

Definition of Management Accounting (2008), Issued by the Institute of Management Accountants

IN PRACTICE

Management accounting is a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy.

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THE BALANCED SCORECARD: MANAGEMENT ACCOUNTING'S SOLUTION FOR MEASURING INTANGIBLE ASSETS

The **balanced scorecard** (BSC) was developed to expand the accounting model beyond financial measures alone. Recognizing that an organization's financial and physical assets often account for less than 25% of a company's value, the BSC supplements financial measures with nonfinancial measures in three other perspectives: customers, processes, and learning and growth, as shown in **Exhibit 1-1**. The BSC's four perspectives address the following fundamental questions:

- **Financial:** How is success measured by our shareholders?
- **Customer:** How do we create value for our customers?
- **Process:** At which processes must we excel to meet our customer and shareholder expectations?
- **Learning and growth:** What employee capabilities, information systems, and organizational capabilities do we need to continually improve our processes and customer relationships?

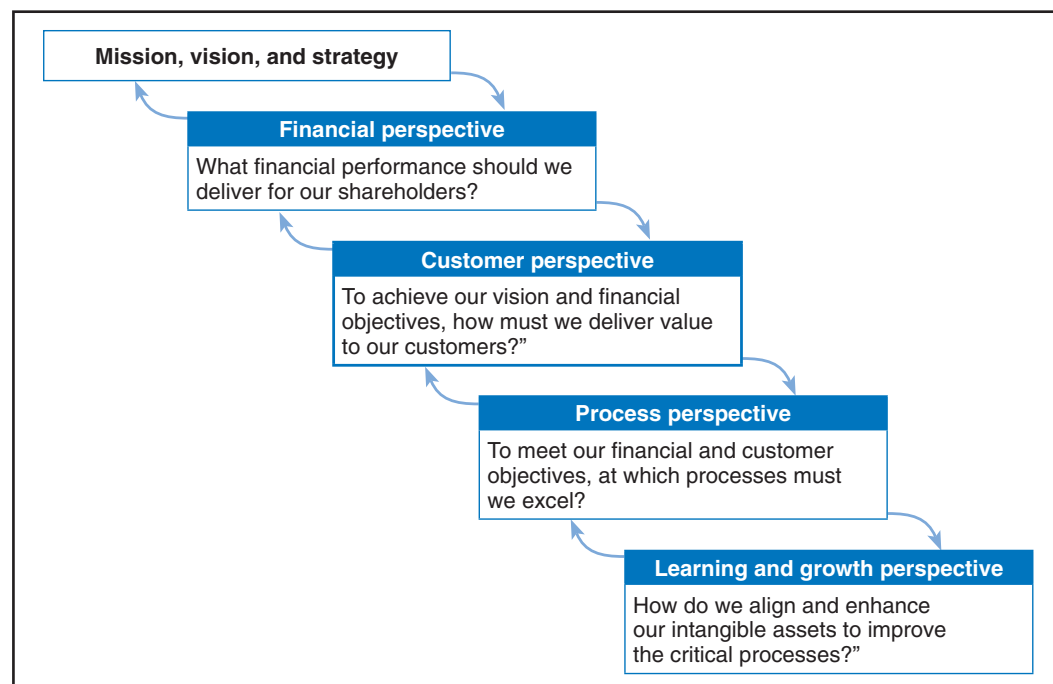


Exhibit 1-1

The Four Perspectives of the Balanced Scorecard

The **BSC** enables companies to continue to track financial results, but these tend to be lagging indicators of performance; they report the financial impact of decisions made in the current and prior periods. The other three perspectives have metrics that are more leading indicators of performance. These metrics indicate whether the company is building or destroying

We have

$$\text{Target after-tax profit} = [(\text{Contribution margin per unit} \times \text{Required unit sales}) - \text{Fixed cost}] \times (1 - \text{Tax rate})$$

Rearranging, we get the following:

$$\text{Required unit sales} = \frac{\frac{\text{Target after-tax profit}}{1 - \text{Tax rate}} + \text{Fixed cost}}{\text{Contribution margin per unit}}$$

For PP, facing a tax rate of 20%, the required crate unit sales to achieve an after-tax profit of \$12,000 will be

$$\text{Required crate sales} = \frac{\frac{\$12,000}{1 - 0.20} + \$240,000}{\$12} = 21,250$$

Financial Modeling and What-If Analysis

CVP analysis is an example of financial modeling. The organization's revenue and cost information is modeled by an equation that can be manipulated when answering questions arising in a **what-if analysis**. Decision makers can use their understanding of cost behavior to make important decisions.

To illustrate, suppose Jon Bartlett, the sales manager at PP, believes that a \$20,000 advertising campaign will increase crate sales by 2,000. Is this advertising campaign financially attractive?

The incremental cost related to this initiative is \$20,000. The incremental benefit equals the crate's contribution margin per unit of \$12 multiplied by the sales increase of 2,000. Therefore, the expected incremental effect on profits at PP of undertaking the advertising campaign will be

$$\begin{aligned} \text{Incremental profit} &= \text{Incremental contribution margin} - \text{Incremental cost} \\ &= (2,000 \times \$12) - \$20,000 = \$4,000 \end{aligned}$$

This sounds like an attractive proposition to Jon because the expected return is 20% (\$4,000/\$20,000) on the initial investment. Once again, however, all investments have associated risks, and Jon will need to consider the likelihood of attaining the expected sales increase of 2,000 crates.

THE MULTI PRODUCT FIRM

Suppose now that PP has expanded and, in addition to making crates, it is making deluxe plastic clothes hampers. The clothes hamper has per-unit variable costs of \$124, and it sells for \$188, yielding a **contribution margin** of \$64 per hamper. Fixed costs at PP have increased by \$110,000 to \$350,000 with the addition of the hamper operations because the clothes hampers required the acquisition of new machinery and equipment that can produce both products.

Jon is wondering about the sales levels needed to break even.

With these two products the CVP equation is

$$\begin{aligned} \text{Profit} &= \left(\frac{\text{Crate unit sales}}{\text{Crate contribution margin}} \right) + \left(\frac{\text{Hamper unit sales}}{\text{Hamper contribution margin}} \right) - \$350,000 \\ \text{Profit} &= (\$12 \times \text{Crate sales}) + (\$64 \times \text{Hamper sales}) - \$350,000 \end{aligned}$$

We have one equation and two unknowns, which means that there are infinitely many combinations of crate sales and hamper sales that will allow PP to break even.

Faced with how to deal with the problem of multiple **breakeven points** many years ago, before the prevalence of computers, the developers of CVP analysis used a practical tool to

- (LO2, 3) 2-42 Breakeven analysis and target profit, taxes** Splash Company manufactures a water squirt cannon called the Defender. The following information summarizes plans for the upcoming year:

THE DEFENDER	
Price per unit	\$20
Per-unit costs	
Direct materials cost	\$ 5
Direct labor cost	\$ 6
Fixed overhead cost	\$ 4
Variable selling cost	\$ 1
Other costs	
Total fixed manufacturing cost	\$8,000,000
Total selling, general, and administrative costs	\$2,400,000
Planned unit sales	2,000,000

Required

- Given the above information, what is the planned income for the upcoming year?
- What total unit sales are required to break even?
- How many units of the Defender must Splash Company sell if it faces a tax rate of 30% and would like to earn \$2.1 million after taxes?

- (LO2, 3) 2-43 Breakeven analysis, target profit, taxes** Patterson Parkas Company's sales revenue is \$30.00 per unit, variable costs are \$19.50 per unit, and fixed costs are \$147,000.00.

Required

- Compute Patterson's contribution margin per unit and contribution margin ratio.
- Determine the number of units Patterson must sell to break even.
- Determine the sales revenue required to earn (pretax) income equal to 20% of revenue.
- How many units must Patterson sell to generate an after-tax profit of \$109,200 if the tax rate is 35%?
- Patterson is considering increasing its advertising expenses by \$38,500. How much of an increase in sales units is necessary from expanded advertising to justify this expenditure (generate an incremental contribution margin of \$38,500)?

- (LO3) 2-44 Multiproduct breakeven analysis, target profit, taxes** Johnson Company manufactures a single product called the Gripper. Patients, under the direction of physiotherapists, use the Gripper to restore, to the extent possible, normal hand functions. The Gripper has the following per-unit revenue and costs:

Revenue	\$20
Direct materials cost	7
Direct labor cost	4
Variable overhead	3
Contribution margin per unit	<u>\$ 6</u>

Johnson Company has fixed manufacturing costs of \$1 million per year and fixed general, and administrative expenses of \$500,000 per year.

Required

- How many Grippers must Johnson Company sell in order to break even?
- How many Grippers must Johnson Company sell in order to earn a target profit of \$300,000?
- The Johnson Company sales manager has come up with an idea for a new product called the Gripper Plus. The sales manager is projecting a sales mix of 300,000 units of the Gripper and 100,000 units of the Gripper Plus. The Gripper Plus has the following per-unit revenue and costs:

Revenue	\$36
Direct materials cost	11
Direct labor cost	9
Variable overhead	6
Contribution margin per unit	<u>\$10</u>

Required

- (a) What is the maximum price that Langdon Company should accept from the Eastern Engine for each engine?
- (b) The factory accountant has reconsidered and now believes that some of the fixed manufacturing overhead could be saved if engine production is stopped. The space now used at Langdon Company is rented at a cost of \$20,000, and that cost could be avoided if engine production is stopped. If Langdon Company discontinues production of its engines, it will transfer the supervisor of the Engine Unit to a manufacturing unit where the supervisor position is open. The engine supervisor's salary is \$60,000, and if the supervisor is moved, the supervisor's salary will not change. However, the salary that would have been paid to an outsider for the open position is \$50,000. If the contract is to supply 2,000 engines, what is the maximum price that Langdon Company should accept from Eastern Engine for each engine?

- (LO2, 3) 3-30 **CVP special order** Maggie Company produces a line of soap. Although there are eight varieties of soap, all varieties cost the same to make and sell. Maggie Company sells its soap in gift boxes. Each gift box contains eight bars of soap—one of each variety.

During the past year, Maggie Company made and sold 400,000 gift boxes. The company accountant has prepared the following summary:

Gift boxes sold	400,000
Selling price per gift box	\$15.90
Costs	
Variable costs	
Direct materials	\$1,200,000
Direct labor	600,000
Variable manufacturing overhead	320,000
Variable selling costs	240,000
Fixed costs	
Manufacturing	\$1,800,000
Selling, general, and administrative	1,400,000

Required

- (a) What is the contribution margin per gift box?
- (b) How many gift boxes must Maggie Company sell to break even?
- (c) How many boxes must Maggie Company sell to achieve a pretax profit of \$250,000?
- (d) If Maggie Company faces a tax rate of 30%, how many boxes must it sell to earn an after-tax profit of \$140,000?
- (e) Maggie Company has received a one-time special order from Giant-Mart to supply 60,000 gift boxes. The gift boxes would be identical to what Maggie Company now sells but would have different packaging, which would cost an additional \$2.00 per box. There would be additional fixed selling costs of \$200,000 for this order, but there would be no variable selling costs associated with this order. Maggie Company has the capacity to produce 450,000 gift boxes each year. What is the minimum price that Maggie Company should be willing to accept for this order?

- (LO3) 3-31 **Dropping a division** George's Grill analyzes profitability of three operating units: restaurant, bar, and billiards room. Revenues, variable costs, and attributable fixed costs (which can be avoided if the unit is eliminated) for each unit are as follows:

	RESTAURANT	BAR	BILLIARDS ROOM
Revenue	\$320,000	\$150,000	\$40,000
Variable costs	120,000	35,000	10,000
Attributable fixed costs	80,000	25,000	15,000

George, the owner, is considering converting the billiards area into an expanded bar area.

Required

- (a) Ignoring remodeling costs, by how much will the bar segment margin have to increase for ~~the~~ the income at George's Grill to be at least as high as it is now?
- (b) What other considerations will George want to take into account before making the decision to eliminate the billiards unit to expand the bar area?

- 3-32 Drop a division relevant cost** Johnny's Bar and Restaurant (JBR) offers three areas to its customers: bar, restaurant, and games. Johnny is concerned about the following division income statement recently prepared by his accountant: **(LO2, 3)**

	RESTAURANT	BAR	GAMES	TOTAL
Revenue	\$220,000	\$180,000	\$ 40,000	\$440,000
Variable costs	80,000	60,000	20,000	160,000
Contribution margin	\$140,000	\$120,000	\$ 20,000	\$280,000
Fixed cost	120,000	70,000	45,000	235,000
Division contribution	\$ 20,000	\$ 50,000	\$(25,000)	\$ 45,000

Johnny feels that these results confirm his intuition that the games area should be closed and the restaurant and bar areas expanded.

Required

- (a) Based on this information, would you recommend that Johnny close the games area?
 (b) Suppose now that the fixed costs in the above exhibit are comprised of two components: costs that can be eliminated if each area is closed and ongoing costs that can only be avoided if JBR is closed. These latter costs are allocated based on floor space occupied. Given the further analysis by Johnny's accountant provided in the following exhibit, what recommendation would you make now about the games room?

	RESTAURANT	BAR	GAMES	TOTAL
Revenue	\$220,000	\$180,000	\$ 40,000	\$440,000
Variable costs	80,000	60,000	20,000	160,000
Contribution margin	\$140,000	\$120,000	\$ 20,000	\$280,000
Avoidable fixed cost	100,000	50,000	15,000	165,000
Division contribution	\$ 40,000	\$ 70,000	\$ 5,000	\$115,000
Fixed cost allocated	20,000	20,000	30,000	70,000
Division contribution	\$ 20,000	\$ 50,000	\$(25,000)	\$ 45,000

- (c) Assume now that if the games area is closed and its space is reallocated equally to the restaurant and bar. Sales in each area would increase by 10%. What recommendation would you make about the games room?

- 3-33 Drop a division relevant cost** The company accountant at Spike Transport Company reported the following information for the most recent operating period: **(LO2, 3)**

	BUS DIVISION	TAXI DIVISION	TRANSPORT DIVISION	TOTAL
Sales	\$17,000,000	\$2,600,000	\$11,000,000	\$30,600,000
Variable costs				
Fuel	\$ 9,350,000	\$1,040,000	\$ 5,610,000	\$16,000,000
Labor	3,740,000	546,000	2,200,000	6,486,000
Other supplies	408,000	57,200	220,000	685,200
Contribution margin	\$ 3,502,000	\$ 956,800	\$ 2,970,000	\$ 7,428,800
Fixed costs				
Avoidable fixed costs	\$ 1,500,000	\$ 456,000	\$ 2,350,000	\$ 4,306,000
Allocated company fixed overhead	1,677,670	273,786	1,048,544	3,000,000
Profit	\$ 324,330	\$ 227,014	\$ (428,544)	\$ 122,800

Required

- (a) The company owner, Spike Potruff is tired of the continuing losses being reported for the Transport Division. What is the effect on Spike Transport Company's operating income if the Transport Division is dropped?
 (b) Ellen Potruff, the operating manager, believes that if the Transport Division is shut down, customers will ship some of the items formerly carried by the Transport Division to the Bus Division and the Taxi Division. Sales in the Bus Division will increase by 15%, and sales in

the Taxi Division will increase by 10%. What is the effect on Spike Transport Company's operating income if the Transport Division is dropped?

(LO2, 3) 3-34 Special order Centrum Manufacturing makes a single product with the following attributes:

PRODUCT PER-UNIT DATA		
Price		\$130.00
Variable costs per unit		
Direct materials	\$30.00	
Direct labor	40.00	70.00
Contribution margin per unit		\$ 60.00
Fixed costs per unit		20.00
Gross margin per unit		\$ 40.00

Direct labor is paid \$20 per hour, and each unit of the product requires 2 labor hours. Fixed manufacturing overhead is applied to products at the rate of \$10 per direct labor hour.

Required

- Centrum Manufacturing has received an offer from a new customer to buy 20 units of a modified version of the existing product. The modification would require an additional \$15 of direct materials cost and an additional 0.50 labor hours for each unit. Centrum Manufacturing has enough idle direct labor capacity to fill this order without disrupting existing production and sales. What is the minimum price that Centrum Manufacturing should accept per unit for this modified product?
- Assume now that Centrum Manufacturing is operating at its direct labor hour capacity and would need to displace some of its existing production to accept this offer to purchase 20 units of the modified product. What is the minimum price that Centrum Manufacturing should accept per unit for this modified product?

(LO2, 3) 3-35 Special order Brant Microwave manufactures a line of microwave ovens that it sells under its name and under various brand names for large retail chains. There are 40 assembly workers, and each is paid an annual salary of \$70,000. Each worker works approximately 1,650 hours per year. The resulting labor rate is therefore \$42.42 (\$70,000/1,650) per hour. The number of assembly workers, which is the constraining factor of production, cannot be increased.

Brant Microwave is currently operating at 90% of capacity (capacity is determined by available labor hours) and is actively considering an offer from Steve's Discount Warehouse. Steve has offered to buy 10,000 microwaves, and Brant Microwave has developed the following cost report for this microwave:

Price per unit		\$80.00
Costs		
Materials	\$50.00	
Labor (0.5 hours @ \$42.42)	21.21	
Fixed manufacturing overhead	15.00	86.21
Profit per unit		\$ (6.21)

There are two components of the fixed manufacturing overhead assigned to this product. There is the regular fixed manufacturing overhead that is applied to all production at the rate of \$20 per labor hour. Also, there is a cost to develop a mold that will be used to make the plastic cabinet for this product. The mold cost would be \$25,000, so a \$5.00 cost is assigned to each of the 10,000 units in the offer. The mold would be worthless when this order is completed.

By comparison, the sales manager has provided the data below for what is currently the least profitable product that Brant Microwave makes—at a current volume of 15,000 units per year.

Price per unit		\$90.00
Costs		
Materials	\$70.00	
Labor (0.25 hours @ \$42.42)	10.61	
Fixed manufacturing overhead	5.00	85.61
Profit per unit		\$ 4.39

- 3-41 Special order pricing** Fullerton Manufacturing makes a single product with the following attributes: **(LO2, 3)**

PRODUCT PER-UNIT DATA	
Price	\$130.00
Variable costs	
Direct materials	\$ 40.00
Direct labor	30.00
Contribution margin per unit	\$ 60.00
Fixed cost	15.00
Gross margin	\$ 45.00

Direct labor is paid \$20 per hour and each unit of the product requires 1.5 labor hours. Fixed manufacturing overhead is applied to products at the rate of \$10 per direct labor hour.

Required

- (a) Fullerton Manufacturing has received an offer from a new customer to buy a modified version of the existing product. The modification would require an additional \$15 of direct materials cost and an additional 0.20 labor hours. Fullerton Manufacturing has enough idle direct labor capacity to fill this order without disrupting existing production and sales. What is the minimum price that Fullerton Manufacturing should accept per unit for this modified product?
- (b) Assume now that Fullerton Manufacturing is operating at direct labor hour capacity and would need to displace some of its existing product to accept this offer. What is the minimum price that Fullerton Manufacturing should accept per unit for this modified product?
- 3-42 Product mix special order pricing** Carolina Chemicals (CC) produces KleenBright, a solvent that is used in many industrial applications. Several customers have suggested that KleenBright be processed to produce a more aggressive solvent. CC has considered this suggestion and developed two new products: KleenMax and KleenUltra. CC would produce KleenMax by processing KleenBright further and KleenUltra would be produced by processing KleenMax further. The marketing manager and plant controller have prepared the following price, demand, and cost estimates. Plant capacity at CC is determined by the capacity of the blending machines, which is 10,000 hours. **(LO2, 3)**

	SALES INFORMATION		
	KLEENBRIGHT	KLEENMAX	KLEENULTRA
Price per kiloliter (KL)	\$1,000	\$1,500	\$2,000
Maximum demand (KL)	1,000	700	400
	COST PER KILOLITER		
Manufacturing costs			
Direct material	\$ 500	\$ 300	\$ 400
Kleenbright	0	720	1,145
Direct labor	100	30	10
Manufacturing overhead			
Variable	\$ 20	\$ 15	\$ 10
Fixed	100	80	60
Total manufacturing cost	\$ 720	\$1,145	\$1,625
Selling cost			
Variable	\$ 100	\$ 150	\$ 200
Fixed	50	60	70
Total selling cost	\$ 150	\$ 210	\$ 270
Total product cost	\$ 870	\$1,355	\$1,895
Total blending machine hours per KL*	5	8	10

*Total blending machine hours per KL includes the time to produce KleenBright.

	ICE CREAM	JUICES	FROZEN DINNERS	FROZEN VEGETABLES
Selling price per unit (square-foot package)	\$12.00	\$13.00	\$24.00	\$9.00
Variable costs per unit (square-foot package)	\$ 8.00	\$10.00	\$20.50	\$7.00
Minimum square footage required	24	24	24	24
Maximum square footage allowed	100	100	100	100

The manager wants a maximum of 250 square feet devoted to the four categories in this table.

Required

- Given the manager's constraints, and assuming that the store can sell whatever is displayed on the shelves, what shelf mix (i.e., what number of square feet for each category in the table) will maximize Superstore's contribution margin from these four categories?
- What other factors might the manager consider in deciding on the amount of shelf space per category?

- 3-46 Product mix decision** Boyd Wood Company makes a regular and a deluxe grade of wood floors. The regular grade is sold at \$16 per square yard, and the deluxe grade is sold at \$25 per square yard. The variable cost of making the regular grade is \$10 per square yard. It costs an extra \$5 per square yard to make the deluxe grade. It takes 0.15 labor hours to make 1 square yard of the regular grade and 0.20 labor hours to make 1 square yard of the deluxe grade. There are 4,600 hours of labor time available for production each week. The maximum weekly sales for the regular and the deluxe models are 30,000 and 8,000 square yards, respectively. Fixed production costs total **\$60,000** per year. All selling costs are fixed. (LO2, 3)

Required

What is the optimal production level in number of square yards for each product?

Problems

- 3-47 Profitability of orders and opportunity cost** Dawson Company produces and sells 80,000 boxes of specialty foods each year. Each box contains the same assortment of food. The company has computed the following annual costs: (LO2, 3)

COST ITEM	TOTAL COSTS
Variable production costs	\$ 400,000
Fixed production costs	480,000
Variable selling costs	320,000
Fixed selling and administrative costs	200,000
Total costs	<u>\$1,400,000</u>

Dawson normally charges \$25 per box. A new distributor has offered to purchase 8,000 boxes at a special price of \$22 per box. Dawson will incur additional packaging costs of \$1 per box to complete this order.

Required

- Suppose Dawson has surplus capacity to produce 8,000 more boxes. What will be the effect on Dawson's income if it accepts this order?
- Suppose that instead of having surplus capacity to produce 8,000 more boxes, Dawson has surplus capacity to produce only 3,000 more boxes. What will be the effect on Dawson's income if it accepts the new order for 8,000 boxes?

- (LO2, 3) 3-48 Costing orders, profitability, and opportunity cost** Wedmark Corporation's Cupertino plant manufactures chips used in personal computers. Its practical capacity is 2,000 chips per week, and fixed costs are \$75,000 per week. The selling price is \$500 per chip. Production this quarter is 1,600 chips per week. At this level of production, variable costs are \$720,000 per week.

Required

- What will the plant's profit per week be if it operates at practical capacity?
- Suppose that a new customer offers \$480 per chip for an order of 200 chips per week for delivery beginning this quarter. If this order is accepted, production will increase from 1,600 chips ~~Standard~~ to 1,800 chips per week. What is the estimated change in the company's profit if it accepts the order?
- Suppose that the new customer in part (b) offered \$480 per chip for an order of 600 chips per week and that Wedmark cannot schedule overtime production. Consequently, it would have to give up some of its current sales to fill the new order for 600 chips per week. What is the estimated change in Wedmark's profit if it accepts this order for 600 chips per week?

- (LO2, 3) 3-49 Special order pricing** Frances's Floral Shop (FFS) produces and sells a wide range of floral arrangements. Designers, who are paid \$30 per hour, produce the arrangements with the help of assistants, who are paid \$18 per hour. There are 200 designer hours available for this period; however, 180 have already been committed. There are unlimited assistant hours available for the period.

Fixed costs at FFS amount to \$2,000 per period. Fixed costs are allocated to customers at a rate of \$10 per designer hour.

FFS has just received a request to produce floral arrangements for a wedding. Frances estimates that completing this order will require \$1,200 of materials, 14 designer hours, and 6 assistant hours.

Required

- What is the minimum price that FFS should charge for this order?
- Suppose now that FFS has already committed to using 190 designer hours this month. If needed, a designer can be diverted from producing arrangements that sell for \$25, have total variable costs of \$16, and require 15 designer minutes, the cost of which is included in the \$16 variable cost. What is the minimum price that FFS should charge for this order?

- (LO2, 3) 3-50 Cost-volume-profit product mix special order pricing** Sunfish Valves Company (SVC) produces two valves that are used in irrigation systems. The following exhibit provides product details:

	PER UNIT		COMPANY FIXED COSTS
	STANDARD	DELUXE	
Price	\$30.00	\$42.00	
Variable cost.	20.00	30.00	
Contribution margin	\$10.00	\$12.00	
			\$400,000
Maximum demand (units)	25,000	18,000	
Labor hours (per unit)	0.20	0.25	

The availability of labor hours limits (constrains) the sales of the two products. The marketing manager provided the maximum sales for each product shown in the above table. The production manager has advised the general manager that a new collective agreement limited the maximum labor hours to 9,025.

After the general manager developed this income statement, she shared it with the production and marketing manager. After some quick calculations, the marketing manager determined that if production and sales of both products were each reduced by 5%, there would be exactly enough production capacity to meet the resulting production levels of the two products. The general manager concurred and proceeded to develop a revised production plan.

Required

- What is the sales level that would result in SVC breaking even if the sales mix is 25/43 standard and 18/43 deluxe?

Required

- (a) If HG projects having 1,800 customers in the upcoming year and cost is the only consideration, should HG continue to deliver groceries to its customers, or should it contract grocery deliveries to CD?
- (b) Assume that, on average, each customer will order 1,000 grocery items each year. What is the number of customers that will cause HG to be indifferent between self-delivery and contracting out delivery?

- (LO2, 3) 3-58 **Dropping a product** Merchant Company manufactures and sells three models of electronic printers. Ken Gail, president of the company, is considering dropping model JT484 from its product line because the company has experienced losses for this product during the past three quarters. The following product-level operating data have been compiled for the most recent quarter:

CATEGORY	TOTAL	JT284	JT384	JT484
Sales	\$965,000	\$500,000	\$200,000	\$265,000
Variable costs	600,000	300,000	100,000	200,000
Contribution margin	\$365,000	\$200,000	\$100,000	\$ 65,000
Fixed costs:				
Rent	\$ 50,000	\$ 25,000	\$ 10,000	\$ 15,000
Depreciation	60,000	30,000	12,000	18,000
Utilities	40,000	20,000	5,000	15,000
Supervision	50,000	15,000	5,000	30,000
Maintenance	30,000	15,000	6,000	9,000
Administrative	100,000	30,000	20,000	50,000
Total fixed costs	\$ 330,000	\$135,000	\$ 58,000	\$137,000
Operating income (loss)	\$35,000	\$ 65,000	\$ 42,000	\$ (72,000)

The following information is also available:

- Factory rent and depreciation will not be affected by a decision to drop model JT484.
- Quarterly utility bills will be reduced from \$40,000 to \$31,000 if JT484 is dropped.
- Supervision costs for JT484 can be eliminated if dropped.
- The Maintenance Department will be able to reduce quarterly costs by \$7,000 if JT484 is dropped.
- Elimination of JT484 will make it possible to eliminate two administrative staff positions with combined salaries of \$30,000 per quarter.

Required

- (a) Should Merchant Company eliminate JT484?
- (b) Merchant's sales manager believes that it is important to continue to produce JT484 to maintain a full product line. He expects the elimination of JT484 will reduce sales of the remaining two products by 5% each. Will this information change your answer to part (a)? Explain.

- (LO2, 3) 3-59 **Drop unprofitable product or department** Perform an internet or electronic library search on "close underperforming departments," "unprofitable products," or a similar phrase to locate an example of a company that has closed unprofitable stores or dropped unprofitable products or services. Describe the cost, revenue, and other issues that the company considered in making the decision.

- (LO2, 3) 3-60 **Product mix and overtime decisions** Excel Corporation manufactures three products at its plant. The plant capacity is limited to 120,000 machine hours per year on a single-shift basis. Direct material and direct labor costs are variable. The following data are available for planning purposes:

PRODUCT	TOTAL UNIT DEMAND FOR NEXT YEAR	SALES PRICE PER UNIT	DIRECT MATERIALS COST PER UNIT	DIRECT LABOR COST PER UNIT	VARIABLE OVERHEAD COST PER UNIT	MACHINE HOURS PER UNIT
XL1	200,000	\$10.00	\$4.00	\$2.00	\$2.00	0.20
XL2	200,000	\$14.00	\$4.70	\$3.30	\$3.30	0.35
XL3	200,000	\$12.00	\$5.00	\$2.50	\$2.50	0.25

	UNITS	MATERIALS	CONVERSION
Work in process, October 1	2,000	30% complete	40% complete
Started in October	10,000		
To account for	12,000		
Completed and transferred out.	8,000	100% complete	100% complete
Work in process, October 30	4,000	40% complete	25% complete
Accounted for	12,000		
Costs, beginning of October.		\$1,050	\$ 3,240
Added during October		8,200	22,620
To be accounted for		\$9,250	\$25,860

Required

- Determine the number of equivalent units of production for materials and conversion during October.
- Determine the cost per equivalent unit for materials and conversion for October and the total cost per equivalent unit. (Round to two digits after the decimal point.)
- Determine whether the cost per equivalent unit for materials and conversion increased or decreased from the previous month.

(LO3, 6, 7) 4-53
APPENDIX

Job bid and direct and sequential allocations Sanders Manufacturing Company produces electronic components on a job-order basis. Most business is gained through bidding on jobs. Most firms competing with Sanders bid full cost plus a 30% markup. Recently, with the expectation of gaining more sales, Sanders dropped its markup from 40% to 30%. The company operates two service departments and two production departments. Manufacturing overhead costs and quantities of activities for each department are shown here:

ITEM	SERVICE DEPARTMENTS		PRODUCTION DEPARTMENTS	
	PERSONNEL	MAINTENANCE	MACHINING	ASSEMBLY
Overhead costs	\$100,000	\$200,000	\$400,000	\$300,000
Number of employees	5	5	5	40
Maintenance hours.	1,500	200	7,500	1,000
Machine hours	0	0	10,000	1,000
Direct labor hours.	0	0	1,000	10,000

Costs of the personnel department are allocated based on employees and those of the maintenance department based on maintenance hours. Departmental rates are used to assign overhead costs to products. The machining department uses machine hours, and the assembly department uses direct labor hours for this purpose.

The firm is preparing to bid on job 781, which requires 3 machine hours per unit produced in the machining department and 5 direct labor hours per unit produced in the assembly department. The expected direct materials and direct labor costs per unit are \$450.

Required

- Allocate the service department costs to the production departments using the direct method.
- Determine the bid price per unit produced for job 781 using the direct method.
- Assume that the costs of the service department incurring the greatest cost are allocated first, and allocate the service department costs to the production departments using the sequential method. When allocating personnel costs, assume the maintenance department has 0 employees.
- Determine the bid price per unit produced for job 781 using the sequential method in part (c).

(LO7) 4-54
APPENDIX

Direct, sequential, and reciprocal allocation Boston Box Company has two service departments, maintenance and grounds, and two production departments, fabricating and assembly. Management has decided to allocate maintenance costs on the basis of machine hours used by the departments and grounds costs on the basis of square feet occupied by the departments. The following data appear in the company's records for last year:

	CUSTOMERS			
	1	2	3	4
Initial acquisition cost	\$1,000	\$1,000	\$1,000	\$1,000
n = Number of years retained	5	3	5	5
r = Retention rate for each of the n years retained	1	1	0.9	1
Cost of capital	0.1	0.1	0.1	0.1
Mt = Margin from customer in year t				
M_1	\$275	\$300	\$275	\$275
M_2	275	300	275	275
M_3	275	300	275	300
M_4	275	—	275	300
M_5	275	—	275	300
ct = Additional costs to serve and retain customer in year t				
c_1	\$0	\$0	\$0	\$50
c_2	0	0	0	25
c_3	0	0	0	0
c_4	0	—	0	0
c_5	0	—	0	0

Required

- Compute the CLV for each customer for the stated number of years.
- Discuss the reasons for differences in CLV between customers 1 and 2, 1 and 3, 1 and 4, and 3 and 4.
- Compute the CLV for customers 1, 2, and 3 assuming that n is very large and the numbers in the table remain about the same each year.
- How does information on a customer's estimated lifetime value help a company manage its customer acquisition and loyalty programs?

- (LO10) 6-33 **NPS** In which industries would you expect the NPS to have the greatest predictive power for repeat purchases and growth and the least predictive power for repeat purchases and growth?

Case

- (LO1, 2, 3, 6, 8) 6-34 **Pricing, customer profitability, managing customer relationships** Read the *Wall Street Journal* article "Amid Weak Inflation, Firms Turn Creative to Boost Prices" by Timothy Aepfel (September 18, 2002, p. A1). The article reports "an all-out search for new ways to charge more money without raising prices."

Required

- How did Jergens Inc. use an ABC approach to justify the price for an order of odd-size metal locating fasteners?
- What issues arose in Goodyear Tire & Rubber's pricing to distributors? What was Goodyear's response?
- What was the outcome of Emerson Electric's decision to depart from cost-based pricing? How can a product costing system contribute to undercosting a low-volume or customized product?
- How did Wildeck influence customers to purchase products and services that are more profitable to Wildeck? How did Wildeck respond to a competitor's lower-priced storage-rack protector? What role should a cost system play in such decisions?
- Why was Union Pacific not concerned if it lost its less profitable customers? Will dropping unprofitable customers always lead to an immediate increase in profit?

The market share variance also requires the weighted average contribution margin, which is computed by weighting each product's sales mix percent by its contribution margin and summing over all the products.

$$\begin{aligned}\text{Weighted average contribution margin per unit} &= 50\% \times \$50 + 30\% \times \$65 + 20\% \times \$75 \\ &= \$59.50 \\ \text{Market share variance} &= 390,000 \times (0.0692 - 0.0625) \times \$59.50 \\ &= \$156,187.50\end{aligned}$$

This means that given actual industry sales, the effect of the Northern Bear Company increasing its market share caused contribution margin to increase by \$156,187.50.

2. The **market size variance** measures the effect, given the Northern Bear Company's planned market share, on contribution margin as planned and actual industry sales diverge.

$$\begin{aligned}\text{Market size variance} &= \left(\frac{\text{Actual total industry sales}}{\text{Static budget total industry sales}} - \frac{\text{Planned market share}}{\text{Weighted average contribution margin per unit}} \right) \times \text{Planned market share} \times \text{Weighted average contribution margin per unit} \\ \text{Market size variance} &= (390,000 - 400,000) \times 0.0625 \times \$59.50 = -\$37,187.50\end{aligned}$$

This means that if the Northern Bear Company had maintained its planned market share, the effect of total industry sales decreasing by 10,000 units would have been to decrease the Northern Bear Company's contribution margin by \$37,187.50.

Exhibit 11-26 provides a summary of the variances discussed in this chapter.

Exhibit 11-26

Summary of
Variances Discussed
in This Chapter

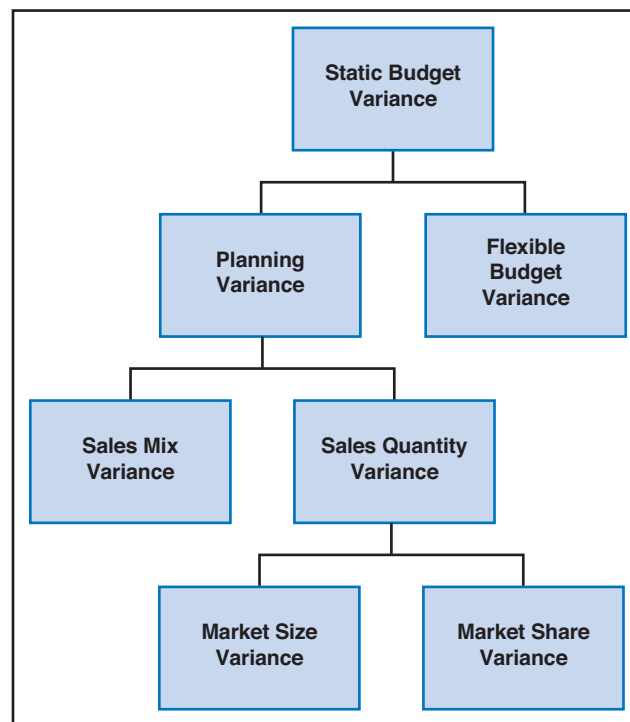


Exhibit 11-27 summarizes the analysis of the planning variance at the Northern Bear Company. The numbers appearing in **Exhibit 11-27** reflect computer level accuracy and may not agree with the numbers above which are rounded for presentation convenience.

- (b) Identify the material price and material quantity variances for both products.
- (c) Identify the labor rate variance and labor efficiency variances for both products.
- (d) Compute the sales mix and sales quantity variances for both products.
- (e) Compute the market size and market share variances.

11-63 Farm Yard Friends (FYF) manufactures plush toys. (LO1, 6)

There are three products: Duck, Cow, and Chicken. The selling price of the Duck, Cow, and Chicken are \$25, \$33, and \$19, respectively. The direct materials costs for the Duck, Cow, and Chicken are 28%, 30%, and 23% of selling price, respectively. The other variable costs, consisting of direct labor and variable overhead costs for the Duck, Cow, and Chicken are 35%, 39%, and 32%, respectively.

Budgeted fixed manufacturing costs and fixed selling, general, and administrative costs at FYF are \$3.5 million and \$2.2 million, respectively.

The following table summarizes the above information and budgeted sales of each of the three products and budgeted market size for each of the three products.

	DUCK	COW	CHICKEN
Selling price	\$25.00	\$33.00	\$19.00
Direct materials cost	7.00	9.90	4.37
Other variable costs	8.75	12.87	6.08
Contribution margin	\$ 9.25	\$10.23	\$ 8.55
Direct materials cost % of selling price	28.00%	30.00%	23.00%
Other variable costs % of selling price	35.00%	39.00%	32.00%
Fixed costs			
Manufacturing	\$3,500,000		
SGA	\$2,200,000		
Static budget sales	250,000	240,000	340,000
Budget market size in units	6,000,000	4,500,000	7,600,000

The following table summarizes the actual results for the past year.

	DUCK	COW	CHICKEN
Selling price	\$25.00	\$33.00	\$19.00
Direct materials cost	7.75	10.89	4.75
Other variable costs	8.25	11.88	5.70
Contribution margin	\$ 9.00	\$10.23	\$ 8.55
Direct materials cost % of selling price	31.00%	33.00%	25.00%
Other variable costs % of selling price	33.00%	36.00%	30.00%
Fixed costs			
Manufacturing	\$3,800,000		
SGA	\$2,400,000		
Actual sales	230,000	190,000	350,000
Actual market size	6,500,000	340,000	6,200,000

Required

- (a) Compute Farm Yard Friends':
 - (i) Static budget income
 - (ii) Flexible budget income
 - (iii) Actual income
 - (iv) Planning variance
 - (v) Flexible budget variance
- (b) Compute each of the following and explain the meaning of each in everyday language.
 - (i) The total sales mix variance
 - (ii) The total sales quantity variance
 - (iii) The market share variance for Farm Yard Friends
 - (iv) The market size variance for Farm Yard Friends