

## Module 2

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### Introduction

This module is designed as an introduction to short-term decision-making. In particular the student will be introduced to techniques commonly used to appraise decisions between alternative courses of action. The principle tools to be used are cost-volume-profit and relevant costs.

Upon completion of this module students will be able to:



#### Outcomes

- *Demonstrate* knowledge and understanding of the relationship between selling prices, variable costs and fixed costs.
- *Demonstrate* knowledge and understanding of the concept of contribution margin and how this is used to assist decision-making.
- *Demonstrate* knowledge and understanding of relevant costs.
- *Demonstrate* knowledge and application of a range of short-term decision-making techniques.



## Unit 4

### Cost-volume-profit analysis

#### Learning outcomes

Upon completion of this unit students will be able to:



#### Outcomes

- *Explain* the difference between fixed and variable costs.
- *Understand* the relationship between selling price, costs and volume.
- *Describe* the components of CVP.
- *Calculate* levels of sales, units and margin for a desired target profit.
- *Understand* the relationship between structure and leverage.
- *Explain* the elements of uncertainty.

## Activity 2.1



### Activity

1. In its budget for next month, Jones Company has revenues of \$500,000, variable costs of \$350,000, and fixed costs of \$135,000.
  - a. Calculate the contribution margin percentage.
  - b. Calculate the total revenues needed to break even.
  - c. Calculate the total revenues needed to achieve a target operating income of \$45,000.
  - d. Calculate the total revenues needed to achieve a target net income of \$48,000, assuming the income tax rate is 40 per cent.
2. Sapphire Ltd intends to sell its own label wine for \$20 a bottle. It expects labour and materials will cost about \$12 a bottle. Fixed costs should be \$20,000 a month.
  - a. Calculate the contribution margin per unit.
  - b. Calculate the sales quantity and revenue required each month in order for Sapphire to break even.
  - c. If fixed costs were to decrease by 10 per cent, calculate the new breakeven point and revenue.
  - d. Sapphire's accountant has advised that cost-volume-profit calculations are useful, but not entirely accurate. Do you agree? Give brief reasons for your answer.
3. VP manufactures CDs for music publishers, in units of 100 disks. VP's variable labour cost is \$20 per unit and its variable material cost is \$40 per unit, while its fixed costs are \$800,000 per annum. VP's selling price is \$100 per unit.
  - a. Calculate VP's breakeven revenue.
  - b. Calculate VP's breakeven in units
  - c. VP is considering replacing its press with a faster machine which will reduce labour costs to \$10 per unit and increase fixed costs to \$1,000,000 per annum. With the drop in music sales, sales are expected to drop to 25,000 units per annum. Is this investment worthwhile? Show your calculations.
4. Soccer Imported Ltd imports soccer boots from Indonesia. The selling price is \$90 per pair of soccer boots (product A). The variable costs are \$50 per pair. The fixed costs are \$200,000. The manager of the company seeks your help to achieve the best result for the company. She provides you with the additional information:
  - A one-off special order has been received by a customer, who is willing to buy 200 units (pairs of soccer boots) for \$80 unit. This would require additional fixed costs of \$5,000, the variable costs per unit remain the same.
  - A new supplier has offered the company \$40 per pair (product B). This would require additional quality checks and



other increases of fixed costs by \$52,000. This offer replaces the current position of product A. The company would have a selling price of \$85 for product B.

- The market capacity is 9,000 units (pairs of soccer boots).
  - a. Identify the breakeven point in units (pairs of soccer boots) under the current position.
  - b. Determine whether the special order should be accepted with the new customer. Show all calculations.
  - c. Identify some of the problems that could be associated with completing the order.
  - d. Determine whether the new supplier offer should be accepted. Show all calculations.
  - e. Explain how the company could maximise profit if a mix of the two products was possible.

## Activity 2.1 Feedback

### 1. Jones Company

a. Contribution margin percentage =  $(\$500,000 - \$350,000) \div \$500,000 = \$150,000 \div \$500,000 = 30\%$

*Note:* variable costs as a percentage of revenues  
 $= \$350,000 \div \$500,000 = 70\%$

b. Breakeven point =  $\$135,000 \div 0.30 = \$450,000$

*Proof of breakeven point:*

Revenues	\$450,000
Variable costs, $\$450,000 \times 0.70$	<u>315,000</u>
Contribution margin	135,000
Fixed costs	<u>135,000</u>
Operating income	<u>\$ -0-</u>

- c. Let X = Total revenues needed to achieve target operating income of \$45,000

$$X = \frac{\$135,000 + \$45,000}{0.30} = \frac{\$180,000}{0.30} = \$600,000$$

- d. Two steps are used to obtain the answer. First, compute operating income when net income is \$48,000:

$\frac{\$48,000}{1 - 0.40} = \frac{\$48,000}{0.60} = \$80,000$

Second, compute total revenues needed to achieve a target operating income of \$80,000 (that is, a target net income of \$48,000), which is denoted by Y:

$$Y = \frac{\$135,000 + \$80,000}{0.30} = \frac{\$215,000}{0.30} = \$716,667$$

## 2. Sapphire Ltd

a.  $(20 - 12) = 8$

b.  $20x - 12x - 20,000 = 0$

$$8x = 20,000$$

$$x = 2,500 \text{ bottles}$$

$$(20 \times 2,500) = \$50,000 \text{ revenue}$$

c.  $20,000 - (.1 \times 20,000) = 18,000$

$$20x - 12x - 18,000 = 0$$

$$8x = 18,000$$

$$x = 2,250 \text{ bottles}$$

$$(20 \times 2,250) = \$45,000 \text{ revenue}$$

d. Sapphire's accountant is correct.

While CVP is a useful tool for sales, variable costs and fixed costs are often estimates.

Sales values may vary due to discounts etc.

Amounts for fixed costs and variable costs are usually estimated, and may also increase or decrease.

Some costs may not be clearly separated into fixed and variable components.

## 3. VP

a.  $BE \text{ Rev} = FC/CM \text{ ratio} = \$800k/40\% = \$2,000,000$

*Or using the answer from below:*

$$BE \text{ Rev} = BEQty \times Price = 20,000 \times \$100 = \$2,000,000$$

b.  $BE \text{ Qty} = FC/CM = \$800k/(\$100 - 20 - 40) = \$800k/\$40 = 20,000 \text{ units}$

c. With new machine, at 25,000 units revenue is  $\$100 \times 25,000 = \$2,500,000$

$$\text{Costs are } FC + VC = \$1m + 25,000 \times (\$10 + \$40) = \$2,250,000$$

New machine will make a profit of \$250,000

$$\text{Old machine will make a profit of } CM \times \text{excess over } BEQty = \$40 \times 5,000 = \$200,000$$

The new machine is expected to make a greater profit than the old at the new lower sales level hence it is a worthwhile investment.



4. Soccer Imported Ltd

a.  $SP \$90 - VC \$50 = CM \$40$

Fixed Costs \$200,000

Breakeven in units =  $\$200,000 / \$40$

= 5,000 units

b. Special order

$SP \$80 - VC \$50 = CM \$30 * 200 = \$6,000$

Fixed costs increase \$5,000

Therefore increase in profit of \$1,000 so accept the order.

c. Existing customers may be alarmed that a new competitor for them is offered a cheaper price. What happens if the special one-off order becomes a regular occurrence? The existing charges of fixed costs would need to be recalculated.

d.  $SP \$85 - VC \$40 = CM \$45$

Fixed costs \$252,000

Breakeven in units =  $\$252,000 / \$45$

= 5,600 units

Or identify the profitability levels for each product:

Prod A Profit = \$160,000

Prod B Profit = \$153,000

So reject new supplier

e. Maximise the product with the highest contribution margin.

e.g. Product B  $6000 * \$45 CM = \$270,000$

Balance of market capacity with Product A  $3000 * \$40 = \$120,000$

Total = \$390,000

Less fixed costs \$210,000

Maximum potential profit \$180,000

## Unit 5

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### Relevant costs for decision making

#### Learning outcomes

Upon completion of this unit students will be able to:



Outcomes

- *Explain* the importance of relevant costs in decision-making.
- *Identify* relevant and non-relevant costs in various decision-making situations.
- *Evaluate* decisions involving relevant and non-relevant costs.
- *Explain* the qualitative characteristics that need to be considered when assessing alternatives.



## Activity 2.2



### Activity

1. The management of Mews Ltd. is considering dropping product E2. Data from the company's accounting system appear below:

Sales .....	\$480,000
Variable expenses .....	\$202,000
Fixed manufacturing expenses .....	\$158,000
Fixed selling and administrative expenses .....	\$130,000

All fixed expenses of the company are fully allocated to products in the company's accounting system. Further investigation has revealed that \$86,000 of the fixed manufacturing expenses and \$67,000 of the fixed selling and administrative expenses are avoidable if product E2 is discontinued.

- What is the net operating income earned by product E2 according to the company's accounting system? Show your calculations.
  - What would be the effect on the company's overall net operating income of dropping product E2? Should the product be dropped? Show your work!
2. Porch Ltd. makes 30,000 units per year of a part it uses in the products it manufactures. The unit product cost of this part is computed as follows:

Direct materials .....	\$15.70
Direct labor .....	17.50
Variable manufacturing overhead .....	4.50
Fixed manufacturing overhead .....	<u>14.60</u>
Unit product cost .....	<u>\$52.30</u>

An outside supplier has offered to sell the company all of these parts it needs for \$51.90 a unit. If the company accepts this offer, the facilities now being used to make the part could be used to make more units of a product that is in high demand. The additional contribution margin on this other product would be \$219,000 per year.

If the part were purchased from the outside supplier, all of the direct labour cost of the part would be avoided. However, \$6.20 of the fixed manufacturing overhead cost being applied to the part would continue even if the part were purchased from the outside supplier. This fixed manufacturing overhead cost would be applied to the company's remaining products.

- How much of the unit product cost of \$52.30 is relevant in the decision of whether to make or buy the part?
- What is the net total dollar advantage (disadvantage) of purchasing the part rather than making it?



- c. What is the maximum amount the company should be willing to pay an outside supplier per unit for the part if the supplier commits to supplying all 30,000 units required each year?
3. Nordstrom makes a range of products. The company's predetermined overhead rate is \$20 per direct labour-hour, which was calculated using the following budgeted data:

Variable manufacturing overhead.....	\$70,000
Fixed manufacturing overhead.....	\$630,000
Direct labor-hours .....	35,000

Component B6 is used in one of the company's products. The unit cost of the component according to the company's cost accounting system is determined as follows:

Direct materials .....	\$30.00
Direct labor .....	25.20
Manufacturing overhead applied .....	<u>24.00</u>
Unit product cost.....	<u>\$79.20</u>

An outside supplier has offered to supply component B6 for \$76 each. The outside supplier is known for quality and reliability. Assume that direct labour is a variable cost, variable manufacturing overhead is really driven by direct labour-hours and total fixed manufacturing overhead would not be affected by this decision. Nordstrom has idle capacity.

- a. Is the offer from the outside supplier financially attractive? Why?
4. Part F7 is used in one of Wiltshire Ltd.'s products. The company's accounting department reports the following costs of producing the 7,000 units of the part needed every year.

	Per Unit
Direct materials .....	\$7.00
Direct labor .....	\$6.00
Variable overhead .....	\$5.60
Supervisor's salary .....	\$4.70
Depreciation of special equipment.....	\$1.50
Allocated general overhead.....	\$5.40

An outside supplier has offered to make the part and sell it to the company for \$28.30 each. If this offer is accepted, the supervisor's salary and all of the variable costs, including direct labour, can be avoided. The special equipment used to make the part was purchased many years ago and has no salvage value or other use. The allocated general overhead represents fixed costs of the entire company. If the outside supplier's offer was accepted, only \$9,000 of these allocated general overhead costs would be avoided.

- a. Prepare a report that shows the effect on the company's total net operating income of buying part F7 from the supplier rather than continuing to make it inside the company.



- b. Which alternative should the company choose?

## Activity 2.2 Feedback

### 1. Mews Ltd

	Keep the Product	Drop the Product	Difference
Sales .....	\$480,000	\$0	(\$480,000)
Variable expenses .....	202,000	0	202,000
Contribution margin .....	278,000	0	( 278,000)
Fixed expenses:			
Fixed manufacturing expenses .....	158,000	72,000	86,000
Fixed selling and administrative expenses .....	130,000	63,000	67,000
Total fixed expenses .....	288,000	135,000	153,000
Net operating income (loss) .....	(\$10,000)	(\$135,000)	(\$125,000)

- a. According to the company's accounting system, the product's net operating loss is \$10,000.
- b. Net operating income would decline by \$125,000 if product E2 were dropped. Therefore, the product should not be dropped.

### 2. Porch Ltd.

#### a. Relevant cost per unit:

Direct materials .....	\$15.70
Direct labor .....	17.50
Variable manufacturing overhead .....	4.50
Fixed manufacturing overhead .....	8.40
Relevant manufacturing cost .....	<u>\$46.10</u>

#### b. Net advantage (disadvantage):

Manufacturing cost savings .....	\$1,383,000
Additional contribution margin .....	219,000
Cost of purchasing the part .....	(1,557,000)
Net advantage (disadvantage) .....	<u>\$45,000</u>

#### c. Maximum acceptable purchase price:

Manufacturing cost savings .....	\$1,383,000
Additional contribution margin .....	219,000
Total benefit .....	<u>\$1,602,000</u>
Number of units .....	30,000
Benefit per unit .....	\$53.40

3. Nordstrom Ltd.

Direct materials, direct labour and variable manufacturing overhead are relevant in this decision. Fixed manufacturing overhead is not relevant since it would not be affected by the decision. The variable portion of the manufacturing overhead rate is computed as follows:

Variable manufacturing overhead .....	\$70,000
÷ Direct labor-hours .....	35,000
= Variable portion of the predetermined overhead rate ..	\$2.00

The direct-labor hours per unit for the special order can be determined as follows:

Manufacturing overhead applied .....	\$24.00
÷ Predetermined overhead rate.....	\$20.00
= Direct labor-hours .....	1.20

Consequently, the variable manufacturing overhead for the special order would be:

Variable portion of the predetermined overhead rate .....	\$2.00
× Direct labor-hours .....	1.20
= Variable manufacturing overhead.....	<u>\$2.40</u>

Putting this all together:

Direct materials .....	\$30.00
Direct labor .....	25.20
Variable manufacturing overhead.....	2.40
Total variable cost.....	<u>\$57.60</u>

Since the outside supplier has offered to sell the component for \$76.00 each, but it only costs the company \$57.60 to make the component internally, this is not a financially attractive offer.

4. Wiltshire Ltd.

a.	Make	Buy
Direct materials (7,000 units @ \$7.00 per unit)....	\$49,000	
Direct labor (7,000 units @ \$6.00 per unit) .....	42,000	
Variable overhead		
(7,000 units @ \$5.60 per unit).....	39,200	
Supervisor's salary		
(7,000 units @ \$4.70 per unit).....	32,900	
Depreciation of special equipment (not relevant) .	0	
Allocated general overhead (avoidable only).....	9,000	
Outside purchase price		
(7,000 units @ \$28.30 per unit).....		\$198,100
Total cost.....	<u>\$172,100</u>	<u>\$198,100</u>

- b. The total cost of the make alternative is lower by \$26,000. Thus, net operating income would decline by \$26,000 if the offer from the supplier was accepted. Therefore, the company should continue to make the part itself.