

Cost-Volume-Profit Relationships

201. Candice Corporation has decided to introduce a new product. The product can be manufactured using either a capital-intensive or labor-intensive method. The manufacturing method will not affect the quality or sales of the product. The estimated manufacturing costs of the two methods are as follows:

	Capital-Intensive	Labor-Intensive
Variable manufacturing cost per unit.....	\$14.00	\$17.60
Fixed manufacturing cost per year.....	\$2,440,000	\$1,320,000

The company's market research department has recommended an introductory selling price of \$30 per unit for the new product. The annual fixed selling and administrative expenses of the new product are \$500,000. The variable selling and administrative expenses are \$2 per unit regardless of how the new product is manufactured.

Required:

- a. Calculate the break-even point in units if Candice Corporation uses the:
 - 1. capital-intensive manufacturing method.
 - 2. labor-intensive manufacturing method.

- b. Determine the unit sales volume at which the net operating income is the same for the two manufacturing methods.

- c. Assuming sales of 250,000 units, what is the degree of operating leverage if the company uses the:
 - 1. capital-intensive manufacturing method.
 - 2. labor-intensive manufacturing method.

- d. What is your recommendation to management concerning which manufacturing method should be used?

	<u>Capital</u>	<u>Labor</u>
S	30	30
VC	14+2=16	17.60+2=19.60
CM	14	10.40
FC	(2,440,000 + 500,000) 2,940,000	(1,320,000 + 500,000) 1,820,000

NI

a) BE Units:

$$\frac{FC}{CM/unit} = \frac{2,940,000}{14} = \frac{1,820,000}{10.40}$$

210,000 units 175,000 units

b) Indifference point = Q = Unit sales volume (quantity)

$$\left(\begin{matrix} \$14 \times Q \\ -\$2,940,000 \end{matrix} \right) = \left(\begin{matrix} \$10.40 \times Q \\ -\$1,820,000 \end{matrix} \right)$$

$$\$3.60 Q = \$1,120,000$$

Q = 311,111 unit sales

Note: CM - FC = NI
[non differential]

c) DOL @ 250,000 unit sales:

$$DOL = \frac{CM}{NI}$$

$$\frac{250,000 \text{ units} \times \$14 = \$3,500,000}{(\$3,500,000 - \$2,940,000)} = \frac{250,000 \text{ units} \times \$10.40 = \$2,600,000}{(\$2,600,000 - \$1,820,000)} =$$

6.25 DOL
capital-intense

>

3.33 DOL
labor-intense

d) capital intensive is preferred with higher DOL assuming at least 311,111 unit sales can be achieved.

a.

1. Capital-intensive:

Unit sales to break even = Fixed expenses ÷ Unit CM

= (\$2,440,000 + \$500,000) ÷ (\$30 per unit - \$14 per unit - \$2 per unit)

= \$2,940,000 ÷ \$14 per unit

= 210,000 units

2. Labor-intensive:

Unit sales to break even = Fixed expenses ÷ Unit CM

= (\$1,320,000 + \$500,000) ÷ (\$30 per unit - \$17.60 per unit - \$2 per unit)

= \$1,820,000 ÷ \$10.40 per unit

= 175,000 units

b.

Profit = Sales - Variable expenses - Fixed expenses

Capital-intensive:

Profit = \$30Q - \$16Q - \$2,940,000 = \$14Q - \$2,940,000

Labor-intensive:

Profit = \$30Q - \$19.60Q - \$1,820,000 = \$10.40Q - \$1,820,000

The profits are equal when:

\$14Q - \$2,940,000 = \$10.40Q - \$1,820,000

\$3.60Q = \$1,120,000

Q = \$1,120,000 ÷ \$3.60

Q = 311,111

c.

1. Capital-intensive:

Sales (250,000 units × \$30 per unit)	\$7,500,000
Variable expenses (250,000 units × \$16 per unit).....	<u>4,000,000</u>
Contribution margin	3,500,000
Fixed expenses	<u>2,940,000</u>
Net operating income	<u>\$ 560,000</u>

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} \\ = \frac{\$3,500,000}{\$560,000} = 6.25$$

2. Labor-intensive:

Sales (250,000 units × \$30 per unit)	\$7,500,000
Variable expenses (250,000 units × \$19.60 per unit)....	<u>4,900,000</u>
Contribution margin	2,600,000
Fixed expenses	<u>1,820,000</u>
Net operating income	<u>\$ 780,000</u>

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} \\ = \frac{\$2,600,000}{\$780,000} = 3.33$$

d. The decision hinges upon the expected sales of the new product. If management is confident that sales will be in excess of 311,111 units, then the capital-intensive method should be used. If sales are likely to fall below this number, then the labor-intensive method should be used. Management should also be aware that net operating income will be more volatile with the capital-intensive method since it has higher operating leverage.

Read

Learning Objective: 03-01 Explain how changes in activity affect contribution margin and net operating income.

Learning Objective: 03-04 Show the effects on net operating income of changes in variable costs; fixed costs; selling price; and volume.

Learning Objective: 03-06 Determine the break-even point.

Learning Objective: 03-08 Compute the degree of operating leverage at a particular level of sales and explain how it can be used to predict changes in net operating income.

Level: 3 Hard

206. In September, Pino Corporation sold 2,100 units of its only product. Its total sales were \$195,300, its total variable expenses were \$84,000, and its total fixed expenses were \$98,700.

Required:

a. Construct the company's contribution format income statement for September in good form.

b. Redo the company's contribution format income statement assuming that the company sells 2,300 units.

	<u>1</u>	a Sept <u>2100</u>	b <u>2300</u>
a	S	2100 units x (\$93) = \$195,300	\$213,900
	VC	2100 units x (\$40) = 84,000	92,000
	CM	\$111,300	121,900
	FC	98,700 →	98,700
	NI	\$12,600	\$23,200

b

a.	Sales (2,100 units)	\$195,300
	Variable expenses	<u>84,000</u>
	Contribution margin	111,300
	Fixed expenses	<u>98,700</u>
	Net operating income	<u>\$ 12,600</u>
b.	Sales (2,300 units)	\$213,900
	Variable expenses	<u>92,000</u>
	Contribution margin	121,900
	Fixed expenses	<u>98,700</u>
	Net operating income	<u>\$ 23,200</u>

Learning Objective: 03-01 Explain how changes in activity affect contribution margin and net operating income.

Level: 1 Easy

211. Parkins Company produces and sells a single product. The company's income statement for the most recent month is given below:

	<u>1</u>		<u>6,000</u>
Sales (6,000 units at \$40 per unit).....	40	\$240,000	240,000 (S)
Less manufacturing costs:			
VC Direct materials.....	8	\$48,000	144,000 (VC)
VC Direct labor (variable).....	10	60,000	
VC Variable factory overhead.....	2	12,000	
FC Fixed factory overhead.....		<u>30,000</u>	
Gross margin.....		150,000	96,000 / 6,000 units = \$16/unit (CM)
Less selling and other expenses:			
VC Variable selling and other expenses.....	4	24,000	
FC Fixed selling and other expenses.....		<u>42,000</u>	
Net operating income.....		<u>\$24,000</u>	[30,000 (FC) 42,000 (FC)] <u>24,000 (NI)</u>

There are no beginning or ending inventories.

Required:

a. Compute the company's monthly break-even point in units of product.

$$\frac{FC}{CM/unit} = BE \text{ units}$$

$$\frac{\$72,000}{\$16 \text{ per unit}} = 4,500 \text{ BE units}$$

b. What would the company's monthly net operating income be if sales increased by 25% and there is no change in total fixed expenses?

S	$[(6,000 \times 1.25) \times \$40]$	\$300,000
VC	$[(6,000 \times 1.25) \times 24]$	180,000
		<u>120,000</u>
CM		
		72,000
FC		
		<u>\$48,000</u>

c. What dollar sales must the company achieve in order to earn a net operating income of \$50,000 per month?

$$\frac{FC + \text{target}}{CM\%} = \frac{\$72,000 + 50,000}{\frac{120,000}{300,000} \div 300,000 (40\%)} = \boxed{\$305,000 \text{ target sales}}$$

d. The company has decided to automate a portion of its operations. The change will reduce direct labor costs per unit by 40 percent, but it will double the costs for fixed factory overhead. Compute the new break-even point in units.

Original

$$\$60,000 \div 6000 \text{ units} = \$10/\text{unit} \times (1 - 40\%) = \$6$$

or $\$10 - \$4 = \$6$

	<u>6000</u>	<u>1</u>	<u>1</u>	<u>2</u>
S	240,000	40	40	100%
VC	<u>144,000</u>	<u>24</u> - 4	<u>20</u>	<u>50%</u>
CM	96,000	16.	\$ 20	50%
FC	<u>72,000 + (30,000)</u>		<u>102,000</u>	
NI	24,000			

30,000 FMOH doubled

$$\text{New FC } 102,000 \div 20 \text{ CM/unit} = \boxed{\$5,100 \text{ units}}$$

a. The company's income statement in contribution format would be:

Sales		\$240,000
Variable expenses:		
Direct materials	\$48,000	
Direct labor.....	60,000	
Variable factory overhead.....	12,000	
Variable selling and other expenses	<u>24,000</u>	<u>144,000</u>
Contribution margin.....		96,000
Fixed expenses:		
Fixed factory overhead.....	30,000	
Fixed selling and other expense.....	<u>42,000</u>	<u>72,000</u>
Net operating income.....		<u>\$ 24,000</u>

The break-even point in units would be: $\$72,000 \div \$16 \text{ per unit} = 4,500 \text{ units}$

b. $6,000 \text{ units} \times 125\% = 7,500 \text{ units}$

Sales (7,500 units × \$40 per unit)	\$300,000
Variable expenses (7,500 units × \$24 per unit).....	<u>180,000</u>
Contribution margin.....	120,000
Fixed expenses.....	<u>72,000</u>
Net operating income.....	<u>\$ 48,000</u>

c. $(\$72,000 + \$50,000) \div 0.40 = \$305,000$

d. Direct labor costs are presently \$10 per unit ($\$60,000 \div 6,000 \text{ units}$) and will decrease by \$4 per unit ($\$10 \times 40\%$). Therefore, the company's new cost structure will be:

Selling price	\$40	100%
Variable expenses (\$24 – \$4).....	<u>20</u>	<u>50%</u>
Contribution margin.....	<u>\$20</u>	<u>50%</u>

$((2 \times \$30,000) + \$42,000) \div \$20 \text{ per unit} = 5,100 \text{ units}$

Learning Objective: 03-04 Show the effects on net operating income of changes in variable costs; fixed costs; selling price; and volume.

Learning Objective: 03-05 Determine the level of sales needed to achieve a desired target profit.

Learning Objective: 03-06 Determine the break-even point.

Level: 2 Medium