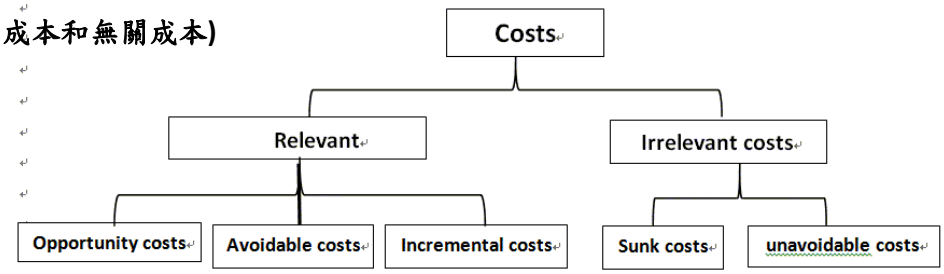
Chapter 22 Cost accounting for decision making

22.1 Introduction (引言)

- In this chapter, you will proceed to solve business problems by applying **costing concepts (成本概念)** to real-life business decisions. They include:
  - **Accept or reject an order at a special price (接受或拒絕特價訂單)**
  - **Hire, make or buy (租用、製造或購買)**
  - **Sell or process further (出售或加工)**
  - **Retain or replace equipment (保留或更換機器／儀器)**
  - **Eliminate or retain an unprofitable segment (結束或保留虧損分部)**

22.2 Sunk costs, opportunity costs and incremental costs (沉沒成本、機會成本與增量成本)

- Before you are able to make sensible business decisions, you have to know the differences between the following costs:
  - **Relevant and irrelevant costs (相關成本和無關成本)**
  - **Sunk costs (沉沒成本)**
  - **Opportunity costs (機會成本)**
  - **Incremental costs (增量成本)**
  - **Avoidable and unavoidable costs (可避免成本和不可避免成本)**



Relevant and irrelevant costs (相關成本和無關成本)

- **Relevant costs** are the **expected future costs (預期未來成本)** that must be considered when making a decision.
- **They differ under various alternatives in decision-making. (不同選項決策的相關成本有所不同)**
- **Irrelevant costs (無關成本)** are **the costs that do not have to be considered when making a decision (是在決策時無須考慮的成本)**. They **are the same under various alternatives (不同選項的成本都是一樣)**.

Sunk costs (沉沒成本)

- The costs that **have already been incurred (已經招致)** and **cannot be recovered (無法收回)**.
- These are **historical costs (歷史成本)** and **should be excluded (應排除以外)** when making decisions as they cannot be changed **regardless (不論)** of any future decisions.
- Sunk costs are **irrelevant costs (無關成本)**.

Opportunity costs (機會成本)

- The opportunity cost of making a decision is the **highest-valued alternative forgone (放棄的選擇中價值最高)**.
- It will be illustrated in Example 1.

Example 1

BAFS Catering Ltd bought a piece of land five years ago for $50 million. The most recent appraisal value of the land is $42 million. The company wants to build a new kitchen on the land at a cost of $7 million. ***What are the relevant costs when making the decision?***

- The land's acquisition cost of $50 million is a sunk cost as it was incurred five years ago. It should be excluded in our analysis.
- The sum of $42 million is the opportunity cost and is to be included in the analysis, because the company can sell the land at this price if it decides not to build the kitchen.
- The construction cost of the kitchen is also a relevant cost.
- Total relevant costs = $42 million + $7 million = $49 million

Incremental costs (增量成本)

- The **additional costs incurred (招致的額外成本)** when a certain action is taken
- Incremental costs are **relevant costs (相關成本)**.
- In this chapter, we will use the **incremental approach (增量法)** in the analyses of various proposals. That is, we will compare the **profit or loss (利潤或損失)** before and after adopting the proposal.

Example 2

Continue with Example 1. Suppose the current monthly staff costs are $2,000,000. BAFS will need to employ four additional staff members after the new kitchen is built at a monthly cost of $56,000. The kitchen can bring in additional monthly revenue of $90,000. ***What should we consider when making the decision?***

- The relevant costs are the additional staff costs of $56,000. This additional cost is an incremental cost.
- The existing staff costs of $2,000,000 are irrelevant.
- Similarly, we do not consider the existing revenue of the company.
- However, the additional revenue of $90,000 generated by the new kitchen should be considered.

Avoidable and unavoidable costs (可避免成本和不可避免成本)

- **Avoidable costs (可避免成本)** are the costs which can be **reduced or avoided (減少或避免)** when a certain action is taken.
- Avoidable costs are **relevant costs (相關成本)**.
- **Unavoidable costs (不可避免成本)** are the costs which have to be incurred **regardless of what action is taken (無論採取任何行動)**.
- Unavoidable costs are **irrelevant cost (無關成本).**

Classwork 0

1 State whether each of the following is a sunk cost or opportunity cost and whether it is a relevant or irrelevant cost.
(a) Material X left from last year was purchased at $20,000. It has no other use.
(b) Material Y left from last year was purchased at $22,000. It is useful. If used up, it has to be replaced at $23,000.

(a) Material X $20,000 is a sunk cost; an irrelevant cost.

(b) Material Y $22,000 is a sunk cost; an irrelevant cost.

The replenishment cost $23,000 is an opportunity cost; a relevant cost.

HKDSE (2014, 3) **(Cost Classification)**

A company uses a machine for production. For each of the descriptions in (a) to (d) below, indicate which of the following cost classifications is most suitable:

*** fixed cost, *variable cost, *semi-variable cost, *step cost, *sunk cost, *incremental cost, *opportunity cost**

(a) A worker is employed to operate the machine for a monthly wage of $6,000 plus $0.3 per unit produced. The total cost of hiring the worker is a / an _____.
(b) The machine has a net book value of $52,000. In evaluating whether to sell the machine, the net book value is a / an _____.
(c) The machine can now be sold for $5,000. If the company decides to retain and use it, the saleable value is a / an _____.
(d) If the machine is sold, the company will rent a new machine for $20,000 per annum. Under marginal costing, the annual rental charge for the new machine is a / an _____.

(a) semi-variable cost

(b) sunk cost

(c) opportunity cost

(d) fixed cost

22.3 Applying costing concepts to real-life business decisions (應用成本概念到現實環境)

- In this chapter, you will proceed to solve business problems by applying costing concepts to real-life business decisions. They include:
  - **Accept or reject an order at a special price (接受或拒絕特價訂單)**
  - **Hire, make or buy (租用、製造或購買)**
  - **Sell or process further (出售或加工)**
  - **Retain or replace equipment (保留或更換機器／儀器)**
  - **Eliminate or retain an unprofitable segment (結束或保留虧損分部)**

22.4 Accept or reject an order at a special price decisions (接受或拒絕特價訂單的決定)

Example 3

BAFS Catering Ltd received a special order of 15,000 lunch boxes at $15 each. The company currently sells 200,000 units per month, with variable production costs: $8 per unit and fixed production costs of $1,500,000 or $7.5 per unit ($1,500,000 ÷ 200,000). Lunch boxes are currently sold for $20 each. ***If the company has sufficient spare capacity to fulfill this order, should it accept or reject it?***

Solution

- **At first glance (驟眼看來)**, this order should be rejected as the company will incur a loss of $0.5 ($15 − $8 − $7.5) on each unit sold.
- However, the **fixed costs** of $1,500,000 are **irrelevant costs (無關成本)** as they have to be incurred regardless of the production volume.
- Therefore, you **should ignore (不應考慮)** the **fixed costs** and compare the effect on profit with and without the special order:

	Order rejected	Order accepted	
	$	$	
Sales revenue	0	225,000	← 15,000 × $15
Less Costs	0	(120,000)	← 15,000 × $8
Profit	0	105,000	

- The company should **accept (接受)** the **special order (特價訂單)** as it will increase profit by $105,000.

Classwork 1

1 FLSS Ltd received a special order of 10,000 fast foods at $8 each. The company currently sells 80,000 units per month, with variable production costs $5 per unit and fixed production costs of $160,000. Lunch boxes are currently sold for $12 each.

(a) When considering the accepting or rejecting the order, which cost items are relevant in making such a decision?

(b) If the company has sufficient spare capacity to fulfill this order, should it accept or reject it?

(a) Only variable costs (avoidable costs, incremental costs) are relevant in making such a decision. Fixed costs (unavoidable costs, sunk costs) are regarded as irrelevant costs because that will not change whether the product is accepted or rejected.

(b) The effect on net profit of the special order:

	Order accepted		Order rejected
	$		$
Sales (10,000 x $8)	80,000		0
Less Costs (10,000 x $5)	(50,000)		0
Profit	30,000		0

The company should accept the special order as it will increase profit by $30,000.

Example 4

A Chinese restaurant produces and sells poon choi. It is operating at 70% of capacity and its latest operating results are as follows:

	$
Sales revenue (10,000 units)	5,000,000
Less Cost of goods sold	(2,500,000)
Gross profit	2,500,000
Less Operating expenses	(1,000,000)
Net profit	1,500,000

The cost of goods sold consists of two parts: 70% variable, 30% fixed. Operating expenses are 60% variable and 40% fixed. The restaurant has just received an order for 1,000 poon choi at $400 each. The order will incur a delivery charge of $2,000. ***Should the Chinese restaurant accept the order?***

Solution

- To analyse, we first prepare the income statement in unit format:

	Total	Per unit	
	$	$	$
Sales revenue (10,000 units)	5,000,000		500
Less Cost of goods sold	(2,500,000)		
Variable (70%)		175	
Fixed (30%)		75	(250)
Gross profit	2,500,000		250
Less Operating expenses	(1,000,000)		
Variable (60%)		60	
Fixed (40%)		40	(100)
Net profit	1,500,000		150

- The restaurant has an order of 1,000 units. It will earn additional revenue of $400,000 (1,000 × $400).
- It will incur an additional variable cost of $175,000 (1,000 x $175) and additional operating expenses of $60,000 (1,000 x $60).
- There is a delivery charge of $2,000.
- The **fixed costs (固定成本)** should be **ignored (無須考慮)**.
- The effect on net profit:

	Order rejected	Order accepted
	$	$
Sales revenue	0	400,000
Less Cost of goods sold: Variable	0	(175,000)
Operating expenses: Variable	0	(60,000)
Delivery charge	0	(2,000)
Net profit	0	163,000

- By accepting the order, an additional net profit of $163,000 is generated. Thus, the restaurant should accept the order.

Classwork 2

1 Free Falling Ltd has a production capacity of 30,000 units per month. The costs per unit are as follows:

	$
Direct materials	25
Direct labour	40
Variable manufacturing overheads	15
Fixed manufacturing overheads	20
Marketing costs – Fixed	20
Marketing costs – Variable	40
Total manufacturing costs	160

Free Falling Ltd currently sells 28,000 units each month. Newton Ltd has approached the company and wishes to purchase 2,000 units at $200 each. Assume current sales would not be affected by this special order and no variable marketing costs would be incurred.

Should this special order be accepted by Free Falling Ltd? Show all calculations. What will the effect on net profit by accepting the order?

	Order accepted		Order rejected
Sales (2,000 x $200)	$400,000		0
Direct materials (2,000 x $25)	$(50,000)		0
Direct labour (2,000 x $40)	$(80,000)		0
Variable manufacturing overheads (2,000 x 15)	$(30,000)		0
Net profit	$240,000		0

As net profit will increase by $240,000, this special order should be accepted

***Example 5 When there is a limiting factor* (當出現限制因素) (Must have opportunity cost)**

Assume that in Example 4, the restaurant is **already operating at full capacity (生產能力已經飽和)**. ***Should the Chinese restaurant accept the order?***

Solution

- In this example, the limiting factor is **production capacity (生產能力)**. If the restaurant accepts the order, it will have to **give up (放棄)** the production for its **regular orders (正常訂單)** by 1,000 units because of **limiting production capacity**.
- If the order it accepted, it will generate **sales revenue** of $400,000 and incur **variable costs** of $235,000 [1,000 × ($175 + $60)].
- At the same time, the company will incur an **opportunity cost** of $265,000 [1,000 × ($500 − $175 − $60)]. This is because it will have to give up the **contribution margin (邊際貢獻)** on sales of 1,000 units at a selling price of $500 each by accepting this order.
- It will also incur a delivery charge of $2,000
- The results of the analysis:

	Order rejected	Order accepted
	$	$
Sales revenue	0	400,000
Variable costs	0	(235,000)
Opportunity costs	**0**	**(265,000)**
Delivery charge	0	(2,000)
Net loss	0	(102,000)

- The acceptance of the special order will result in a net loss of $102,000. Therefore, the restaurant **should not accept (不應接受)** this special order.

Classwork 3

1. Marrow Ltd has been asked to quote a price for a one-off special order. The order requires 600 kg of material X. There are 700 kg of material X in inventory which are not required for normal production. This material cost $2,800 to purchase. If not used in this order the material could be sold for $5 per kg.

   The order also requires 1,000 hours of direct labour. Direct labour is paid $80 per hour. Currently, there is a shortage of direct labour and all the available direct labour is fully employed in the company in the production of another product, Zoda. Zoda is sold at $500 per unit and its production costs are as follows:

	$ Per unit
Direct materials – Y	90
Direct labour	240
Variable production overheads	**20**
Fixed production overheads	60
	410

Variable production overheads of $2 per direct labour hour will be incurred and fixed production overheads will be absorbed at $3 per direct labour hour for the special order. The total fixed production overheads of the company will remain unchanged no matter whether the special order is accepted or rejected.

Calculate the minimum quoted price for the special order, showing the relevant costs of direct material, direct labour, variable production overheads, fixed production overheads and opportunity costs, if any.

Minimum quoted price:

	$
Direct materials – X (600 x $5) (W1)	3,000
Direct labour (1,000 x $80)	80,000
Variable production overheads (1,000 x $2)	2,000
Fixed production overheads	—
Opportunity cost for Zoda (W2)	50,000
	135,000

W1: Original direct material purchase price per unit = $2,800/700 = $4 per unit

resale direct material price per unit = $5 per unit

Relevant direct materials cost per unit = resale direct material price per unit = $5 per unit

W2: The unit direct labour hour of Zoda = $240 ÷ $80 = 3 labour hour

The unit of Zoda to give up = 1,000 ÷ 3

The opportunity cost for Zoda = [1,000 × ($500 − $350) ÷ 3] = $50,000.

22.5.1 Hire, make or buy decisions (租用、製造或購買)

A company may **make a product itself (本身生產產品)**, **buy it from outside suppliers (從外部供應商購買)**. **If a company is able to buy products at prices lower than the costs of producing them, it will buy from outside (如果一家公司能夠以低於生產成本的價格購買產品，它會從外面買)**.

Example 6 Make or buy decisions (製造或購買的決定)

BAFS Catering Ltd supplies 50,000 cups of ice cream to schools each month. The monthly manufacturing costs of ice cream:

Direct materials	$100,000
Direct labour	$150,000
Variable manufacturing overheads	$80,000
Fixed manufacturing overheads	$120,000
Total manufacturing costs	$450,000
Cost per unit ($450,000 ÷ 50,000)	9

If BAFS is able to buy ice cream of the same quality from outside suppliers for $7.5 each, it will be able to reduce its fixed costs by $20,000. ***Should the company make ice cream itself or buy it from outside suppliers?***

Solution

This amount of $20,000 is an **avoidable cost (可避免成本)** since it can be avoided if the company **outsources the production to other suppliers (外判給其他供應商的生產)**. The fixed costs of $100,000 is an **unavoidable cost (不可避免成本)** as it is incurred **whether the production is outsourced or not (不論是否外判)**.

- Comparison between the total manufacturing costs of making the product itself and buying from outside:

	Make	Buy
Direct materials	$100,000	—
Direct labour	$150,000	—
Variable manufacturing overheads	$80,000	—
Fixed manufacturing overheads	$120,000	$100,000
Purchase costs (50,000 x $7.5)	—	$375,000
Total manufacturing costs	$450,000	$475,000

- The analysis shows the company can save $25,000 ($475,000 − $450,000). Therefore, the company should make ice cream itself as the costs are $25,000 lower ($475,000 − $450,000).

Classwork 4

1 Kangaroo Ltd manufactures a component (LM334) which is used in cooling machines. Monthly production costs for 1,000 units are as follows:

	$
Direct materials	420,000
Direct labour	100,000
Variable manufacturing overheads	300,000
Fixed manufacturing overheads	200,000
Total manufacturing costs	1,020,000

10% of the fixed manufacturing overheads allocated to LM334 will not be incurred if the company purchases LM334 from outside suppliers. Kangaroo Ltd can purchase this component from an outside supplier at $850 per unit.

(a) What are the avoidable costs if Kangaroo Ltd decides to purchase the component from an outside supplier?
(b) Calculate the total purchase cost of the component from an outside supplier?
(c) What is the effect on net profit if Kangaroo Ltd decides to purchase the component from an outside supplier?
(d) Calculate the maximum price Kangaroo is willing to pay to purchase the component from an outside supplier?

(a) Avoidable costs = $420,000 + $100,000 + $300,000 + ($200,000 × 10%) = $840,000

(b) Total purchase cost for buying = [1,000 x $850 + ($200,000 × 90%)] = $1,030,000

(c) Profit will be reduced by $10,000 if the component is purchased from an outside supplier.

(d) For the maximum price, the total purchase cost for buying = total manufacturing costs

Maximum price + $200,000 × 90% = $1,020,000

Maximum price = $1,020,000 – $200,000 × 90% = $840,000 = Avoidable costs

***Example 7 Make or buy decisions with limited capacity* (在生產力有限的情況下作製造或購買的決定)**

Assume that BAFS Catering Ltd decides to buy ice cream from outside suppliers. It can earn a profit of $30,000 each month by **using its unused capacity to make products (使用未使用的生產力製造產品)** for other companies. ***Should the company make ice cream itself or buy it from outside suppliers?***

Solution

The $30,000 represents the **opportunity cost (機會成本)** of producing ice cream **in-house (自製)** instead of buying it from outside. If BAFS Catering Ltd chooses the **'buy' alternative (購買方案)**, **total manufacturing costs (總製造成本)** would be reduced by $30,000. The results of the analysis:

	Make	Buy
	$	$
Direct materials	100,000	—
Direct labour	150,000	—
Variable manufacturing overheads	80,000	—
Fixed manufacturing overheads	120,000	100,000
Purchase costs (50,000 x $7.5)	—	375,000
Additional profit	—	**(30,000)**
Total manufacturing costs	450,000	445,000

BAFS should buy ice cream from outside as the costs of choosing this alternative are lower.

Classwork 5

1. Mickey Ltd produces a component of blu-ray player. Cost information for producing 30,000 units of the component is as follows:

Direct materials	$300,000	Direct labour	$150,000
Variable overheads	$180,000	Fixed overheads	$120,000

The company has received an offer from an outside supplier to provide 30,000 units of the component at a unit price of $30. If the component is purchased from this outside supplier, fixed overheads would be reduced by $20,000. Also, the factory space used to make this component could be rented out for $100,000 per annum.

(a) What are the opportunity costs if Mickey Ltd decides to buy the component from the outside supplier?

(b) If Mickey Ltd decides to buy the component from the outside supplier, what will the effect on the company's profits be?

(c) Compute the unit price charged by the outside supplier so that it makes no difference whether or not Mickey Ltd makes the component itself.

(a) The rental income earned from renting out the factory space is the opportunity cost of making the component itself.

(b)

	Make		*Buy*
	$		$
Direct materials	300,000		—
Direct labour	150,000		—
Variable overheads	180,000		—
Fixed overheads	120,000		100,000
Rental income*	—		(100,000)
Purchase costs (30,000 × $30)	—		900,000
Total costs	750,000		900,000

If Mickey Ltd decides to buy the components from the outside supplier, the company's profits will be reduced by $150,000 ($900,000 – $750,000).

(c) Let the required unit price of the component be P,

$100,000 + (30,000 × P) – $100,000 = $750,000

30,000P = $750,000

P = $25

Example 8 ***Hire decisions* (租用的決定)**

BAFS Catering Ltd supplies 50,000 cups of ice cream to schools each month. The monthly manufacturing costs of ice cream:

Direct materials	$100,000
Direct labour	$150,000
Variable manufacturing overheads	$80,000
Fixed manufacturing overheads	$120,000
Total manufacturing costs	$450,000
Cost per unit ($450,000 ÷ 50,000)	9

BAFS is considering **hiring fully automated ice-cream making machinery from outside (從外租用全自動化雪糕機械)**. The machinery can reduce direct materials cost by 20%, direct labour cost by 50%, variable manufacturing overheads by 25% and fixed manufacturing overheads by $20,000. **The monthly hire charge for the machinery (機械每月租用費)** is $100,000. ***Should the company hire the machinery?***

Solution

Monthly cost information before and after hiring new machinery:

	Make	Hire	
	$	$	
Direct materials	100,000	80,000	[$100,000 x (1 – 20%)]
Direct labour	150,000	75,000	[$150,000 x (1 – 50%)]
Variable manufacturing overheads	80,000	60,000	[$80,000 x (1 – 25%)]
Fixed manufacturing overheads	120,000	100,000	($120,000 – $20,000)
Hire charge	—	100,000	
Total manufacturing costs	450,000	415,000	

The company should hire new machinery as doing so will reduce total manufacturing costs by $35,000

Classwork 6

1. Mickey Ltd produces a component of blu-ray player. Cost information for producing 30,000 units of the component is as follows:

Direct materials	$300,000
Direct labour	$150,000
Variable overheads	$180,000
Fixed overheads	$120,000

   The company is considering hiring fully automated making machinery from outside. The machinery can reduce direct materials cost by 30%, direct labour cost by 40%, variable manufacturing overheads by 20% and fixed manufacturing overheads by $10,000. The monthly hire charge for the machinery is $150,000. Should the company hire the machinery?

	Make		Hire
	$		$
Direct materials	300,000		210,000
Direct labour	150,000		90,000
Variable manufacturing overheads	180,000		144,000
Fixed manufacturing overheads	120,000		110,000
Hire charge	—		150,000
Total manufacturing costs	750,000		704,000

The company should hire new machinery as doing so will reduce total manufacturing costs by $46,000

22.6 Sell or process further decisions (出售或加工的決定)

- Management often has to decide whether to sell a product now or to **process it further (加工後)** and sell later.

Example 9

BAFS Catering Ltd produces two types of ice cream: 'regular' and 'super'. The current selling price of regular ice cream is $150 per box. If regular ice cream is processed further into super ice cream, the selling price will be $180 per box. Further processing of each box of regular ice cream will increase direct materials cost by $6, direct labour cost by $12 and variable manufacturing overheads by $7.2, with no change in fixed costs.

Costs and profit information for regular ice cream:

	$ per box
Direct materials	45
Direct labour	30
Variable manufacturing overheads	18
Fixed manufacturing overheads	12
Total manufacturing costs	105
Profit ($150 – $105)	45

Should the company sell regular ice cream or process it further into super ice cream?

Solution

- Comparing the profit generated by 'regular' and 'super':

	Regular ice cream $	Super ice cream $	
Selling price	150	180	
Direct materials	45	51.0	($45 + $6)
Direct labour	30	42.0	($30 + $12)
Variable manufacturing overheads	18	25.2	($18 + $7.2)
Fixed manufacturing overheads	12	12.0	
Total manufacturing costs	105	130.2	
Profit	45	49.8	

- The sale of a box of super ice cream increases profit by $4.8 ($49.8 – $45).
- Thus, the company should further process regular ice cream into super ice cream in order to earn more profit.

Classwork 7

1 The costs of manufacturing one unfinished table of Forever Furniture Ltd are as follows: direct materials cost $30, direct labour cost $20, variable manufacturing overheads $12 and fixed manufacturing overheads $8. If an unfinished table can be sold for $100 and if it is processed further, it can be sold for $120 but will increase direct materials cost by $4, direct labour cost by $8 and variable manufacturing overheads by $4.8, with no change in fixed costs. Should Forever Furniture Ltd further process the unfinished table?

Comparing the profit generated by 'unfinished table' and 'finished table':

	Unfinished table	Finished table
	$	$
Sales price	100	120
Direct materials	(30)	(34)
Direct labour	(20)	(28)
Variable manufacturing overheads	(12)	(16.8)
Fixed manufacturing overheads	(8)	(8)
Profit	30	33.2

As a finished table can generate a higher profit, Forever Furniture Ltd should process the unfinished table further.

2 Davidson Ltd produces two types of glass: 'ordinary glass' and 'mirror glass'. Ordinary glass can be further processed into 'safety glass', which is eight times stronger than ordinary glass. Ordinary glass and mirror glass are sold for $300 and $400 each, respectively. If ordinary glass is further processed into safety glass, the selling price can be increased to $600 each.

Cost information for ordinary glass and mirror are as follows:

	Ordinary glass	*Mirror glass*
Per unit:	$	$
Direct materials	50	65
Direct labour	30	30
Variable manufacturing overheads	20	20
Fixed manufacturing overheads	15	15

Additional costs incurred in processing ordinary glass into safety glass are as follows:

Per unit:	$
Direct materials	116
Direct labour	12
Variable manufacturing overheads	18

No extra fixed costs will be incurred in making safety glass. Should Davidson Ltd sell ordinary glass or process it further into safety glass?

	Ordinary glass		*Safety glass*
Per unit:	$		$
Selling price	300		600
Direct materials	50	($50 + $116)	166
Direct labour	30	($30 + $12)	42
Variable manufacturing overheads	20	($20 + $18)	38
Fixed manufacturing overheads	15		15
Total manufacturing costs	115		261
Profit	185		339

The sale of each unit of safety glass would increase profit by $154 ($339 – $185). Therefore, the company should further process ordinary glass into safety glass.

22.7 Retain or replace equipment decisions (保留或更換機器／儀器)

***Example 10 The old machine has zero current disposal value* (舊機器的現時變賣價值為零)**

BAFS Catering Ltd has an ice-making machine and is considering replacing it with a new one. Information on the machines is as follows:

	Old machine	New machine
Net book value	$8,000	—
Cost of the new machine	—	$240,000
Remaining useful life	5 years	5 years
Current disposal value	$0	—
Residual value at the end of five years	$0	$0
Machine operator's annual salary	$100,000	$100,000
Annual fixed costs	$50,000	$50,000
Annual variable manufacturing costs	$320,000	$250,000

Should the management retain the old machine or replace it with a new one?

Solution

- The machine operator's annual salary and the fixed costs are irrelevant as they have to be incurred whether the company uses the old ice-making machine or a new one.
- The net book value of the old machine is also irrelevant, because it is just the difference between the acquisition cost and accumulated depreciation.
- Total relevant costs incurred on the machines over the five year period:

		Retain the old machine		Replace with a new machine
		$		$
Variable manufacturing costs	(5 x $320,000)	1,600,000	(5 x $250,000)	1,250,000
Cost of the new machine		—		240,000
Total relevant costs		1,600,000		1,490,000

- The management should replace the old machine as the new machine will cost less over the five-year period.

Classwork 8

1 Winners Ltd is considering replacing an existing truck with a new one. The new truck can save on operating costs and both trucks can be used for 10 years. The following information is related to the existing truck and the new one.

	Existing truck	New truck
Purchase cost	$500,000	$900,000
Annual operating costs (variable)	$165,000	$100,000
Accumulated depreciation	$300,000	—
Current disposal value	$0	—
Remaining useful life (years)	10	10
Residual value 10 years later	$0	$0

(a) What is the different in total relevant costs between the two trucks over the 10-year period?
(b) Advise the management if the existing truck should be replaced.

(a) Total relevant costs incurred by the two the trucks over ten-year period:

		Keeping Existing truck		Replacing New truck
		$		$
Purchase cost of the new truck		—		900,000
Variable operating costs (10 years)		1,650,000		1,000,000
Total costs		1,650,000		1,900,000

Difference in total relevant costs = $1,900,000 − $1,650,000 = $250,000

The new truck has higher total relevant costs over the 10-year period.

(b) The existing truck should be kept as it has lower total relevant costs over the 10-year period.

***Example 11 The old machine has a current disposal value* (舊機器有現行變賣價值)**

Refer to Example 10. Suppose the old machine has a current disposal value of $10,000. ***Should the management retain the old machine or replace it with a new one?***

Solution

- The current disposal value is relevant as this is the amount the company can receive if the old machine is sold now.
- The sum of $10,000 is deducted when calculating the relevant costs of the 'replacement' alternative.
- However, the amount of gain on disposal of $2,000 is not relevant as this is just the difference between the disposal value and the net book value of the asset.
- Revised presentation of total relevant costs incurred on the machines over the five year period:

		Retain the old machine		Replace with a new machine
		$		$
Variable manufacturing costs	(5 x $320,000)	1,600,000	(5 x $250,000)	1,250,000
Disposal value of the old machine		—		**(10,000)**
Cost of the new machine		—		240,000
Total relevant costs		1,600,000		1,480,000

- The management should replace the old machine with a new one as its total relevant costs will decrease.

Classwork 9

1 Lam's Ltd is considering replacing an old van with a new one. Details of the two vans are as follows:

	Old van	*New van*
Cost of purchase	$202,500	$256,000
Remaining book value	$155,250	—
Annual variable operating costs	$154,000	$135,000
Remaining useful life	5 years	5 years
Current disposal value	$108,000	—
Disposal value at the end of five years	$3,000	$15,000

The old van can be used as part exchange for the new van. The trade-in value of the old van is $125,000.

Projected annual sales revenue and fixed costs (excluding depreciation) for the next five years are $1,688,000 and $235,000, respectively.

Required:

(a) Indicate whether each of the following items is a relevant cost or an irrelevant cost:
  (i) Net book value of the old van
  (ii) Current disposal value of the old van
  (iii) Purchase cost of the new van

(b) Should the company purchase a new van? (Ignore the time value of money.)

(a) (i) Irrelevant cost

(ii) Irrelevant cost* (The current disposal value of the old van is not the opportunity cost of making the decision in this case as it is not the highest-valued alternative forgone.)

(iii) Relevant cost

(b) Total relevant costs incurred by the two vans over the five-year period:

		Retain		*Replace*
		$		$
Purchase cost of the new van		—		256,000
Variable operating costs (Workings)	5 × $154,000	770,000	5 × $135,000	675,000
Trade-in value of the old van		—		(125,000)
Disposal value at the end of five years		(3,000)		(15,000)
Total relevant costs		767,000		791,000

The company should therefore retain the old van as the new van will cost $24,000 more over the five-year period.

22.8 Eliminate or retain an unprofitable segment decisions (結束或保留虧損分部的決定)

A company may have many business segments but not all business segments are profitable. Some companies have both profitable and unprofitable segments. In this case, the companies need to decide to eliminate or retain an unprofitable segment.

Example 12

BAFS Catering Ltd has three different business segments: local lunch box, continental lunch box and ice cream. Their financial results for the year are as follows:

	Local lunch box	Continental lunch box	Ice cream	Total
	$	$	$	$
Sales revenue	60,000,000	12,000,000	4,000,000	76,000,000
Variable costs	(24,000,000)	(8,400,000)	(3,600,000)	(36,000,000)
Contribution margin	36,000,000	3,600,000	400,000	40,000,000
Fixed costs	(18,000,000)	(2,000,000)	(1,200,000)	(21,200,000)
Net profit/(loss)	18,000,000	1,600,000	(800,000)	18,800,000

The ice cream business is making a loss. Should the management eliminate this segment?

Solution

- Even when the ice cream segment is discontinued, its fixed costs cannot be eliminated immediately. These are unavoidable costs.
- The fixed costs of the ice cream segment ($1,200,000) have to be allocated between the local lunch box and continental lunch box business segments based on sales revenue:
  Fixed costs of local lunch box = $18,000,000 + $1,200,000 x [$60,000,000 / ($60,000,000 + 12,000,000)] = $19,000,000
  Fixed costs of continental lunch box = $2,000,000 + $1,200,000 x [$12,000,000 / ($60,000,000 + 12,000,000)] = $2,200,000
- Allocation of fixed costs

	Local lunch box	Continental lunch box	Total
	$	$	$
Sales revenue	60,000,000	12,000,000	76,000,000
Variable costs	(24,000,000)	(8,400,000)	(36,000,000)
Contribution margin	36,000,000	3,600,000	40,000,000
Fixed costs	(19,000,000)	(2,200,000)	(21,200,000)
Net profit/(loss)	17,000,000	1,400,000	18,400,000

- Net profit will fall from $18,800,000 to $18,400,000 after eliminating the ice cream business. Therefore, the management should not eliminate this segment

- Alternatively, you can compare the net loss suffered with and without the ice cream business segment:

	Segment retained	Segment eliminated
	$	$
Sales revenue	4,000,000	0
Variable costs	(3,600,000)	0
Contribution margin	400,000	0
Fixed costs	(1,200,000)	(1,200,000)
Net loss	(800,000)	(1,200,000)

- If the ice cream segment is eliminated, the net loss will be even higher. Therefore, the company should keep this unprofitable segment
- In addition to using quantitative factors in evaluation, management must consider qualitative factors when deciding whether or not a business segment is to be eliminated.
- These factors include customers' reactions, and the effects on staff morale and the company's reputation.
- A loss-making segment may become a profitable one in the future.

Classwork 10

1 i-Toys Ltd, a toy manufacturer, has three product lines: electronic games, dolls and puzzle games. The company's financial budget for the coming year shows that the puzzle games product line will incur a loss. The company is considering discontinuing this product line. Budgeted cost and revenue information for the three product lines is as follows:

	Electronic games	***Dolls***	***Puzzle games***	***Total***
	$	$	$	
Sales revenue	6,000,000	3,500,000	2,500,000	12,000,000
Less Variable costs	(2,000,000)	(1,000,000)	(1,500,000)	(4,500,000)
Fixed costs	(3,000,000)	(2,000,000)	(1,500,000)	(6,500,000)
Net profit/(loss)	1,000,000	500,000	(500,000)	1,000,000

Fixed costs include factory rent of $4,500,000. This is allocated to the three product lines based on the factory floor area occupied. The ratio of floor area occupied by electronic games, dolls and puzzle games is 3 : 2 : 1. The factory's tenancy has two more years to run. The remaining fixed costs represent the salaries of three product managers. Each of the product managers is responsible for one of the product lines, and their employment can be terminated without compensation if the product line is discontinued.

Required:

(a) Find the unavoidable fixed costs for discontinuing of puzzle games product.

(b) Find the fixed costs of electronic games and dolls for discontinuing of puzzle games product.

(c) Should the puzzle games product line be discontinued? If so, what will the effect on the company's net profit?

(d) Explain the following terms:

(i) Avoidable costs

(ii) Unavoidable costs

(a) Since the salaries of product managers of puzzle games can be terminated without compensation, only the factory rent of puzzle games is unavoidable.

Factory rent of puzzle games = $4,500,000 x 1/6 = $750,000

(b) Fixed costs of Electronic games: $3,000,000 + $750,000 x 3/5 = $3,450,000

Fixed costs of Dolls: $2,000,000 + $750,000 x 2/5 = $2,300,000

(c) Financial results with the puzzle games product line discontinued:

	Electronic games		*Dolls*		Total
	$		$		$
Sales revenue	6,000,000		3,500,000		9,500,000
Less Variable costs	(2,000,000)		(1,000,000)		(3,000,000)
Fixed costs	(3,450,000)		(2,300,000)		(5,750,000)
Net profit/(loss)	550,000		200,000		750,000

i-Toys Ltd should not discontinue the puzzle games product line as this will reduce the net profit by $250,000 ($1,000,000 – $750,000).

(d) (i) Avoidable costs are the costs which can be reduced or avoided when a certain action is taken.

(ii) Unavoidable costs are the costs which have to be incurred regardless of what action is taken.

2 Shinjuku Ltd produces two products: traditional DVD player and Blu-ray DVD player. The financial performance for the year ended 31 December 2010 was as follows:

	Traditional DVD player	Blu-ray DVD player	Total
Units sold	10,000	3,700	13,700
	$	$	$
Sales	2,400,000	7,400,000	9,800,000
Less Cost of goods sold	(1,800,000)	(4,810,000)	(6,610,000)
Gross profit	600,000	2,590,000	3,190,000
Less Selling expenses	(600,000)	(1,340,000)	(1,940,000)
Net profit	0	1,250,000	1,250,000

Fixed manufacturing costs were included in the cost of goods sold at $30 per unit for the traditional DVD player and $200 per unit for the Blu-ray DVD player. Variable selling expenses were $40 per unit for the traditional DVD player and $200 per unit for the Blu-ray DVD player.

(a) Shinjuku Ltd is considering eliminating its traditional DVD player product line. If this line is eliminated, total fixed selling expenses would be reduced by 10%. What will the impact on net profit be if this line is eliminated?

(b) Disregarding the information in part (a), if Shinjuku Ltd eliminates its traditional DVD player product line and uses the spare capacity to produce and sell an additional 1,500 Blu-ray DVD players, what will the impact on net profit be?

Answer:

(a) Profit after eliminating the traditional DVD player product line:

	$
Sales	7,400,000
Less Variable manufacturing costs (4,810,000 – 3,700 x $200)	(4,070,000)
Variable selling expenses (3,700 x $200)	(740,000)
Contribution margin	2,590,000
Less Fixed manufacturing costs (10,000 x $30 + 3,700 x $200)	(1,040,000)
Fixed selling expenses [(1,940,000 – 10,000 x $40 – 3,700 x $200) x 90%]	(720,000)
Net profit	830,000

If the traditional DVD player product line is eliminated, net profit will be reduced by $420,000 ($1,250,000 – $830,000)

(b) Profit after eliminating the traditional DVD player product line **with spare capacity**:

	$
Sales (3,700 + 1,500) x (7,400,000 / 3,700)	10,400,000
Less Variable manufacturing costs (3,700 + 1,500) x (4,070,000 / 3,700)	(5,720,000)
Variable selling expenses (3,700 + 1,500) x $200	(1,040,000)
Contribution margin	3,640,000
Less Fixed manufacturing costs	(1,040,000)
Fixed selling expenses (1,940,000 – 10,000 x $40 – 3,700 x $200)	(800,000)
Net profit	1,800,000

If the traditional DVD player product line is eliminated, net profit will be increased by $550,000 ($1,800,000 – $1,250,000).

(HKALE 2006, Paper 2, 1) **(Cost accounting for decision-making)**

Healthy 99 started its business in 2003 as a retailer of Product X. Facing keen competition from a new shop nearby, the management of Healthy 99 is considering the following alternatives for 2006:

Alternative A
Take no action and accept a fall in sales.
Alternative B
Arrange advertising amounting to $100,000 per month to boost the sales of Product X.
Alternative C
Introduce a new, environmentally friendly product, Product Y.

Additional information:

(i) The average monthly sales of Product X in 2005 was 1,000 units. The average monthly sales in 2006 under the three alternatives are estimated as follows:

	Estimated average monthly sales	
Alternative	Product	Quantity (units)
A – Take no action	X	700
B – Arrange advertising	X	900
C – Introduce Product Y	X	600
	Y	300

Product X is selling at a unit price of $800. Product Y will be sold at $400 per unit.

(ii) Sales Support
Healthy 99 has three salesmen with a monthly salary of $20,000 each. On top of the salary, there is an incentive pay based on 5% of gross sales to the salesmen for both Product X and Product Y. No additional salesmen will be recruited if Alternative C is chosen.

(iii) Cost of Goods Sold
Product X and Product Y will cost $250 per unit and $90 per unit respectively in 2006. In addition, a royalty of $40 has to be paid to the patent owner for each unit of Product Y sold. Healthy 99 does not keep any stock as the delivery lead time is very short.

(iv) After-sales Service
After-sales service is provided free of charge once per unit to the customers of Product X in the month of sale, incurring a variable cost of $70 per service. This service will not be offered to customers of Product Y.

(v) Rental
The existing shop is rented under a 10-year tenancy agreement at a fixed monthly rental $150,000. If Product Y is launched, an additional area will be rented on a monthly basis from the same landlord at $16,000 per month.

You are required to:

(a) Calculate the contribution per unit of Product X and Product Y respectively.
(b) Based on financial analysis only, advise Healthy 99 which of the three alternatives it should take.
(c) Assume that the sales (units) ratio for Product X and Product Y is fixed at 2 : 1. Calculate the breakeven quantities of Product X and Product Y to be sold per month under Alternative C.

Sunshine Club, a potential client, approaches Healthy 99 for a bulk purchase scheme on Product X. Each of its members (400 in total) will be allowed to purchase one unit of Product X at 30% discount, with the free after-sales service provided at the club's premises. In return for the deal, Healthy 99 will give a lump sum of $20,000 to Sunshine Club for sponsoring the club's activities.

Healthy 99 estimates that (i) 80% of the members of Sunshine Club will take advantage of the bulk discount; (ii) the after-sales service provided at the club's premises will incur a total cost of $25,000, which includes the variable cost of $70 per unit; and (iii) sales of Product X to other customers will reduce by 50 units as the salesmen have to serve Sunshine Club.

The 5% incentive pay will not be allowed on this bulk purchase of Sunshine Club.

You are required to:

(d) Based on the financial information above, advise whether Healthy 99 should accept the scheme proposed by Sunshine Club.

(e) Suggest three other factors that Healthy 99 has to consider in deciding whether it should accept the scheme.

(a)

		Product X		Product Y
		$		$
Selling price		800		400
Less: Variable costs				
Sales incentive (5%)	800 x 5%	40	400 x 5%	20
Cost of goods sold		250		90
Royalties		—		40
Cost of after-sales service		70		—
Contribution per unit		440		250

(b) The total profit of each alternative is shown below:

Alternative A

	$		$
Contribution (700 x $440)			308,000
Less: Fixed costs			
Salesmen's salaries (3 x $20,000)	60,000		
Rental cost	150,000		210,000
Total profit			98,000

Alternative B

	$		$
Contribution (900 x $440)			396,000
Less: Fixed costs			
Advertising	100,000		
Salesmen's salaries (3 x $20,000)	60,000		
Rental cost	150,000		310,000
Total profit			86,000

Alternative C

	$		$
Contribution of Product X (600 x $440)			264,000
Contribution of Product Y (300 x $250)			75,000
			339,000
Less: Fixed costs			
Salesmen's salaries (3 x $20,000)	60,000		
Rental cost ($150,000 + $16,000)	166,000		226,000
Total profit			113,000

Healthy 99 should adopt Alternative C as it yields the highest total profit.

(c) Unit weighted average contribution = $440 × (2/3) + $250 × (1/3) = $1,130/3

Break-even sales volume = $226,000 / ($1,130/3) = 600 units

Break-even sales unit of Product X = 600 x (2/3) = 400 units

Break-even sales unit of Product Y = 600 x (1/3) = 200 units

To break even, Healthy 99 has to sell 400 units of Product X and 200 units of Product Y.

(d)

	$		$
Sales (400 x 80% x $800 x 70%)			179,200
Less: Cost of goods sold (400 x 80% x $250)	80,000		
Cost of after-sales service	25,000		
Lump sum payment	20,000		
Contribution of Product X forgone (50 x $440)	22,000		147,000
Incremental profit			32,200

Healthy 99 should take the order as there is an increase in profit.

(e)
- The order may affect staff morale as there could be an increase in work pressure and having to serve Sunshine Club without the incentive pay.
- The order would help Healthy 99 explore the possibility of improving Product X's profitability, e.g. making similar deals with other corporate clients.
- The order will arouse expectation of price reduction by individual customers.
- The order may serve as a start-up of a long-term business relationship with Sunshine Club.