25. Responsibility accounting: Segmental analysis

Learning objectives

After studying this chapter, you should be able to:

- Explain responsibility accounting and its use in a business entity.
- Prepare responsibility accounting reports.
- Prepare a segmental income statement using the contribution margin format.
- Calculate return on investment, margin, and turnover for a segment.
- Calculate the residual income of a segment.
- Allocate costs from service departments to operating departments (Appendix).

When a business is small, the owner usually supervises many different activities in the business. As a business grows, responsibility for some of these activities must be given to other persons. Obviously, the success of a business depends to a great extent on the persons responsible for these activities.

In this chapter, you learn about delegating authority to lower level managers for managing various business activities and holding these lower level managers responsible for the activities under their control. You also learn how to assess the performance of these managers. A company's activities are grouped into responsibility centers. The company measures the performance of each center manager in terms of the items of revenue and expense over which that manager has control.

Responsibility accounting

The term **responsibility accounting** refers to an accounting system that collects, summarizes, and reports accounting data relating to the responsibilities of individual managers. A responsibility accounting system provides information to evaluate each manager on the revenue and expense items over which that manager has primary control (authority to influence).

A responsibility accounting report contains those items controllable by the responsible manager. When both controllable and uncontrollable items are included in the report, accountants should clearly separate the categories. The identification of controllable items is a fundamental task in responsibility accounting and reporting.

To implement responsibility accounting in a company, the business entity must be organized so that responsibility is assignable to individual managers. The various company managers and their lines of authority

(and the resulting levels of responsibility) should be fully defined. The organization chart in Exhibit 53 demonstrates lines of authority and responsibility that could be used as a basis for responsibility reporting.

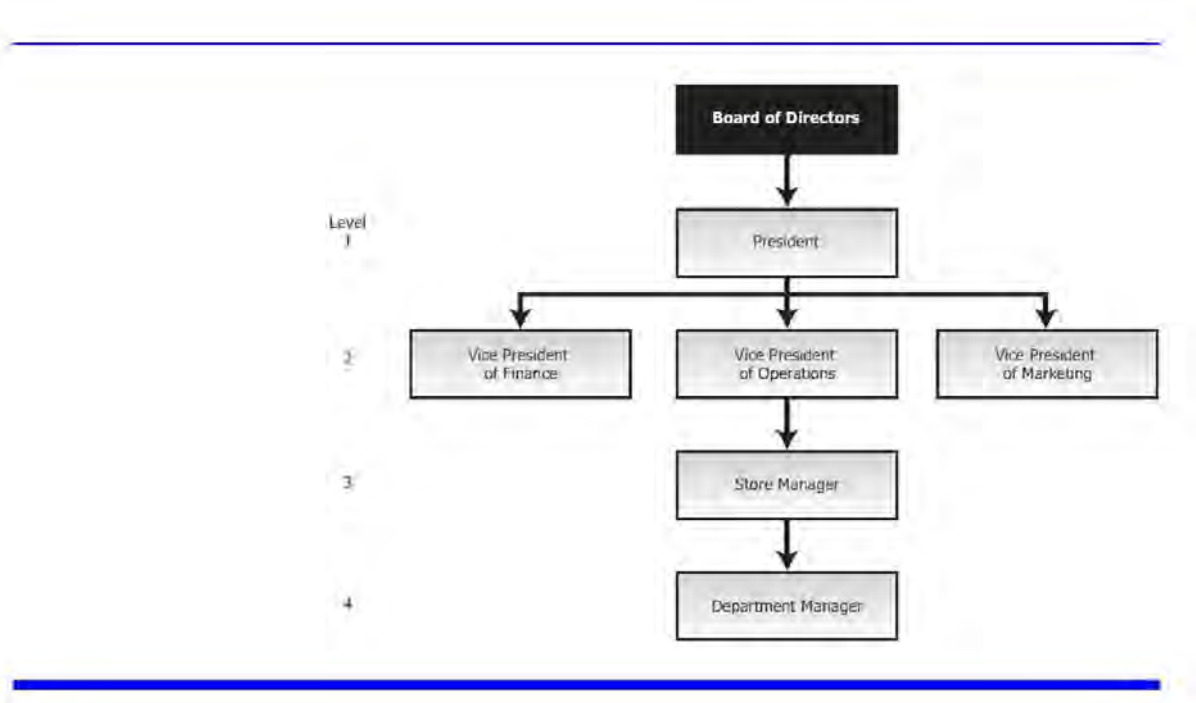

Exhibit 53: A corporate functional organization chart including four levels of management

To identify the items over which each manager has control, the lines of authority should follow a specified path. For example, in Exhibit 53 we show that a department supervisor may report to a store manager, who reports to the vice president of operations, who reports to the president. The president is ultimately responsible to stockholders or their elected representatives, the board of directors. In a sense, the president is responsible for all revenue and expense items of the company, since at the presidential level all items are controllable over some period. The president often carries the title, Chief Executive Officer (CEO) and usually delegates authority to lower level managers since one person cannot keep fully informed of the day-to-day operating details of all areas of the business.

The manager's level in the organization also affects those items over which that manager has control. The president is usually considered a first-level manager. Managers (usually vice presidents) who report directly to the president are second-level managers. Notice on the organization chart in Exhibit 53 that individuals at a specific management level are on a horizontal line across the chart. Not all managers at that level, however, necessarily have equal authority and responsibility. The degree of a manager's authority varies from company to company.

While the president may delegate much decision-making power, some revenue and expense items remain exclusively under the president's control. For example, in some companies, large capital (plant and equipment) expenditures may be approved only by the president. Therefore, depreciation, property taxes, and other related expenses should not be designated as a store manager's responsibility since these costs are not primarily under that manager's control.

The controllability criterion is crucial to the content of performance reports for each manager. For example, at the department supervisor level, perhaps only direct materials and direct labor cost control are appropriate for measuring performance. A plant manager, however, has the authority to make decisions regarding many other costs not controllable at the supervisory level, such as the salaries of department supervisors. These other costs would be included in the performance evaluation of the store manager, not the supervisor.

A broader perspective: Employee buyouts

Traditional organization lines of responsibility have workers reporting to supervisors or department managers, who in turn report to higher managers, who report to even higher managers, and so forth on up the organization. Top management is accountable to stockholders.

What happens when those stockholders are also employees, as in the case of many employee buyouts (such as The Chilcote Company – http://www.chilcotecompany.com)? Now, employees report to managers who are accountable back to the employees in their role as stockholders. Employees wear two hats: They own the company and they work for the company. In some sense, this makes each employee like a proprietor of a business. Presumably, after employees buy their company, they have greater incentives to make the company successful.

Source: Based on the authors' research.

Responsibility reports

Responsibility accounting provides reports to different levels of management. The amount of detail varies depending on the manager's level in the organization. A performance report to a department manager of a retail store would include actual and budgeted dollar amounts of all revenue and expense items under that supervisor's control. The report issued to the store manager would show only totals from all the department supervisors' performance reports and any additional items under the store manager's control, such as the store's administrative expenses. The report to the company's president includes summary totals of all the stores' performance levels plus any additional items under the president's control. In effect, the president's report should include all revenue and expense items in summary form because the president is responsible for controlling the profitability of the entire company.

Management by exception is the principle that upper level management does not need to examine operating details at lower levels unless there appears to be a problem. As businesses become increasingly complex, accountants have found it necessary to filter and condense accounting data so that these data may be analyzed quickly. Most executives do not have time to study detailed accounting reports and search for problem areas. Reporting only summary totals highlights any areas needing attention and makes the most efficient use of the executive's time.

The condensation of data in successive levels of management reports is justified on the basis that the appropriate manager will take the necessary corrective action. Thus, specific performance details need not be reported to superiors.

For example, if sales personnel costs have been excessively high in a particular department, that departmental manager should find and correct the cause of the problem. When the store manager questions the unfavorable budget variance of the department, the departmental supervisor can inform the store manager that corrective action was taken. Hence, it is not necessary to report to any higher authority that a particular department within one of the stores is not operating satisfactorily because the matter has already been resolved. Alternatively, if a manager's entire store has been performing poorly, summary totals reported to the vice president of operations discloses this situation, and an investigation of the store manager's problems may be indicated.

In preparing responsibility accounting reports, companies use two basic methods to handle revenue or expense items. In the first approach, only those items over which a manager has direct control are included in the responsibility report for that management level. Any revenue and expense items that cannot be directly controlled are not included. The second approach is to include all revenue and expense items that can be traced directly or allocated indirectly to a particular manager, whether or not they are controllable. This second method represents a full-cost approach, which means all costs of a given area are disclosed in a single report. When this approach is used, care must be taken to separate controllable from noncontrollable items to differentiate those items for which a manager can and should be held responsible.

For accounting reports to be of maximum benefit, they must be timely. That is, accountants should prepare reports as soon as possible after the end of the performance measurement period. Timely reporting allows prompt corrective action to be taken. When reports are delayed excessively, they lose their effectiveness as control devices. For example, a report on the previous month's operations that is not received until the end of the current month is virtually useless for analyzing poor performance areas and taking corrective action.

Companies also should issue reports regularly so that managers can spot trends. Then, appropriate management action can be initiated before major problems occur. Regular reporting allows managers to rely on reports and become familiar with their contents.

Firms should make the format of their responsibility reports relatively simple and easy to read. Confusing terminology should be avoided. Where appropriate, expressing results in physical units may be more familiar and understandable to some managers. To assist management in quickly spotting budget variances, companies can report both budgeted (expected) and actual amounts. A **budget variance** is the difference between the budgeted and actual amounts of an item. Because variances highlight problem areas (exceptions), they are helpful in applying the management-by-exception principle. To help management evaluate performance to date, responsibility reports often include both a current period and year-to-date analysis.

Responsibility reports—An illustration

Exhibit 54 on the next page, shows how Macy's Corporation could relate its responsibility accounting reports. Assume Macy's has four management levels—the president, vice president of operations, store manager, and department manager. In Exhibit 54 on the next page, we show that a responsibility report would be prepared for each management level.

Note in Exhibit 55, the detailed information included in the responsibility reports for each manager. Only the individual manager's controllable expenses are contained in these reports. For example, the store manager's report includes only totals from the Men's Clothing Department manager's report. In turn, the report to the vice president

includes only totals from the store manager's report, and so on. Detailed data from the lower levels are summarized or condensed and reported at the next higher level.

You can see that at each level, more and more costs become controllable. Also, the company introduces controllable costs not included on lower level reports into the reports for levels 3, 2, and 1. The only store cost not included at the store manager's level is the store manager's salary because it is noncontrollable by that store manager. It is, however, controllable by the store manager's supervisor, the vice president of operations.

Based on an analysis of these reports, the Men's Clothing Department manager probably would take immediate action to see why supplies and overtime were significantly over budget this month. The store manager may ask the department manager what the problems were and whether they are now under control. The vice president may ask the same question of the store manager. The president may ask each vice president why the budget was exceeded this month and what corrective action has been taken.

Illustration 25.2 Organization Chart—Macy's Corporation

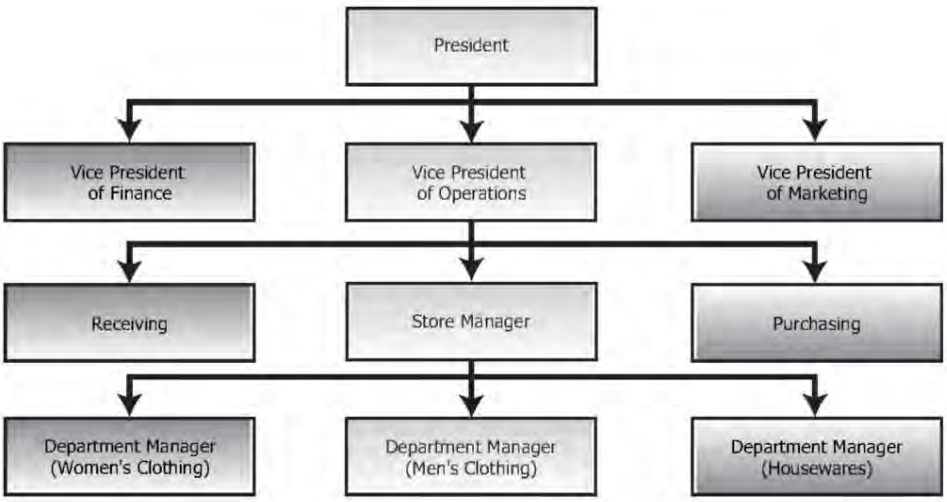

Illustration 25.3 Responsibility Reports for Macy's Corporation

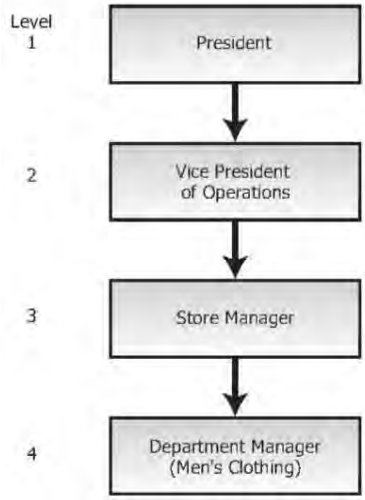

Exhibit 54: Organization chart-Macy's corporation

Responsibility centers

A **segment** is a fairly autonomous unit or division of a company defined according to function or product line. Traditionally, owners have organized their companies along functional lines. The segments or departments organized along functional lines perform a specified function such as marketing, finance, purchasing, production, or shipping. Recently, large companies have tended to organize segments according to product lines such as an electrical products division, shoe department, or food division.

A **responsibility center** is a segment of an organization for which a particular executive is responsible. There are three types of responsibility centers—expense (or cost) centers, profit centers, and investment centers. In designing a responsibility accounting system, management must examine the characteristics of each segment and

the extent of the responsible manager's authority. Care must be taken to ensure that the basis for evaluating the performance of an expense center, profit center, or investment center matches the characteristics of the segment and the authority of the segment's manager. The following sections of the chapter discuss the characteristics of each of these centers and the appropriate bases for evaluating the performance of each type.

First Level

Macy's Corporation
President

	Amount		Over or (Under) Budget	
Controllable Expenses	**This Month**	**Year to Date**	**This Month**	**Year to Date**
President's office expense	$ 11,000	$ 55,000	$ 1,000	$ 2,000
Vice president of operations	128,720	700,000	6,000	8,000
Vice president of marketing	18,700	119,000	4,000	8,000
Vice president of finance	14,000	115,000	8,000	9,000
Vice presidents' salaries	29,000	145,000	-0-	-0-
Total	$ 201,420	$ 1,134,000	$ 19,000	$ 27,000

Second Level

Macy's Corporation
Vice President of Operations

	Amount		Over or (Under) Budget	
Controllable Expenses	**This Month**	**Year to Date**	**This Month**	**Year to Date**
Vice president's office expense	$ 2,840	$ 9,500	$ (500)	$ (8,000)
Store manager	88,800	490,000	2,500	5,000
Purchasing	5,300	32,500	1,000	2,000
Receiving	4,700	33,000	3,000	9,000
Salaries of store managers and heads of purchasing and receiving	27,000	135,000	-0-	-0-
Total (include in report for next higher level)	$ 128,720	$ 700,000	$ 6,000	$ 8,000

Fourth Level

Macy's Corporation
Manger, Men's Clothing Department

	Amount		Over or (Under) Budget	
Controllable Expenses	**This Month**	**Year to Date**	**This Month**	**Year to Date**
Inventory losses	$ 2,000	$ 10,000	$ 100	$ 400
Supplies	1,800	8,500	800	950
Salaries	11,000	53,000	(100)	810
Overtime	2,000	14,500	800	140
Total (include in report for next higher level)	$ 16,800	$ 86,000	$ 1,600	$ 2,300

Exhibit 55: Responsibility reports for Macy's corporation

An **expense center** is a responsibility center incurring only expense items and producing no direct revenue from the sale of goods or services. Examples of expense centers are service centers (e.g. the maintenance department or accounting department) or intermediate production facilities that produce parts for assembly into a finished product. Managers of expense centers are held responsible only for specified expense items.

The appropriate goal of an expense center is the long-run minimization of expenses. Short-run minimization of expenses may not be appropriate. For example, a production supervisor could eliminate maintenance costs for a short time, but in the long run, total costs might be higher due to more frequent machine breakdowns.

A **profit center** is a responsibility center having both revenues and expenses. Because segmental earnings equal segmental revenues minus related expenses, the manager must be able to control both of these categories. The manager must have the authority to control selling price, sales volume, and all reported expense items. To properly evaluate performance, the manager must have authority over all of these measured items. **Controllable profits of a segment** result from deducting the expenses under a manager's control from revenues under that manager's control.

Closely related to the profit center concept is an investment center. An **investment center** is a responsibility center having revenues, expenses, and an appropriate investment base. When a firm evaluates an investment center, it looks at the rate of return it can earn on its investment base. Accountants compute the **return on investment (ROI)**, also called the rate of return, by dividing segmental income by the appropriate investment base. For example, a segment that earns USD 500,000 on an investment base of USD 5,000,000 has an ROI of 10 per cent.

Determining the investment base to be used in the ROI calculation is a tricky matter. Normally, the assets available for use by the division make up its investment base. But accountants disagree on whether depreciable assets should be included in the ROI calculation at original cost, original cost less accumulated depreciation, or current replacement cost. **Original cost** is the price paid to acquire the assets. **Original cost less accumulated depreciation** is the book value of the assets—the amount paid less total depreciation taken. **Current replacement cost** is the cost of replacing the present assets with similar assets in the same condition as those now in use. A different rate of return results from each of these measures. Therefore, management must select and agree on an appropriate measure of investment base prior to making ROI calculations or interdivision comparisons.

Even after the investment base is defined, problems may still remain because many segment managers have limited control over some of the items included in the investment base of their segment. For instance, top-level management often makes capital expenditure decisions for major store assets rather than allowing the segment

managers to do so. Therefore, the segment manager may have little control over the store assets used by the segment. Another problem area may be the company's centralized credit and collection department. The segment manager may have little or no control over the amount of accounts receivable included as segment assets because the manager cannot change the credit-granting or collection policies of the company.

Usually these problems are overcome when managers realize that if all segments are treated in the same manner, the inclusion of noncontrollable items in the investment base may have negligible effects. Then, comparisons of the ROI for all segments are based on a consistent treatment of items. To avoid adverse reactions or decreased motivation, segment managers must agree to this treatment.

Companies prefer to evaluate segments as investment centers because the ROI criterion facilitates performance comparisons between segments. Segments with more resources should produce more profits than segments with fewer resources, so it is difficult to compare the performance of segments of different sizes on the basis of profits alone. However, when ROI is a performance measure, performance comparisons take into account the differences in the sizes of the segments. The segment with the highest percentage ROI is presumably the most effective in using whatever resources it has.

Typical investment centers are large, autonomous segments of large companies. The centers are often separated from one another by location, types of products, functions, and/or necessary management skills. Segments such as these often seem to be separate companies to an outside observer. But the investment center concept can be applied even in relatively small companies in which the segment managers have control over the revenues, expenses, and assets of their segments.

Transfer prices

Profit centers and investment centers inside companies often exchange products with each other. The Pontiac, Buick, and other divisions of General Motors buy and sell automobile parts from each other, for example. No market exchange takes place, so the company sets transfer prices that represent revenue to the selling division and costs to the buying division.

A **transfer price** is an artificial price used when goods or services are transferred from one segment to another segment within the same company. Accountants record the transfer price as a revenue of the producing segment and as a cost, or expense, of the receiving segment. Usually no cash actually changes hands between the segments. Instead, the transfer price is an internal accounting transaction.

Segments are generally evaluated based on some measure of profitability. The transfer price is important because it affects the profitability of the buying and selling segments. The higher the transfer price, the better for the seller. The lower the transfer price, the better for the buyer.

Ideally, a transfer price provides incentives for segment managers to make decisions not only in their best interests but also in the interests of the entire company. For example, if the selling segment can sell everything it produces for USD 100 per unit, the buying segment should pay the market price of USD 100 per unit. A seller with excess capacity, however, should be willing to transfer a product to the buying segment for any price at or above the differential cost of producing and transferring the product to the buying segment (typically all variable costs).

In practice, companies mostly base transfer prices on (1) the market price of the product, (2) the cost of the product, or (3) some amount negotiated by the buying and selling segment managers.

Use of segmental analysis

So far we have described only the fundamentals of responsibility accounting. In this section we focus specifically on segmental analysis.

Decentralization is the dispersion of decision-making authority among individuals at lower levels of the organization. In other words, the extent of decentralization refers to the degree of control that segment managers have over the revenues, expenses, and assets of their segments. When a segment manager has control over these elements, the investment center concept can be applied to the segment. Thus, the more decentralized the decision making is in an organization, the more applicable is the investment center concept to the segments of the company. The more centralized the decision making is, the more likely responsibility centers are to be established as expense centers.

Some advantages of decentralized decision making are:

- Managing segments trains managers for high-level positions in the company. The added authority and responsibility also represent job enlargement and often increase job satisfaction and motivation.
- Top management can be more removed from day-to-day decision making at lower levels of the company and can manage by exception. When top management is not involved with routine problem solving, it can devote more time to long-range planning and to the company's most significant problem areas.
- Decisions can be made at the point where problems arise. It is often difficult for top managers to make appropriate decisions on a timely basis when they are not intimately involved with the problem they are trying to solve.
- Since decentralization permits the use of the investment center concept, performance evaluation criteria such as ROI and residual income (to be explained later) can be used.

Concepts used in segmental analysis

To understand segmental analysis, you need to know about the concepts of variable cost, fixed cost, direct cost, indirect cost, net income of a segment, and contribution to indirect expenses. Next, we describe each concept.

Costs may be either directly or indirectly related to a particular cost object. A **cost object** is a segment, product, or other item for which costs may be accumulated. In other words, a cost is not direct or indirect in and of itself. It is only direct or indirect in relation to a given cost object.

A **direct cost (expense)** is specifically traceable to a given cost object. An **indirect cost (expense)** is not traceable to a given cost object but has been allocated to it. Accountants can designate a particular cost (expense) as direct or indirect by reference to a given cost object. Thus, a cost that is direct to one cost object may be indirect to another. For instance, the salary of a segment manager may be a direct cost of a given manufacturing segment but an indirect cost of one of the products manufactured by that segment. In this example, the segment and the product are two distinct cost objects.

Because a direct cost is traceable to a cost object, the cost is likely to be eliminated if the cost object is eliminated. For instance, if the plastics segment of a business closes down, the salary of the manager of that segment probably is eliminated. Sometimes a direct cost would remain even if the cost object were eliminated, but this is the exception rather than the rule.

An indirect cost is not traceable to a particular cost object; therefore, it only becomes an expense of the cost object through an allocation process. For example, consider the depreciation expense on the company headquarters building that is allocated to each segment of the company. The depreciation expense is a direct cost for the company headquarters, but it is an indirect cost to each segment. If a segment of the company is eliminated, the indirect cost for depreciation assigned to that segment does not disappear; the cost is simply allocated among the remaining segments. In a given situation, it may be possible to identify an indirect cost that would be eliminated if the cost object were eliminated, but this would be the exception to the general rule.

Because the direct costs of a segment are clearly identified with that segment, these costs are often controllable by the segment manager. In contrast, indirect costs become segment costs only through allocation; therefore, most indirect costs are noncontrollable by the segment manager. Be careful, however, not to equate direct costs with controllable costs. For example, the salary of a segment manager may be direct to that segment and yet is noncontrollable by that manager because managers cannot specify their own salaries.

When preparing internal reports on the performance of segments of a company, management often finds it is important to classify expenses as fixed or variable and as direct or indirect to the segment. These classifications may be more useful to management than the traditional classifications of cost of goods sold, operating expenses, and nonoperating expenses that are used for external reporting in the company's financial statements. As a result, many companies prepare an income statement for internal use with the format shown in Exhibit 56(A).

A. All Expenses Allocated to Segments

	Segment A	**Segment B**	**Total**
Sales	$ 2,500,000	$ 1,500,000	$ 4,000,000
Less: Variable expenses (all of which are direct expenses)	700,000	650,000	1,350,000
Contribution margin	**$ 1,800,000**	**$ 850,000**	**$ 2,650,000**
Less: Direct fixed expenses	450,000	550,000	1,000,000
Contribution to indirect expenses	**$ 1,350,000**	**$ 300,000**	**$ 1,650,000**
Less: Indirect fixed expenses	270,000	330,000	600,000
Net Income	**$ 1,080,000**	**$ (30,000)**	**$ 1,050,000**

B. Indirect Expenses not allocated to Segments

	Segment A	**Segment B**	**Total**
Sales	$ 2,500,000	$ 1,500,000	$ 4,000,000
Less: Variable expenses	700,000	650,000	1,350,000
Contribution margin	**$ 1,800,000**	**$ 850,000**	**$ 2,650,000**
Less: Direct fixed expenses	450,000	550,000	1,000,000
Contribution to indirect expenses	**$ 1,350,000**	**$ 300,000**	**$ 1,650,000**
Less: Indirect fixed expenses			600,000
Net income			**$ 1,050,000**

Exhibit 56: Contribution margin format income Statement

This format is called the **contribution margin format** for an income statement (first introduced in Chapter 22) because it shows the contribution margin. **Contribution margin** is defined as sales revenue less variable expenses. Notice in Exhibit 56(A) that all variable expenses are direct expenses of the segment. The second subtotal in the contribution margin format income statement is the segment's contribution to indirect expenses. **Contribution to indirect expenses** is defined as sales revenue less all direct expenses of the segment (both variable direct expenses and fixed direct expenses). The final total in the income statement is **segmental net income**, defined as segmental revenues less all expenses (direct expenses and allocated indirect expenses).

Earlier we stated that the performance of a profit center is evaluated on the basis of the segment's profits. It is tempting to use segmental net income to make this evaluation since total net income is used to evaluate the performance of the entire company. The problem with using segmental net income to evaluate performance is that segmental net income includes certain indirect expenses that have been allocated to the segment but are not directly related to it or its operations. Because segmental contribution to indirect expenses includes only revenues and expenses directly related to the segment, this amount is often more appropriate for evaluation purposes.

Given the facts in Exhibit 56(A), if management relied on segmental net income to judge segmental performance, management might conclude that Segment B should be eliminated because it shows a loss of USD 30,000. But this action would reduce overall company income by USD 300,000, as shown here:

Reduction in corporate revenues		$ 1,500,000
Reduction in corporate expenses:		
Variable expenses	$ 650,000	
Direct fixed expenses	550,000	1,200,000
Reduction in corporate income		$ 300,000

Notice that the elimination of Segment B would not eliminate the USD 330,000 of allocated fixed costs. These costs would need to be allocated to Segment A if Segment B no longer existed.

To stress the importance of a segment's contribution to indirect expenses, many companies prefer the contribution margin income statement format in Exhibit 56(B), over that in Exhibit 56(A). The difference is that indirect fixed costs are not allocated to individual segments in Exhibit 56(B). Indirect fixed expenses appear only in the total column for the computation of net income for the entire company. The computation for each segment stops with the segment's contribution to indirect expenses; this is the appropriate figure to use for evaluating the earnings performance of a segment. Only for the company as a whole is net income (revenues minus all expenses) computed; this is, of course, the appropriate figure to use for evaluating the company as a whole.

Arbitrary allocations of indirect fixed expenses As stated earlier, indirect fixed expenses, such as depreciation on the corporate administration building or on the computer facility maintained at company headquarters, can only be allocated to segments on some arbitrary basis. The two basic guidelines for allocating indirect fixed expenses are by the benefit received and by the responsibility for the incurrence of the expense.

Accountants can make an allocation on the basis of benefit received for certain indirect expenses. For instance, assume the entire company used a corporate computer for a total of 10,000 hours. If it used 4,000 hours, Segment K could be charged (allocated) with 40 per cent of the computer's depreciation for the period because it received 40 per cent of the total benefits for the period.

For certain other indirect expenses, accountants base allocation on responsibility for incurrence. For instance, assume that Segment M contracts with a magazine to run an advertisement benefiting Segment M and various

other segments of the company. Some companies would allocate the entire cost of the advertisement to Segment M because it was responsible for incurring the advertising expense.

To further illustrate the allocation of indirect expenses based on a measure of benefit or responsibility for incurrence, assume that Daily Company operates two segments, X and Y. It allocates the following indirect expenses to its two segments using the designated allocation bases:

Expense	**Allocation Base**
Administrative office building occupancy expense, $ 50,000	Net sales
Insurance expense, $ 35,000	Cost of segmental plant assets
General administrative expenses, $ 40,000	Number of employees

The following additional data are provided:

	Segment X	**Segment Y**	**Total**
Net sales	$ 400,000	$ 500,000	$ 900,000
Segmental plant assets	$ 250,000	$ 400,000	$ 650,000
Number of employees	50	80	130

The following expense allocation schedule shows the allocation of indirect expenses:

	Segment X	**Segment Y**	**Total**
Administrative office building occupancy expense	$ 22,222[a]	$ 27,778[b]	$ 50,000
Insurance expense	13,462[c]	21,538[d]	35,000
General administrative expenses	15,385[e]	24,615[f]	40,000

[A] $ 400,000/$ 900,000 x $ 50,000 = $ 22,222

[B] $500,000/$900,000 x $50,000 = $27,778

[c] $250,000/$650,000 x $35,000 = $13,462

[D] $400,000/$650,000 x $35,000 = $ 21,538

[e] 50/130 x $40,000 = $ 15,385

[F] 80/130 x $40,000 = $24,615

When it uses neither benefit nor responsibility to allocate indirect fixed expenses, a company must find some other reasonable, but arbitrary, basis. Often, for lack of a better approach, a firm may allocate indirect expenses based on net sales. For instance, if Segment X's net sales were 60 per cent of total company sales, then 60 per cent of the indirect expenses would be allocated to Segment X. Allocating expenses based on sales is not recommended because it reduces the incentive of a segment manager to increase sales because this would result in more indirect expenses being allocated to that segment.

Having covered some basic concepts essential to segmental analysis, we next present some specific procedures for performance evaluation.

Investment center analysis

To this point, the segmental analysis discussion has concentrated on the contribution to indirect expenses and segmental net income approaches. Now we introduce the investment base concept into the analysis. Two evaluation bases that include the concept of investment base in the analysis are ROI (return on investment) and RI (residual income).

A segment that has a large amount of assets usually earns more in an absolute sense than a segment that has a small amount of assets. Therefore, a firm cannot use absolute amounts of segmental income to compare the performance of different segments. To measure the relative effectiveness of segments, a company might use **return**

on investment (ROI), which calculates the return (income) as a percentage of the assets employed (investment). The formula for ROI is:

$$\text{ROI} = \frac{\text{Income}}{\text{Investment}}$$

To illustrate the difference between using absolute amounts and using percentages in evaluating a segment's performance, consider the data in Exhibit 57, for a company with three segments.

	Segment A	**Segment B**	**Segment C**	**Total**
(a) Income	$ 250,000	$1,000,000	$ 500,000	$1,750,000
(b) Investment	2,500,000	5,000,000	2,000,000	9,500,000
Return on investment (a) ÷ (b)	10 per cent	20 per cent	25 per cent	18.42 per cent

Exhibit 57: Computation of return on investment (ROI)

When using absolute dollars of income to evaluate performance, Segment B appears to be doing twice as well as Segment C. However, using ROI to evaluate the segments indicates that Segment C is really performing the best (25 per cent), Segment B is next (20 per cent), and Segment A is performing the worst (10 per cent). Therefore, ROI is a more useful indicator of the relative performance of segments than absolute income.

Although ROI appears to be a quite simple and straightforward computation, there are several alternative methods for making the calculation. These alternatives focus on what is meant by income and investment. Exhibit 58, shows various definitions and applicable situations for each type of computation.

Situation	**Definition of Income**	**Definition of Investment**
1. Evaluation of the earning power of the company. Do not use for segments or segment managers due to inclusion of non controllable expenses.	Net income of the company.*	Total assets of the company.†
2. Evaluation of rate of income contribution of segment. Do not use for segment managers due to inclusion of non controllable expenses.	Contribution to indirect expenses.	Assets directly used by and identified with the segment.
3. Evaluation of income performance of segment manager.	*Controllable* income. Begin with contribution to indirect expenses and eliminate any revenues and direct expenses not under the control of the segment manager.	Assets under the control of the segment manager.

* Often *net operating income* is used; this term is defined as income before interest and taxes.
† *Operating assets* are often used in the calculation. This definition excludes assets not used in normal operations.

Exhibit 58: Possible definitions of income and investment

As discussed earlier in the chapter, alternative valuation bases include cost less accumulated depreciation, original cost, and current replacement cost. Each of the valuation bases has merits and drawbacks, as we discuss next. First, cost less accumulated depreciation is probably the most widely used valuation base and is easily determined. Because of the many types of depreciation methods, comparisons between segments or companies may be difficult. Also, as book value decreases, a constant income results in a steadily increasing ROI even though the segment's performance is unchanged. Second, the use of original cost eliminates the problem of decreasing book value but has its own drawback. The cost of old assets is much less than an investment in new assets, so a segment with old assets can earn less than a segment with new assets and realize a higher ROI. Third, current replacement cost is difficult to use because replacement cost figures often are not available, but this base does eliminate some of the problems caused by the other two methods. Whichever valuation basis is adopted, all ROI calculations that are to be used for comparative purposes should be made consistently.

An accounting perspective:

Business insight

Although financial performance measures such as ROI are important for providing incentives to perform well, so is the company's culture. For example, Johnson & Johnson has a culture emphasizing high ethical standards. The Johnson & Johnson Credo, published in its annual report and displayed throughout the company, is a famous example of this culture. HP is known as a people-oriented company that emphasizes personal development and long-term employment.

To encourage long-term growth, 3M requires that at least 25 per cent of each division's sales come from new products. This encourages constant innovation and new product development. In addition, the company allows employees to spend 15 per cent of their time on innovative projects, encourages sharing of technology across divisions, and provides "seed" grants for employees to develop new products. With this corporate culture, 3M has a worldwide reputation for innovation.

Expanded form of ROI computation The ROI formula breaks into two component parts:

$$\text{ROI} = \frac{\text{Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

The first part of the formula, Income/Sales, is called margin or return on sales. The **margin** refers to the percentage relationship of income or profits to sales. This percentage shows the number of cents of profit generated by each dollar of sales. The second part of the formula, Sales/Investment, is called turnover. **Turnover** shows the number of dollars of sales generated by each dollar of investment. Turnover measures how effectively each dollar of assets was used.

A manager can increase ROI in the following three ways. In Exhibit 59, note the possible outcomes of some of these strategies to increase ROI.

- By concentrating on increasing the profit margin while holding turnover constant: Pursuing this strategy means keeping selling prices constant and making every effort to increase efficiency and thereby reduce expenses.

- By concentrating on increasing turnover by reducing the investment in assets while holding income and sales constant: For example, working capital could be decreased, thereby reducing the investment in assets.

Past year's return on investment:

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$

$$\text{ROI} = \frac{\text{Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

$$\text{ROI} = \frac{\text{USD}\,100{,}000}{\text{USD}\,2{,}000{,}000} \times \frac{\text{USD}\,2{,}000{,}000}{\text{USD}\,1{,}000{,}000}$$

$$\text{ROI} = 5\,\text{per cent} \times 2\,\text{time}$$

ROI = 10 per cent

- Increase margin through reducing expenses by USD 40,000; no effect on sales or investment.

$$\text{ROI} = \frac{\text{USD}\,140{,}000}{\text{USD}\,2{,}000{,}000} \times \frac{\text{USD}\,2{,}000{,}000}{\text{USD}\,1{,}000{,}000}$$

$$\text{ROI} = 7\,\text{per cent} \times 2\,\text{time}$$

ROI = 14 per cent

- Increase turnover through reducing investment in assets by USD 200,000; no effect on sales or investment.

$$\text{ROI} = \frac{\text{USD}\,100{,}000}{\text{USD}\,2{,}000{,}000} \times \frac{\text{USD}\,2{,}000{,}000}{\text{USD}\,800{,}000}$$

$$\text{ROI} = 5\,\text{per cent} \times 2.5\,\text{time}$$

ROI = 12.5 per cent

- (a) Increase margin and turnover by disposing of nonproductive depreciable assets; income increased by USD 10,000; investment decreased by USD 200,000; no effect on sales.

$$\text{ROI} = \frac{\text{USD}\,110{,}000}{\text{USD}\,2{,}000{,}000} \times \frac{\text{USD}\,2{,}000{,}000}{\text{USD}\,800{,}000}$$

$$\text{ROI} = 5.5\,\text{per cent} \times 2.5\,\text{time}$$

ROI = 13.75 per cent

- (b) Increase margin and turnover through increased advertising; sales increased by USD 500,000 and income by USD 50,000; no effect on investment.

$$\text{ROI} = \frac{\text{USD}\,150{,}000}{\text{USD}\,2{,}500{,}000} \times \frac{\text{USD}\,2{,}500{,}000}{\text{USD}\,1{,}000{,}000}$$

$$\text{ROI} = 6\,\text{per cent} \times 2.5\,\text{time}$$

ROI = 15 per cent

- (c) Increase turnover through increased advertising; sales increased by USD 500,000 and income by USD 12,500; no effect on investment.

$$\text{ROI} = \frac{\text{USD}\,112{,}500}{\text{USD}\,2{,}500{,}000} \times \frac{\text{USD}\,2{,}500{,}000}{\text{USD}\,1{,}000{,}000}$$

$$\text{ROI} = 4.5\,\% \times 2.5\ \text{times}$$

$$\text{ROI} = 11.25\%$$

Exhibit 59: Strategies for increasing return on investment (ROI)

• By taking actions that affect both margin and turnover: For example, disposing of nonproductive depreciable assets would decrease investment while also increasing income (through the reduction of depreciation expense). Thus, both margin and turnover would increase. An advertising campaign would probably increase sales and income. Turnover would increase, and margin might increase or decrease depending on the relative amounts of the increases in income and sales.

Economic value added and residual income

When a company uses ROI to evaluate performance, managers have incentives to focus on the average returns from their segments' assets. However, the company's best interest is served if managers also focus on the marginal returns.

To illustrate, assume the manager of Segment 3 in Exhibit 60, has an opportunity to take on a project involving an investment of USD 100,000 that is estimated to return USD 22,000, or 22 per cent, on the investment. Since the segment's ROI is currently 25 per cent, or USD 250,000/USD 1,000,000, the manager may decide to reject the project because accepting the project will cause the segment's ROI to decline. Suppose however, from the company's point of view, all projects earning greater than a 10 per cent return should be accepted, even if they are lower than a particular segment's ROI.

Before acceptance of the project by Segment 3, the amounts are as follows:

	Segment 1	**Segment 2**	**Segment 3**
a. Income	$ 100,000	$ 500,000	$ 250,000
b. Investment	1,000,000	2,500,000	1,000,000
c. Cost of capital	10%	10%	10%
d. Desired minimum income	$ 100,000	$ 250,000	$ 100,000
e. Residual Income (RI)	-0-	250,000	150,000

With acceptance of the project by Segment 3, the amounts would be as follows:

	Segment 1	**Segment 2**	**Segment 3**
a. Income	$ 100,000	$ 500,000	$ 272,000†
b. Investment	1,000,000	2,500,000	1,100,000‡
c. Cost of capital	10%	10%	10%
d. Desired minimum income	$ 100,000	$ 250,000	$ 110,000
e. Residual Income (RI)	-0-	250,000	162,000

† $250,000 + (22% of $100,000).
‡ $1,000,000 original investment + $100,000 new investment.

Exhibit 60: Computation of Residual Income (RI)

The rejection by a segment manager of a project that exceeds the 10 per cent desired minimum return is an example of suboptimization. **Suboptimization** occurs when a segment manager takes an action that is in the segment's best interest but is not in the best interest of the company as a whole.

To deal with this type of suboptimization, many companies use the concept of economic value added which computes the residual income of a business segment. **Residual income (RI)** is defined as the amount of income a segment has in excess of the segment's investment base times its cost of capital percentage. Each company based on debt costs establishes its cost of capital coverage and desired returns to stockholders. The formula for residual income (RI) is:

$$\text{RI} = \text{Income} - (\text{Investment} \times \text{Cost of capital percentage})$$

When a company uses RI to evaluate performance, the segment rated as the best is the segment with the greatest amount of RI rather than the one with the highest ROI.

Returning to our example, the project opportunity for Segment 3 could earn in excess of the desired minimum ROI of 10 per cent. In fact, the project generates RI of USD 12,000, calculated as (USD 22,000 - [10 per cent X USD 100,000]). If RI were applied as the basis for evaluating segmental performance, the manager of Segment 3 would accept the project because doing so would improve the segment's performance. That choice would also be beneficial to the entire company.

Critics of the RI method complain that larger segments are likely to have the highest RI. In a given situation, it may be advisable to look at both ROI and RI in assessing performance or to scale RI for size.

A manager tends to make choices that improve the segment's performance. The challenge is to select evaluation bases for segments that result in managers making choices that benefit the entire company. When performance is evaluated using RI, choices that improve a segment's performance are more likely also to improve the entire company's performance.

When calculating RI for a segment, the income and investment definitions are contribution to indirect expenses and assets directly used by and identified with the segment. When calculating RI for a manager of a segment, the income and investment definitions should be income controllable by the manager and assets under the control of the segment manager.

In evaluating the performance of a segment or a segment manager, comparisons should be made with (1) the current budget, (2) other segments or managers within the company, (3) past performance of that segment or manager, and (4) similar segments or managers in other companies. Consideration must be given to factors such as general economic conditions and market conditions for the product being produced. A superior segment in Company A may be considered superior because it is earning a return of 12 per cent, which is above similar segments in other companies but below other segments in Company A. However, segments in Company A may be more profitable because of market conditions and the nature of the company's products rather than because of the performance of the segment managers. Top management must use careful judgment whenever performance is evaluated.

Segmental reporting in external financial statements

In June 1997, the Financial Accounting Standards Board issued *Statement of Financial Accounting Standards No. 131*, "Disclosures about Segments of an Enterprise and Related Information". This statement requires publicly held companies to publish certain segmental information in their annual and interim financial statements. It also requires that these companies report certain information about their products and services, the geographic areas in which they operate, and their major customers. Thus, external users of financial statements of a company can (1) better understand the company's performance, (2) better assess the prospects for future net cash flows, and (3) make more informed judgments about the company.

In this chapter you learned about responsibility accounting and segmental analysis. Chapter 26 discusses capital budgeting and long-term planning.

Understanding the learning objectives

• Responsibility accounting refers to an accounting system that collects, summarizes, and reports accounting data relating to the responsibilities of individual managers.

• Although the amount of detail varies, reports issued under a responsibility accounting system are interrelated. Totals from the report on one level of management are carried forward in the report to the management level immediately above.

• The contribution margin format for the income statement shows the contribution margin for the company.

• Contribution to indirect expenses is defined as sales revenue less all direct expenses of the segment.

• The final total in the income statement is segmental net income, defined as segmental revenues less all expenses (direct expenses and allocated indirect expenses).

• Return on investment measures the relative effectiveness of segments. The formula for return on investment is:

$$\text{Return on investment} = \frac{\text{Income}}{\text{Investment}}$$

• Alternatively, the formula for return on investment can be broken into two components:

$$\text{Return on investment} = \frac{\text{Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

• Margin refers to the percentage relationship of income or profits to sales. This percentage shows the number of cents of profit generated by each dollar of sales. The formula for margin can be expressed as:

$$\text{Margin} = \frac{\text{Income}}{\text{Sales}}$$

• Turnover shows the number of dollars of sales generated by each dollar of investment. Turnover measures how effectively each dollar of assets was used. The formula for turnover can be expressed as:

$$\text{Turnover} = \frac{\text{Sales}}{\text{Investment}}$$

• Residual income is defined as the amount of income a segment has in excess of its investment base times its cost of capital percentage.

• Each company sets its cost of capital based on debt costs and desired returns to stockholders.

• The formula for residual income is:

$$\text{RI} = \text{Income} - (\text{Investment} \times \text{Cost of capital percentage})$$

• Two basic methods exist for allocating service department costs: (1) the direct method and (2) the step method.

Appendix: Allocation of service department costs

Throughout this text, we have emphasized cost allocations only in the operating departments of a company. These operating departments perform the primary purpose of the company—to produce goods and services for

consumers. Examples of operating departments are the assembly departments of manufacturing firms and the departments in hotels that take and confirm reservations.

The costs of service departments are allocated to the operating departments because they exist to support the operating departments. Examples of service departments are maintenance, administration, cafeterias, laundries, and receiving. Service departments aid multiple production departments at the same time, and accountants must allocate and account for all of these costs. It is crucial that these service department costs be allocated to the operating departments so that the costs of conducting business in the operating departments are clearly and accurately reflected.

Accountants allocate service department costs using some type of base. When the companies' managers choose bases to use, they consider such criteria as the types of services provided, the benefits received, and the fairness of the allocation method. Examples of bases used to allocate service department costs are number of employees, machine-hours, direct labor-hours, square footage, and electricity usage.

Two basic methods exist for allocating service department costs. The first method, the direct method, is the simplest of the two. The direct method allocates costs of each of the service departments to each operating department based on each department's share of the allocation base. Services used by other service departments are ignored. For example, if Service Department A uses some of Service Department B's services, these services would be ignored in the cost allocation process. Because these services are not allocated to other service departments, some accountants believe the direct method is not accurate.

The second method of allocating service department costs is the step method. This method allocates service costs to the operating departments and other service departments in a sequential process. The sequence of allocation generally starts with the service department that has incurred the greatest costs. After this department's costs have been allocated, the service department with the next highest costs has its costs allocated, and so forth until the service department with the lowest costs has had its costs allocated. Costs are not allocated back to a department that has already had all of its costs allocated.

To illustrate the direct method and the step method, we use the following data:

	Service Department	**Operating Departments**	
	Maintenance	**Administration**	**1**	**2**
Costs	$ 8,000	$ 4,000	$ 32,000	$ 36,000
Machine-hours used	1,000	2,000	1,500	2,500
Number of employees	100	200	250	150

The costs of the maintenance department are allocated based on the machine-hours used. For the administration department, the cost allocation is based on the number of employees.

Using the preceding data, an example of the direct method follows:

	Service Departments		**Operating Departments**	
	Maintenance	**Administration**	**1**	**2**
Costs	$ 8,000	$ 4,000	$ 32,000	$ 36,000
Allocation of maintenance department's costs*	(8,000)		3,000	5,000
	$ -0-			
Allocation of		(4,000)	2,500	1,500

administration department's costs†				
		$ -0-	$ 37,500	$ 42,500
* Department 1's 2,500/4,000.	fraction is	1,500/4,000;	Department	2's fraction is
† Department 1's 150/400.	fraction is	250/400;	Department	2's fraction is

Using the same data, an example of the step method follows:

	Service	**Departments**	**Operating**	**Departments**
	Maintenance	**Administration**	**1**	**2**
Costs	$ 8,000	$ 4,000	$ 32,000	$ 36,000
Allocation of maintenance department's costs*	(8,000)	2,667	2,000	3,333
	$ -0-			
Allocation of administration department's costs†		(6,667)	4,167	2,500
		$ -0-	$ 38,167	$ 41,833
* Administration 1's 1,500/6,000;	fraction is Department	2,000/6,000; 2's fraction:	Department 2,500/6,000.	1's fraction:
† Department 1's 150/400.	fraction:	250/400;	Department	2's fraction is

Note in the preceding examples that the maintenance department costs were not allocated to the administration department under the direct method but were allocated under the step method. Also, to eliminate the administration department's costs, under the step method those costs allocated to the administration department from the maintenance department must be allocated to the operating departments as part of the total administration department's cost.

Demonstration problem

The results of operations for Alan Company's two segments in 2009 follow:

	Segment 1	**Segment 2**	**Total**
Sales	$ 90,000	$ 135,000	$ 225,000
Variable expenses	63,000	81,000	144,000
Fixed expenses:			
Direct	9,000	25,200	34,200
Indirect			12,600

The company has total operating assets of USD 315,000; USD 288,000 of these assets are identified with particular segments as follows:

	Segment 1	**Segment 2**
Assets directly used by and identified with the segment	$ 108,000	$ 180,000

a. Prepare a statement showing the contribution margin, contribution to indirect expenses for each segment, and the total income for Alan Company.

b. Determine the return on investment for each segment and then for the entire company.

c. Comment on the results of (a) and (b).

Solution to demonstration problem

a. **Alan Company**

25. Responsibility accounting: Segmental analysis

Income statement showing segmental contribution to indirect expenses
For the year ended 2009 December 31

	Segment 1	Segment 2	Total
Sales	$ 90,000	$ 135,000	$ 225,000
Less: Variable expenses	63,000	81,000	144,000
Contribution margin	$ 27,000	$ 54,000	$ 81,000
Less: Direct fixed expenses	9,000	25,2000	34,200
Contribution to indirect expenses	$ 18,000	$ 28,800	$ 46,800
Less: Indirect fixed expenses			12,600
Net income			$ 34,200

b. 1. $$\text{ROI} = \frac{\text{Contribution for indirect expenses}}{\text{Assets directly used by also identified with the segment}}$$

Segment 1			Segment 2		
ROI =	USD 18,000 / USD 108,000 =	16.67%	ROI =	USD 28,800 / USD 180,000 =	16%

2. $$\text{ROI} = \frac{\text{Net operating income}}{\text{Operating assets}} = \frac{\text{USD } 34{,}200}{\text{USD } 315{,}000} = 10.9 \text{ per cent}$$

c. In part (a), Segment 2 showed a higher contribution to indirect expenses. But in (b), Segment 1 showed a higher return on investment. The difference between these calculations shows that when a segment is evaluated as a profit center, the center with the highest investment base usually shows the best results. But when the segment is evaluated as an investment center, the segment with the highest investment base does not necessarily show the highest return. The computations in (b) also demonstrate that the return on investment for the company as a whole will be lower than that of each segment because of the increased investment base.

Key terms*

Budget variance The difference between the budgeted and actual amounts of an item.

Contribution margin Sales revenues less variable expenses.

Contribution margin format An income statement format that shows the contribution margin (Sales - Variable expenses) for a segment.

Contribution to indirect expenses Sales revenue less all direct expenses of the segment.

Controllable profits of a segment Profit of a segment when expenses under a manager's control are deducted from revenues under that manager's control.

Cost object A segment, product, or other item for which costs may be accumulated.

Current replacement cost The cost of replacing the present assets with similar assets in the same condition as those now in use.

Decentralization The dispersion of decision-making authority among individuals at lower levels of the organization.

Direct cost (expense) A cost that is specifically traceable to a given cost object.

Expense center A responsibility center incurring only expense items and producing no direct revenue from the sale of goods or services. Examples include the accounting department and the maintenance department.

Indirect cost (expense) A cost that is not traceable to a given cost object but has been allocated to it.

Investment center A responsibility center having revenues, expenses, and an appropriate investment base.

Management by exception The principle that upper level management does not need to examine operating details at lower levels unless there appears to be a problem (an exception).

Margin (as used in ROI) The percentage relationship of income (or profits) to sales.

$$\text{Margin} = \frac{\text{Income}}{\text{Sales}}$$

Original cost The price paid to acquire an asset.

Original cost less accumulated depreciation The book value of an asset—the amount paid less total depreciation taken.

Profit center A responsibility center having both revenues and expenses.

Residual income (RI), Economic Value Added The amount of income a segment has in excess of the investment base times the cost of capital percentage. Residual income is equal to Income - (Investment X Cost of capital percentage).

Responsibility accounting Refers to an accounting system that collects, summarizes, and reports accounting data relating to the responsibility of the individual managers. A responsibility accounting system provides information to evaluate each manager on revenue and expense items over which that manager has primary control.

Responsibility center A segment of an organization for which a particular executive is responsible.

Return on investment (ROI) Calculates the return (income) as a percentage of the assets employed (investment).

$$\text{Return on investment} = \frac{\text{Income}}{\text{Investment}} \quad \text{Or} \quad \frac{\text{Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

Segment A fairly autonomous unit or division of a company defined according to function or product line.

Segmental net income The final total in the income statement; segmental revenues less all expenses (direct expenses and allocated indirect expenses).

Suboptimization A situation when a segment manager takes an action in the segment's best interest but not in the best interest of the company as a whole.

Transfer price An artificial price used when goods or services are transferred from one segment to another segment within the same company.

Turnover (as used in ROI) The number of dollars of sales generated by each dollar of investment.

$$\text{Turnover} = \frac{\text{Sales}}{\text{Investment}}$$

*Some terms listed in earlier chapters are repeated here for your convenience.

Self-test

True-false

Indicate whether each of the following statements is true or false.

Items that a manager has direct control over are included in responsibility accounting reports for that management level.

An appropriate goal of an expense center is the long-run minimization of expenses.

The salary of a segment manager would be considered a direct cost as well as an uncontrollable cost to that segment.

Segmental net income is the most appropriate figure to use when evaluating the performance of a segment.

When calculating RI for a segment, the income and investment definitions are income controlled by a manager, and assets directly used by and identified with the segment.

Multiple-choice

Select the best answer for each of the following questions.

The investment base used when determining the ROI calculation could be which of the following?

a. Current replacement cost.

b. Original cost.

c. Original cost less accumulated depreciation.

d. Any of the above.

25. Responsibility accounting: Segmental analysis

Which of the following actions would increase ROI?

a. Reduce operating expenses with no effect on sales or assets.

b. Increase investment in assets, with no change in income.

c. Increase sales with no change in income or assets.

d. None of the above.

Calculate ROI using the expanded form (margin times turnover) from the following data:

Sales	$1,000,000
Investment	500,000
Income	50,000

a. 20 per cent.

b. 10 per cent.

c. 15 per cent.

d. None of the above.

In evaluating the performance of a segment or manager, comparisons should be made with:

a. Other segments and managers within the company and in other companies.

b. Past performance of the segment manager.

c. The current budget.

d. All of the above.

Calculate the ROI and RI for each of the following segments and determine if a segment should be dropped based on RI.

	Segment 1	**Segment 2**	**Segment 3**
Income	$ 180,000	$ 1,000,000	$ 500,000
Investment	2,000,000	5,000,000	2,000,000
ROI	?	?	?
Desired minimum ROI (10%)	200,000	500,000	200,000
RI	?	?	?

a. 9 per cent, 20 per cent, 20 per cent

USD 0, USD 500,000, USD 200,000

Consider dropping Segment 1.

b. 20 per cent, 20 per cent, 20 per cent

USD 200,000, USD 500,000, USD 200,000

Do not drop any segment.

c. 9 per cent, 20 per cent, 25 per cent

USD (20,000), USD 500,000, USD 300,000

Consider dropping Segment 1.

d. 20 per cent, 20 per cent, 25 per cent

USD 200,000, USD 500,000, USD 300,000

Do not drop any segment.

Now turn to “Answers to self-test” at the back of the chapter to check your answers.

Questions

- What is the fundamental principle of responsibility accounting?
- List five important factors that should be considered in designing reports for a responsibility accounting system.
- How soon should accounting reports be prepared after the end of the performance measurement period? Explain.
- Name and describe three types of responsibility centers.
- Describe a segment of a business enterprise that is best treated as an expense center. List four indirect expenses that may be allocated to such an expense center.
- Compare and contrast an expense center and an investment center.
- What purpose is served by setting transfer prices?
- What is the advantage of using investment centers as a basis for performance evaluation?
- Which categories of items must a segment manager have control over for the investment center concept to be applicable?
- What is the connection between the extent of decentralization and the investment center concept?
- Give some of the advantages of decentralization.
- Differentiate between a direct cost and an indirect cost of a segment. What happens to these categories if the segment to which they are related is eliminated?
- Is it possible for a cost to be direct to one cost object and indirect to another cost object? Explain.
- Describe some of the methods by which indirect expenses are allocated to a segment.
- Give the general formula for return on investment (ROI). What are its two components?
- Give the three sets of definitions for income and investment that can be used in ROI calculations, and explain when each set is applicable.
- Give the various valuation bases that can be used for plant assets in investment center calculations. Discuss some of the advantages and disadvantages of these methods.
- In what way is the use of the residual income (RI) concept superior to the use of ROI?
- How is residual income (RI) determined?

- If the RI for segment manager A is USD 50,000 while the RI for segment manager B is USD 100,000, does this necessarily mean that B is a better manager than A? Explain.
- **Real world question** Refer to the annual report of a publicly traded company. Which of the company's geographic regions performed better? Explain.
- (Based on Appendix) Briefly discuss the two methods of allocating service department costs.

Exercises

Exercise A The following information refers to the inspection department of a chemical packaging plant for September:

	Amount	Over or (Under) Budget
Supplies	$ 54,000	$ (10,800)
Repairs and maintenance	270,000	21,600
Overtime paid to inspectors	108,000	10,800
Salary of inspection department manager	32,400	(5,400)
Salary of plant manager	43,200	-0-
Allocation of company accounting costs	32,400	10,800
Allocation of building depreciation to the inspection department	21,600	(5,400)

Using this information, prepare a responsibility report for the manager of the inspection department for September. Include those items for which you think the inspection department manager would be held responsible.

Exercise B Present the following information for the Hardware Division of ABC Computer Company,

Sales	$ 1,400,000
Variable selling and administrative expenses	100,000
Fixed direct manufacturing expenses	35,000
Fixed indirect manufacturing expenses	56,000
Variable manufacturing expenses	400,000
Fixed direct selling and administrative expenses	175,000
Fixed indirect selling and administrative expenses	28,000

Exercise C Given the following data, prepare a schedule that shows contribution margin, contribution to indirect expenses, and net income of the Sharks Division of Hockey, Inc.:

Direct fixed expenses	$ 324,000
Indirect fixed expenses	259,200
Sales	2,100,000
Variable expenses	1,500,000

What would be the effect on the company income if the segment were eliminated?

Exercise D Three segments (A, B, and C) of Trump Enterprises have net sales of USD 300,000, USD 150,000, and USD 50,000, respectively. A decision is made to allocate the pool of USD 25,000 of administrative overhead expenses of the home office to the segments, using net sales as the basis for allocation.

a. How much of the USD 25,000 should be allocated to each segment?

b. If Segment C is eliminated, how much of the USD 25,000 will be allocated to A and B?

Exercise E Two segments (Mountain Bike and Road Bike) showed the following data for the most recent year:

	Mountain bike	Road bike
Contribution to indirect expenses	$ 840,000	$ 504,000
Assets directly used by and identified with the segment	2,520,000	2,184,000
Sales	3,360,000	6,720,000

a. Calculate return on investment for each segment in the most direct manner.

b. Calculate return on investment using the margin and turnover components.

Exercise F Calculate the new margin, turnover, and return on investment of the Mountain Bike segment for each of the following changes. Consider each change independently of the others.

a. Direct variable expenses were reduced by USD 33,600. Sales and assets were unaffected.

b. Assets used by the segment were reduced by USD 540,000, while income and sales were unaffected.

c. An advertising campaign increased sales by USD 336,000 and income by USD 50,000. Assets directly used by the segment were unaffected.

Exercise G The following data are available for Segment A of ABC Company:

Net income of the segment	$ 50,000
Contribution to indirect expenses	40,000
Controllable income by manager	48,000
Assets directly used by the manager	360,000
Assets under the control of the segment manager	240,000

Determine the return on investment for evaluating (a) the income performance of the manager of Segment A and (b) the rate of income contribution of the segment.

Exercise H Travel Company has three segments: Air, Land, and Sea. Data concerning income and investment follow:

	Air	Land	Sea
Contribution to indirect expenses	$ 43,200	$ 86,400	$ 115,200
Assets directly used by and identified with the segment	288,000	576,000	1,296,000

Assuming that the cost of capital on investment is 12 per cent, calculate the residual income of each of the segments. Do the results indicate that any of the segments should be eliminated?

Problems

Problem A You are given the following information for Farflung Company for the year ended 2009 December 31. The company is organized according to functions:

	Plant Manager		Vice Of	President Manufacturing	President	
Controllable expenses	**Budget**	**Actual**	**Budget**	**Actual**	**Budget**	**Actual**
Office expense	$ 7,200	$ 9,600	$ 12,000	$ 16,800	$ 24,000	$ 16,800
Printing	19,200	16,800				
Paging	2,400	2,160				
Binding	4,800	4,800				
Purchasing			24,000	26,400		
Receiving			12,000	14,400		
Inspection			19,200	16,800		
Vice president of marketing					192,000	168,000
Controller					144,000	120,000
Treasurer					96,000	72,000

Vice president of personnel	48,000	72,000

Prepare the responsibility accounting reports for the three levels of management—plant manager, vice president of manufacturing, and president.

Problem B Joey Bauer Corporation has production plants in Sacramento, Dallas, and Seattle. Following is a summary of the results for 2009:

Plant	Revenues	Expenses	Investment base (gross assets)
Sacramento	$ 450,000	$ 225,000	$ 4,500,000
Dallas	450,000	180,000	3,375,000
Seattle	675,000	247,500	7,200,000

a. If the plants are treated as profit centers, which plant manager appears to have done the best job?

b. If the plants are treated as investment centers, which plant manager appears to have done the best job? (Assume the plant managers are evaluated by return on investment on gross assets.)

c. Do the results of profit center analysis and investment center analysis give different findings? If so, why?

Problem C Quinn Company allocates all of its home office expenses to its two segments, A and B. Allocations are based on the following selected expense account balances and additional data:

Expenses (allocation bases)	
Home office building expense (net sales)	$ 76,800
Buying expense (net purchases)	67,200
Uncollectible accounts (net sales)	8,000
Depreciation of home office equipment (net sales)	21,120
Advertising expense (indirect, allocated on basis of relative amounts of direct advertising)	86,400
Insurance expense (relative amounts of equipment plus average inventory in department)	23,040

	Segment A	Segment B	Total
Purchases (net)	$ 243,200	$ 76,800	$ 320,000
Sales (net)	512,000	128,000	640,000
Equipment (cost)	96,000	64,000	160,000
Advertising (cost)	25,600	12,800	38,400
Average inventory	160,000	64,000	224,000

a. Prepare a schedule showing the amounts of each type of expense allocable to Segments X and Y using these data and bases of allocation.

b. Evaluate and criticize these allocation bases.

Problem D Allentown, Inc., is a company with two segments, X and Y. Its revenues and expenses for 2009 follow:

	Segment X	Segment Y	Total
Net sales	$ 96,000	$ 144,000	$ 240,000
Direct expenses:*			
Cost of goods sold	45,000	99,000	144,000
Selling	13,680	7,200	20,880
Administrative:			
Uncollectible accounts	3,000	1,800	4,800
Insurance	2,400	1,200	3,600
Interest	480	240	720
Indirect expenses (all fixed):			
Selling			18,000

Administrative	25,200

* All the direct expenses are variable except insurance and interest, which are fixed.

a. Prepare a schedule showing the contribution margin, the contribution to indirect expenses of each segment, and net income for the company as a whole. Do not allocate indirect expenses to the segments.

b. Assume that indirect selling expenses are to be allocated on the basis of net sales and that indirect administrative expenses are to be allocated on the basis of direct administrative expenses. Prepare a statement (starting with the contribution to indirect expenses) that shows the net income of each segment.

c. Comment on the appropriateness of the income amounts shown in parts (a) and (b) for determining the income contribution of the segments.

Problem E The following data pertain to the operating revenues and expenses for Golden State Company for 2009:

	Los Angeles (LA) Segment	**San Francisco (SF) Segment**	**Total**
Sales	$ 180,000	$ 360,000	$ 540,000
Variable expenses	96,000	240,000	336,000
Direct fixed expenses	24,000	30,000	54,000
Indirect fixed expenses			72,000

Regarding the company's total operating assets of USD 900,000, the following facts exist:

	Los Angeles Segment	**San Francisco Segment**
Assets directly used by and identified with the segment	$ 180,000	$ 360,000

a. Prepare a statement showing the contribution margin of each segment, the contribution to indirect expenses of each segment, and the total income of Golden State Company.

b. Determine the return on investment for evaluating (1) the earning power of the entire company and (2) the performance of each segment.

c. Comment on the results of part (b).

Problem F Shaq Company operates with three segments, Louisiana, Orlando, and LA. Data regarding these segments follow:

	Louisiana segment	**Orlando segment**	**LA segment**
Contribution to indirect expenses	$ 324,000	$ 180,000	$ 144,000
Assets directly used and identified with the segment	1,800,000	1,440,000	720,000

a. Calculate the return on investment for each segment. Rank them from highest to lowest.

b. Assume the cost of capital is 12 per cent for a segment. Calculate residual income for each segment. Rank them from highest to lowest.

c. Repeat (b), but assume the cost of capital is 17 per cent for a segment. Rank them from highest to lowest.

d. Comment on the rankings achieved.

Problem G The manager of the Winston Company faced the following data for the year 2009:

Contribution to indirect expenses	$ 1,800,000
Assets directly used by and identified with the segment	22,500,000
Sales	36,000,000

a. Determine the margin, turnover, and return on investment for the segment in 2009.

b. Determine the effect on margin, turnover, and return on investment of the segment in 2010 if each of the following changes were to occur. Consider each change separately and assume that any items not specifically mentioned remain the same as in 2009:

A campaign to control costs resulted in USD 180,000 of reduced expenses.

Certain nonproductive assets were eliminated. As a result, investment decreased by USD 900,000, and expenses decreased by USD 72,000.

An advertising campaign resulted in increasing sales by USD 3,600,000, cost of goods sold by USD 2,700,000, and advertising expense by USD 540,000.

An investment was made in productive assets costing USD 900,000. As a result, sales increased by USD 360,000, and expenses increased by USD 54,000.

Problem H For the year ended 2009 December 31, Fore Company reported the following information for the company as a whole and for the sports segment of Fore Corporation:

		Sports Segment		
	Fore company	**Woods Project**	**Irons Project**	**Total**
Sales	$ 12,000,000	$ 1,350,000	$ 600,000	$ 1,950,000
Income	1,125,000	300,000	37,500	337,500
Investment	4,500,000	900,000	105,000	1,005,000

Fore Company anticipates that these relationships (return on investment, margin, and turnover) will hold true for the upcoming year. The sports segment is faced with the possibility of adding a new project in 2010, with the following projected data:

	Putters Project
Sales	$ 450,000
Income	52,500
Investment	187,500

a. Determine the return on investment for Fore Company, for the sports segment, and for the Woods and Irons projects separately for the year ended 2009 December 31.

b. Using this information, determine the effect of adding the Putters project on the sports segment's return on investment. What problem may be encountered?

Using the data provided in the previous problem, determine the residual income (1) for all three projects and (2) for the sports segment with and without the Putters project, if the cost of capital is 25 per cent. What is the effect on the sport segment's residual income if the Putter project is added? How does this result compare with your answer to the previous problem?

Alternate problems

Alternate problem A Swiss Corporation has three production plants (X, Y, and Z). Following is a summary of the results for January 2009:

Plant	Revenues	Expenses	Investment Base (gross assets)
X	$ 720,000	$ 300,000	$ 1,440,000
Y	960,000	180,000	1,920,000
Z	5,040,000	1,920,000	13,200,000

a. If the plants are treated as profit centers, which plant manager appears to have done the best job?

b. If the plants are treated as investment centers, which plant manager appears to have done the best job? (Assume the plant managers are evaluated by return on investment.)

c. Do the results of profit center analysis and investment center analysis give different findings? If so, why?

Alternate problem B Easy Loans, Inc., allocates expenses and revenues to the two segments that it operates. Easy Loans extends credit to customers under a revolving charge plan whereby all account balances not paid within 30 days are charged interest at the rate of 11/2 per cent per month.

Following are selected revenue and expense accounts and some additional data needed to complete the allocation of the one revenue amount and the expenses.

Revenue and Expenses (allocation bases)	
Revolving charge service revenue (net sales)	$ 600,000
Home office building occupancy expense (net sales)	45,000
Buying expenses (net purchases)	150,000
General administrative expenses (number of employees in department)	75,000
Insurance expense (relative average inventory plus cost of equipment and fixtures in each department)	18,000
Depreciation expense on home office equipment (net sales)	30,000

	High Risk Segment	Low Risk Segment	Total
Number of employees	3	7	10
Net sales	$ 300,000	$ 600,000	$ 900,000
Net purchases	240,000	360,000	600,000
Averaging inventory	60,000	120,000	180,000
Cost of equipment fixtures	90,000	180,000	270,000

a. Prepare a schedule showing allocation of these items to the High and Low Risk segments.

b. Do you think these are good allocation bases? Why or why not?

Alternate problem C Student Painters, Inc., operates two segments, interior and exterior. The revenue and expense data for 2009 follow:

	Interior	Exterior	Total
Net sales	$ 335,700	553,800	$ 889,500
Direct expenses:*			
Cost of goods sold	186,000	282,000	468,000
Selling	31,800	27,000	58,800
Administrative	9,000	6,000	15,000
Uncollectible accounts	2,400	6,600	9,000
Indirect expenses (all fixed):			
Selling			126,000
Administrative			156,000

*All the direct expenses are variable except administrative expense, which is fixed.

a. Prepare a schedule showing the contribution margin, the contribution to indirect expenses of each segment, and net income for the company as a whole. Do not allocate indirect expenses to the segments.

b. Assume that indirect selling expenses are to be allocated to segments on the basis of net sales (round to the nearest per cent) and that indirect administrative expenses are to be allocated on the basis of direct administrative expenses. Prepare a statement (starting with the contribution to indirect expenses) which shows the net income of each segment.

c. Comment on the appropriateness of the income amounts shown in parts (a) and (b) for determining the income contribution of the segments.

Alternate problem D Elliott Corporation has three segments. Following are the results of operations for 2009:

	Segment A	**Segment B**	**Segment C**	**Total**
Sales	$36,000,000	$ 21,600,000	$ 14,400,000	$ 72,000,000
Variable expenses	25,920,000	12,240,000	9,720,000	47,880,000
Fixed expenses:				
Direct	5,040,000	1,800,000	720,000	7,560,000
Indirect				3,600,000

For the company's total operating assets of USD 100,800,000, the following facts exist:

	Segment A	Segment B	Segment C
Assets directly used by and identified with the segment	$ 50,400,000	$ 28,800,000	$ 14,400,000

a. Prepare a statement (in thousands of dollars) showing the contribution margin, the contribution to indirect expenses for each segment, and the total income of the Elliott Corporation.

b. Determine the return on investment for evaluating (1) the performance of the entire company and (2) performance of each segment.

c. Comment on the results of part (a).

Alternative problem E Goodwin Company has three segments, 1,2, and 3. Data regarding these segments follow:

	Segment 1	Segment 2	Segment 3
Contribution to indirect expenses	$ 432,000	$ 208,800	$ 72,000
Assets directly used by and identified with the segment	3,600,000	1,440,000	360,000

a. Calculate the return on investment for each segment. Rank them from highest to lowest.

b. Assume the cost of capital is 10 per cent for a segment. Calculate the residual income for each segment. Rank them from highest to lowest.

c. Repeat (b), but assume the desired cost of capital is 14 per cent. Rank the segments from highest to lowest.

d. Comment on the rankings achieved.

Beyond the numbers—Critical thinking

Business decision case A Texas Company manufactures skateboards. Because the company's business is seasonal, between August and December skilled manufacturing employees are laid off. To improve morale, the financial vice president suggested that 10 employees not be laid off in the future. Instead, she suggested that they work in general labor from August to December but still be paid their manufacturing wages of USD 10 per hour. General labor personnel earn USD 6.60 per hour. What are the implications of this plan for the assignment of costs to the various segments of the business?

Business decision case B Piero Company builds new homes. Sarah Richards is in charge of the construction department. Among other responsibilities, Sarah hires and supervises the carpenters and other workers who build the homes. Piero Company does not do its own foundation work. The construction of foundations is done by subcontractors hired by Leslie Larue of the procurement department.

To start the development of a 500-home community, Larue hired Dire Company to build the foundations for the homes. On the day construction was to begin, Dire Company went out of business. Consequently, construction was delayed six weeks while Larue hired a new subcontractor. Which department should be charged with the cost of the delay in construction? Why?

Business decision case C Ken Silva is the supervisor of Department 103 of Laguna Company. The annual budget for Silva's department is as follows:

Annual budget for Department 103	
Small tools	$ 6,750
Set up	7,500

Direct labor	8,250
Direct materials	15,000
Supplies	3,750
Supervision	22,500
Property taxes	3,750
Property insurance	750
Depreciation, machinery	1,500
Depreciation, building	1,500
Total	$ 71,250

Silva's salary of USD 15,000 is included in supervision. The remaining USD 7,500 in supervision is the salary of the assistant supervisor directly responsible to Silva. Identify the budget items that Silva controls.

Broader perspective – Writing experience D Refer to "A broader perspective: Employee buyouts". Write a brief report explaining the effects of employee buyouts on employee motivation.

Group project E Macrofast Software, Inc., faces stiff competition in selling its products. Macrofast's top management feels considerable pressure from the company's stockholders to increase earnings.

Mac Washington, the vice president of marketing at the company's Production Software Division, received a memorandum from top management that said, in effect, "Increase your division's earnings or look for a new job".

Washington could think of only one way to increase earnings by the end of the year. The Production Software Division had several installations that should be completed early the following year, probably in February or March. For each of those jobs, he asked the customers to sign a Completed Installation document stating the job was completed to the customer's satisfaction. He did this because Macrofast's accounting department would record the revenue from the job when it received the Completed Installation document.

Several customers signed Completed Installation documents even though the jobs were not complete because Washington gave them a personally signed letter stating the Completion Installation document was not legally binding.

The scheme initially worked. Revenues were prematurely recorded for these jobs, sales and earnings for the year were up, Macrofast's top management was delighted with the results, and Washington was rewarded with a large bonus and a promotion to a vice presidency at corporate headquarters.

The following June, a staff accountant discovered the scheme when a customer called to complain that he was being billed for a job that was not yet completed. When the accountant produced the customer's Completed Installation document, the customer produced Washington's letter saying the document was not binding. The accountant did some detective work and unearthed the scheme. When she presented the results to her supervisor, the supervisor said, "This practice is unfortunate and is against company policy. But what is done is done. Do not worry about last year's financial statements. Just be sure it does not happen again."

a. In teams of four, discuss what the staff accountant should do.

b. Then, decide how your solution would change if all jobs had been completed to the customers' satisfaction.

c. As a team, write a memorandum to your instructor describing your solutions. The heading of the memo should contain the date, to whom it is written, from whom, and the subject matter.

Group project F Bleak Prospects, Inc., found that its market share was slipping. Division managers were encouraged to maximize ROI and made decisions consistent with that goal. Nonetheless, there were frequent

customer complaints, with resulting loss of business. Moreover, Bleak depended on an established product line and was unable to find new products for expansion while its competitors seemed to be able to generate new products almost yearly. What would you suggest Bleak Prospects' management do to improve the situation? In groups of two or three students, write a memorandum to your instructor addressing this question. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

Group project G Management of Division A is evaluated based on residual income measures. The division can either rent or buy a certain asset. Will the performance evaluation technique have an impact on the rent-or-buy decision? Why or why not? In groups or three students, write a memorandum to your instructor addressing this question. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

Using the Internet—A view of the real world

Visit the website for PepsiCo, Incorporated.

http://www.pepsico.com

Go to the company's most recent annual report. Compare the performance of PepsiCo's three business segments: (1) beverages, (2) snack foods, and (3) restaurants. (You will find business segment information in the notes to the financial statements.) Which business segment had the most operating profits? Which business performed better using ROI, profit margin, and asset turnover as the performance measures? Use end-of-year "identifiable assets" to measure investment, "operating profits" to measure income, and "net sales" to measure sales. Be sure to submit a copy of PepsiCo's business segment information from the annual report.

Visit the website for PepsiCo, Incorporated.

http://www.pepsico.com

Go to the company's most recent annual report. Using financial information for the most recent year, which of the company's geographic areas had the highest ROI? (You will find business segment information in the notes to the financial statements, including geographic segments.) Use end-of-year "identifiable assets" to measure investment, "operating profits" to measure income, and "net sales" to measure sales. Be sure to submit a copy of PepsiCo's business segment information from the annual report.

Answers to self-test

True-false

True. Those items that a manager has direct control over are included in responsibility reports for that management level.

True. An appropriate goal of an expense center is the long-run minimization of expenses.

True. The manager's salary would be a direct cost of the segment but not controllable at that level. (The salary would be controllable by someone higher in the organization.)

False. Segments should be evaluated using their revenues and direct expenses.

False. The income and investment definitions when calculating RI for a segment are contribution to indirect expenses and assets directly used by and identified with the segment.

25. Responsibility accounting: Segmental analysis

Multiple-choice

d. Any of these bases—current replacement cost, original cost, or original cost less accumulated depreciation—could be used.

a. ROI would increase if operating expenses were reduced, all other things remaining constant.

b.

$$\text{ROI} = \frac{\text{Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Investment}}$$

$$\text{ROI} = \frac{50{,}000}{1{,}000{,}000} \times \frac{1{,}000{,}000}{500{,}000}$$

$$\text{ROI} = .05 \times 2$$

ROI = 10 per cent

d. All of these should be used to evaluate managerial performance.

c.

	Segment 1	**Segment 2**	**Segment 3**
Income	$ 180,000	$ 1,000,000	$ 500,000
Investment	2,000,000	5,000,000	2,000,000
ROI	9%	20%	25%
Desired minimum ROI (10%)	200,000	500,000	200,000
RI	$ (20,000)	$ 500,000	$ 300,000

Consider dropping Segment 1.