can signal to division managers that decisions to expand (contract) activities will likely require increases (decreases) in corporate costs that should be considered in the initial decision about expansion (contraction). When top management is allocating resources to divisions, analysis of relative division profitability should consider differential use of corporate services by divisions. Some allocation schemes can encourage the use of central services that would otherwise be underutilized. A common rationale related to this purpose is "to remind profit center managers that central corporate costs exist and that division earnings must be adequate to cover some share of those costs."
  - b. **Motivation.** Creates an incentive for division managers to control costs; for example, by reducing the number of employees at a division, a manager will save direct labor costs as well as central personnel and payroll costs allocated on the basis of number of employees. Allocation also creates incentives for division managers to monitor the effectiveness and efficiency with which central corporate costs are spent.
  - c. **Cost justification or reimbursement.** Some lines of business of Richfield Oil may be regulated with cost data used in determining "fair prices"; allocations of central corporate costs will result in higher prices being set by a regulator.
  - d. **Income measurement for external parties.** Richfield Oil may include allocations of central corporate costs in its external line-of-business reporting.

Instructors may wish to discuss the "Surveys of Company Practice" evidence from the United States, Canada, Australia, and the United Kingdom in Chapter 14 (p. 499).

2. Total costs in single pool = \$3,000  
Allocation base = \$30,000 revenue  
Allocation rate =  $\$3,000 \div \$30,000 = \$0.10$  per \$1 of revenue

See Solution Exhibit 14-29 for additional answers.

3. See Solution Exhibit 14-29 for answer.

14-29 (Cont'd.)

**SOLUTION EXHIBIT 14-29**

(in millions)

	<b>Oil &amp; Gas Upstream</b>	<b>Oil &amp; Gas Downstream</b>	<b>Chemical Products</b>	<b>Copper Mining</b>	<b>Total</b>
Revenues	<u>\$7,000</u>	<u>\$16,000</u>	<u>\$4,000</u>	<u>\$3,000</u>	<u>\$30,000</u>
Operating costs	3,000	15,000	3,800	3,200	25,000
Allocated costs, \$0.10 per \$1 revenue	<u>700</u>	<u>1,600</u>	<u>400</u>	<u>300</u>	<u>3,000</u>
Division income	<u>\$3,300</u>	<u>\$ (600)</u>	<u>\$ (200)</u>	<u>\$ (500)</u>	<u>\$ 2,000</u>

Allocation Base	<b>Oil &amp; Gas Upstream</b>	<b>Oil &amp; Gas Downstream</b>	<b>Chemical Products</b>	<b>Copper Mining</b>
1. Allocated on basis of identifiable assets Total costs = \$2,000	14/25 \$1,120	6/25 \$480	3/25 \$240	2/25 \$160
2. Allocated on basis of revenues Total costs = \$600	7/30 \$140	16/30 \$320	4/30 \$ 80	3/30 \$ 60
3. Allocated on basis of operating income (if positive) Total costs = \$208	40/52 \$160	10/52 \$ 40	2/52 \$ 8	-- \$ 0
4. Allocated on basis of number of employees Total costs = \$192	9/30 \$ 57.6	12/30 \$ 76.8	6/30 \$ 38.4	3/30 \$ 19.2

14-29 (Cont'd)

	<b>Oil &amp; Gas Upstream</b>	<b>Oil &amp; Gas Downstream</b>	<b>Chemical Products</b>	<b>Copper Mining</b>	<b>Total</b>
Revenues	<u>\$7,000</u>	<u>\$16,000</u>	<u>\$4,000</u>	<u>\$3,000</u>	<u>\$30,000</u>
Operating costs	3,000	15,000	3,800	3,200	25,000
Cost Pool 1 Allocation	1,120	480	240	160	2,000
Cost Pool 2 Allocation	140	320	80	60	600
Cost Pool 3 Allocation	160	40	8	0	208
Cost Pool 4 Allocation	<u>57.6</u>	<u>76.8</u>	<u>38.4</u>	<u>19.2</u>	<u>192</u>
Division income	<u>\$2,522.4</u>	<u>\$ 83.2</u>	<u>\$ (166.4)</u>	<u>\$ (439.2)</u>	<u>\$ 2,000</u>

4. Strengths of Rhodes' proposal relative to existing single-cost pool method:

a. Better able to capture cause-and-effect relationships. Interest on debt is more likely caused by the financing of assets than by revenues. Personnel and payroll costs are more likely caused by the number of employees than by revenues.

b. Relatively simple. No extra information need be collected beyond that already available. (Some students will list the extra costs of Rhodes' proposal as a weakness. However, for a company with \$30 billion in revenues, those extra costs are minimal.)

Weaknesses of Rhodes' proposal relative to existing single-cost pool method:

a. May promote dysfunctional decision making. May encourage division managers to lease or rent assets rather than to purchase assets, even where it is economical for Richfield Oil to purchase them. This off-balance sheet financing will reduce the "identifiable assets" of the division and thus will reduce the interest on debt costs allocated to the division. (Richfield Oil could counteract this problem by incorporating leased and rented assets in the "identifiable assets" base.)

*Note:* Some students criticized Rhodes' proposal, even though agreeing that it is preferable to the existing single-cost pool method. These criticisms include:

a. Proposal does not adequately capture cause-and-effect relationships for the legal and research and development cost pools. For these cost pools, specific identification of individual projects with an individual division can better capture cause-and-effect relationships.

b. Proposal may give rise to disputes over the definition and valuation of "identifiable assets."

**14-29 (Cont'd.)**

- c. Use of actual rather than budgeted amounts in the allocation bases creates interdependencies between divisions. Moreover, use of actual amounts means that division managers do not know cost allocation consequences of their decisions until the end of each reporting period.
- d. Separate allocation of fixed and variable costs would result in more refined cost allocations.
- e. Questionable that 100% of central corporate costs should be allocated. Many students argue that public affairs should not be allocated to any division, based on the notion that division managers may not control many of the individual expenditures in this cost pool.

**14-30** (30 min.) **Cost allocation, monthly reports.**

1. Problems with the monthly allocation report include:

- a. The single-rate method used does not distinguish between fixed vs. variable costs.
- b. Actual costs and actual quantities are used. This results in managers not knowing cost rates until year-end.
- c. Monthly time periods are used to determine cost rates. The use of a monthly time period can result in highly variable cost rates depending on seasonality, days in a month, demand surges and so on.

Budgeted variable cost (based on normal usage):

$$\frac{\$7,500,000}{100,000,000} = \$0.075 \text{ per kwh}$$

**Monthly Allocation Report  
November 2000**

Allocations of Variable Costs (based on budgeted rate  $\times$  actual usage)\*

To Department A: 60,000,000 $\times$ \$0.075	\$4,500,000
To Department B: 20,000,000 $\times$ \$0.075	<u>1,500,000</u>
	<u>\$6,000,000</u>

\*There will be \$1,500,000 of unallocated variable costs for November 2000.

Allocation of Fixed Costs (Based on budgeted usage  $\times$  budgeted amount)

To Department A: 60% $\times$ \$30,000,000	\$18,000,000
To Department B: 40% $\times$ \$30,000,000	<u>12,000,000</u>
	<u>\$30,000,000</u>

Department A

Variable costs	\$ 4,500,000
Fixed costs	<u>18,000,000</u>
	<u>\$22,500,000</u>

Department B

Variable costs	\$ 1,500,000
Fixed costs	<u>12,000,000</u>
	<u>\$13,500,000</u>

3. Under Lamb's allocation report, the production manager has both risk-exposure and uncertainty concerns:

- *Risk-exposure*—Changes in the demand for energy by Department A affect the costs Lamb will report for Department B. Increases in demand by A will reduce B's cost per kwh and vice versa. Department B's production manager may seek to curtail production in periods when Department A's production declines. This could create an ever-diminishing cycle of production. Alternatively, Department B may subcontract outside to avoid a higher energy rate, even if it is not in Bulldog's best interest to subcontract.
- *Uncertainty*—When actual costs are used, managers cannot plan costs with certainty. Managers typically have less ability to bear uncertainty than do companies. The result is that managers may reject alternatives that are good risks from Bulldog's perspectives but not attractive risks for themselves.

**14-31 (40 min.) Allocating costs of support departments; step-down and direct methods.**

	<u>Building &amp; Grounds</u>	<u>Personnel</u>	<u>General Plant Admin.</u>	<u>Cafeteria Operating Loss</u>	<u>Storeroom</u>	<u>Machining</u>	<u>Assembly</u>
1. Step-down Method:	\$10,000	\$1,000	\$26,090	\$1,640	\$2,670	\$34,700	\$48,900
(1) Building & grounds @ \$0.10/sq. ft.	\$10,000	200	700	400	700	3,000	5,000
(2) Personnel @ \$6/employee		\$1,200	210	60	30	300	600
(3) General plant administration @ \$1/labor-hour			\$27,000	1,000	1,000	8,000	17,000
(4) Cafeteria @ \$20/employee				\$3,100	100	1,000	2,000
(5) Storeroom @ \$1.50/requisition					\$4,500	3,000	1,500
(6) Costs allocated to operating depts.						\$50,000	\$75,000
(7) Divide (6) by direct labor-hours						÷ 5,000 hrs	÷ 15,000
(8) Overhead rate per direct-manuf. labor-hour						\$ 10	\$ 5
2. Direct method:	\$10,000	\$1,000	\$26,090	\$1,640	\$2,670	\$34,700	\$48,900
(1) Building & grounds, 3/8 and 5/8	(10,000)					3,750	6,250
(2) Personnel, 1/3 and 2/3		(1,000)				333	667
(3) General plant administration, 8/25 and 17/25			(26,090)			8,349	17,741
(4) Cafeteria, 1/3 and 2/3				(1,640)		547	1,093
(5) Storeroom: 2/3 and 1/3					(2,670)	1,780	890
(6) Costs allocated to operating depts.						\$49,459	\$75,541
(7) Divide (6) by direct manufacturing labor-hours						÷ 5,000	÷ 15,000
(8) Overhead rate per direct manufacturing labor-hour						\$ 9.892	\$ 5.036

**14-31 (Cont'd.)**

3.

**Comparison of Methods:**

Step-down method:	Job 88:	18 × \$10	\$180	
		2 × \$ 5	<u>10</u>	\$190.00
	Job 89:	3 × \$10	\$ 30	
		17 × \$ 5	<u>85</u>	<u>115.00</u>
			<u>\$305.00</u>	
Direct method:	Job 88:	18 × \$9.892	\$178.06	
		2 × \$5.036	<u>10.07</u>	\$188.13
	Job 89:	3 × \$9.892	\$ 29.68	
		17 × \$5.036	<u>85.61</u>	<u>115.29</u>
			<u>\$303.42</u>	

**14-32 (40-60 min.) Support department cost allocations; single-department cost pools; direct, step-down, and reciprocal methods.**

All the following computations are in dollars.

1.

Direct method:

	<u>To X</u>	<u>To Y</u>
A	$250/400 \times \$100,000 = \$62,500$	$150/400 \times \$100,000 = \$37,500$
B	$100/500 \times \$40,000 = \underline{8,000}$	$400/500 \times \$40,000 = \underline{32,000}$
Total	<u>\$70,500</u>	<u>\$69,500</u>

Step-down method, allocating A first:

	<u>A</u>	<u>B</u>	<u>X</u>	<u>Y</u>
Costs to be allocated	\$100,000	\$40,000	—	—
Allocate A: (0.2, 0.5, 0.3)	(100,000)	20,000	\$50,000	\$30,000
Allocate B: (0.2, 0.8)	—	(60,000)	<u>12,000</u>	<u>48,000</u>
Total	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$62,000</u>	<u>\$78,000</u>

Step-down method, allocating B first:

	<u>A</u>	<u>B</u>	<u>X</u>	<u>Y</u>
Costs to be allocated	\$100,000	\$40,000	—	—
Allocate B: (0.5, 0.1, 0.4)	20,000	(40,000)	\$ 4,000	\$16,000
Allocate A: (250/400, 150/400)	(120,000)	—	<u>75,000</u>	<u>45,000</u>
Total	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$79,000</u>	<u>\$61,000</u>

Note that these methods produce significantly different results, so the choice of method may frequently make a difference in the budgeted department overhead rates.

Reciprocal method:

Stage 1: Let A = total costs of materials-handling department

B = total costs of power-generating department

(1) A = \$100,000 + 0.5B

(2) B = \$ 40,000 + 0.2A

Stage 2: Substituting in (1): A = \$100,000 + 0.5(\$40,000 + 0.2A)

A = \$100,000 + \$20,000 + 0.1A

0.9A = \$120,000

A = \$133,333

Substituting in (2): B = \$40,000 + 0.2(\$133,333)

B = \$66,666

**14-32 (Cont'd.)**

Stage 3:

	<b>A</b>	<b>B</b>	<b>X</b>	<b>Y</b>
Original amounts	100,000	40,000	—	—
Allocation of A	(133,333)	26,666(20%)	66,667(50%)	40,000(30%)
Allocation of B	<u>33,333(50%)</u>	<u>(66,666)</u>	<u>6,667(10%)</u>	<u>26,666(40%)</u>
Totals accounted for	<u>—</u>	<u>—</u>	<u>73,334</u>	<u>66,666</u>

Comparison of methods:

<b>Method of Allocation</b>	<b>X</b>	<b>Y</b>
Direct method	\$70,500	\$69,500
Step-down: A first	62,000	78,000
Step-down: B first	79,000	61,000
Reciprocal method	73,334	66,666

Note that *in this case* the direct method produces answers that are the closest to the "correct" answers (that is, those from the reciprocal method), step-down allocating B first is next, and step-down allocating A first is least accurate.

2. At first glance, it appears that the cost of power is \$40 per unit plus the material handling costs. If so, Manes would be better off by purchasing from the power company. However, the decision should be influenced by the effects of the interdependencies and the fixed costs. Note that the power needs would be less (students miss this) if they were purchased from the outside:

	<b>Outside Power Units Needed</b>
X	100
Y	400
A (500 units minus 20% of 500 units, because there is no need to service the nonexistent power department)	<u>400</u>
Total units	<u>900</u>

Total costs, 900 x \$40 = \$36,000

**14-32 (Cont'd.)**

In contrast, the total costs that would be saved by not producing the power inside would depend on the effects of the decision on various costs:

	<b>Avoidable Costs of 100 Units of Power Produced Inside</b>
Variable indirect labor and indirect material costs	\$10,000
Supervision in power department	10,000
Materials handling, 20% of \$70,000*	<u>14,000</u>
Probable minimum cost savings	\$34,000
Possible additional savings:	
a. Can any supervision in materials handling be saved because of overseeing less volume? Minimum savings is probably zero; the maximum is probably 20% of \$10,000 or \$2,000.	?
b. Is any depreciation a truly variable, wear-and-tear type of cost?	?
Total savings by not producing 100 units of power	<u>\$34,000</u> + ?
* Materials handling costs are higher because the power department uses 20% of materials handling. Therefore, materials-handling costs will decrease by 20%.	

In the short run (at least until a capital investment in equipment is necessary), the data suggest continuing to produce internally because the costs eliminated would probably be less than the comparable purchase costs.

**14-33** (60 min.) **Allocating costs of support departments; dual rates; direct, step-down, and reciprocal methods.**

1. Solution Exhibit 14-33 presents the costs allocated to each assembly department under the four service department cost allocation methods. The linear equations underlying the complete reciprocated costs reported in Solution Exhibit 14-33 are:

Fixed-Cost Pool:

$$\begin{aligned} \text{ES} &= \$2,700 + 0.20\text{IS} \\ \text{IS} &= \$8,000 + 0.10\text{ES} \end{aligned}$$

$$\begin{aligned} \text{ES} &= \$2,700 + 0.20(\$8,000 + 0.10\text{ES}) \\ \text{ES} &= \$4,300 + 0.02\text{ES} \\ 0.98\text{ES} &= \$4,300 \\ \text{ES} &= \$4,300 \div 0.98 = \$4,387.76 \end{aligned}$$

$$\begin{aligned} \text{IS} &= \$8,000 + 0.10(\$4,387.76) \\ &= \$8,438.78 \end{aligned}$$

Variable-Cost Pool:

$$\begin{aligned} \text{ES} &= \$8,500 + 0.25\text{IS} \\ \text{IS} &= \$3,750 + 0.15\text{ES} \end{aligned}$$

$$\begin{aligned} \text{ES} &= \$8,500 + 0.25 (\$3,750 + 0.15\text{ES}) \\ \text{ES} &= \$9,437.5 + 0.0375\text{ES} \\ 0.9625\text{ES} &= \$9,437.5 \\ \text{ES} &= \$9,437.5 \div 0.9625 = \$9,805.19 \end{aligned}$$

$$\begin{aligned} \text{IS} &= \$3,750 + 0.15(\$9,805.19) \\ &= \$3,750 + \$1,470.78 = \$5,220.78 \end{aligned}$$

**14-33 (Cont'd.)**

A summary of the costs allocated under each method (from Solution Exhibit 14-33) is:

	<b>Home Security Systems</b>	<b>Business Security Systems</b>
a. Direct Method: Fixed-cost pool Variable-cost pool	\$4,200.00 <u>3,750.00</u> <u>\$7,950.00</u>	\$ 6,500.00 <u>8,500.00</u> <u>\$15,000.00</u>
b. Step-down (Information First): Fixed-cost pool Variable-cost pool	\$4,311.11 <u>3,893.38</u> <u>\$8,204.49</u>	\$ 6,388.89 <u>8,356.62</u> <u>\$14,745.51</u>
c. Step-down (Engineering First): Fixed-cost pool Variable- cost pool	\$4,181.25 <u>3,555.00</u> <u>\$7,736.25</u>	\$ 6,518.75 <u>8,695.00</u> <u>\$15,213.75</u>
d. Reciprocal Method: Fixed-cost pool Variable-cost pool	\$4,286.73 <u>3,724.68</u> <u>\$8,011.41</u>	\$ 6,413.27 <u>8,525.32</u> <u>\$14,938.59</u>

2. Support department costs allocated per unit:

	<b>Home Security Systems</b>	<b>Business Security Systems</b>
a. Direct method	\$1.00	\$4.00
b. Step-down (Information first)	1.03	3.93
c. Step-down (Engineering first)	0.97	4.06
d. Reciprocal method	1.01	3.98

**14-33** (Cont'd.)

3. Factors that might explain the very limited adoption of the reciprocal method include:
  - a. Managers find the reciprocal method difficult to understand, especially where there are many support departments.
  - b. The final cost allocations yielded by using the reciprocal method differ little in some cases from those yielded by using the direct or step-down methods. As illustrated in requirement 2, the differences among the four methods in this problem appear small.
  - c. It is costly to maintain records of the use of the support departments by other support departments.

**SOLUTION EXHIBIT 14-33**  
(in thousands)

	<b>Engineering Support</b>	<b>Information Systems Support</b>	<b>Home Security Systems</b>	<b>Business Security Systems</b>
<i>a. Direct Method</i>				
Fixed- Cost Pool	\$ 2,700	\$ 8,000		
Eng. Support (4/9, 5/9)	<u>(2,700)</u>		\$1,200.00	\$1,500.00
Info. Support (3/8, 5/8)		<u>(8,000)</u>	<u>3,000.00</u>	<u>5,000.00</u>
			<u>\$4,200.00</u>	<u>\$6,500.00</u>
Variable-Cost Pool:	\$ 8,500	\$ 3,750		
Eng. Support (30/85, 55/85)	<u>(8,500)</u>		\$3,000.00	\$5,500.00
Info. Support (15/75,60/75)		<u>(3,750)</u>	<u>750.00</u>	<u>3,000.00</u>
			<u>\$3,750.00</u>	<u>\$8,500.00</u>
<i>b. Step-down (Information First)</i>				
Fixed-Cost Pool:	\$ 2,700	\$ 8,000		
Info. Support (.2, .3, .5)	1,600	(8,000)	\$2,400.00	\$4,000.00
Eng. Support (4/9, 5/9)	<u>(4,300)</u>	<u>—</u>	<u>1,911.11</u>	<u>2,388.89</u>
			<u>\$4,311.11</u>	<u>\$6,388.89</u>
Variable-Cost Pool:	\$ 8,500	\$ 3,750		
Info. Support (.25, .15, .60)	937.5	(3,750)	\$ 562.50	\$2,250.00
Eng. Support (30/85, 55/85)	<u>(9,437.5)</u>	<u>—</u>	<u>3,330.88</u>	<u>6,106.62</u>
			<u>\$3,893.38</u>	<u>\$8,356.62</u>
<i>c. Step-down (Engineering First):</i>				
Fixed-Cost Pool:	\$ 2,700	\$ 8,000		
Eng. Support (.1, .4, .5)	<u>(2,700)</u>	270	\$1,080.00	\$1,350.00
Info. Support (3/8, 5/8)		<u>(8,270)</u>	<u>3,101.25</u>	<u>5,168.75</u>
			<u>\$4,181.25</u>	<u>\$6,518.75</u>
Variable-Cost Pool:	\$ 8,500	\$ 3,750		
Eng. Support (.15, .30, .55)	<u>(8,500)</u>	1,275	\$2,550.00	\$4,675.00
Info. Support (.2, .8)		<u>(5,025)</u>	<u>1,005.00</u>	<u>4,020.00</u>
			<u>\$3,555.00</u>	<u>\$8,695.00</u>
<i>d. Reciprocal Method</i>				
Fixed-Cost Pool:	\$ 2,700	\$ 8,000.00		
Eng. Support (.1, .4, .5)	(4,387.76)	438.78	\$1,755.10	\$2,193.88
Info. Support (.2, .3, .5)	<u>1,687.76</u>	<u>(8,438.78)</u>	<u>2,531.63</u>	<u>4,219.39</u>
			<u>\$4,286.73</u>	<u>\$6,413.27</u>
Variable-Cost Pool:	\$ 8,500.00	\$ 3,750.00		
Eng. Support (.15, .30, .55)	(9,805.19)	1,470.78	\$2,941.56	\$5,392.85
Info. Support (.25, .15, .60)	<u>1,305.19</u>	<u>(5,220.78)</u>	<u>783.12</u>	<u>3,132.47</u>
			<u>\$3,724.68</u>	<u>\$8,525.32</u>

**14-34** (30–40 min.) **Overhead disputes.**

1. This problem, which is based on an actual case, shows how overhead cost allocation can affect contract pricing. The Navy would claim a refund of \$689,658.

The overhead cost would be allocated differently:

$$\text{Previous overhead allocation rate} = \frac{\$30}{\$50 + \$100} = 20\% \times \text{DL\$}$$

$$\text{Revised overhead allocation rate} = \frac{\$30}{\$45 + \$100} = 20.68965\%$$

	Navy Costs	Commercial Costs
Original cost assignment:		
Direct materials	\$ —	\$ —
Direct labor	45,000,000	100,000,000
SE group	5,000,000	—
Allocated overhead (20% x DL\$)	<u>10,000,000<sup>a.</sup></u>	<u>20,000,000<sup>b.</sup></u>
Total	<u>\$60,000,000</u>	<u>\$120,000,000</u>
Revised cost assignment:		
Direct materials	\$ —	\$ —
Direct labor	45,000,000	100,000,000
SE group	5,000,000	—
Allocated overhead (20.68965% x DL\$)	<u>9,310,342<sup>c.</sup></u>	<u>20,689,650<sup>d.</sup></u>
Total	<u>\$59,310,342</u>	<u>\$120,689,650</u>

a.  $20\% \times (\$45,000,000 \text{ direct labor} + \$5,000,000 \text{ SE group classified as direct labor}) = \$10,000,000$

b.  $20\% \times \$100,000,000 = \$20,000,000$

c.  $20.68965\% \times \$45,000,000 = \$9,310,342$

d.  $20.68965\% \times \$100,000,000 = \$20,689,650$

**14-34** (Cont'd.)

The Navy claim would be:

Remove the original overhead allocation of \$50 million x 0.20 \$10,000,000

This means that the overhead pool, which has been totally allocated to products, is now underallocated by \$10 million. This overhead must be reallocated in proportion to the "corrected" direct labor in nuclear work and commercial work. In short, if the overhead allocation base shrinks from \$150 to \$145 million, the overhead rate increases from 20% to 20.68965%.

The revised allocation is \$45 million × .2068965. 9,310,342  
\$ 689,658

$$2. \text{ Revised overhead allocation rate} = \frac{\$26}{\$45 + \$100} = 17.93103\%$$

	<b>Navy Costs</b>	<b>Commercial Costs</b>
Revised cost assignment:		
Direct materials	\$ -	\$ -
Direct labor	45,000,000	100,000,000
SE group	5,000,000	-
Commercial purchasing	-	4,000,000
Allocated overhead (17.93103% x DL\$)	<u>8,068,964</u>	<u>17,931,030</u>
	<u>\$58,068,964</u>	<u>\$ 121,931,030</u>

Given that the original Navy cost is \$60,000,000, and the revised cost is \$58,068,964, the Navy would claim a total refund of \$1,931,036.

**14-35** (60 min.) **Cost allocation, pricing decisions.**

1. Single pool:

$$= \frac{\$1,262,460}{106,000 \text{ hours}}$$

$$= \$11.91 \text{ per hour}$$

$$\text{Hourly billing rate} = \$11.91 \times 1.45$$

$$= \$17.27 \text{ per billing hour}$$

2. See Solution Exhibit 14-35.

**SOLUTION EXHIBIT 14-35**

	<b>HTT</b>	<b>ATT</b>	<b>SST</b>	<b>ACT</b>	<b>AQT</b>	<b>Total</b>
Test pool labor (.3, .2, .2, .1, .2)	\$126,000	\$84,000	\$84,000	\$42,000	\$84,000	\$420,000
Supervision (.40, .15, .15, .15, .15)	28,800	10,800	10,800	10,800	10,800	72,000
Equip. depreciation	48,230	22,000	39,230	32,000	37,000	178,460
Heat (.50, .05, .05, .30, .10)	85,000	8,500	8,500	51,000	17,000	170,000
Electricity (.30, .10, .10, .40, .10)	37,200	12,400	12,400	49,600	12,400	124,000
Water (.00, .00, .20, .20, .60)	0	0	14,800	14,800	44,400	74,000
Set-up (.20, .15, .30, .15, .20)	11,600	8,700	17,400	8,700	11,600	58,000
Indirect materials (.15, .15, .30, .20, .20)	15,600	15,600	31,200	20,800	20,800	104,000
Operating supplies (.10, .10, .25, .20, .35)	<u>6,200</u>	<u>6,200</u>	<u>15,500</u>	<u>12,400</u>	<u>21,700</u>	<u>62,000</u>
Total costs	<u>\$358,630</u>	<u>\$168,200</u>	<u>\$233,830</u>	<u>\$242,100</u>	<u>\$259,700</u>	<u>\$1,262,460</u>
Total lab hours	29,680	12,720	27,560	22,260	13,780	
Hourly lab cost	\$12.08	\$13.22	\$8.48	\$10.88	\$18.85	
Hourly billing rate (labor cost x 1.45)	\$17.52	\$19.17	\$12.30	\$15.78	\$27.33	

3. The new costing method will have the following effects on the pricing structure for each of the five test types given the competitors' hourly billing rates.

	<b>HTT</b>	<b>ATT</b>	<b>SST</b>	<b>ACT</b>	<b>AQT</b>
New hourly billing rate (hour cost x 1.45)	\$17.52	\$19.17	\$12.30	\$15.78	\$27.33
Competitor rate	\$17.50	\$19.00	\$15.50	\$16.00	\$20.00
New rate over/(under) market	\$.02	\$.17	\$(3.20)	\$(.22)	\$7.33
Percent over/(under) market	0.1%	0.9%	(20.6)%	(1.4)%	36.7%
Common pool rate	\$17.27	\$17.27	\$17.27	\$17.27	\$17.27
New rate over/(under) old rate	\$0.25	\$1.90	\$(4.97)	\$(1.49)	\$10.06
Percent over/(under) old rate	1.4%	11.0%	(28.8)%	(8.7)%	58.3%

- Best Test will now be pricing all its lab tests more competitively in the market.
- For Heat Testing (HTT), there is minimal variance between the common pool rate, the new separate rate, and the competitors' rates. The HTT rate could either be left at the old rate, or nominally raised to the competitors' rates or new pool rate without much impact, depending upon how Best Test wanted to position the test compared to the competition.
- For Air Turbulence Testing (ATT), the new separate computed billing rate is significantly different than the common pool rate as well as close to the competitors' rates. In both cases, Best Test would probably want to adjust billing rates (raise ATT rate and lower ACT rate) to the newly computed rates or competitors' rates to better reflect resources consumed by the tests.
- For Stress Testing (SST), the newly computed rate is dramatically less than both the common pool rate and the competitors' rates. Best Test would want to significantly reduce the price to at least meet the competitors' price or reduce it further towards to newly computed price, depending upon how aggressively it wanted to market this test.
- For Aquatic Testing (AQT), the newly computed rate is significantly higher than both the common pool rate and the competitors' rates. Best Test would want to raise the billing rate at least to the competitors' rates to recover its cost plus some contribution towards administrative costs. Its current common billing rate of \$17.27 is below the \$18.85 cost to perform the AQT test.
- Because the newly computed billing prices for both SST and AQT are significantly different than competitors' prices, the cost assumptions should be further analyzed to verify accuracy and identify opportunities.

4. In general, at least three other internal or external determinants of pricing structure include the:

- number and nature of competitors for additional tests and their quality and timeliness of service.
- company's overall capacity and its ability to react to volume and mix changes for tests if the demand changes due to the new pricing structure.
- number of potential customers, overall demand for the tests, and price elasticity of demand for the tests.
- strategic focus, such as desire to gain or defend market share, long-term support for entry into or exit from a market, or stage in the test's product life cycle (introduction, growth, mature, or dying).