CHAPTER 9

The Need for Multiple Overhead Accounts

REVIEW QUESTIONS:

9.1 The overall goal of all CASs is to determine the cost of products or services. The cost of a product or service is used for many purposes:

- Evaluate how well the organization is doing relative to its budget
- Facilitate continuous improvement
- Derive the value of inventory and cost of goods manufactured and sold for financial reporting
- Value inventory for taxation
- Price products or bid on contracts for various jobs
- Determine product or job profitability
- Decide whether to make or buy certain components

9.2 All product and service costs are based on assumptions, estimates, allocations, and averages. Examples of these costing procedure choices include:

- Average cost of freight charges for direct materials
- Average cost of direct materials movement from RMI to the shop floor
- Average amount of direct materials included in the normal scrap rate used in setting the direct materials standard quantity
- Average per hour cost of payroll taxes and fringe benefits included in the standard and actual direct labor rates
- Average amount of "downtime" included in the normal input loss ratio for the direct labor standard quantity
- Allocations of plantwide factory costs such as building depreciation, property taxes, insurance, utilities (heating and air conditioning), and ICBIS-related costs
- Allocations of production supervision costs which include average payroll taxes and fringe benefits for these employees
- Allocations of direct technology costs (i.e., depreciation, machinery-related utility costs, repairs and maintenance, insurance, and property taxes on the equipment)

9.3 As manufacturers become more capital intensive (automated), the proportion of costs traditionally classified as indirect costs (included in overhead) increases relative to the costs of direct materials and direct labor. Thus, these costs, whether included in overhead or classified as direct technology costs, are becoming a more significant component of product or service costs. This was first illustrated in Chapter 1 (Exhibit 1-1).

9.4 Many traditional manufacturers still maintain only one total overhead account, using one plantwide TOH POR to allocate all the overhead into jobs (JOCAS) or production departments (PCAS). Two reasons have been cited for this:

- Historically, many CASs were designed primarily for financial accounting reporting purposes, rather than for the management accounting objective of cost management (planning, operational control, and performance evaluation). To satisfy financial accounting requirements (GAAP), only a reasonable allocation of overhead is needed, which could be satisfied with one TOH account and POR.
- Also, when these CASs were first designed, many manufacturing processes were labor intensive. Consequently, a direct labor-based overhead allocation system was reasonable.

9.5 *Service departments:*
Service departments provide services to production departments. Because their costs are not directly traceable to products, they are part of the plant's total overhead. Examples of types of service departments include:

- Janitorial services (Building and Grounds Department)
- Repairs and Maintenance Department
- Factory Personnel Department
- Nurses (First Aid) Station
- Factory Data Processing Center
- Factory Cost Accounting Department
- Factory Cafeteria (or hospital cafeteria)
- Hospital Laundry Services

Production departments:
Production departments work directly on the creation of a product. In service industries, the personnel and departments directly providing services to customers are analogous to production departments in manufacturing firms. Examples of production departments include:

- Assembly and processing departments in a plant
- Milling, cutting, and/or sawing departments
- Painting Department
- Surgery, Obstetrics, and Trauma Centers in a hospital
- Welfare case workers
- Audit, Tax, and MAS Departments in a CPA firm

9.6 Service department costs are allocated to production department overhead accounts so that these costs can be included with the production departments' direct (primary) overhead costs in the departmental PORs. In this manner, all production overhead costs can be included in the overhead ultimately applied to the products (and included in their sales prices). The sales price of each product must be high enough to cover the direct production costs, a fair share of all of the indirect production costs, an allocation of the nonproduction costs of the enterprise, and a target profit.

9.7 The TOH POR can be broken down in at least five ways:
- Separate rates for applying VOH and FOH
- Separate rates for each production department
- Separate rates for different machines
- Separate rates for each product line or service class
- Separate rates for applying material-related, labor-related, and machine-related overhead costs

9.8 Four reasons for using multiple PORs include:
- When there are important differences in the nature of the work performed in different areas of the plant, separate POR's for these areas (production departments, JIT cells, and/or machines) should be used.
- When different products or services use resources in significantly different ways, separate POR's should be used for each product or service.
- When products differ substantially in their relative use of direct materials, a more accurate allocation of material-related overhead costs (such as purchasing, receiving, storing, and handling) may result from using a special supplementary material-related POR.
- In special situations, similar arguments can be made for using separate POR's for applying different labor-related and machine-related overhead costs.

9.9 No matter how diverse the products or services, they will receive a fairer share of the total overhead through the use of separate production department PORs.
- In this way, products or services will only be charged with the overhead associated with the departments they pass through.
- The overhead associated with each department can then represent just those indirect cost resources used by that department.

9.10 Cross-subsidization occurs when overhead is applied to products or services using a basis that does not represent how (why) overhead is consumed. For example, overhead is caused by machine usage in department A, and by labor usage in department B. Two products are manufactured that require different machine usage and different amounts of labor. Too much, or too little, of the machinery-related overhead incurred in department A will be applied to the two products if a labor-related TOH POR is used. Conversely, too much, or too little, of the department B (labor-related) overhead will be applied to the two products when a machinery-based TOH POR is used. When multiple products are manufactured, or services provided, and different types of overhead are used (i.e., multiple overhead cost pools exist, each with its own cost driver), cross-subsidization can occur from the use of a plantwide TOH POR. The Starfire Insight and Application illustrates such a situation.

9.11 Separate VOH and FOH PORs are important for standard cost card calculations and overhead budgeting, as well as in cost control through four-way overhead cost variance analysis.

- VOH items are generally caused by the usage of these cost elements in production.
- FOH items are generally caused by the size of the production facilities, in other words, by the potential (maximum) demand for these items.
- Consequently, a more accurate product cost may result from separate allocations of VOH and FOH based on what drives these different cost elements (the different causal bases).
- Different VOH and FOH line items are budgeted and controlled by different responsibility centers within the process. Separate accounting for these different items, through the use of subsidiary VOH and FOH accounts, each with its own POR, promotes better cost management of these costs.

9.12 As overhead costs are incurred, they are debited to the proper service and production department overhead accounts. This is called primary cost allocation. Its purpose is to directly trace as many overhead costs as possible to the responsibility centers that actually used these items.

Once overhead costs are accumulated in the service and production department overhead accounts, the service department costs can then be allocated to the production department overhead accounts so that they can be included in the departments' PORs. This is called secondary cost allocation. Through primary and secondary cost allocations, all overhead can be included in the production department PORs, and subsequently applied into the cost of products or services.

9.13 Stage one and two cost allocations were discussed in the previous review question.

- Stage one allocations are called primary cost allocations. The purpose is to trace as many overhead resource costs as is possible to the responsibility centers (service departments and production departments) directly using those resources.
- Stage two secondary cost allocations involve allocating service department overhead costs to the production department VOH and FOH accounts. All of the overhead costs are now included in the production department overhead accounts.
- In stage three, as products (services) pass through these departments, their VOH and FOH PORs will apply all of the overhead costs to the costs of the products made or services rendered.

9. 4 The choice of an overhead cost driver (overhead allocation basis) should be based on a cause-effect relationship. Exhibit 9-2 lists possible bases for different types of services. For example:

Service department type:	*Possible allocation bases:*
• Cafeteria	Number of employees
• Computing center	Number of reports, or CPU time used
• Custodial services	Square footage serviced
• Human resource management	Number of employees, time spent (if different time is required for different departments due to the nature of the specific work), employee turnover
• Laundry services	Pounds of laundry, time required (if different for different items)
• Materials handling	Volume, number of material requisitions
• Occupancy services	Square or cubic footage
• Power	Kilowatt hours used, number or type of machine
• Repairs and maintenance	Number of machines, number of repair calls

9.15 The service departments from Review Question 9.5 are listed below with possible overhead allocation bases.

Service department type:	*Possible allocation bases:*
• Janitorial services (Building and Grounds Dept)	Square footage serviced
• Repairs and Maintenance	Number of machines, number of repairs
• Factory Personnel Department	Number of employees (by department)
• Nurses (First Aid) Station	Number of employees (by department)
• Factory Data Processing	CPU time, number of reports
• Factory Cost Accounting	Number of reports or journal entries
• Factory (hospital) Cafeteria	Number of employees
• Hospital Laundry Services	Number of loads, pounds of laundry

9.16 The direct method allocates each service department's costs directly to the production department overhead accounts. No service department costs are allocated to other service departments.

When performed manually, this method provides the simplest and quickest allocation technique. Using a spreadsheet program or other computer software, the direct method may not have any advantages over the step or reciprocal methods.

The major weakness of the direct method is that it ignores any services rendered by one service department to another. The failure to account for inter-service department usage can cause overhead allocations resulting in product cost cross-subsidization.

See the Let's Talk" box on the next page to relate the direct, step, and reciprocal methods to Activity-based Costing (Chapter 10).

Let's Talk

After completing Chapter 10 on Activity-based Costing (ABC), you may wish to return to Review Questions 9.16 through 9.18 and relate ABC to the three methods for service department allocations.

In stage one, overhead costs are traced to responsibility center overhead accounts. In ABC, stage one allocations are performed by tracing resource costs, through resource cost drivers, to activity centers. Service departments are formal overhead activity centers. Production departments also are formal activity centers.

Stage two allocations assign service department costs to production department overhead accounts. Relating this step to ABC, overhead activity center costs are allocated to production activity centers. Using activity cost drivers, cost objects are defined as production departments. With traditional service department allocations, all overhead must funnel through the production department overhead accounts. Using ABC, some overhead activity costs can be allocated to production activities (i.e., to production department overhead accounts), while some overhead activity costs can be allocated to other cost objects such as products and product lines.

Service department costs can be allocated to production department overhead accounts using the direct, step, or reciprocal methods. The step and reciprocal methods recognize that one overhead activity may use the services of another. ABC employs the direct method, however. For example, ABC does not provide for inter-service allocations (i.e., between activities), such as between a cafeteria and a custodial department. Both provide and use the services of the other.

9.17 The step method allows for limited recognition of services rendered by one service department to other service departments. Once a service department costs are allocated to other services and production department overhead accounts, no costs from other services can be allocated backward to it. For example, if the costs of a cafeteria are allocated prior to the costs of the custodial department, none of the custodial costs can be allocated back to the cafeteria, even though the cafeteria uses custodial services.

Advantages:

- The step method has an advantage over the direct method through the recognition of certain inter-service department usage.
- It is also simpler to use than the reciprocal method, at least when performed manually.
- The step method can be used within a responsibility accounting system to provide cost variances for VOH and FOH.

Disadvantages:

- This method is more complex than the direct method because a sequence of allocations must be chosen.
- The cross-subsidization problem with the direct method may not be sufficiently overcome by the step method due to the sequence used. Some sequences may be required by regulatory agencies or parent companies for comparability and consolidation reasons. These sequences may not represent the most accurate usage of services by other service departments.
- The step method recognizes only one-way, inter-service department use. When a service department both provides services to another service department, as well as uses that department's services, the reciprocal method may yield more accurate cost allocations.

9.18 The reciprocal method of overhead cost allocation, similar to the step method, recognizes that services rendered by certain service departments are used, in part, by other service departments. Through solving a series of simultaneous equations, reciprocal usage between service departments can be accounted for.

The advantage of this method is in potentially more accurate service department costs. Its disadvantages involve the need for a computer program to perform the calculations when more than a few departments are involved, and the inability to calculate cost variances for responsibility accounting.

9.19 The first step in making reciprocal allocations is to determine the shares of each service department's cost to be allocated to the other service departments and to the production departments. To make these percentage share calculations, a system of simultaneous equations must be solved. When only a few departments and interrelationships are involved, these equations can be solved by hand. When many variables and equations exist, computer (spreadsheet) programs are needed.

9.20 The term "vicious circle" is used because where service departments are interrelat ɹd, it is impossible to know the total cost of department A until allocation of the department B is complete, but the allocation of department B cannot be made until it has received its share of department A's cost. The nature of simultaneous equations requires iterative (a vicious circle of) reallocations. Some spreadsheet programs display a circular error message (CIRC) within the spreadsheet, signifying this condition.

9.21 Under- or overapplied overhead can result from:

- *Actual and estimated variable overhead cost per unit differences.* For example, if the actual VOH cost per unit of its cost driver (VOH allocation basis) is greater than the VOH POR, this signals that more was spent on VOH items than should have been. This is captured in the VOH spending variance. It can be caused by overspending on the VOH items when purchased, or by using more than SQA (the standard quantity allowed). The resulting unfavorable VOH spending variance creates underapplied overhead.
- *Actual and estimated total fixed overhead costs differences.* If actual FOH is less than budgeted FOH, a favorable FOH budget variance results. Favorable overhead variances create overapplied overhead in a normal and standard costing-based CAS because the FOH applied to products (or services) is based upon budgeted FOH. Budgeted FOH is the numerator of the FOH POR used to apply overhead to the product's cost.
- *Actual activity and expected capacity differences.* If a CAS employs absorption costing, FOH is applied (absorbed) into the cost of each product or service. The amount of FOH applied to each product (i.e., the FOH standard cost) is based upon some estimate of production volume. Chapter 7 presented four options: theoretical, normal, expected, and practical. The production volume is the denominator of the FOH standard cost. If the actual volume differs from the volume used in calculating the FOH standard cost, more or less FOH than originally budgeted will be applied to the product costs.

  To illustrate this, assume the FOH standard cost is $2.00, based on budgeted FOH of $2,000 per month, and a production quota of 1,000 products per month. If 1,100 products are made, $2,200 of FOH is applied to the product costs. FOH is overapplied by $200 due to producing more products than budgeted. The over- or underapplied overhead that results from differences between actual and budgeted production volume is captured in the FOH volume variance.

9.22 For proper responsibility accounting and cost management, cost variances need to be traced to their underlying sources and causes. As the first step in the variance cause identification process, cost variances need to be identified with the responsibility centers where they occurred. With respect to overhead cost variances, these responsibility centers can be production departments or service departments. To facilitate planning, operational control, and performance evaluation, the people controlling the activities within a service department need to know which cost variances occurred in their department. These people are in the best position to begin the cause identification process. Thus, service department cost variance analysis is needed for a high-quality SCAS.

9.23 Many traditional service department allocation procedures use percentages to represent the consumption of service department activities by other departments. This can create two problems in cost variance analysis.

- First, VOH and FOH are usually combined into one TOH account. Without separate accounting of VOH and FOH, four-way overhead variance analysis cannot be performed. The aggregated overhead variances that such a system produces (e.g., two-way overhead variance analysis) do not provide the detailed cost management information needed to identify where costs may be out of control. Examples of the detailed VOH and FOH information and variances are illustrated in Exhibits 8-3 and 8-4.
- Second, the percentage basis used in all three traditional methods (direct, step, and reciprocal) usually is recalculated based on actual relative usage when making actual overhead cost allocations throughout the year. This means that activities in one department can result in pseudo-variances in another department. This is demonstrated in the Birchtree Manufacturing example used in Chapter 9.

9.24 Exhibit 9-9 presents two overhead control accounts within the subsidiary ledger system for WIP. Separate VOH and FOH subsidiary accounts are created for each production and service department. This is based on the recognition that VOH and FOH are caused by different activities, even within an individual responsibility center.

The amount of VOH costs incurred results, in part, from the usage of VOH items. The greater the amount of VOH items used, the greater the total VOH cost. FOH, though, should not change in total with changes in the level of activity within a responsibility center (within the relevant range). For the most part, FOH is caused by the capacity or size of the responsibility centers. Consequently, VOH and FOH should be separately accounted for, with separate cost variance calculations, to aid in the identification and control of the underlying sources and causes of the production problems creating the cost variances.

9.25 It is important to involve all those responsible for the cost and control of service department activities because other departments are the customers (users) of each service. The users need to supply service demand information so that the proper level of services can be budgeted. The users also need to be aware of the capacity constraints of each service so that total demand does not exceed the service department's ability.

Accordingly, each department head should coordinate plans with the other department heads, sharing information so that the budgeting process can be efficiently and effectively performed. For example, in budgeting the variable costs of repairs and maintenance, this manager needs to know the number of machine hours planned to be worked within each department. With this information, the manager can budget a VOH POR for the allocation of variable repair and maintenance costs to the users of this service. This manager also needs to schedule maintenance services so that all users are satisfied, within the constraints of the repairs and maintenance department. This information then needs to be communicated to those users.

9.26 Some costs can be directly traced to a department, but also be classified as indirect costs with respect to individual products. To illustrate, assume that each production department has its own VOH and FOH subsidiary ledger accounts within WIP. Factory supplies can be requisitioned for this department and be directly traced to it. These indirect materials are included in the department's VOH account, though, because they cannot be directly traced to each product passing through the department.

Let's Talk

The important point to emphasize to students in classifying costs as direct and indirect is to identify the cost object involved. A cost element can be a direct cost of one cost object (such as a production department), but indirect with respect to a different cost object (e.g., a particular product).

All variable service department costs can be directly traced to those other service and production departments using that service. Thus, variable service department costs are direct costs of the using departments, but still indirect costs of the products made because these costs are included in each production department's VOH account. Budgeted service department costs are included in the production department's VOH POR and applied to each product with the other VOH costs of that department.

Fixed service department costs are allocated to each using department in lump-sum amounts based on relative size ratios. Because they are allocated, fixed service department costs are indirect costs to both the production departments as well as the products.

9.27 Variable costs are constant per unit of their cost driver. Expressing a variable cost on a per unit, or rate, basis gives it predictive usefulness. In other words, knowing a variable cost per unit, total variable cost can be budgeted for any given volume (within the relevant range).

Variable service department costs can be budgeted and expressed on a per unit basis. For example, it should cost $2.00 per meal for the variable costs of lunch at a hospital. Knowing this information and the projected number of meals to be eaten, a user of this service can then budget the total variable lunch costs that should be included in the user's VOH POR.

In controlling costs, the cafeteria manager has contracted to provide lunches at $2.00 each. This manager is responsible for controlling the variable food costs so that no spending variances are incurred.

In evaluating performance, the budgeted rate of $2.00 is used to allocate variable lunch costs to the using departments. The total amount allocated depends on the actual number of meals eaten. If more meals are eaten than should have been, this usage variance is the responsibility of the department receiving this service, and is included in the user department's VOH subsidiary ledger account. In contrast, if the variable costs of a lunch are different from the $2.00 standard price, this difference is the responsibility of the service department (cafeteria) manager. By using the $2.00 rate, any spending variance remains in the service department's VOH account.

9.28 Budgeted VOH rates for service department costs can be determined for use with the direct and step methods, but not with the reciprocal method. The rate is developed by dividing the total budgeted variable costs of a service department by the budgeted volume of the service to be provided to the users.

With the direct method, user volume only includes the usage budgeted by the production departments. With the step method, user volume includes all service departments not previously allocated plus the usage in the production departments.

To illustrate the calculation, assume laundry services budgets $100,000 in variable costs to process 110,000 loads during the forthcoming year. The step method is used and two service departments (the pharmacy and radiology) are allocated prior to laundry services. These two services projected 10,000 loads of laundry. For the users receiving a variable laundry cost allocation, only 100,000 loads are budgeted. Dividing the $100,000 budgeted variable costs into the 100,000 budgeted loads for the departments receiving an allocation, a $1.00 per load laundry rate results.

9.29 Each user contracts to receive a particular service for a mixed cost. The variable cost of the service depends upon its budgeted rate and the volume of that service to be consumed. The FOH allocations represent the fixed costs of having this service available for the users.

The logic behind using relative size ratios for fixed service department allocations is that the fixed costs represent the costs of having a certain level (capacity) of the service available. Service capacity depends upon the size of its users. The bigger the users, the more of a service they may need. The bigger the service department must be, the greater its fixed costs. Relative size ratios capture this size cause-effect relationship in terms of the amount of a service each user can possibly demand (i.e., when it is operating at its maximum capacity). Using these ratios to allocate the fixed service department costs, each user assumes a fair share of the service's fixed costs based on its potential maximum demand; the cause of the service's fixed costs.

9.30 Relative size ratios are calculated by dividing the maximum demand for a service from a particular using department into the sum of the maximum demands of all users to receive an allocation of the service department's fixed costs.

To illustrate this calculation, assume the assembly department could demand 1,000 hours of maintenance work for its equipment if operating at maximum capacity. The total hours of maintenance that could be needed if all departments operated at maximum capacity is 10,000, which is the maximum capacity the maintenance department could supply. The assembly department's relative size ratio is 10 per cent (1,000 hours ÷ 10,000 hours). It could demand up to 10 per cent of the capacity of the maintenance department. Thus, the assembly department is responsible for 10 per cent of the budgeted fixed costs of maintenance.

9.31 In designing a high-quality responsibility accounting system, the budgeted service department cost equations can be viewed as a contractual agreement between the service departments and the user departments. Each user department contracts for service department activities at a standard variable rate for each service provided plus a lump-sum allocation of the service department's fixed costs. In effect, services are based on a mixed cost contract.

For example, many universities have their own power plants. Different academic and service departments contract for power usage. Associated with the usage of power is a variable cost for each kilowatt hour consumed. The power plant requires fixed costs just to exist and maintain its level (capacity) of service. Each user can be allocated a portion of this budgeted fixed cost in relation to the amount of power it could demand. Using this mixed service department cost equation, users can budget the cost of power based upon their anticipated demand.

The manager of the power plant, using this contractual mixed cost contract, agrees to provide power at a predetermined rate per kilowatt hour and for a budgeted fixed cost. In this manner, the power plant manager assumes responsibility for budgeting and controlling power plant costs.

9.32 Actual variable service department costs are allocated to the users of that service based on a budgeted rate multiplied by the actual volume of the service used. This method allows the users of services to budget the costs of these services in preparing their variable overhead budgets. This method also allows for the isolation and reporting of service-related cost variances according to who is responsible for a particular aspect of the service used. This is discussed in the following review question.

9.33 The use of a predetermined (standard) rate for variable service department cost allocations allows the variable cost variances to be isolated in the appropriate responsibility center accounts. To illustrate this in a governmental setting, assume the variable costs of the building and grounds department (which performs equipment repairs) is budgeted at $20.00 per hour. Also assume that the actual hourly rate is $19.90 due to a savings in the cost of labor. This ten cent per hour favorable variable cost spending variance ($20.00/hour standard rate versus the $19.90/hour actual rate) for each of the 40,000 actual hours worked is the responsibility of the building and grounds manager.

This $4,000 favorable spending variance is not allocated to the user departments if the standard $20.00 per hour rate is used. This allocation method keeps the spending variance within the buildings and grounds VOH account. If the actual rate of $19.90 per hour is used to allocate variable buildings and grounds cost, this spending variance would be passed through the accounting system into the users' VOH accounts and buried in their other costs.

In allocating the variable costs of this service, if a user requests more of the service than budgeted, this usage variance is the responsibility of department requesting the service. For example, the Office of Contract Administration for the state government budgets 1,000 hours of equipment repair time, but requests 1,400 hours throughout the year. The amount of variable repair costs allocated is based on the budgeted rate of $20.00 per hour multiplied by the 1,400 actual hours requested. It is the responsibility of the Office of Contract Administration to understand why more hours were actually used than budgeted, and this variance is reported within the VOH account of that department. With this information, the Office of Contract Administration is in a better position to budget and control this usage in subsequent periods.

9.34 There are two variable service department cost variances, spending and usage. Each service and producing department will have a variable cost spending variance for its direct variable overhead costs. Each department will also have a usage variance for each service it used.

9.35 If the actual FOH costs incurred by a service department are allocated to the users of the service, the service department manager may have less incentive to control these costs. Any cost overruns (or savings) will be buried in multiple allocations to the users. By only allocating the budgeted FOH costs, then any FOH budget variance will remain within the service department's FOH subsidiary ledger account. It is the responsibility of that manager to budget and control these costs.

CHAPTER-SPECIFIC PROBLEMS:

9.41 *Multiple choice questions:*

1. d Answers a-c address the budgeting goals for service department allocations. The goal of budgeted service department allocations at the beginning of a period is to determine PORs (answer c). This requires predicting each service department's costs (answer a), which, in turn, requires group decision-making activities (coordination, answer b).

> ***Let's Talk***
>
> You may wish to ask your students about the other goals for service department allocations.
>
> In addition to the planning goals, service department allocations serve operational control and performance evaluation goals. Accomplishing these goals is facilitated by allocating actual VOH costs with a standard service department rate, and by not allocating actual FOH service department costs (instead allocating budgeted FOH, as shown in Exhibit 9-10).
>
> Enhanced performance evaluation results from identifying and reporting service department cost variances within each responsibility center's WIP accounts. Using the budgeted service department variable cost rates multiplied by the actual volume of the service consumed, user departments are motivated to monitor and control usage, facilitating operational control.

2. a
3. a
4. c
5. d
6. c (See the "Let's Talk" box on the next page.)

(This problem is continued on the next page.)

Let's Talk

Are both answers b and c correct? Sweeping, washing, and polishing floors is most likely a fixed cost based on the square footage of each department. Some cleaning costs may vary with the number of employees, however, such as the costs of trash disposal. These types of costs could vary with the number of sales transactions or sales volume, though. Some cleaning costs, such as polishing glass display cases may be driven by the size of the cases (surface square footage).

This question provides an interesting vehicle for the introduction of Activity-based Costing. You may wish to have your students answer the following two questions (perhaps writing their answers for class discussion):

- How many activities are involved in providing janitorial services?
- What is the cost driver for each activity?

7. b Answer c is not correct because the "cost object" is what we are measuring the cost of (i.e., different overhead activities and their responsibility centers). The cost allocation basis, if properly chosen, represents the cost driver for the service departments' costs. Thus, it is essential for estimating service department costs, and answer a is also correct. Usually, professional certification exams seek the best answer, though. Estimating costs is only one use for cost drivers. They are also used to allocate budgeted and actual costs, and in the calculations of overhead variances. Cost allocation is the "umbrella" (or overall goal) under which the other subgoals exist.

8. d Answer a is not correct because the cause-effect direction is from budgeting to PORs. PORs result from the budgeting process. Both answers b and c were presented in Chapter 4 as justifications for evolving from an actual CAS to a normal CAS. Management needs timely cost information, and cannot wait until year-end to know actual overhead rates (AORs) for product costing. Normal CASs using PORs better match overhead costs to the activities consuming them, and to these activities' time periods (cash versus accrual-based accounting, and matching principle).

9. c

9.42 *TOH POR Calculations:*

Department M = $\frac{\$600{,}000}{\$200{,}000}$ = 300% of Direct labor cost

Department A = $\frac{\$400{,}000}{\$800{,}000}$ = 50% of Direct labor cost

Costs for job 432:

Direct materials		$25,000
Direct labor:	Department M	8,000
	Department A	12,000
Total overhead:	Department M (300% x $8,000)	24,000
	Department A (50% x $12,000)	6,000
Total costs for job 432		**$75,000**

9.43 a,b.

PROBLEM 9.43a,b

DATA SECTION:

	SERVICE DEPARTMENTS		PRODUCTION DEPARTMENTS		
	CAFETERIA	MAINTENANCE	ADMIN	FABRICATION	ASSEMBLY
Direct labor costs	$87,000	$82,100	$90,000	$1,950,000	$2,050,000
Direct materials costs	91,000	65,000	0	3,130,000	950,000
Direct total overhead	62,000	56,100	70,000	1,650,000	1,850,000
TOTAL DEPARTMENT COSTS	$240,000	$203,200	$160,000	$6,730,000	$4,850,000
Number of employees	480	0	0	280	200
Square footage occupied		160,000	0	88,000	72,000
Direct labor hours			1,000,000	562,500	437,500

SOLUTION SECTION:

	SERVICE DEPARTMENTS		PRODUCTION DEPARTMENTS		
COST ALLOCATIONS:	CAFETERIA	MAINTENANCE	ADMIN	FABRICATION	ASSEMBLY
DIRECT COSTS	$240,000	$203,200	$160,000	$6,730,000	$4,850,000
CAFETERIA RATIOS	100%	0%	0%	58%	42%
CAFETERIA ALLOCATIONS	(240,000)	0	0	140,000	100,000
MAINTENANCE RATIOS		100%	0%	55%	45%
MAINTENANCE ALLOCATIONS		(203,200)	0	111,760	91,440
ADMINISTRATION RATIOS			100%	56%	44%
ADMINISTRATION ALLOCATIONS			(160,000)	90,000	70,000
TOTAL OVERHEAD COSTS	$0	$0	$0	$7,071,760	$5,111,440

9.43 c. See the "Let's Talk" box on the next page concerning rounding percentages in manual calculations and formatting percentages in spreadsheet programs.

PROBLEM 9.43c

DATA SECTION:

	SERVICE DEPARTMENTS		PRODUCTION DEPARTMENTS	
	CAFETERIA	MAINTENANCE	ADMIN	FABRICATION	ASSEMBLY
Direct labor costs	$87,000	$82,100	$90,000	$1,950,000	$2,050,000
Direct materials costs	91,000	65,000	0	3,130,000	950,000
Direct total overhead	62,000	56,100	70,000	1,650,000	1,850,000
TOTAL DEPARTMENT COSTS	$240,000	$203,200	$160,000	$6,730,000	$4,850,000
Number of employees	500	8	12	280	200
Square footage occupied		161,750	1,750	88,000	72,000
Direct labor hours			1,000,000	562,500	437,500

SOLUTION SECTION:

COST ALLOCATIONS:	SERVICE DEPARTMENTS CAFETERIA	MAINTENANCE	PRODUCTION DEPARTMENTS ADMIN	FABRICATION	ASSEMBLY
DIRECT COSTS	$240,000	$203,200	$160,000	$6,730,000	$4,850,000
CAFETERIA RATIOS	100%	2%	2%	56%	40%
CAFETERIA ALLOCATIONS	(240,000)	~~3,840~~ 4800	~~5,760~~ 4800	~~134,400~~	~~96,000~~
MAINTENANCE RATIOS		100%	1%	54%	45%
MAINTENANCE ALLOCATIONS		~~(207,040)~~ 208000	~~2,240~~ 2080	~~112,640~~ 112,320	~~92,160~~ 93600
ADMINISTRATION RATIOS			100%	56%	44%
ADMINISTRATION ALLOCATIONS			~~(168,000)~~	~~94,500~~ 93450	~~73,500~~ 73427
TOTAL OVERHEAD COSTS	$0	$0	~~$0~~ 166880 $0	$7,071,540	$5,111,660

166880

Let's Talk

The spreadsheet solution is formatted to display percentages as whole percentages. Using rounded percentages, though, creates different allocation amounts. Students should be cautioned against rounding when performing the calculations manually.

- For example, in parts b and c, the administration ratios are 56.25% and 43.75%.
- In part c, the cafeteria ratios for maintenance and administration are 1.6% and 2.4%.
- In part c, the maintenance ratios are 1.082%, 54.405%, and 44.513%.

In performing traditional allocations using total service department costs and percentages, the fixed costs allocation section of the dual method spreadsheet program in the chapter and the demonstration problems is used.

9.44 Using the step method, service department B percentages must be recomputed. Even though 10 percent of department B's services are for department A, no costs can be allocated back to A from B. Department B costs can only be allocated to departments C, Y, and Z. Recomputing the percentages:

- Department C: 9% ÷ (9% + 18% + 63% = 90%) = **10%.**
- Department Y: 18% ÷ 90% = **20%.**
- Department Z: 63% ÷ 90% = **70%.**

SOLUTION SECTION:

	-----SERVICE DEPARTMENTS-----			-PRODUCTION DEPARTMENTS-	
COST ALLOCATIONS:	DEPT. A	DEPT. B	DEPT. C	DEPT. Y	DEPT. Z
DIRECT COSTS	$100,000	$75,000	$60,000		
DEPARTMENT A RATIOS	100%	15%	5%	55%	25%
DEPT. A ALLOCATIONS	(100,000)	15,000	5,000	55,000	25,000
DEPARTMENT B RATIOS		100%	10%	20%	70%
DEPT. B ALLOCATIONS		(90,000)	9,000	18,000	63,000
DEPARTMENT C RATIOS			100%	30%	70%
DEPT. C ALLOCATIONS			(74,000)	22,200	51,800
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$0	$95,200	$139,800

15

Let's Talk

Students may have some difficulty with this problem because the departments are not classified into service versus production. By looking at the allocation percentages, though, departments D_4 and D_5 are production departments. None of their costs are allocated to the other departments.

Reciprocal Allocations

Service Departments	Costs	Reciprocal Allocation Amounts	Formulas
D1	$22,000	$22,000	22000
D2	$18,000	$24,671	0.25*DEPT1+0.04*DEPT3+18000
D3	$15,000	$29,268	0.2*DEPT1+0.4*DEPT2+15000
Production Departments			
D4	$14,400	$35,638	0.15*DEPT1+0.3*DEPT2+0.36*DEPT3+14400
D5	$65,000	$98,762	0.4*DEPT1+0.3*DEPT2+0.6*DEPT3+65000
TOTAL COSTS	$134,400	$134,400	

9.46 a. Recomputed percentages for the direct method:

- Maintenance: Departments A and B each use 40%, thus, each receives 50% of the Maintenance Department costs (40% ÷ 80%).
- Utilities: Department A uses 30% of 90% (30% + 60%), thus, it is allocated one-third of the utilities costs. Department B uses 60% of 90%, and is allocated two-thirds of the utilities costs.

The spreadsheet solution is presented on the next page. $6,000 of the utilities costs is allocated to Department B.

b. Recomputed percentages for the step method:

- Utilities: The same percentages used in the direct method are appropriate for the step method because the utilities costs are the last service costs to be allocated.

b. (continued)
Technically, this question is asking for the amount of utilities cost to be allocated to the production departments ($12,740).

c. $18,700 + (10% x Utilities costs to be allocated)

d. $9,000 + (20% x Maintenance costs to be allocated)

PROBLEM 9.46a

COST ALLOCATIONS:	-SERVICE DEPARTMENTS- Maintenance	Utilities	-PRODUCTION DEPTS-- Dept. A	Dept. B
Direct costs	$18,700	$9,000		
Maintenance Dept. ratios	100%	0%	50%	50%
Cost allocations	(18,700)	0	$9,350	$9,350
Utilities Dept. ratios		100%	33%	67%
Cost allocations		(9,000)	3,000	6,000
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$12,350	$15,350

PROBLEM 9.46b

COST ALLOCATIONS:	-SERVICE DEPARTMENTS- Maintenance	Utilities	-PRODUCTION DEPTS-- Dept. A	Dept. B
Direct costs	$18,700	$9,000		
Maintenance Dept. ratios	100%	20%	40%	40%
Cost allocations	(18,700)	3,740	$7,480	$7,480
Utilities Dept. ratios		100%	33%	67%
Cost allocations		(12,740)	4,247	8,493
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$11,727	$15,973

9.47 The Janitorial, Accounting, and Orderlies Departments are service departments. Under the direct method, these departments' square footage is not included in computing the allocation percentages. No service department costs are allocated to other service departments with this method.

The Hospital Rooms Department percentage is **75%** (30,000 sq. ft. ÷ [4,000 + 30,000 + 6,000 = 40,000 sq. ft.]). **$75,000** of the utility bill (75% x $100,000) is allocated to the Hospital Rooms Department.

9.48

PROBLEM 9.48

DATA SECTION: BUDGETED VARIABLE AND FIXED OVERHEAD COSTS

	SVC. DEPT.	PRODUCING DEPTS			
	ELECTRIC	ROCKFORD	PEORIA	HAMMOND	KANKAKEE
BUDGETED DVOH	$6,000	$25,000	$30,000	$20,000	$15,000
BUDGETED USAGE (KWhrs)	30,000	8,000	9,000	7,000	6,000
BUDGETED DLhr		266,000	3,180	107,000	8,100
BUDGETED DFOH	$9,000	$130,000	$145,000	$90,000	$150,000
CAPACITY USAGE (KWhrs)	50,000	10,000	20,000	12,000	8,000

SOLUTION SECTION: BOP ALLOCATIONS

	SVC. DEPT.	PRODUCING DEPTS			
VOH ALLOCATIONS:	ELECTRIC	ROCKFORD	PEORIA	HAMMOND	KANKAKEE
BUDGETED DVOH	$6,000	$25,000	$30,000	$20,000	$15,000
ELECTRIC RATE per KWhr	$0.20				
VOH ALLOCATION	(6,000)	1,600	1,800	1,400	1,200
TOTAL VOH BUDGETED	$0	$26,600	$31,800	$21,400	$16,200
DEPARTMENTAL VOH POR/DLhr		$0.10	$10.00	$0.20	$2.00
FOH ALLOCATIONS:					
BUDGETED DFOH	$9,000	$130,000	$145,000	$90,000	$150,000
ELECTRIC CAPACITY	100.00%	20.00%	40.00%	24.00%	16.00%
FOH ALLOCATION	(9,000)	1,800	3,600	2,160	1,440
TOTAL FOH BUDGETED	$0	$131,800	$148,600	$92,160	$151,440
DEPARTMENTAL FOH POR/DLhr		$0.50	$46.73	$0.86	$18.70
TOTAL OVERHEAD BUDGETED	$0	$158,400	$180,400	$113,560	$167,640
DEPARTMENTAL TOH POR/DLhr		$0.60	$56.73	$1.06	$20.70

9.49

PROBLEM 9.49

DATA SECTION: BUDGETED VARIABLE AND FIXED OVERHEAD COSTS

	SVC. DEPT.	--------PRODUCING DEPTS---------		
	MAINTENANCE	GRINDING	POLISHING	ASSEMBLY
BUDGETED DVOH	$9,000	$3,000	$4,000	$5,000
BUDGETED USAGE (DLhr)	900	300	200	400
BUDGETED MACHINE HOURS		1,000	800	2,000
BUDGETED DFOH	$4,500	$6,000	$7,000	$8,000
CAPACITY USAGE (DLhr)	1,500	500	600	400

SOLUTION SECTION: BOP ALLOCATIONS

	SVC. DEPT.	--------PRODUCING DEPTS---------		
VOH ALLOCATIONS:	MAINTENANCE	GRINDING	POLISHING	ASSEMBLY
BUDGETED DVOH	$9,000	$3,000	$4,000	$5,000
MAINTENANCE RATE per DLhr	$10.00			
VOH ALLOCATION	(9,000)	3,000	2,000	4,000
TOTAL VOH BUDGETED	$0	$6,000	$6,000	$9,000
DEPARTMENTAL VOH POR/Mhr		$6.00	$7.50	$4.50
FOH ALLOCATIONS:				
BUDGETED DFOH	$4,500	$6,000	$7,000	$8,000
MAINTENANCE CAPACITY RATIOS	100.00%	33.33%	40.00%	26.67%
FOH ALLOCATION	(4,500)	1,500	1,800	1,200
TOTAL FOH BUDGETED	$0	$7,500	$8,800	$9,200
DEPARTMENTAL FOH POR/Mhr		$7.50	$11.00	$4.60
TOTAL OVERHEAD BUDGETED	$0	$13,500	$14,800	$18,200
DEPARTMENTAL TOH POR/Mhr		$13.50	$18.50	$9.10

9.50

PROBLEM 9.50a

DATA SECTION: BUDGETED VARIABLE AND FIXED OVERHEAD COSTS

	SVC. DEPT.	PRODUCING DEPTS			
	A/R	UPTOWN	DOWNTOWN	EASTSIDE	WESTSIDE
BUDGETED DTOH	$70,000				
BUDGETED CREDIT SALES	$200,000	$20,000	$100,000	$40,000	$40,000

SOLUTION SECTION: BOP ALLOCATIONS

	SVC. DEPT.	PRODUCING DEPTS			
VOH ALLOCATIONS:	A/R	UPTOWN	DOWNTOWN	EASTSIDE	WESTSIDE
BUDGETED DTOH	$70,000				
A/R RATE (per credit sales dollar)	$0.35				
TOH ALLOCATION	(70,000)	$7,000	$35,000	$14,000	$14,000

PROBLEM 9.50b

DATA SECTION: BUDGETED VARIABLE AND FIXED OVERHEAD COSTS

	SVC. DEPT.	PRODUCING DEPTS			
	A/R	UPTOWN	DOWNTOWN	EASTSIDE	WESTSIDE
BUDGETED DVOH	$20,000				
BUDGETED CREDIT SALES	$200,000	$20,000	$100,000	$40,000	$40,000
BUDGETED DFOH	$50,000				
MAXIMUM CREDIT SALES	$300,000	$75,000	$120,000	$60,000	$45,000

SOLUTION SECTION: BOP ALLOCATIONS

	SVC. DEPT.	PRODUCING DEPTS			
VOH ALLOCATIONS:	A/R	UPTOWN	DOWNTOWN	EASTSIDE	WESTSIDE
BUDGETED DVOH	$20,000				
A/R RATE (per credit sales dollar)	$0.10				
VOH ALLOCATION	(20,000)	$2,000	$10,000	$4,000	$4,000
FOH ALLOCATIONS:					
BUDGETED DFOH	$50,000				
MAXIMUM CREDIT SALES	100.00%	25.00%	40.00%	20.00%	15.00%
FOH ALLOCATION	(50,000)	$12,500	$20,000	$10,000	$7,500
TOTAL OVERHEAD BUDGETED	$0	$14,500	$30,000	$14,000	$11,500

THINK-TANK PROBLEMS:

9.51 *Competence:*

The third criterion of competence requires complete and clear reports and recommendations after appropriate analyses of relevant information. To satisfy the management accounting objective for a CAS, relevant performance evaluation information should be reported. To create relevant cost variances, the dual allocation method should be used.

- Variable costs of services should be allocated to production departments using the budgeted variable rate for the service multiplied by the actual amount of the service used. The spending variance remains within the service department's account (either the VOH account or a cost variance account). The usage variance remains within the user's account (either the VOH account or its cost variance account).
- Service department fixed costs are allocated using budgeted amounts based on the relative size ratios of the user departments. The FOH spending variance remains within the service department's account (either its FOH account or its cost variance account).

Integrity:

- If traditional allocation methods are used, such as allocating service department TOH costs based on relative usage percentages, the management accountant should recognize and communicate the limitations of these allocations in evaluating performance.
- By not communicating this information, the management accountant may be actively or passively subverting the attainment of the organization's legitimate objectives with respect to performance evaluation.

Objectivity:

The management accountant has the responsibility to fully disclose all relevant information that could reasonably be expected to influence users' understanding and recommendations. In evaluating performance, relevant information includes cost variances for service departments and for production departments' VOH and FOH. Both spending and usage variances should be identified and accumulated with the appropriate responsibility centers.

9.52 *Accuracy:*

The reciprocal allocation technique provides the most accurate service department allocations because it recognizes inter-service department usage. The step method only recognizes partial inter-service department usage, while the direct method ignores all such usage.

Relevance:

- The step method provides the most relevant information because it allows the calculation of cost variances. The dual method allows separate calculations of VOH and FOH spending and usage variances.

(Continued on the next page.)

- The reciprocal method requires the use of percentages based on the relative usage of services. While this method provides the most accurate allocations, it does not allow for cost variance calculations. Cost variances are needed for a performance evaluation system that is accepted as legitimate by organizational members. Consequently, the reciprocal method does not provide the relevant information needed for this management accounting objective of the CAS.
- Cost variances can be calculated with the direct method, but this method does not allocate service costs to other service departments using a particular service. Thus, no cost variances for service department usage of other services can be calculated. Further, VOH spending variances are not as useful as with the step method. Service department VOH spending variances include controllable spending factors and uncontrollable usage factors when inter-service usage exists.

Timeliness:

- When budgeting service department costs and production department PORs, the managers must share projected usage information and price information. Service department managers need projected usage information to prepare their budgets and develop budgeted variable and fixed costs for their departments. The managers using various services need to know the cost equations for the services so that they can determine PORs. This information must be available when needed for the efficient functioning of a participative budgeting process.
- For operational control, cost variance information needs to be available in real time. While reporting monthly cost variances may be sufficient for performance evaluation, to manage the activities creating cost variances, this information is needed when the variances occur.
- Cost variance reports should be available prior to the scheduled evaluations of cost center managers. These managers need time to reconcile the reports to their information identifying the underlying sources and causes of the cost variances. Upper management then needs time to reconcile information about inter-departmental cause-effects in assigning responsibility for the variances.

Fairness:

- Fairness means that information is impartial. Under traditional allocation methods, recalculating relative usage percentages based on actual usage, and then allocating actual service department costs with these percentages, introduces a bias into the CAS. The allocations are not impartial if certain managers can manipulate the amount of service costs allocated to them and to others through affecting the allocation bases used.
- For example, a manager may layoff all part-time or currently unnecessary workers at the end of a reporting period to change an allocation base. To avoid increased allocations of service costs, another manager may delay the implementation of an unbudgeted, but needed and approved, expansion project, such as the hiring of three additional people in the Computing Center at Birchtree Manufacturing (see Exhibit 9-8 and the discussion on pages 414-416).

(Continued on the next page.)

- Finally, the managers using services will not accept the CAS allocations as fair if actual service department costs are allocated. As was illustrated in the Birchtree Manufacturing example, a service center manager will have little incentive to control his costs. This manager may actually be rewarded and the using managers not rewarded when cost overruns occur within the service department.

Usability:
Managers should be able to understand CAS output instantly. Reporting cost variances by responsibility center for service-related activities along with the materials and labor cost variances, increases the usability of the information. Traditional allocation methods that do not provide management accounting information needed for planning, control, and evaluation of service-related activities inhibit effective and efficient management of these activities.

9.53 This problem continues the issues raised in Think-Tank Problem 8.65. That solution presents a general ledger coding system identifying the sources and causes of production-related cost variances. The coding system is limited to the inter-production department (or cell) cost variances. This system should be expanded to include cost variances caused by service-related activities.

For example, the excess usage of utilities, or engineering services, may be due to a special rush order. The budgeted meal rate for a hospital cafeteria is affected by the projected mix of patients and their special dietary needs. If operating managers realize a significant shift in the projected mix of their patients from budget, the cause of this service department spending variance needs to be captured and reported by the CAS. Such information is relevant for proper performance evaluation, on-going control of the hospital, and to aid future budgeting.

Whether a responsibility center is a JIT cell or a traditionally designed production department, service department cost variance information is necessary to understand the differences between budgeted and actual overhead costs. The sources and causes of cost variances need to be identified with the service and production responsibility centers for proper control and evaluation. Therefore, we believe that dual method cost allocations should be made to JIT cells just as they are made to traditional production departments as presented within the chapter.

The only difference between a JIT-based WIP system and a traditional process costing system may be that the level one subsidiary accounts become JIT cells instead of production departments. With both JITs and traditional processes, service departments and overhead activities exist. Consequently, level two overhead accounts will be needed in a JIT just as they are needed in a traditional environment.

9. 14 It's doubtful that a backflush system can provide relevant cost variance information concerning service-related activities. The key consideration driving backflush systems is simplicity. Operations are assumed under control, so minimum accounting and journal entries are made. Unless major discrepancies exist between the actual overhead costs debited into the conversion costs account and the amounts credited (backflushed out) based on standard costs, no detailed cost variance information is needed.

9.55
PROBLEM 9.55

DATA SECTION: BUDGET ALLOCATIONS AT BEGINNING OF PERIOD (BOP)

	-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
	CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
BUDGETED DVOH	$75,000	$8,000	$5,000	$15,280	$5,600	$35,120
BUDGETED MEALS	30,000	900	400	0	8,000	20,700
BUDGETED FILES		25,625	1,500	3,800	8,000	12,325
BUDGETED LOADS			11,000	2,000	2,000	7,000
BUDGETED PATIENT-DAYS				6,000	3,000	48,000
BUDGETED DFOH	$60,000	$17,500	$20,000	$39,766	$99,696	$315,038
CAPACITY MEALS	50,000	1,000	500	0	8,500	40,000
CAPACITY FILES		35,000	3,500	7,000	10,500	14,000
CAPACITY LOADS			12,000	2,400	2,400	7,200

SOLUTION SECTION: BUDGET ALLOCATIONS AT BEGINNING OF PERIOD (BOP)

		-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
VOH ALLOCATIONS:		CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
BUDGETED DVOH		$75,000	$8,000	$5,000	$15,280	$5,600	$35,120
MEAL RATE	$2.50						
MEAL ALLOCATION		(75,000)	2,250	1,000	0	20,000	51,750
FILE RATE	$0.40						
FILE ALLOCATION			(10,250)	600	1,520	3,200	4,930
LAUNDRY RATE	$0.60						
LAUNDRY ALLOCATION				(6,600)	1,200	1,200	4,200
TOTAL VOH		$0	$0	$0	$18,000	$30,000	$96,000
VOH POR/PATIENT-DAY					$3.00	$10.00	$2.00
FOH ALLOCATIONS:							
BUDGETED DFOH		$60,000	$17,500	$20,000	$39,766	$99,696	$315,038
MEAL CAPACITIES		100%	2%	1%	0%	17%	80%
MEAL ALLOCATION		(60,000)	1,200	600	0	10,200	48,000
FILE CAPACITIES			100%	10%	20%	30%	40%
FILE ALLOCATION			(18,700)	1,870	3,740	5,610	7,480
LAUNDRY CAPACITIES				100%	20%	20%	60%
LAUNDRY ALLOCATION				(22,470)	4,494	4,494	13,482
TOTAL FOH		$0	$0	$0	$48,000	$120,000	$384,000
FOH POR/PATIENT-DAY					$8.00	$40.00	$8.00
TOH BUDGETED		$0	$0	$0	$66,000	$150,000	$480,000
TOH POR/PATIENT-DAY					$11.00	$50.00	$10.00

9.56
PROBLEM 9.56

DATA SECTION: ACTUAL COST ALLOCATIONS AT END OF PERIOD (EOP)

	-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
	CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
ACTUAL DVOH	$80,000	$5,200	$5,000	$15,000	$10,000	$25,000
ACTUAL MEALS	39,250	800	450	0	8,000	30,000
ACTUAL FILES		18,000	1,280	4,000	1,500	11,220
ACTUAL LOADS			10,000	1,500	500	8,000
ACTUAL PATIENT-DAYS				6,500	4,000	45,000
ACTUAL DFOH	$60,000	$17,000	$22,000	$41,766	$95,000	$340,000

SOLUTION SECTION: ACTUAL COST ALLOCATIONS AT END OF PERIOD (EOP)

		-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
VOH ALLOCATIONS:		CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
ACTUAL DVOH		$80,000	$5,200	$5,000	$15,000	$10,000	$25,000
MEAL RATE	$2.50						
MEAL ALLOCATION		(98,125)	2,000	1,125	0	20,000	75,000
FILE RATE	$0.40						
FILE ALLOCATION			(7,200)	512	1,600	600	4,488
LAUNDRY RATE	$0.60						
LAUNDRY ALLOCATION				(6,000)	900	300	4,800
TOTAL VOH		($18,125)	$0	$637	$17,500	$30,900	$109,288
LESS: PATIENT CHARGES					(19,500)	(40,000)	(90,000)
ENDING VOH BALANCE		($18,125)	$0	$637	($2,000)	($9,100)	$19,288
FOH ALLOCATIONS:							
ACTUAL DFOH		$60,000	$17,000	$22,000	$41,766	$95,000	$340,000
MEAL CAPACITIES		100%	2%	1%	0%	17%	80%
MEAL ALLOCATION		(60,000)	1,200	600	0	10,200	48,000
FILE CAPACITIES			100%	10%	20%	30%	40%
FILE ALLOCATION			(18,700)	1,870	3,740	5,610	7,480
LAUNDRY CAPACITIES				100%	20%	20%	60%
LAUNDRY ALLOCATION				(22,470)	4,494	4,494	13,482
TOTAL FOH		$0	($500)	$2,000	$50,000	$115,304	$408,962
LESS: PATIENT CHARGES					(52,000)	(160,000)	(360,000)
ENDING FOH BALANCE		$0	($500)	$2,000	($2,000)	($44,696)	$48,962
ENDING TOH BALANCE		($18,125)	($500)	$2,637	($4,000)	($53,796)	$68,250

9.57a
PROBLEM 9.57a

DATA SECTION: BUDGET ALLOCATIONS AT BEGINNING OF PERIOD (BOP)

	-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
	CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
BUDGETED DVOH	$75,000	$8,000	$5,000	$15,280	$5,600	$35,120
BUDGETED MEALS	28,700	0	0	0	8,000	20,700
BUDGETED FILES		24,125	0	3,800	8,000	12,325
BUDGETED LOADS			11,000	2,000	2,000	7,000
BUDGETED PATIENT-DAYS				6,000	3,000	48,000
BUDGETED DFOH	$60,000	$17,500	$20,000	$39,766	$99,696	$315,038
CAPACITY MEALS	48,500	0	0	0	8,500	40,000
CAPACITY FILES		31,500	0	7,000	10,500	14,000
CAPACITY LOADS			12,000	2,400	2,400	7,200

SOLUTION SECTION: BUDGET ALLOCATIONS AT BEGINNING OF PERIOD (BOP)

		-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
VOH ALLOCATIONS:		CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
BUDGETED DVOH		$75,000	$8,000	$5,000	$15,280	$5,600	$35,120
MEAL RATE	$2.61						
MEAL ALLOCATION		(75,000)	0	0	0	20,906	54,094
FILE RATE	$0.33						
FILE ALLOCATION			(8,000)	0	1,260	2,653	4,087
LAUNDRY RATE	$0.45						
LAUNDRY ALLOCATION				(5,000)	909	909	3,182
TOTAL VOH		$0	$0	$0	$17,449	$30,068	$96,483
VOH POR/PATIENT-DAY					$2.91	$10.02	$2.01
FOH ALLOCATIONS:							
BUDGETED DFOH		$60,000	$17,500	$20,000	$39,766	$99,696	$315,038
MEAL CAPACITIES		100%	0%	0%	0%	18%	82%
MEAL ALLOCATION		(60,000)	0	0	0	10,515	49,485
FILE CAPACITIES			100%	0%	22%	33%	44%
FILE ALLOCATION			(17,500)	0	3,889	5,833	7,778
LAUNDRY CAPACITIES				100%	20%	20%	60%
LAUNDRY ALLOCATION				(20,000)	4,000	4,000	12,000
TOTAL FOH		$0	$0	$0	$47,655	$120,045	$384,300
FOH POR/PATIENT-DAY					$7.94	$40.01	$8.01
TOH BUDGETED		$0	$0	$0	$65,104	$150,113	$480,783
TOH POR/PATIENT-DAY					$10.85	$50.04	$10.02

s 57b
PROBLEM 9.57b

DATA SECTION: ACTUAL COST ALLOCATIONS AT END OF PERIOD (EOP)

	-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
	CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
ACTUAL DVOH	$80,000	$5,200	$5,000	$15,000	$10,000	$25,000
ACTUAL MEALS	38,000	0	0	0	8,000	30,000
ACTUAL FILES		16,720	0	4,000	1,500	11,220
ACTUAL LOADS			10,000	1,500	500	8,000
ACTUAL PATIENT-DAYS				6,500	4,000	45,000
ACTUAL DFOH	$60,000	$17,000	$22,000	$41,766	$95,000	$340,000

SOLUTION SECTION: ACTUAL COST ALLOCATIONS AT END OF PERIOD (EOP)

		-----SERVICE DEPARTMENTS-----			------BILLING DEPARTMENTS------		
VOH ALLOCATIONS:		CAFETERIA	ADMIN	LAUNDRY	OUT-PATIENT	OB	GENERAL
ACTUAL DVOH		$80,000	$5,200	$5,000	$15,000	$10,000	$25,000
MEAL RATE	$2.61						
MEAL ALLOCATION		(99,303)	0	0	0	20,906	78,397
FILE RATE	$0.33						
FILE ALLOCATION			(5,544)	0	1,326	497	3,721
LAUNDRY RATE	$0.45						
LAUNDRY ALLOCATION				(4,545)	682	227	3,636
TOTAL VOH		($19,303)	($344)	$455	$17,008	$31,631	$110,754
LESS: PATIENT CHARGES					(18,903)	(40,090)	(90,453)
ENDING VOH BALANCE		($19,303)	($344)	$455	($1,895)	($8,460)	$20,301
FOH ALLOCATIONS:							
ACTUAL DFOH		$60,000	$17,000	$22,000	$41,766	$95,000	$340,000
MEAL CAPACITIES		100%	0%	0%	0%	18%	82%
MEAL ALLOCATION		(60,000)	0	0	0	10,515	49,485
FILE CAPACITIES			100%	0%	22%	33%	44%
FILE ALLOCATION			(17,500)	0	3,889	5,833	7,778
LAUNDRY CAPACITIES				100%	20%	20%	60%
LAUNDRY ALLOCATION				(20,000)	4,000	4,000	12,000
TOTAL FOH		$0	($500)	$2,000	$49,655	$115,349	$409,262
LESS: PATIENT CHARGES					(51,626)	(160,060)	(360,282)
ENDING FOH BALANCE		$0	($500)	$2,000	($1,971)	($44,711)	$48,981
ENDING TOH BALANCE		($19,303)	($844)	$2,455	($3,866)	($53,171)	$69,282

9.58

PROBLEM 9.58a-c

DATA SECTION:

	--SERVICE DEPARTMENTS-- MAINTENANCE	ENGINEERING	------PRODUCTION DEPARTMENTS----- PRODUCT A	PRODUCT B	PRODUCT C
MAINTENANCE HOURS	1,200	0	800	200	200
ENGINEERING HOURS		1,600	800	400	400

SOLUTION SECTION:

COST ALLOCATIONS:	--SERVICE DEPARTMENTS-- MAINTENANCE	ENGINEERING	------PRODUCTION DEPARTMENTS----- PRODUCT A	PRODUCT B	PRODUCT C
DIRECT COSTS	$12,000	$54,000			
MAINTENANCE RATIOS	100%	0%	67%	17%	17%
MAINTENANCE ALLOCATIONS	(12,000)	0	$8,000	$2,000	$2,000
ENGINEERING RATIOS		100%	50%	25%	25%
ENGINEERING ALLOCATIONS		(54,000)	27,000	13,500	13,500
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$35,000	$15,500	$15,500

PROBLEM 9.58d-h

DATA SECTION:

	--SERVICE DEPARTMENTS-- MAINTENANCE	ENGINEERING	------PRODUCTION DEPARTMENTS----- PRODUCT A	PRODUCT B	PRODUCT C
MAINTENANCE HOURS	1,600	400	800	200	200
ENGINEERING HOURS		1,600	800	400	400

SOLUTION SECTION:

COST ALLOCATIONS:	--SERVICE DEPARTMENTS-- MAINTENANCE	ENGINEERING	------PRODUCTION DEPARTMENTS----- PRODUCT A	PRODUCT B	PRODUCT C
DIRECT COSTS	$12,000	$54,000			
MAINTENANCE RATIOS	100%	25%	50%	13%	13%
MAINTENANCE ALLOCATIONS	(12,000)	3,000	$6,000	$1,500	$1,500
ENGINEERING RATIOS		100%	50%	25%	25%
ENGINEERING ALLOCATIONS		(57,000)	28,500	14,250	14,250
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$34,500	$15,750	$15,750

.59

PROBLEM 9.59a,b

DATA SECTION:

	----SERVICE DEPARTMENTS----- QUALITY CONTROL	MAINTENANCE	PRODUCTION DEPARTMENTS MACHINING	ASSEMBLY
QUALITY CONTROL HOURS	28,000	0	21,000	7,000
MAINTENANCE HOURS		30,000	18,000	12,000

SOLUTION SECTION:

COST ALLOCATIONS:	----SERVICE DEPARTMENTS----- QUALITY CONTROL	MAINTENANCE	PRODUCTION DEPARTMENTS MACHINING	ASSEMBLY
DIRECT COSTS	$350,000	$200,000	$400,000	300 000
QUALITY CONTROL RATIOS	100%	0%	75%	25%
QC ALLOCATIONS	(350,000)	0	262,500	$87,500
MAINTENANCE RATIOS		100%	60%	40%
MAINTENANCE ALLOCATIONS		(200,000)	120,000	80,000
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$782,500	167,500 $167,500

b: TOH POR per Mhr $15.65/MH 18.7$/DLH

PROBLEM 9.59c

DATA SECTION:

	----SERVICE DEPARTMENTS----- QUALITY CONTROL	MAINTENANCE	PRODUCTION DEPARTMENTS MACHINING	ASSEMBLY
QUALITY CONTROL HOURS	35,000	7,000	21,000	7,000
MAINTENANCE HOURS		30,000	18,000	12,000

SOLUTION SECTION:

COST ALLOCATIONS:	----SERVICE DEPARTMENTS----- QUALITY CONTROL	MAINTENANCE	PRODUCTION DEPARTMENTS MACHINING	ASSEMBLY
DIRECT COSTS	$350,000	$200,000	400 000	300 000
QUALITY CONTROL RATIOS	100%	20%	60%	20%
QC ALLOCATIONS	(350,000)	→ 70,000	$210,000	$70,000
MAINTENANCE RATIOS		100%	60%	40%
MAINTENANCE ALLOCATIONS		(270,000)	162,000	108,000
TOTAL SERVICE DEPARTMENT COSTS ALLOCATED	$0	$0	$372,000	$178,000
			772 000	478 000

PROBLEM 9.59d

Quality control costs = $350,000 + (0.25 x Maintenance costs)
Maintenance costs = $200,000 + (0.20 x Quality control costs)

Quality control costs = $350,000 + {0.25 x [$200,000 + (0.20 x QC costs)]}

Quality control costs = $421,053

9.30

PROBLEM 9.60 (a1)

	Direct Charges	Systems Development	Computer Processing	Report Generation	Budget Totals
WAGES AND BENEFITS:					
Administration		$60,000	$20,000	$20,000	$100,000
Computer operators			11,000	44,000	55,000
Analysts/programmers		165,000			165,000
MAINTENANCE:					
Hardware			18,000	6,000	24,000
Software			20,000		20,000
OUTPUT SUPPLIES				50,000	50,000
PURCHASED SOFTWARE	$45,000				45,000
UTILITIES			28,000		28,000
DEPRECIATION:					
Mainframe computer			325,000		325,000
Printing equipment				60,000	60,000
Building improvements			10,000		10,000
TOTALS	$45,000	$225,000	$432,000	$180,000	$882,000
PORs		$50 per hour	$1,200 per CPUhr	$0.036 per page	

PROBLEM 9.60 (a2)

FINANCE		$5,000	$9,600	$21,600	$36,200
MARKETING		12,500	14,400	12,960	39,860
PERSONNEL		10,000	14,400	3,888	28,288
PRODUCTION	$16,000	20,000	38,400	2,592	76,992
R&D		2,500	19,200	2,160	23,860
	$16,000	$50,000	$96,000	$43,200	$205,200

b1. Two types of events can result in a difference between the actual costs incurred by a service department and the amounts allocated under Elaine Jergens proposed allocation system:
- If ISD spends more than budgeted in the PORs developed for the three services provided, these spending variances remain within the ISD WIP account. Usage different than budgeted will increase the total variable ISD costs debited into its WIP account. These higher costs are allocated to the users, though, through the use of actual services consumed. Thus, this will not create a difference between the actual costs incurred and the costs allocated.
- Fixed ISD costs are not separately budgeted or allocated, however. The ISD fixed costs are included in the PORs. Assume that no FOH budget variance results, but different amounts of services are used than budgeted when the PORs were created. The different actual quantities will create FOH volume variances. This problem can be avoided by the use of the dual method proposed within the chapter.

b2. The use of PORs (standard prices) to allocate actual ISD costs should improve the motivations of the ISD manager to manage his costs. Spending variances will not be automatically allocated to user departments as happens under the current system.

Not separating the fixed and variable ISD costs, with separate allocations for each, inhibits this manager's ability to control his fixed costs. The proposed system will not separately report variances due to variable cost versus fixed cost spending. Additionally, the amount of fixed costs allocated will be influenced by the volume of the services used, further complicating the analysis and control of ISD costs.

The use of annual capacity amounts as the basis for the PORs will understate them whenever planned usage is less than capacity. This will always result in underapplied overhead (an unfavorable FOH volume variance) which the ISD manager will have to understand and know to ignore.

b3. The other functional department managers will be motivated to control their usage of ISD services. Actual usage determines the amount allocated to them. Conversely, if these managers are unwilling to accept the amount of ISD costs allocated, they may reduce the level of ISD services requested. This may inhibit their abilities to properly monitor and control activities, and obtain high-quality information needed to improve operations over the long run in accordance with their TQM schedules.