



C9: Accounting and Finance Course

Module 2



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Module overview

Welcome to Module 2

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.

Opportunities will be given throughout the course for students to select, calculate and make appropriate decisions using these tools. The ultimate object is for the student to identify the correct data to make business decisions.

Upon completion of this module you 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

Introduction

This unit is intended to provide students with an introduction to the relationship between cost, volume and profit (CVP). Because CVP analysis helps managers understand how profits are affected by changes in selling prices, volume, variable costs, fixed costs and product mix, CVP is a vital tool in many business decisions.

The unit comprises five main sections:

1. Fixed and variable costs
2. Contribution margin
3. Graphical representation of CVP
4. Target profit and tax
5. Structure, leverage and uncertainty

Upon completion of this unit you 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.

Terminology



Terminology

Break-even point:	The quantity of output sold at which total revenues equal total costs.
Contribution margin:	Revenues minus variable expenses.
Fixed costs:	Costs that do not fluctuate with changes in the level of activity within the relevant range of output.



Relevant range:	The anticipated activity level at which the business will perform.
Variable costs:	Costs that vary in direct proportion to changes in the level of an activity.

Fixed and variable costs

A good manager must learn to use information to make informed decisions about which business prospects to pursue. Managerial accounting methods provide techniques for evaluating the viability and ability to grow or “scale” a business. These techniques are called cost-volume-profit analysis (CVP).

The nature of costs

Before we begin to understand how a business is going to perform over time and with shifts in volume, it is imperative to first consider the cost structure of the business. This requires an understanding of the specific types of costs that are to be incurred and trying to understand their unique attributes.

Variable costs

Variable costs will vary in direct proportion to changes in the level of an activity. For example, direct material, direct labour, sales commissions, fuel cost for a trucking company, and so on, may be expected to increase with each additional unit of output.

Assume that Orange Limited produces portable music players. Each unit produced requires a printed circuit board (PCB) that costs \$11 so total PCB costs will rise with increases in unit production. For example, \$1,650,000 is spent when 150,000 units are produced ($150,000 \times \$11 = \$1,650,000$).

If 160,000 units are produced then variable costs will increase to \$1,760,000 ($160,000 \times \11), an increase of \$110,000 which is the additional 10,000 units \times \$11.

Therefore total variable cost increases in a linear fashion as total production rises. However, on a per unit basis, the variable cost is constant at \$11 per unit. Increases in volume do not change the per unit cost.

In summary, every additional unit produced brings another incremental unit of variable cost.

The activity base is the item or event that causes the incurrence of a variable cost. It is easy to think of the activity base in terms of units produced, but it can be more than that. Activity can relate to labour hours worked, units sold, customers processed, or other such cost drivers. For example, a dentist will use a new pair of disposable gloves for each

patient seen, no matter how many teeth are being filled. Therefore, disposable gloves are a variable and will vary with the number of patients seen. But, the material used for fillings is a variable that is tied to the number of decayed teeth that are repaired. Some patients have none, some have one, and others have many. So, each variable cost must be considered independently and with careful attention to what activity drives the cost.

Fixed costs

The opposite of variable costs are fixed costs. Fixed costs do not fluctuate with changes in the level of activity over the relevant range of activity. Assume that Orange leases the manufacturing facility where the portable music players are assembled. Assume that rent is \$1,200,000 no matter the level of production. The rent is said to be a fixed cost, because total rent will not change as output rises and falls. In this case the fixed cost per unit will decline with increases in production.

In the Orange Limited example in the variable costs section above, if the production level increases from 150,000 units to 160,000 units, the cost of rent will remain unchanged.

This attribute of fixed costs is important to consider in assessing the scalability of a business proposition. There are numerous types of fixed costs. Examples include administrative salaries, rents, property taxes, security, networking and infrastructure support.

Business implications of the fixed cost structure

The nature of a specific business will have a lot to do with defining its inherent fixed cost structure. For example, airlines have historically been burdened with high fixed costs related to gates, maintenance, contractual labour agreements, computer reservation systems, aircraft and so on. Airlines have struggled during lean years because they are unable to cover fixed costs. During boom years, these same companies have been extremely profitable, because costs do not rise (much) with increases in volume – there is not much cost difference in flying a plane empty or full. Software companies have a big investment in product development, but very little cost in reproducing multiple electronic copies of the finished product. Their variable costs are low.

Other businesses have attempted to avoid fixed costs so that they can maintain a more stable stream of income relative to sales. For example, a computer company might outsource its technical support. So instead of having a fixed staff that is either idle or overloaded at any time, they pay an independent support company a per-call fee. The effect is to transform the organisation's fixed costs to variable, and therefore try to avoid fluctuations in overall profitability brought about by the related ability to cover or not cover the fixed costs of operations.

Every business is unique, and good managers will be careful to understand their cost structure. For a long time, the trend for many businesses was toward increased fixed costs. Some of this was the result



of increased investment in robotics and technology. However, those components have become more affordable. Now there is a trend for more outsourcing, elimination of health insurance, or conversion of pension plans. These activities suggest attempts to structure businesses with a definitive margin (revenues minus variable costs) that scales up and down with changes in the level of business activity. No matter the specific example, a manager must understand its cost structure.

Economies of scale

Economists speak of the concept of economies of scale. This means certain efficiencies are achieved as production levels rise. This can take many forms. First, fixed costs can be spread over larger production runs, and this causes a decrease in the per unit fixed cost. In addition, enhanced buying power results (for example, quantity discounts) as volume goes up, and this can reduce the per unit variable cost. These are valid considerations. The manager must take them into consideration in decision-making. However, care must also be exercised to limit the analysis to a relevant range of activity, which is discussed in the next section.

Relevant range

The relevant range is the anticipated activity level at which the business will perform. Any costing or pricing data outside of this range is irrelevant and need not be considered.

The relevant range is also considered when assessing fixed costs. Many fixed costs are only fixed for a certain level of production. For example, a machine or manufacturing plant can reach capacity. To increase production beyond a certain level, additional machinery (or a new plant, or additional supervisors) must be used. This will cause a major step upward in the fixed cost. Fixed costs that behave in this fashion are also called *step costs*. The key conceptual point is to note that fixed costs are only fixed over some particular range of activity, and moving outside that range can significantly alter the cost structure.

Other business issues to consider

After grasping the concepts of variable and fixed costs, it is important to understand their full implications in managing a business. First, let's give some added thought to fixed cost concepts. Ideally, an organisation would try to produce at the maximum output of a fixed-cost step. This squeezes maximum productive output for a given level of expenditure. For a machine, it is as simple as running at full capacity. However, for a business with many fixed costs, it is more challenging to organise operations so that each component is fully utilised.

Some fixed costs are *committed* fixed costs arising from an organisation's commitment to engage in operations. These elements include such items as depreciation, rent, insurance, or property taxes. These costs are not easily adjusted with changes in business activity.

However, *discretionary* fixed costs originate from top management's yearly spending decisions where proper planning can avoid these costs if cutbacks become necessary or desirable. Examples of discretionary fixed costs include advertising and employee training. Committed fixed costs relate to the desired long-run positioning of the organisation, whereas discretionary fixed costs have a short-term orientation.

Committed fixed costs are significant because they cannot be avoided in lean times; discretionary fixed costs can be altered with proper planning. Of course, an organisation should be careful to avoid incurring excessive committed fixed costs.

Variable costs are also subject to adjustment. For example, an organisation might order and store large quantities of raw materials or components for use in future periods. They may do this to take advantage of supplier discounts.

Direct labour cost can be subject to adjustment for overtime premiums, based on whether or not overtime is worked. It may or may not make sense to meet customer demand by increasing production when overtime premiums are payable.

The link between all of the different costs emphasises the importance of good planning. The objective is to synchronise operations so that the benefits of each fixed cost are maximised, and variable cost patterns are established in the most efficient economic pattern. All of this must be weighed against revenue opportunities. In other words, the organisation must be able to sell what it produces.

Later in this module, in the break-even analysis section, we will portray the relationship between fixed costs, variable costs and revenue in a graphical form.

Contribution margin

Cost-volume, profit (CVP) analysis is used to build an understanding of the relationship between costs, business volume and profitability. The analysis focuses on the linkage between variable and fixed costs, pricing, volume, and product mix. This analysis will drive decisions about what products to offer, how to price them, and how to manage an organisation's cost structure. CVP is at the heart of techniques that are useful for calculating the break-even point, volume levels necessary to achieve targeted profit levels and similar computations. The starting point for these calculations is to consider the contribution margin.

Contribution margin

The contribution margin is revenues minus variable expenses. Do not confuse the contribution margin with gross profit (revenues minus cost of sales). Gross profit would be calculated after deducting all manufacturing costs associated with sold units, whether fixed or variable. Instead, the contribution margin is a conceptual number reflecting the amount



available from each sale, after deducting all variable costs associated with the units sold. Some of these variable costs are product costs, and some are selling and administrative in nature. The contribution margin is generally a number calculated for internal use and analysis; it does not ordinarily become a part of the externally reported financial statements.

CVP analysis is based on several assumptions including:

- Changes in the level of revenues and costs arise only because of changes in the number of product (or service) units produced and sold (that is, the number of output units is the only driver of revenues and costs).
- Total costs can be separated into a fixed component that does not vary with the output level and a component that is variable with respect to the output level.
- When represented graphically, the behaviours of both total revenues and total costs are linear (straight lines) in relation to the output level within the relevant range (and time period).
- The analysis either covers a single product or assumes that the proportion of different products when multiple products are sold will remain constant as the level of total units sold changes.

Even though CVP assumptions simplify real-world situations, many companies have found CVP relationships can be helpful in making decisions about strategic and long-range planning, as well as decisions about product features and pricing. Managers, however, must always assess whether the simplified CVP relationships generate sufficiently accurate predictions of how total revenues and total costs behave. If decisions can be significantly improved, managers should choose a more complex approach that, for example, uses multiple cost drivers and nonlinear cost functions.

Because managers want to avoid operating losses, they are interested in the break-even point calculated using CVP analysis. The break-even point is the quantity of output sold at which total revenues equal total costs. There is neither a profit nor a loss at the break-even point. To illustrate, assume a company sells 2,000 units of its only product for \$50 per unit, variable cost is \$20 per unit, and fixed costs are \$60,000 per month.



Given these conditions, the company is operating at the break-even point:

Revenues, 2,000 x \$50	\$100,000
Deduct:	
Variable costs, 2,000 x \$20	40,000
Fixed costs	<u>60,000</u>
Operating income	<u>\$ -0-</u>

The break-even point can be expressed two ways: *2,000 units* and *\$100,000 of revenues*. We will discuss break-even analysis in more detail later in this module.

Under CVP analysis, the income statement above is reformatted to show a key line item, contribution margin:

Revenues, 2,000 x \$50	\$100,000
Variable costs, 2,000 x \$20	<u>40,000</u>
Contribution margin	60,000
Fixed costs	<u>60,000</u>
Operating income	<u>\$ -0-</u>

This format is called the contribution income statement.

Contribution margin can be expressed three ways:

1. in total,
2. on a per unit basis, and
3. as a percentage of revenues.

In the above example, total contribution margin is \$60,000. Contribution margin per unit is the difference between selling price and variable cost per unit: $\$50 - \$20 = \$30$.

Contribution margin per unit is also equal to contribution margin divided by the number of units sold: $\$60,000 \div 2,000 = \30 .

Contribution margin percentage (also called contribution margin ratio) is contribution margin per unit divided by selling price: $\$30 \div \$50 = 60\%$; it is also equal to contribution margin divided by revenues: $\$60,000 \div \$100,000 = 60\%$. This contribution margin percentage means that 60 cents in contribution margin is gained for each \$1 of revenues.

Target profit and tax

From the example in the contribution margin section above, the break-even point (BEP) in units and in revenues is as follows:



$$\text{BEP units} = \frac{\text{Total fixed costs}}{\text{Contribution margin per unit}}$$

$$\text{BEP units} = \frac{\$60,000}{\$30} = 2,000 \text{ units}$$

$$\text{BEP revenues} = \frac{\text{Total fixed costs}}{\text{Contribution margin percentage}}$$

$$\text{BEP revenues} = \frac{\$60,000}{0.60} = \$100,000$$

While the break-even point is often of interest to managers, CVP analysis considers a broader question: What amount of sales in units or in revenues is needed to achieve a specified target operating income (or profit)? The answer is easily obtained by adding target operating income to total fixed costs in the numerator of the formulas above. Assuming target operating income (TOI) is \$15,000:

□

$$\begin{array}{l} \text{Unit sales to} \\ \text{achieve TOI} \end{array} = \frac{\$60,000 + \$15,000}{\$30} = 2,500 \text{ units}$$

$$\begin{array}{l} \text{Revenues to} \\ \text{achieve TOI} \end{array} = \frac{\$60,000 + \$15,000}{0.60} = \$125,000$$

Also, as for-profit organisations are subject to income taxes, their CVP analyses must include this factor. For example, if a company earns \$50,000 before income taxes and the tax rate is 40 per cent, then:

□

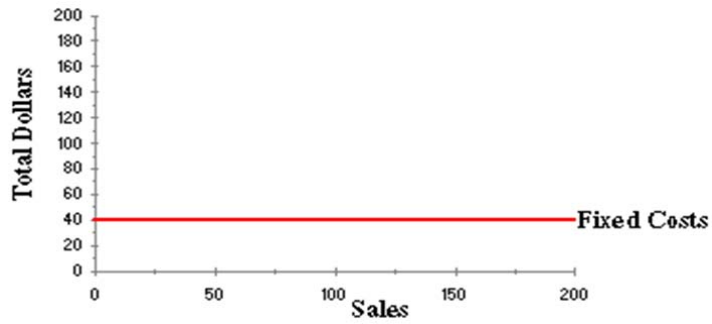
Operating income	\$50,000
Deduct income taxes (40%)	<u>20,000</u>
Net income	<u>\$30,000</u>

To state a target net income figure in terms of operating income we need to divide target net income by 1 - tax rate: $\$30,000 \div (1 - .40) = \$50,000$. Note the income-tax factor does not change the break-even point because no income taxes arise if operating income is \$0.

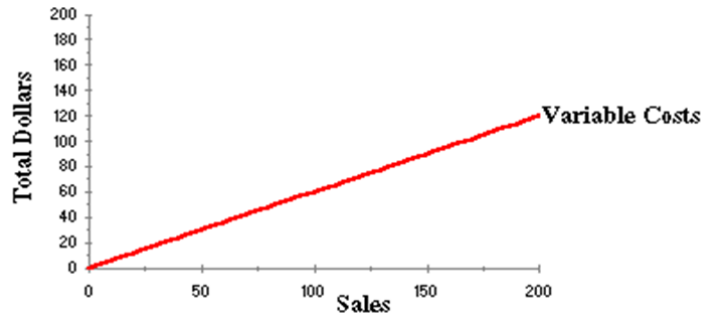
Graphical representation of CVP

The following graphs illustrate how to build a break-even chart. The example company has annual fixed costs of \$40,000, a unit selling price of \$1,000, and a unit variable cost of \$600. Since it earns \$400 from each unit that it sells for \$1,000, the company has a margin of 40 per cent ($\$400 / \$1,000$) of sales.

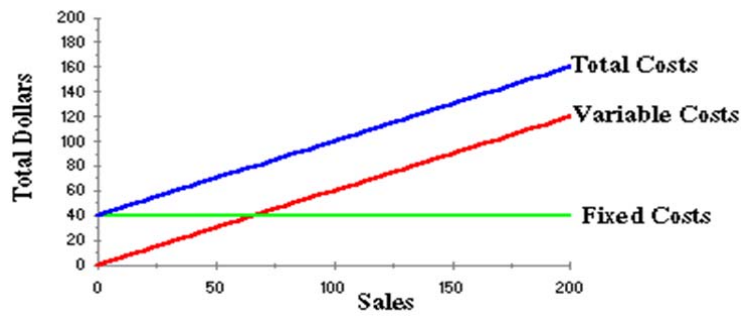
First, one draws the fixed cost line on a graph. A flat line at the \$40,000 level represents fixed costs (note: the vertical axis, total dollars, in the graphs below are in \$,000s).



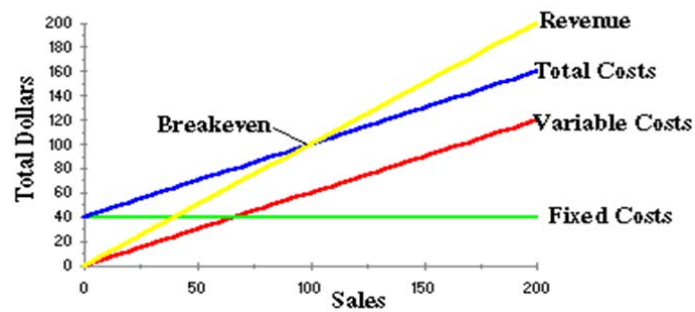
Next we show the variable cost line in this graph.



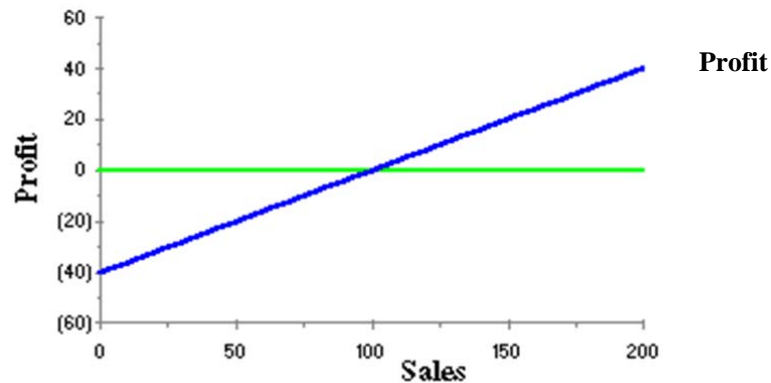
Adding the variable costs to the fixed costs provides the total costs. In break-even and cost-volume-profit analysis, accountants assume all costs are either fixed or variable.



Finally, we add the revenue line to complete the break-even chart. This line enables us to identify the break-even point, the point at which the total revenue line crosses the total cost line.



Because the break-even chart has so many lines it can be confusing to read. Accordingly, accountants have developed the profit graph to show the same information but with fewer lines. The profit graph below shows the same information as the break-even chart.



Structure, leverage and uncertainty

Managers use CVP analysis to guide their decisions, many of which are strategic. For example, CVP analysis helps managers decide how much to spend on advertising, whether or not to expand into new markets, and which features to add to existing products. Of course, different choices can affect fixed costs, variable cost per unit, selling prices, units sold, and operating income.

Single-number “best estimates” of input data for CVP analysis are subject to varying degrees of uncertainty – the possibility that an actual amount will deviate from an expected amount. One approach to deal with uncertainty is to use sensitivity analysis. Another approach is to compute expected values using probability distributions.

Sensitivity analysis is a technique for systematically changing variables in a mathematical model to determine the effects of such changes. This is sometimes known as a “what if” technique. Managers can use sensitivity analysis to examine how an outcome will change if the original predicted data are not achieved or if an underlying assumption changes.

In the context of CVP analysis, sensitivity analysis examines how operating income (or the break-even point) changes if the predicted data

for selling price, variable cost per unit, fixed costs, or units sold are not achieved. For example, what happens if the selling price changes or the variable costs change or the units sold change? Each variable could have an effect on the break-even point or the overall profitability.

The sensitivity to various possible outcomes broadens managers' perspectives as to what might actually occur before they make cost commitments. Electronic spread sheets, such as Excel, enable managers to conduct CVP-based sensitivity analyses in a systematic and efficient way.

One aspect of sensitivity analysis is margin of safety, the amount by which budgeted (or actual) revenues exceed break-even revenues. The margin of safety answers the "what if" question: If budgeted revenues are above break-even and drop, how far can they fall below the budget before the break-even point is reached?

CVP-based sensitivity analysis highlights the risks and returns that an existing cost structure holds for a company. This insight may lead managers to consider alternative cost structures. For example, compensating a salesperson on the basis of a sales commission (a variable cost) rather than a salary (a fixed cost) decreases the company's risk if demand is low but decreases its return if demand is high. The risk-return trade-off across alternative cost structures can be measured as operating leverage. Operating leverage describes the effects that fixed costs have on changes in operating income as changes occur in units sold and hence in contribution margin. Companies with a high proportion of fixed costs in their cost structures have high operating leverage. Consequently, small changes in units sold, cause large changes in operating income.

At any given level of sales:

Degree of operating leverage	$= \frac{\text{Contribution margin}}{\text{Operating income}}$
-------------------------------------	--

Knowing the degree of operating leverage at a given level of sales helps managers calculate the effect of changes in sales on operating income.

The time horizon being considered for a decision affects the classification of costs as variable or fixed. The shorter the time horizon, the greater the proportion of total costs that are fixed. For example, virtually all the costs of an airline flight are fixed one hour before take-off. When the time horizon is lengthened to one year and then five years, more and more costs become variable. This example underscores the point: which costs are fixed in a specific decision situation depends on the length of the time horizon and the relevant range.

Sales mix is the quantities of various products (or services) that constitute total unit sales of a company. If the sales mix changes and the overall unit sales target is still achieved, the effect on the break-even point and operating income depends on how the original proportions of lower or higher contribution margin products have shifted. Other things being



equal, for any given total quantity of units sold, the break-even point decreases and operating income increases if the sales mix shifts toward products with higher contribution margins.

In multiple product situations, CVP analysis assumes a given sales mix of products remains constant as the level of total units sold changes. In this case, the break-even point is some number of units of each product, depending on the sales mix. To illustrate, assume a company sells two products, A and B. The sales mix is four units of A and three units of B. The contribution margins per unit are \$80 for A and \$40 for B. Fixed costs are \$308,000 per month. To compute the break-even point:

Let 4X	=	No. of units of A to break even
Then 3X	=	No. of units of B to break even
BEP in X units	=	$\frac{\$308,000}{4(\$80) + 3(\$40)}$
BEP in X units	=	$\frac{\$308,000}{\$440} = 700$ units
A units to break even	=	$4 \times 700 = 2,800$ units
B units to break even	=	$3 \times 700 = 2,100$ units

Proof of break-even point:

□

A: 2,800 × \$80	\$224,000
B: 2,100 × \$40	<u>84,000</u>
Total contribution margin	308,000
Fixed costs	<u>308,000</u>
Operating income	<u>\$ -0-</u>

CVP analysis can be applied to service organisations and non-profit organisations. The key is measuring their output. Unlike manufacturing and merchandising companies that measure their output in units of product, the measure of output differs from one service industry (or non-profit organisation) to another. For example, airlines measure output in passenger-miles and hotels and motels use room-nights occupied. Government welfare agencies measure output in number of clients served and universities use student credit-hours.

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 break-even 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 break-even revenue.
 - b. Calculate VP's break-even 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 per 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 break-even 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.

Unit summary



Summary

In this unit you learned:

- the difference between fixed and variable costs,
- how contribution margin is revenue less variable costs,
- how target profit and tax can be incorporated into CVP calculations,
- that CVP analysis can be applied to organisations with different structures that can lead to significant levels of leverage, and
- that there are analysis tools to deal with uncertainty.

Unit 5

Relevant costs for decision-making

Introduction

This unit is intended to provide students with an introduction to the concept of relevant costs for decision-making purposes. Every decision involves choosing from among at least two alternatives. In making a decision, the costs and benefits of one alternative must be compared with the costs and benefits of other alternatives. Costs that differ between alternatives are called relevant costs.

Being able to distinguish between relevant and irrelevant costs and benefits is critical for two reasons. First, irrelevant data can be ignored, therefore saving decision-makers time and effort. Second, bad decisions can easily result from erroneously including irrelevant costs and benefits when analysing alternatives. To be successful in decision-making, managers must be able to tell the difference between relevant and irrelevant data and must be able to correctly use the relevant data in analysing alternatives.

The unit comprises four main sections:

1. Identifying relevant costs and benefits
2. The make or buy decision process
3. Adding or dropping a product line or segment
4. Outsourcing problems

Upon completion of this unit you 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.



Terminology



Terminology

Incremental cost:	A cost that is incurred by specifically following a course of action and that is avoidable if such action is not taken.
Opportunity cost:	A level of profit or benefit foregone by the pursuit of a particular course of action.
Sunk cost:	A cost that has already been incurred and cannot be altered by any future decision.

Identifying relevant costs and benefits

Relevance is one of the key characteristics of good management accounting information. This means that management accounting information produced for each manager must relate to the decisions that he or she will have to make.

Relevant costs are the costs that meet this requirement of good management accounting information. The Chartered Institute of Management Accounting (CIMA) defines relevant costs as “*the costs appropriate to a specific management decision*”.

This definition could be restated as: relevant costs are the amount by which costs increase and benefits decrease as a direct result of a specific management decision. Accordingly, relevant benefits are the amounts by which costs decrease and benefits increase as a direct result of a specific management decision.

Before the management of an enterprise can make an informed decision on any matter, they need to incorporate all of the relevant costs which apply to the specific decision at hand in their decision-making process. To include any non-relevant costs or to exclude any relevant costs will result in management basing their decision on misleading information and ultimately to poor decisions being taken.

Relevant costs and benefits only deal with the quantitative aspects of decisions. The qualitative aspects of decisions are of equal importance to the quantitative and no decision should be made in practice without full consideration being given to both aspects.

Identifying relevant and non-relevant costs

The identification of relevant and non-relevant costs in various decision-making situations is based primarily on common sense and the knowledge of the decision maker of the area in which the decision is being made.

In identifying relevant costs for various decisions, you may find that some costs not included in the normal accounting records of an enterprise are relevant and some costs included in such records are non-relevant. It is important that you realise that there is a substantial difference between recorded accounting costs and relevant costs for decision-making, and while the latter may be recorded in the former, this is not always the case. Accounting records are used to record the incidence of actual costs and revenues as they arise. Decisions, on the other hand, are based only on the relevant costs and benefits appropriate to each decision while the decision is being made. This point is particularly appropriate when you come to examine opportunity costs and sunk costs, which are dealt with below.

In practice, you may also find that the information presented in respect of a decision does not include all the relevant costs appropriate to the decision but the identification of this omission is very difficult unless you are familiar with the area in which the decision is being made.

The more common types of costs which you will meet when evaluating different decisions are incremental, non-incremental and spare capacity costs, which are defined as follows:

- **Incremental costs.** An incremental cost can be defined as a cost which is incurred by specifically following a course of action and which is avoidable if such action is not taken. Incremental costs are, by definition, relevant costs because they are directly affected by the decision (that is, they will be incurred if the decision goes ahead and they will not be incurred if the decision is scrapped). For example, if an organisation is deciding whether or not to accept a special order for its product, the extra variable costs (number of units in special order x variable cost per unit) that would be incurred in filling the order are an incremental cost because they would not be incurred if the special order were to be rejected.
- **Non-incremental costs.** These are costs which will not be affected by the decision at hand. Non-incremental costs are non-relevant costs because they are not related to the decision at hand (non-incremental costs stay the same no matter what decision is taken). An example of non-incremental costs would be fixed costs, which by their very nature should not be affected by decisions (at least in the short term). If, however, a decision gives rise to a specific increase in fixed costs then the increase in fixed costs would be an incremental and, hence, relevant cost. For example, in a decision on whether to extend the factory floor area of an organisation, the extra rent incurred would be a relevant cost for that decision.
- **Spare capacity costs.** Because of the recent advancements in manufacturing technology most enterprises have greatly increased their efficiency and as a result are often operating at below full capacity. Operating with spare capacity can have a significant impact on the relevant costs for any short-term



production decision the management of such an enterprise might have to make.

If spare capacity exists in an organisation, some costs which are generally considered incremental may in fact be non-incremental and thus, non-relevant, in the short term. For example, if an organisation is operating at less than full capacity then its work force is probably under-utilised. If it is the policy of the organisation to maintain the level of its work force in the short term, until activity increases, then the labour cost of this work force would be a non-relevant cost for a decision on whether to accept or reject a one-off special order. The labour cost is non-relevant because the wages will have to be paid whether the order is accepted or not. If the special order involved an element of overtime then the cost of such overtime would of course be a relevant cost (as it is an incremental cost) for the decision.

- **Opportunity costs.** An opportunity cost is a level of profit or benefit foregone by the pursuit of a particular course of action. In other words, it is the value of an option, which cannot be taken as a result of following a different option. For example, if an organisation has a quantity of raw material in stock which cost \$7 per kg and it plans to use this material in the filling of a special order then you would normally incorporate \$7 per kg as part of your cost calculations for filling the order. If, however, this quantity of material could be resold, without further processing, for \$8 per kg, then the opportunity cost of using this material in the special order is \$8 per kg. By filling the order you forego the \$8 per kg which was available for a straight sale of the material. Opportunity costs are, therefore, the 'real' economic costs of taking one course of action as opposed to another.

In the above decision-making situation it is the opportunity cost which is the relevant cost and, hence, the cost which should be incorporated into your cost-versus-benefit analysis. It is because the loss of the \$8 per kg is directly related to the filling of the order and the opportunity cost is greater than the book cost. Opportunity costs are relevant costs for a decision only when they exceed the costs of the same item in the option for the decision under consideration.

You may find the idea of opportunity costs difficult to grasp at first because they are notional costs, which may never be included in the books and records of an organisation. They are, however, relevant in certain decision-making situations and must be taken into account when assessing any such situations.

- **Sunk costs.** A sunk cost is one that has already been incurred and cannot be altered by any future decision. If sunk costs are not affected by a decision then they must be non-relevant costs for decision-making purposes. Common examples of sunk costs are market research costs and development expenditure incurred by organisations in getting a product or service ready for sale. The final decision on whether to launch the product or service would

regard these costs as “sunk” (irrecoverable) and therefore not included in the launch decision.

Sunk costs are the opposite of opportunity costs in that they are not included in the decision-making process even though they have already been recorded in the books and records of the organisation.

Evaluating decisions involving relevant and non-relevant costs

When faced with making a decision, there are generally two tasks that need to be undertaken before making the final decision:

1. Evaluate the options in the decision on a monetary basis using cost-versus-benefit analysis.
2. Take account of the qualitative factors associated with each option in the decision.

Nearly all decisions involve some relevant and non-relevant costs. As stated earlier the hardest part of the evaluation process will be the identification of the relevant costs for the decision. This identification is often required from a large amount of information that has to be assessed to ensure the completeness of the evaluation.

Once the relevant costs are identified for each option then a cost-versus-benefit analysis for each option is developed. The next step is to select the one that results in the greatest gain or least cost to the organisation.

However, in practice, qualitative factors can result in a different option being selected than that suggested by the quantitative evaluation.

Make or buy decision process

Companies must frequently choose between using outside vendors/suppliers or producing a good or service internally. Outsourcing occurs across many functional areas. For example, some companies outsource data processing, technical support, payroll services and similar operational aspects of running a business. Manufacturing companies also may find it advantageous to outsource certain aspects of production (frequently termed the *make or buy* decision). Further, some companies (for example, certain high-profile sporting apparel companies) have broad product lines, but actually produce no tangible goods. They, instead, focus on branding and marketing and outsource all manufacturing.

Outsourcing has been around for decades, but it has received increased media and political attention with the increase in global trade. Taxes, regulations and cost factors can vary considerably from one global region to another. As a result, companies must constantly assess the opportunities for improved results through outsourcing.



The outsourcing decision process should include an analysis of all relevant costs and benefits. Items that differ between the “make” alternative and the “buy” alternative should be studied. As detailed in the previous section, sunk costs should not be considered as part of the decision analysis. A comparison is generally made between the variable production/manufacturing costs of a service/product with the purchase price of the service/product. Unless the outsourcing option results in a complete elimination of a factory or facilities, the fixed overhead normally continues whether the service/product is purchased or produced. As a result, unavoidable fixed overhead does not vary between the alternatives and can be disregarded. However, if some fixed factory overhead can be avoided by outsourcing, it should be taken into consideration as a relevant item.



Case Study/Example

A company is often faced with the decision as to whether it should manufacture a component or buy it outside.

Suppose for example, that Williams Ltd. makes four components, A, B, C and D, with expected costs for the coming year as follows:

	A	B	C	D
Production (units)	1,000	2,000	4,000	3,000
Unit variable costs	\$	\$	\$	\$
Direct materials	4	5	2	4
Direct labour	8	9	4	6
Variable production overheads	<u>2</u>	<u>3</u>	<u>1</u>	<u>2</u>
Total variable costs	<u>14</u>	<u>17</u>	<u>7</u>	<u>12</u>

Direct fixed costs/annum and committed fixed costs are as follows:

Incurring as a direct consequence of making A	\$1,000
Incurring as a direct consequence of making B	\$5,000
Incurring as a direct consequence of making C	\$6,000
Incurring as a direct consequence of making D	\$8,000
Other committed fixed costs	<u>\$30,000</u>
	<u>\$50,000</u>

A subcontractor has offered to supply units A, B, C and D for \$12, \$21, \$10 and \$14 respectively.

Decide whether Williams Ltd. should make or buy the components.

Solution and discussion

The relevant costs are the differential costs between making and buying. They consist of differences in unit variable costs plus differences in directly attributable fixed costs. Subcontracting will result in some savings on fixed cost.

	A	B	C	D
	\$	\$	\$	\$
Unit variable cost of making	14	17	7	12
Unit variable cost of buying	<u>12</u>	<u>21</u>	<u>10</u>	<u>14</u>
Incremental (cost) / saving of making vs buying	(2)	4	3	2
Annual requirements in units	1,000	2,000	4,000	3,000
Extra variable cost of buying per annum	(2,000)	8,000	12,000	6,000
Fixed cost saved by buying	<u>(1,000)</u>	<u>(5,000)</u>	<u>(6,000)</u>	<u>(8,000)</u>
Extra total cost of buying	<u>(3,000)</u>	<u>3,000</u>	<u>6,000</u>	<u>(2,000)</u>

The company would save \$3,000/annum by sub-contracting component A, and \$2,000/annum by sub-contracting component D.

In this example, relevant costs are the variable costs of in-house manufacture, the variable costs of sub-contracted units and the saving in fixed costs.

Other important considerations are:

- If components A and D are sub-contracted, the company could have spare capacity. How should that spare capacity be profitably used? Are there hidden benefits to be obtained from sub-contracting? Will there be resentment from the workforce?
- Would the sub-contractor be reliable with delivery times and is the quality the same as those manufactured internally?
- Does the company wish to be flexible and maintain better control over operations by making everything itself?
- Are the estimates of fixed costs savings reliable? In the case of product A, buying is clearly cheaper than making in-house. However, for product D, the decision to buy rather than make



would only be financially attractive if the fixed cost savings of \$8,000 could be delivered by management. In practice, this may not materialise.

Adding and dropping product lines and segments

One of the more difficult decisions management must make is when to abandon a product line, department or business unit that is performing poorly. Such decisions can have far-reaching effects on the company and shareholder perceptions about management, employees and suppliers.

Management should not merely conclude that any unit generating a net loss is to be eliminated. This is an all-too-common error made by those who lack sufficient accounting knowledge to look beyond the bottom line. Sometimes, eliminating a unit with a loss can reduce overall performance. Consider that some fixed costs identified with a discontinued unit may continue and must be absorbed by other units. This creates a potential domino effect where each failing unit pushes down the next. Instead, the appropriate analysis is to compare company-wide net income *with* and *without* the unit targeted for elimination.

Closure or shutdown problems involve the following types of decisions:

- Whether or not to close a factory, department, product line or other activity, either because it is making losses or because it is too expensive to run.
- If the decision is to shut down, whether the closure should be permanent or temporary. Shutdown decisions often involve long-term considerations, capital expenditures and revenues.
- A shutdown should result in savings in annual operating costs for a number of years in the future.
- Closure results in release of some fixed assets for sale. Some assets might have a small scrap value, but others, such as property, might have a substantial sale value.
- Employees affected by the closure must be made redundant or relocated, perhaps even offered severance or early retirement. There will be lump sums payments, which must be taken into consideration. For example, suppose closure of a regional office results in annual savings of \$100,000, fixed assets sold off for \$2 million, but redundancy payments would be \$3 million. The shutdown decision would involve an assessment of the net capital cost of closure (\$1 million) against the annual benefits (\$100,000 per annum).



Case Study/Example

The following is a segmented income statement for Grass Limited.

	Total	Product Lines		
		U	V	W
Sales	\$250,000	\$100,000	\$75,000	\$75,000
Variable expenses	<u>119,000</u>	<u>37,000</u>	<u>35,000</u>	<u>47,000</u>
Contribution margin.....	131,000	63,000	40,000	28,000
Traceable fixed expenses*	98,000	31,000	37,000	30,000
Common expenses, allocated..	<u>32,900</u>	<u>18,000</u>	<u>10,500</u>	<u>4,400</u>
Net operating income (loss) ...	<u>\$ 100</u>	<u>\$ 14,000</u>	<u>\$(7,500)</u>	<u>\$(6,400)</u>

*These traceable expenses could be eliminated if the product lines to which they are traced were discontinued.

Recommend which segments, if any, should be eliminated.

Solution and discussion

A segmented income report, without the allocation of common fixed expenses, will provide the basis for deciding which segments to drop.

	Total	Product Lines		
		U	V	W
Sales	\$250,000	\$100,000	\$75,000	\$75,000
Variable expenses	<u>119,000</u>	<u>37,000</u>	<u>35,000</u>	<u>47,000</u>
Contribution margin.....	131,000	63,000	40,000	28,000
Traceable fixed expenses	98,000	31,000	37,000	30,000
Segment margin	<u>33,000</u>	<u>\$32,000</u>	<u>\$3,000</u>	<u>\$(2,000)</u>
Common expenses, allocated.....	<u>32,900</u>			
Net operating income (loss)	\$100			

The only segment that possibly should be eliminated is segment W, which shows a negative segment margin of \$2,000.

Outsourcing dangers

In the make or buy section above, we used the example of Williams Ltd. trying to decide whether to produce components in-house or have the production of the components out-sourced. In the discussion and solution to this problem we highlighted some qualitative issues that should be considered before making any decision. In this section we explore some of these issues further.

Outsourcing analysis is made more complicated if a business is operating at capacity. If outsourcing will free up capacity to be used on other services or products, then the contribution margin associated with the additional services or products also becomes a relevant item in the decision process. In other words, if a company continues to manufacture a product in lieu of outsourcing, it foregoes the chance to produce the alternative product. The loss of this opportunity has a cost that must be



considered in the final decision. It is appropriate to factor opportunity costs into any outsourcing analysis.

In addition to the opportunity cost considerations, companies must be very careful to consider qualitative issues in making decisions about outsourcing. Outsourcing places quality control, production scheduling and similar issues in the hands of a third party. It is therefore important to continually monitor the supplier's financial health and ability to continue to deliver quality products on a timely basis.

If goods are being moved internationally, goods may be subject to high freight costs, customs fees, taxes and other costs. Delays are often associated with the uncertain logistics of moving goods through brokers, large sea ports and homeland security inspections. Hopefully rare, but not to be ignored are risks associated with relying on suppliers in politically unstable environments as significant disruptions are not without precedent.

Language barriers can also be problematic. Although global trade is increasingly reliant on English, there are still many misunderstandings brought about by a failure to have full and complete communication.

Additionally, some global outsourcing can be met with customer resistance. Examples include frustrations with call centres and technical support lines where language barriers become apparent and customers protest or reject the service because of perceived unfair labour practices in certain global regions.

However, despite the potential problems, there are decided trends suggesting that the most successful businesses learn to utilise logical outsourcing opportunities in both local and global markets.

Activity 2.2



Activity

- 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!
- 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?



- b. 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?



Unit summary



Summary

In this unit you learned to:

- Identify relevant costs and benefits.
- Evaluate make or buy decisions and understand the process to arrive at a decision.
- Evaluate adding or dropping a product line or segment.
- Be aware that there are a number of outsourcing problems which need to be addressed in arriving at a decision.

Activity feedback

Activity 2.1

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. Break-even point = $\$135,000 \div 0.30 = \$450,000$

Proof of break-even point:

Revenues	\$450,000
Variable costs, \$450,000 x 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. $20x - 12x - 20,000 = 0$

$8x = 20,000$



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

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

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

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

$$8x = 18,000$$

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

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

- 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.

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

Or using the answer from below:

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

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

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

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

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.

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

Fixed Costs \$200,000

$$\text{Break-even in units} = \$200,000/\$40$$

$$= 5,000 \text{ units}$$

- 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
Break-even 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



Activity 2.2

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)

- According to the company's accounting system, the product's net operating loss is \$10,000.
- 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	<u>(1,557,000)</u>
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.