

The background of the entire page is a complex, abstract geometric pattern composed of numerous triangles in various shades of blue and purple. The triangles are of different sizes and are arranged in a way that creates a sense of depth and movement. The colors range from deep navy blue to bright cyan, with various intermediate shades of indigo and violet. The pattern is dense and covers the entire surface of the page.

Management Accounting Supplement

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Table of contents

M1	Introduction to management accounting	1
M2	Cost-volume-profit analysis	27
M3	Introduction to costing	49
M4	Introduction to activity-based costing	79
M5	Budgeting and the planning process	103

Chapters M2—M5 of this supplement are an adaption of three chapters from *Financial and Management Accounting* by M.A. Diamond, D.R. Hansen and D.S. Murphy, South-Western Publishing Co, 1994.

M1

Introduction to management accounting

ON COMPLETION OF THIS CHAPTER YOU SHOULD BE ABLE TO:

- summarise the basic aims of management accounting
- identify the users of management accounting information
- distinguish management accounting from financial accounting
- understand how management accounting can assist in the attainment of an organisation's strategic goals
- identify different organisational settings and describe the role of cost information in each setting
- define basic cost concepts
- classify costs by function
- prepare an absorption-costing income statement and explain how financial statements differ among manufacturing, service, and merchandising organisations.

M1.1 CHAPTER OVERVIEW

In this chapter we define a **management accounting system**, outline the role it plays within an organisation and describe how management accounting differs from financial accounting. Particular emphasis is placed on how management accounting can assist in the attainment of an organisation's strategic objectives. The chapter presents several basic cost concepts, the way they are classified and the role of cost information in the management of organisations.

M1.2 What is Management Accounting?

Accounting is widely acknowledged as ‘a process of identifying, measuring and communicating economic information to allow informed decisions by the users of that information’. More specifically, the terms ‘management accounting’ and ‘management accounting system’ relate to the provision of information specifically for the internal decision-makers within an organisation. In this chapter we will expand on these basic descriptions.

Management accounting includes a broad spectrum of activities and can be described as the procedures, practices and methods that are employed by an organisation’s management to ensure the effective use of its resources. To guarantee the optimum deployment of resources, a management accounting system relies on all aspects of the broader accounting system to collect and distribute the best available data to a hierarchy of managers within an organisation so as to assist in their collective objective to increase **stakeholder value**.

While we will expand on the issue of stakeholder value in a later section, we can say now that the rationale for the existence of any organisation is to simply provide benefit to its various stakeholders. The success of management is measured on its ability to maximise both the long- and short-term benefits flowing to a range of organisational stakeholders. As a result, all levels of management are constantly involved in making decisions as to how resources should be best employed within their specific business unit so as to pursue this objective. Resources may include the organisation or business unit’s cash or other assets, its internal services, its expertise, its staff – effectively anything that it controls that can be used to produce benefit. Resource allocation decisions can be generically categorised as one of planning, directing, motivating and/or controlling where and how resources can best be utilised by the organisation to optimise the increase in stakeholder value. As a result, an effective management accounting system should specifically identify, collect, measure, classify and report information that is useful to all managers in making these types of decisions.

Our definition and discussions of management accounting systems must remain initially generic because of the range of organisations that operate within Australia. For example, consider differences between Westpac, BHP, Woolworths, Apple, the University of New South Wales, the Red Cross and the Swans Football Club. The diversity of these entities means the specific characteristics of an effective management accounting system may vary significantly from one organisation to another, or even between the various business units within a single organisation. This is because the information requirements of management will differ based on the type of business it operates and the size, nature or structure of the organisation. For example, the information needs of management of a large, complex mining organisation will be much different to those of a small, family-owned, wholesale business. The resources each entity has available to develop a management accounting system will also be significantly different.

In addition to their diverse organisational characteristics, within all organisations there is a hierarchy of management, from the very senior executive officers, who may require long-term, strategically important data, to lower-level managers who may simply need daily information on the short-term operational aspects of their specific business unit within the organisation. Overall, this diversity means management accounting systems, while having similar generic characteristics and objectives, may vary considerably in practice from one organisation to the next.

M1.3 How Does Management Accounting Differ from Financial Accounting?

As the previous section suggests, the primary distinction between the two major subsystems of an organisation’s *accounting information system* is the *targeted user*. The management accounting system produces information for **internal users**, whereas the *financial accounting system* produces it for **external users**. It should be emphasised, however, that both the management accounting system and the financial accounting system are part of the total accounting information system and that both subsystems rely extensively on transaction-based data.

In the text, we have looked at the financial reports of Woolworths Ltd. Why does the management of Woolworths Ltd prepare an annual balance sheet, income statement and statement of cash flows? It is so that stakeholders outside of the organisation can assess the financial position and performance of the organisation over previous periods.

As you know from the text, the compilation of these statements relies on the concept of 'historic cost' and as a result, the *financial accounting* perspective of Woolworths Ltd is based on its past performance. If the management of Woolworths Ltd is to continue to add value to its stakeholders, they need to reconfigure that data in a way that will allow them to determine how the organisation will use its resources in subsequent accounting periods. As a result, *management accounting* tends to emphasise the collation of accounting information in a way that can be used for planning or decision-making purposes and is thus more focused on the future than financial accounting. Financial accounting has a historical orientation, so it records and reports what has happened, while management accounting seeks to determine what should happen.

As noted above, being a major component of the total accounting information system, the management accounting system relies heavily on historic transaction-based data. However, where financial accounting is heavily reliant on the transactional data collected from an organisation's journals and ledgers, a management accounting system, in seeking to adopt a future-orientation, integrates both current and historic information assembled from a variety of internal and external sources such as employees, customers and market-sourced databases.

Depending upon the characteristics of the organisation, the nature of the data collected may be both financial and non-financial. The integration of data from a variety of sources provides an organisation's management with a more holistic representation of their business unit and thus allows them to plan, direct, motivate and control it through the development of a variety of financial, operational and physical metrics. What types of financial and non-financial information do you believe the various managers of Woolworths Ltd would seek to utilise in their decisions regarding the organisation's future use of resources? What types of data would the organisation's management accounting system seek to collect from Woolworth Ltd's employees, customers or from external databases?

Earlier we suggested the diversity among and within organisations meant management accounting systems, although similar in their characteristics and objectives, may vary considerably in practice between organisations. Now reconsider the financial statements of Woolworths Ltd for a moment. If you were to review the notes that accompany the organisation's financial statements, you would find that rather than a single entity, Woolworths Ltd is an amalgamation of many subsidiary organisations. Woolworths Ltd controls subsidiary businesses working across five main operating groups. These clusters not only include the food and liquor retail operations of their Australian and New Zealand supermarkets but also petrol supply through a network of service stations, Big W stores and hotel (and gaming) businesses.

Woolworth Ltd's financial statements pool all of these subsidiary entities into a single set of reports that provides only a consolidated view of the organisation. As a result, the reports disclose only one 'sales' figure, one 'net profit' figure, one 'total asset' figure or one amount that represents 'cash flow from operating activities' for the entire group. Given the large volume of economic transactions that each of the subsidiary organisations would be involved in during a single accounting period, and the inherent diversity of the five main operating areas, these statements can only provide a very aggregated perspective of the workings of each of the individual business units. While such an overview is useful to those people outside the organisation, it will provide little support to those managers making resource-allocation decisions within each of the organisations. Because Woolworths Ltd operates these different business units across a number of geographic locations within Australia and New Zealand, if its management accounting system is to facilitate effective decision-making it must 'identify, measure and communicate economic information' relevant to each of these segments and settings individually, using an appropriate level of detail and at a reasonable cost.

As the text has previously suggested, it is very important that organisations provide reliable, comparable and understandable information, in their financial reports so as to maximise their utility for external users. As a consequence, when comparing management accounting to financial accounting it should be noted that the former is not subject to the requirements of generally accepted accounting principles. As outlined in earlier chapters, a variety of interested parties are involved in the development and monitoring of the structure and contents of external financial reports. However, there are no official bodies that prescribe the format, contents or rules for preparing internal management accounting reports. Managers are free to choose whatever information they want and present it in a manner they wish, provided it can be justified on a cost-benefit basis. This means that where the management of a company needed to comply with international and Australian reporting requirements in the preparation of the

financial reports, no such obligation exists with regard to the structure and components of their internal management accounting reports or the systems used to create them. So it becomes important to note the emphasis in the design of the management accounting system may be more on relevance, timeliness and flexibility rather than reliability. While management desires organisational information to be as reliable as possible, given the need to make decisions on a very timely basis, they often can't wait for that information to be absolutely confirmed. As a result, organisations must tailor information to specific management's needs in a form that best suits them. It may often just come down to how the individual managers want the information presented.

M1.4 Contemporary Management Accounting and Stakeholder Value

Most people would acknowledge that the business environment in Australia continues to evolve very quickly and that organisations are all operating in an increasingly competitive world. For example, everybody is aware that the technological changes and innovations associated with online retailing are rapidly changing all consumer markets. As a result, retailers operate in an environment where customers are increasingly expecting lower prices and a greater variety of goods or services. Retailers, their competitors and their suppliers are always under growing pressure to not only get products to the market but also to provide a wider range of goods and services to their customers at a lower cost. Given such competitive pressures, the time-compression needed to develop products and make them available to consumers has grown incrementally over recent years. In addition to the increasing consumer demands associated with online shopping, management must simultaneously consider and balance the expectations of the capital markets and the potential for government and regulatory intervention. Given the complexity of the situation and the range of stakeholders involved, management's decisions as to the current allocation of organisational resources will have significant implications for the organisation's performance in future periods.

Early in this chapter, a management accounting system was said to include those aspects of an organisation's accounting processes that collect and distribute the best available data to various levels of management in their objective to increase stakeholder value. Before we can explore the data requirements needed to support procedures, practices and methods that are employed by management we must appreciate the objective of increasing stakeholder value. As a consequence, to truly understand the role that management accounting plays in an organisation we need to answer two questions: Who are the stakeholders? And what does it mean to 'add value' to those stakeholders?

If we again refer to the above scenario we can ask, 'Who are the stakeholders of a large retailer?' The above suggests that a large retailer's primary stakeholders are its shareholders and customers. We could add to this list their employees, state and federal governments, suppliers, regulators and the communities within which the company operates. The text has outlined those parties interested in the data provided by financial accounting reports. If these external stakeholder groups are using financial reports to assess the overall performance of an organisation and its management, it is reasonable to expect that the management accounting system must also be sensitive to how these stakeholders view the success or failure of the organisation and therefore the activities or processes that occur within the organisation that will drive those desired outcomes. For example, management must be aware that to enhance the value of the organisation to its shareholders, they need to actively employ organisational resources to increase profits and dividends while promoting capital growth. Equally, management must pursue policies that add value to the company's customers, such as the provision of a wide variety of goods and services at lower prices. Management must actively seek to understand and balance the needs, expectations and desired returns that each of these stakeholder groups demands from their organisation.

As a result, the management accounting system needs to collect and report data that will allow an organisation's management to plan, direct, motivate and control those procedures, practices and methods associated with delivering the desired outcomes expected by stakeholders. For example, Woolworths Ltd, in adding value to its shareholders, may require data that helps senior managers make the right decisions so that they can maximise the organisation's *operating profit* or the *return on its shareholder's equity*. This will require the collection of information

about the relative sales, costs and assets deployed by the individual business units within the group. This data will then be merged with the short-term and long-term funding requirements of various business units to determine the individual contributions of each segment of the organisation to its overall success.

However, in adding value to its customers, management of a retailer may need to isolate data on the volume of sales of their individual products at various locations so as to best service their consumers' demands across their retail network. This may include external information about the various markets within which the stores operate, and internal data collected from those employees involved in the actual sales process. Simultaneously, if a company is to succeed, its management accounting system must also gather information that allows management to add value to the organisation's employees by making it a more attractive and fulfilling working environment. Equally, the management accounting infrastructure must also assemble data on how the organisation adds value to the local communities with which it interacts and to its suppliers through the provision of mutually beneficial contracts for their goods and services.

As we can see, the variety of stakeholders and their needs means the demand for information within a company is significant and very diverse. Thus, an effective management accounting system is a substantial component of a complex organisation's management function.

M1.5 Management Accounting Systems and Organisational Strategies

For the management of an organisation to successfully add value to all of its stakeholders, it needs to have a well-defined strategy in place showing how they plan to achieve this. A strategy can be described as a 'map' of an organisation's future that bridges the gap between where it is and where it wants to be and outlines how it intends to get there.

Many organisations outline their strategies in a set of formal documents, which often include a *mission statement*. This statement assists in defining the organisation, explicitly describing the nature of the businesses within which it will operate and clearly outlining its purpose for existing. Having defined the organisation's **corporate strategy**, the statement then outlines how it will contest the markets within which its business units will operate. As an organisation often competes across a number of sectors and within a variety of geographic regions, the content of its **business strategy** needs to be segment-specific. While varying in their degree of detail, strategic statements must reflect that the different markets within which an organisation operates have different characteristics and require different approaches. So again revisiting a large retailer, we can say that those people that manage the Eastlakes retail store may face a different market (and a very different set of situations and decisions) to the manager of petrol distribution across Victoria. The manager of a Chatswood supermarket may face a range of different decisions to the manager of a hotel in Perth, although both are part of the group of companies that form the total entity.

While other subjects in your studies will more comprehensively examine the strategies available to those managing organisations, given the focus of this chapter on how management accounting systems aid in the decision-making process, it is useful to briefly look at two basic strategic models. The first is **cost leadership**. This is an approach that sees an organisation compete in a market using a strategy based on having a lower product or **service cost** than its competitors. Cost leadership is often associated with organisations that operate at high levels of sales-turnover, with tight controls over their product's costs. Such a strategy is often underpinned by higher levels of economic scale. An alternative strategy is based on **product differentiation**. As the name suggests, this approach relies on an organisation's product or service exhibiting characteristics or attributes that make it more desirable to consumers other than simply its low price. Organisations adopting this approach attempt to differentiate their products by highlighting their uniqueness in a variety of ways. Some organisations differentiate their products through their brand image, its quality or innovation, others on the basis of the additional services they provide consumers (e.g. full service versus a discount airline).

While some organisations may compete solely on a strategy of cost leadership and others only using product differentiation, many large, diverse organisations would have some of their products or business units adopting differing strategies. While the strategic approach selected by an organisation's management in practice may be

determined by a number of factors or attributes, the primary consideration cited by most observers lies in the organisation or its business unit's **competitive advantage**. An organisation's competitive advantage is the advantage it holds over its competitors, which is difficult to easily duplicate. This may include its ownership of intangible assets, such as the rights to technology or a widely recognised brand. Alternatively, an organisation's advantage may come from its existing scale of operation, geographic location or a host of other determining factors.

Usually having outlined both the organisation's corporate and business strategies management will include the ways by which they intend to implement their plans, both in the long- and short-term. This involves providing an overview of how and where within the organisation resources will be channelled. For example, if an organisation sees its comparative advantage is in its large scale of operations and wishes to further pursue a strategy based on cost leadership, it may seek to achieve its objectives through the acquisition of more assets or other existing companies. Alternatively, an organisation may believe its advantage lies in its product's uniqueness, adopt a differentiation-based approach and thus outline its plans for the internal development of new technologies and improvements to its current product range. Having outlined their plans for resource utilisation, often such documents regularly include senior management's vision of the goals that the organisation aspires to achieve in the future after they have implemented their strategies. This vision outline by management should be aligned directly with the *value-add* to its stakeholders.

Collectively these strategic documents provide the foundations upon which management develops the long- and short-term objectives for the various business units they control within the organisation. Short-term objectives are those that the organisation primarily seeks to achieve within a twelve-month period. Long-term objectives tend to be those objectives that take perhaps 3–5 years, but certainly have a horizon of more than a single year. An organisation's objectives are often quite broad in that they encompass a number of organisational goals. This is understandable given that a variety of stakeholders are all seeking to benefit from their involvement with the organisation. An organisation's objectives may include both financial and non-financial goals, such as growth, profitability, innovation, market share, and service or product quality and employee satisfaction.

It is these objectives that determine the actual procedures, practices and methods that are employed by management and thus the day-to-day processes adopted by each of an organisation's individual business units that are needed to operationalise its plan. To be effective, the management accounting system needs to provide information supportive of these day-to-day processes. This means the management accounting system needs to collect, collate and distribute information (such as budgets or product costing data) that helps business unit management to plan and manage their resources.

Management needs to *direct* and *motivate* its workforce in the implementation of its plans. This means there is a need to *monitor* and *control* their employee's performance. In terms of a management accounting system, 'controls' refer to those attributes of the system that ensure that the business unit operates according to the organisation's plan and that the strategies are carried out and the objectives are therefore met. This usually entails management translating the procedures, practices and methods used by the organisation into *measurable outcomes* or **performance measures**.

Simply knowing that their performance will be measured often impacts on the approach people take to implementing an organisation's plans. If an individual is aware that management is going to monitor the quality or quantity of his or her outputs, then that changes what they do in practice. So the monitoring and measuring of performance provides a form of control over people's behaviour. For most situations this entails a comparison between the actual performances an individual or business unit was required to undertake and the desired levels of their performance that were outlined in the organisation's plan. Often just the act of measuring people's performance against a desired target aligns their performance and decisions with those required by the organisation's strategies and goals.

Again, given the diversity of different organisations, and the different business units within each organisation, there will be a need to establish different performance measures to monitor and control people within the organisation. The most important thing is that management needs to appropriately link performance measures to organisational strategy. For example, an organisation seeking to pursue a strategy associated with cost leadership will tend to want to more closely control different aspects of its business processes and thus have different performance measures than another organisation that is seeking to *differentiate* its products or services. Overall, it is

an organisation's strategy that will affect its goals, the way it hires, trains and remunerates people and thus what kind of measures it will use to assess their performance.

An organisation may have both financial and non-financial measurable objectives. The measures it employs may also be both backward and forward looking. Financial measures tend to be focused on an individual or business unit's past performance and are therefore backward-looking. Examples of financial objectives include a desired level of sales, a desired return on equity or assets, a desired profit margin or percentage of cost reduction. Forward-looking metrics are predominantly based upon non-financial measures. Examples of non-financial goals may be expressed in terms of product quality, leadership or innovation, employee satisfaction, customer satisfaction or community engagement. For example, have you booked an airline ticket, rented a car or stayed at a hotel and then been given a customer satisfaction survey?

So what are the basic attributes of a good performance measure? Effective performance measures must be understandable. An important aspect to the success of the monitoring and controlling functions is that employees understand and accept that their performance measures are relevant. For employees to seek to achieve the levels of performance sought by management, they need to consciously understand and agree that the performance measure is a reasonable, achievable indicator of their input to the organisation's operations. To be understandable, performance measures need to be as specific as is possible. Terms such as innovation or satisfaction may mean many things to different people. A good measure is also comparable within the company and across companies over different time periods. Both financial and non-financial objectives are most effective when they specifically nominate the desired level of performance required by management for a nominated period of time. As mentioned earlier, management accounting systems vary significantly from one organisation to another, or even within the various business units of a single organisation, but to truly assist the management of an organisation with the implementation of strategy performance measures, they need to be customised to the organisation's desired outcomes.

M1.6 Management Accounting, Strategy and Costing

Alternate corporate strategies lead to different objectives, which in turn lead to a variety of operating procedures, practices and methods. These different plans will mean organisational controls will be based on different measures of performance, and this will lead to management accounting systems collecting and distributing data centred on the individual information requirements of management. One important function of an organisation's management accounting system is to determine the cost of an organisation's products or services.

Why is product or service cost data particularly important to management in the implementation of an organisation's strategy? To answer this question, we need to revisit the two basic strategic models that we discussed in an earlier section. As you may recall, cost leadership is a strategy that sees an organisation compete primarily on its product's relative price. To succeed in simultaneously adding value to both its customers and shareholders, the organisation must price its product as inexpensively as possible. Given that the cost leadership approach is usually associated with products or commodities of a relatively homogenous nature, management knows that even a slight price advantage over its competitors will maximise its market share. As a result, organisations will adopt a *target costing* approach. In applying this approach, management uses competitive market data to determine what the optimum price of a product should be. They then subtract a desired profit margin from that price, which then provides them with a 'target' cost for the product. Given that the success of a cost leadership strategy is based on consistently achieving that targeted cost, an organisation needs an effective management accounting system to constantly monitor and tightly control the resources it uses in the production process.

The second strategy is based on product differentiation. This model relies on an organisation's product or service exhibiting unique attributes that make it more desirable to consumers other than simply its low price. While a cost leadership model obviously demands the collection of cost-based data, so does a strategy based on product differentiation. Even with the most desirable characteristics, as a product's price increases, consumer demand for it generally declines. Consumers do not have limitless resources and, as a result, as a product's price rises,

progressively greater proportions of consumers choose alternative commodities. Managers need to understand both the market demand and cost structures of their products at various production levels in order to optimise their returns. Where a cost leadership model relies on a target costing approach, product differentiation uses the more traditional cost-plus margin method in its pricing decisions. Using a cost-plus margin approach, management simply look to the management accounting system to determine the total unit cost of the product at various volumes of sales and then add the desired profit margin to establish both a selling price and the sales volume that maximises shareholder value.

History tells us that the pricing and costing of products are fundamentally important aspects of management, as there are many examples of organisations that have failed because their costing systems did not provide appropriate support. The management of these organisations could not accurately determine the cost of their products and as a result the products were either overpriced or underpriced and consumers eventually rejected them, or the shareholders did not receive the returns they desired. In later chapters of this text, we will further explore some issues in the costing of products and the relationship product cost shares with sales volume and an organisation's overall profitability.

M1.7 Costing and Organisational Frameworks

As noted above, management accounting systems vary significantly between organisations. However, given its importance to strategic decision-making, a common element shared by all effective management accounting systems is the collection and reporting of product or service cost data. To understand and pursue their organisation's strategy and thus request the appropriate information provided by a management accounting system, all managers must have a basic knowledge of cost concepts and the terminology that defines them.

To understand and effectively use product or service cost data, managers need to contextualise it within the type of organisation they are operating. In general, organisations can be classified into one of three categories: **manufacturing**, **merchandising**, or **service**.

Manufacturing organisations produce goods by converting raw materials into a physical product through the use of labour, materials and capital inputs such as land, factories and machinery. An important distinguishing characteristic of a manufacturing organisation from an accounting perspective is that to support the production process it must hold three different types of inventory. These are **raw materials**, **work in progress** and **finished goods inventories**.

As the name implies, raw materials are the basic physical inputs from which a finished product will be manufactured. A manufacturing organisation needs to hold sufficient supplies of these materials to ensure a continuity of production. For example, timber would be the raw material used to make wooden tables. Work in progress is inventory that is comprised of raw materials that have been partially processed, but not yet finished. In order to have work in progress, an organisation must have used up some of its supplies of raw materials. As the organisation has partially processed these raw materials, it must also have incurred both some labour and overhead costs. When an organisation has completed the manufacturing process, it has transformed raw materials and partially complete products into finished goods. Prior to their eventual sale, the organisation will hold an inventory of finished goods. Thus at any point in time, an organisation may hold all three different types of inventory. All three inventories will be used to determine a manufacturing organisation's *cost of goods sold*. We will further define and discuss the implications of these different inventories in a later section of this chapter.

Manufacturing organisations usually sell their goods to merchandising organisations (or to other manufacturing organisations) and as a consequence will also incur administration and selling costs. Such organisations currently operating in Australia include General Motors Holden and Fosters Brewing, who produce goods such as automobiles and beer or wine.

Merchandising organisations buy goods already made (by manufacturers) and then sell them on to consumers or to other merchandising organisations. Merchandising organisations selling directly to consumers are sometimes referred to as *retailers*. Merchandising organisations selling to other merchandising organisations are widely referred to as *wholesalers*.

The treatment of merchandising inventory is much simpler than that of a manufacturer because they are only dealing in completed goods rather than manufacturing their own products. As a result, this type of organisation does

not have supplies of raw materials, or partially completed products in work in progress, nor do they stock unsold goods that they have recently finished. They only have supplies of merchandising inventory that is ready for sale. Very simply, when these organisations sell their merchandising inventory it becomes cost of goods sold. Like manufacturers, merchandising organisations also incur administration and selling costs.

Examples of merchandising organisations operating in Australia range from very large to very small. They include Woolworths Ltd and its major competitor Coles Myer, as well as Harvey Norman and a wide variety of smaller retailers.

Service organisations differ from both manufacturing and merchandising organisations in two ways. First, they deal with intangible products (or services) rather than tangible ones. Importantly, this means these organisations do not carry any type of inventory. Second, many service organisations are not profit-making. Examples of profit-making service organisations are Telstra, Westpac, KPMG and Qantas. Examples of non-profit service organisations include the Australian Taxation Office and Department of Defence (government agencies), the Red Cross (charitable organisation), and some hospitals. However, like both manufacturing and merchandising organisations, service providers do incur administrative and selling/marketing costs.

While the manufacturing sector in Australia has contracted during the last twenty years, the service sector has rapidly expanded. Providers of educational services, tourism and professional services now make up an increasingly greater proportion of the Australian economy.

Although manufacturing organisations offer the richest array of cost concepts and applications, most of the management accounting practices and processes are applicable to both of the other two organisational settings. The management of each of these organisational types requires an array of cost information to effectively allocate resources and add to stakeholder value. While all profit-making organisations and many non-profit organisations engage in selling, marketing and administrative activities, only manufacturing organisations are involved in production. The type and quantity of information needed by managers, however, will always depend on the organisation and the type of activities in which it engages. For example, manufacturing organisations are often more complex and engage in more activities than either service or merchandising organisations; thus, managers in these organisations need more specific cost information about individual products, processes and activities within the organisation. However, for service organisations the array of activities can be large. For example, airlines such as Qantas perform a lot of activities besides flying, such as check-in, reservations and frequent flyer programs.

M1.8 Basic Cost Concepts

Management accounting systems use their own specialised terminologies. Learning this vocabulary is essential to understanding the concepts and procedures discussed throughout this section. One of the main purposes of this chapter is to introduce the basic cost terminology used in these systems.

Before cost terminology can be discussed, the term 'cost' itself must be defined. *Cost* is the cash or cash equivalent value sacrificed for goods and services that are expected to bring a current or future benefit to the organisation. We say 'cash equivalent' because non-cash assets can be exchanged for the desired goods or services. For example, it may be possible to exchange land for some needed equipment.

Costs are incurred to produce future benefits. These future benefits will add value to an organisation's stakeholders. In a profit-making organisation, future benefits usually mean revenues. As costs are used up in the production of revenues, they are said to expire. Expired costs are called *expenses*. In each period, expenses are deducted from revenues to determine the period's profit.

Many costs do not expire in a given period. As you are aware from the text, unexpired costs are classified as *assets* and appear on the balance sheet. Equipment and the addition to a factory building are examples of assets lasting more than one period. Note that the main difference between a cost being classified as an expense or an asset is *timing*. This distinction is important and will be referred to in the development of other cost concepts later in the text.

From your studies in economics you will know an *opportunity cost* is the benefit given up or sacrificed when one alternative is chosen over another. For example, choosing to attend university instead of working has an opportunity

cost equal to the wages foregone. Similarly, an organisation may choose to invest \$100,000 in inventory for a year instead of investing the capital in a productive investment that would yield a 12 per cent rate of return. The opportunity cost of having the capital tied up in inventory is \$12,000 ($0.12 \times \$100,000$) and is part of the cost of carrying the inventory. While opportunity costs do not appear in the 'books' or financial statements of an organisation, they are often critical inputs for managerial decisions. For example, the \$12,000 opportunity cost of carrying inventory is equivalent to a cash outlay of \$12,000. This cost is an important factor for a manager to consider when assessing different inventory policies.

A **differential cost** is the cost associated with the different ways an organisation may achieve the same outcome. A differential cost is the amount by which a cost differs between the two or more alternatives. Suppose, for example, that you are trying to decide whether to drive or fly to Noosa over the mid-session break. Upon investigation, you find that the cost of a return-trip plane ticket is \$350. The cost of driving, including petrol, is \$200. The differential cost is computed as follows:

	\$
Flying option	350
Driving option	<u>200</u>
Differential cost	<u>150</u>

A **sunk cost** is a cost for which an outlay has already been made. It is a cost that has been paid and is irretrievable. Thus, sunk costs cannot be changed by any present or future decision. For example, depreciation is a sunk cost – it represents the assignment of a portion of a past cash outlay to a particular time period. Because sunk costs cannot be changed, they should have no bearing on the decision. Unfortunately, we attempt too often to consider these costs in our decisions. How often have you heard people say that they cannot afford to get rid of a car because they have sunk too much money into it (new carburettor, new tyres, etc.)? Yet the outlays already made have no bearing on the decision because the funds spent in the past are irretrievable regardless of whether the car is kept or not. What they need to do is compare the future costs and benefits of keeping the car with the future costs and benefits of disposing of it.

Often, managers are given responsibility for certain cost items. They are held accountable for these items and are evaluated on their ability to ensure that expenditures for the items do not exceed some predetermined level. If managers are to be held accountable for certain costs, they must be able to control these costs. **Controllable costs** are those costs heavily influenced by a manager – in effect, costs a manager is authorised to incur. For example, a maintenance manager has the ability to authorise the use of supplies in repair work. The cost of these supplies is, therefore, a controllable cost for the maintenance manager. The maintenance manager, however, is not free to negotiate the rental on the building for which he is charged a certain percentage. In this case, rent is an example of a **non-controllable cost** – a cost over which the manager has no significant influence. Although the maintenance manager may not have control over the rent, someone does. The factory manager, for example, may be the person who has this control. All costs are controllable at some level. Controllability, therefore, depends on the point of reference.

A **cost object** is any item or activity, such as products, departments, projects, and so on, to which costs are assigned. Effectively, a cost object is anything that the management of an organisation wants to know the cost of. Cost objects may be a product, a department, a process or a customer. In most of the examples used in this chapter, the cost object will be the product.

Direct costs are those costs that can be traced to a cost object, in a convenient and cost-effective way. **Indirect costs** are those costs that are common to several cost objects and, accordingly, are not directly traceable to any one particular cost object. Assume, for example, that the cost object is an assembly department. The salary of the supervisor of this department is directly traceable to the department and, therefore, is a direct cost of the department. The salary of the gatekeeper, however, is common to all departments in the plant. It is an indirect cost of the assembly department. Like controllable costs, traceability depends on the point of reference. While the salary of the

supervisor is a direct cost of the assembly department, it is an indirect product cost if more than one product is assembled in that department.

As can be seen, there are many different types of costs. There are different costs for different purposes. For example, some costs are used for decision-making (e.g. differential costs) and other costs are used for performance evaluation (e.g. controllable costs). There are also many different ways that costs can be classified. We have chosen to classify costs into two major categories: by function and by behaviour. These cost categories correspond to two different ways of organising costs for purposes of external and internal financial reporting. The functional classification, the traditional way of viewing costs, plays a key role in the external reporting activities of an organisation.

Alternatively, you can classify costs according to their behaviour. The behavioural approach to classifying costs provides information more suitable for planning and control and thus is often more beneficial to internal users. For example, costs can be divided into fixed and variable costs (see our next chapter). In the following chapters we will discuss what is meant by cost behaviour and examine how costs change over different levels of activity. The remainder of this chapter will focus on the functional approach.

M1.9 Functional Classification of Costs

For a management accounting system to be effective it needs to organise costs in terms of the special purposes, or functions, they serve. The remaining sections of the chapter will primarily focus on manufacturing organisations but can be equally applied to merchandising or service organisations.

In a manufacturing organisation, costs are subdivided into two major functional categories: *manufacturing* and *non-manufacturing*. As the term would imply, manufacturing costs are those associated with the production function in the plant or factory. Non-manufacturing costs are those costs associated with the functions of selling and administration.

As a result, a functional cost classification is consistent with the way an organisation would present its financial statements. By that we mean the income statement for an organisation will have revenue minus the cost of goods sold, giving the user gross margin. Gross profit less selling, general and administrative costs then determines net profit. This approach follows tradition in that the income statement separates cost of goods sold from all the other costs based on their function. What is the function of the cost? If the cost is related to inventory or manufacturing, it is a component of the cost of the goods actually sold. If the cost is related to selling or administration, it is not a component of the cost of the inventory sold. As a result, a functional cost classification relates to the way an organisation sets out its income statement, and for that reason it is more of an external-user orientation.

Manufacturing costs can be further subdivided into direct manufacturing costs and indirect manufacturing costs.

Direct manufacturing costs

Manufacturing costs may be classified as either direct or indirect. Direct manufacturing costs are those manufacturing costs that are directly traceable to the product being converted from raw materials into a finished good. In a single-product organisation, all manufacturing costs are traceable to the product. In a traditional, multiple-product organisation, there are two types of direct manufacturing costs: the cost of raw materials and the cost of the labour needed to convert the raw materials into a finished product.

Raw materials are those materials that actually become part of the product. Since they are directly traceable to the product, they are commonly referred to as direct materials. While many types of materials may be used in the manufacturing process, direct materials are only those materials that can be easily associated with the finished product. In other words, direct materials are only those materials that can be traced to the finished product in a convenient and cost-effective way. For example, steel in a motor vehicle, wood in furniture, alcohol in beer, denim in jeans, and plastic in a microcomputer would all be classified as direct materials.

The cost of labour used to convert raw materials to a finished product is usually referred to as direct labour. This direct labour cost is directly traceable to the product. To be classified as a direct labour cost, the labour must be

actually involved with the physical transformation of the raw materials into the finished goods. As with direct materials, direct labour is only that labour that can be traced to the finished product in a convenient and cost-effective way. Workers actually on an assembly line at a car manufacturing plant or in the mixing department of a paint factory are examples of direct labourers.

Indirect manufacturing costs

In a traditional, multiple-product manufacturing environment, direct materials and direct labour are the only manufacturing costs assumed to be directly traceable to products. All other costs associated with the manufacturing process are indirect manufacturing costs; these costs are common to all products. This occurs because of the difficulties that arise when you have numerous products or services being produced and all jointly generate some costs. How do you apportion those costs to the individual products or services produced? Given that the costs would be difficult to directly trace to each of the finished products in a convenient and cost-effective way, we would have to allocate them to all the products. In other words, indirect manufacturing costs cannot be traced to any one product. Indirect costs are lumped into one category called *manufacturing overhead*. Manufacturing overhead is also known as *factory burden* or *indirect product costs*. For simplicity, we will usually refer to manufacturing overhead as *overhead*.

The overhead cost category contains a wide variety of items. Many inputs other than direct labour and direct materials are needed to make a product. All factory-related indirect costs belong to the overhead category. Examples include depreciation on plant and equipment, maintenance, supplies (indirect materials), supervision, material handling and other indirect labour, electricity, landscaping of factory grounds, and factory security. *Indirect materials* are generally those materials necessary for production that do not become part of the finished product. Lubricating oil for machinery used in production is an example of an indirect material. The oil is necessary to maintain the machinery but is not directly traceable to any one product. Raw materials that form an insignificant part of the final product are usually lumped into the overhead category as a special kind of indirect material. This is justified on the basis of cost and convenience. The glue used in furniture or toys is an example.

Indirect labour is generally all factory labour other than those workers who actually transform the raw materials into a finished good. Examples include production-line supervisors, cleaners, store clerks, and maintenance workers.

The cost of overtime for direct labourers is usually assigned to indirect labour as well. The rationale is that typically no particular production run can be identified as the cause of the overtime. Accordingly, overtime cost is common to all production runs and is therefore an indirect manufacturing cost. Note that *only* the overtime cost itself is treated this way. If workers are paid a \$16 regular rate and an \$8 overtime premium, only the \$8 overtime premium is assigned to overhead. The \$16 regular rate is still regarded as a direct labour cost. In certain cases, however, overtime is associated with a particular production run; for example, a special order is taken when production is at 100 per cent capacity. In these special cases, it is appropriate to treat overtime premiums as a direct labour cost.

Labour costs include additional labour-related expenses for staff who work directly on the product (e.g. payroll tax, workers' compensation insurance). Because on-costs represent a significant component of the total direct labour cost, the best approach for handling this item is to assign it to the direct labour cost category. In practice, some organisations also treat the cost of labour on-costs as an overhead item. This practice can be justified only on the basis of convenience, since the cost of on-costs for direct labour technically should be a direct labour cost.

Non-manufacturing costs

There are two categories of non-manufacturing costs: selling costs and administrative costs. The level of these costs can be significant (often greater than 25 per cent of sales revenue), and controlling them may bring greater cost savings to a manufacturing organisation than the same control exercised in the area of production costs. Furthermore, the relative importance of selling and administrative costs is greater in merchandising organisations because those organisations do not engage in production. Service organisations, on the other hand, do produce an intangible product, so the production function is present in this type of organisation. The relative importance of selling and administrative costs depends on the nature of the service being produced. Physicians and dentists, for example, do

very little marketing and thus have very low selling costs. In contrast, airlines and insurance companies have significant selling costs.

Those costs necessary to market and distribute a product or service are called *marketing* or *selling costs*. Examples of these costs include such items as salaries and commissions for sales personnel, advertising, warehousing, customer service, and shipping. The first two items are examples of order-getting costs; the last three are order-filling costs.

All costs associated with the general administration of the organisation that cannot be reasonably assigned to either marketing or manufacturing are *administrative costs*. General administration has the responsibility of ensuring that the various activities of the organisation are properly integrated so that the overall mission of the organisation is realised.

Examples, then, of administrative costs are top executive salaries (e.g. general manager, financial controller, head of human resources), legal fees, printing the annual report, general accounting, internal audit and research and development.

Related cost concepts

The manufacturing and non-manufacturing classifications give rise to some related cost concepts. The functional delineation between non-manufacturing and manufacturing costs is essentially the basis for the concepts of period costs and product costs – at least for the purposes of external reporting. Combinations of different manufacturing costs also produce the concepts of conversion costs and prime costs.

Costs that are expensed in the period in which they are incurred are called **period costs**. Costs are incurred to produce future benefits (usually revenues) and as costs are used up, they expire and are matched against the revenues they generated. They are associated with a specific time period and we consider that to be matching. So they are expensed and deducted from revenue in that period, when they are incurred. Generally we can say that period costs benefit only the period in which they are incurred. This is not entirely accurate, of course. Some costs classified as period costs may actually benefit more than one period. For example, an airline may advertise its flights to warm, sunny Cairns in May. Some people will see these ads and immediately book a trip to Cairns. Others will let the idea sit quietly in the back of their minds until the following July, and then buy tickets. If the year-end is 30 June, one advertisement has led to sales in two different time periods. Thus, the extreme difficulty of matching advertising costs with benefiting periods justifies the expedient practice of expensing all of these costs immediately.

To illustrate the concept of period costs, we consider a sales supervisor. Her salary is incurred and expensed during the year because she is expected to produce sales during the year. The next year, the same cost is incurred with the expectation that sales will be produced in *that* year. The salary is period-related and should be matched with the revenues produced during that period.

Anything that is not in the 'factory' actually involved in the production process is generally considered to be a non-manufacturing cost. As a result, all selling and administrative costs are viewed as being period-related. Thus, such costs as sales commissions, depreciation on delivery trucks and warehouses, salary of the pilot for the corporate jet, legal fees, and public relations are examples of period costs. They are deducted, in total, each and every period from the revenues of the period.

Some costs have the potential to produce revenues beyond the current period. The costs of manufacturing a product are incurred because benefits (revenues) will be realised upon the sale of the product. However, products produced currently can be placed in inventory and sold in some future period. When the product is sold, the potential benefits for which the costs were incurred are realised. Then, and only then, are the costs expensed (e.g. cost of goods sold). Consequently, costs to produce a product in a current period can appear as expenses in several different future periods, depending on when they are sold.

Recall that the costs of direct materials, direct labour, and overhead are incurred to produce finished goods. These costs are product-related, not period-related. Until the finished goods are sold, these costs appear as assets (inventory) on the balance sheet. Therefore, for external financial reporting, **product costs** are defined as manufacturing costs that are first inventoried and later expensed as the goods are sold.

This is a concept that many students have trouble dealing with. To understand their difficulties we need to consider what is happening from the financial accounting perspective. You remember from the text that the inventory account is an asset. Therefore raw materials, work in progress and finished goods are all classified as asset accounts. Because expenditures such as the cost of rent or the depreciation on the organisation's equipment are flowing into the inventory account, they are, therefore, being treated as an asset rather than an expense of the period. So at what point does this become an expense? This means these expenses are being **capitalised** in the inventory account until they are sold. It is only when the organisation sells the inventory that its manufacturing costs become an expense within the cost of goods sold account.

The unit product cost is simply the cost of producing one unit of a product. For external financial reporting, product costs are defined as direct materials, direct labour, and overhead. Thus, the unit product cost is the amount of direct materials, direct labour, and overhead cost assigned to a single unit of production

For example, in producing a can of beer, a brewery might incur the following costs:

	\$
Direct materials (can, yeast, water, etc.)	0.12
Direct labour	0.02
Overhead	<u>0.16</u>
Total unit cost	<u>0.30</u>

The unit product cost just defined is driven by the requirements of external financial reporting. If a bottling company has 100,000 cans of beer on hand at the end of the year, it would be reported as a \$30,000 asset ($\$0.30 \times 100,000$).

For managerial purposes, other definitions of product cost may, at times, be more suitable. For planning and decision-making purposes, managers may demand a different definition of product cost. For example, a manager may want to know the comprehensive cost of a new product – a unit cost that includes both manufacturing and non-manufacturing costs – to have some idea of what selling price should be set to earn an acceptable return. In this case, a unit product cost might appear as follows:

	\$
Direct materials	12.00
Direct labour	5.00
Overhead	14.00
Selling and administrative	<u>6.00</u>
Total unit cost	<u>37.00</u>

The manager would then know that a proposed selling price of \$36 per unit would be unacceptable. Unit selling and administrative costs must also be covered.

Other unit cost definitions based on cost behaviour may also prove useful to managers. The key point to understand is that internal managerial needs should not be restricted by the formal external reporting requirements. Managerial product costing is designed to provide the information managers need and is not necessarily concerned with inventory valuation. This illustrates the maxim of 'different costs for different purposes'. It may also require 'different systems for different purposes'. One cost accounting system may be needed for inventory valuation (to satisfy external reporting requirements), another for managerial product costing, and a third for control.

Two other useful cost terms are *prime cost* and *conversion cost*. Management sometimes refers to a combination of direct materials and direct labour as a product's **prime costs**. **Conversion costs** refer to the combined labour and overhead costs that are incurred in the transformation of direct material into a finished product. The reason they call these things conversion costs is that they say these are the costs that we incur in converting the raw materials into our product.

M1.10 Financial Statements and the Functional Classification

The functional classification is the cost classification required for *external* reporting. This approach is mandated for financial statements prepared for external use.

The income statement based on a functional classification for a manufacturing organisation is displayed in Exhibit M1.1. This statement follows the traditional format used in financial accounting. Profit computed by following a functional classification is frequently referred to as an **absorption-costing profit** or **full-costing profit** because *all* manufacturing costs are fully assigned to the product.

Under the absorption-costing approach, expenses are segregated according to function and then deducted from revenues to arrive at profit before taxes. As can be seen in Exhibit M1.1, there are two major functional categories of expense: cost of goods sold and operating expenses. These categories correspond, respectively, to an organisation's manufacturing and non-manufacturing expenses. Cost of goods sold is the cost of direct materials, direct labour, and overhead attached to the units sold. To compute the cost of goods sold, it is first necessary to determine the cost of goods manufactured.

EXHIBIT M1.1

INCOME STATEMENT: FUNCTIONAL CLASSIFICATIONS FOR THE YEAR ENDED 30 JUNE 2017

	\$	\$
Sales		4,000,000
Cost of goods sold:		
Beginning finished goods inventory	500,000	
Add: Cost of goods manufactured	2,400,000	
Goods available for sale	2,900,000	
Less: Ending finished goods inventory	(300,000)	2,600,000
Gross profit		1,400,000
Less operating expenses:		
Selling expenses	600,000	
Administrative expenses	300,000	(900,000)
Profit before tax		<u>500,000</u>

Cost of goods manufactured

The *cost of goods manufactured* represents the total cost of goods completed during the current period. The only costs assigned to goods completed are the manufacturing costs of direct materials, direct labour, and overhead. The details of this cost assignment are given in a supporting schedule, called the *statement of cost of goods manufactured*. An example of this supporting schedule for the income statement in Exhibit M1.1 is shown in Exhibit M1.2. Notice in Exhibit M1.2 that the total manufacturing costs added during the period are added to the manufacturing costs found in beginning work in progress, yielding total manufacturing costs to account for. The costs found in ending work in progress are then deducted from total manufacturing costs to arrive at the cost of goods manufactured. If the cost of goods manufactured is for a single product, then the average unit cost can be computed by dividing the cost of goods manufactured by the units produced. For example, assume that the statement in Exhibit M1.2 was prepared for the production of bottles of perfume and that 480,000 bottles were completed during the period. The average unit cost is \$5 per bottle ($\$2,400,000 / 480,000$).

Work in progress consists of all partially completed units found in production at a given point in time. Beginning work in progress consists of the partially completed units on hand at the beginning of a period. Ending work in

progress consists of those on hand at the period's end. In the statement of cost of goods manufactured, the cost of these partially completed units is reported as the cost of beginning work in progress and the cost of ending work in progress. The cost of beginning work in progress represents the manufacturing costs carried over from the prior period; the cost of ending work in progress represents the manufacturing costs that will be carried over to the next period. In both cases, additional manufacturing costs must be incurred to complete the units in work in progress.

EXHIBIT M1.2

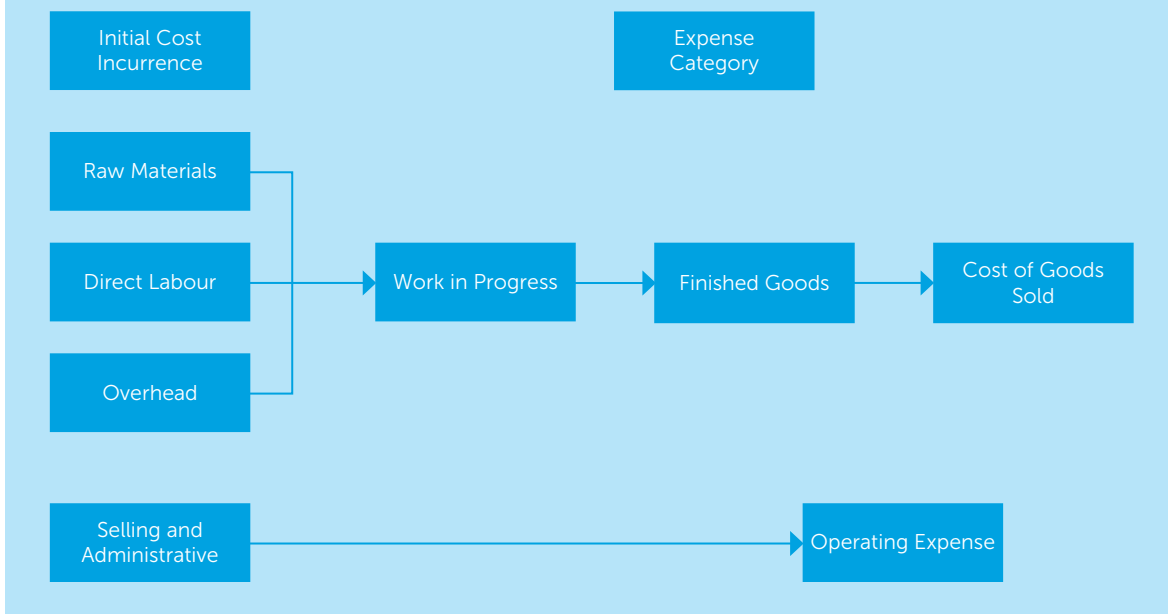
**STATEMENT OF COST OF GOODS MANUFACTURED
FOR THE YEAR ENDED 30 JUNE 2017: FUNCTIONAL CLASSIFICATIONS
FOR THE YEAR ENDED 30 JUNE 2017**

	\$	\$
Direct materials:		
Beginning inventory	400,000	
Add: Purchases	<u>900,000</u>	
Materials available	1,300,000	
Less: Ending inventory	<u>(100,000)</u>	
Direct materials used		1,200,000
Direct labour		700,000
Manufacturing overhead:		
Indirect labour	255,000	
Depreciation	345,000	
Rent	100,000	
Electricity	75,000	
Factory cleaning	25,000	
Maintenance	<u>100,000</u>	<u>900,000</u>
Total manufacturing costs added		2,800,000
Add: Beginning work in progress		<u>400,000</u>
Total manufacturing costs		3,200,000
Less: Ending work in progress		<u>(800,000)</u>
Cost of goods manufactured		<u>2,400,000</u>

Cost flows in a manufacturing organisation

Costs are accounted for from the point they are incurred to their recognition as expenses on the income statement. This process is referred to as **cost flows**. As will be shown, the cost flows of a manufacturing organisation are more complex than those of a service organisation or those of a merchandising organisation.

The cost flow pattern of manufacturing organisations is displayed in Exhibit M1.3. For a manufacturing organisation, the selling and administrative costs are expensed immediately. However, the flow of product costs is more involved. In order to produce, the organisation must purchase raw materials, acquire services of direct labourers, and incur overhead costs. As raw materials are purchased, the costs are initially assigned to an inventory account (i.e. raw materials inventory). When materials are placed in production, costs flow from the raw materials inventory account to the work in progress inventory account. The cost of direct labour is assigned to the work in progress account as it is incurred. Overhead costs are accumulated in a separate account and assigned periodically to the work in progress account (the procedures for assigning overhead are discussed in a later chapter). When the goods being worked on are completed, the costs associated with these goods are transferred from the work in progress account to the finished goods inventory account. Finally, when the goods are sold, the cost of the finished goods is transferred from finished goods inventory to the cost of goods sold expense account.

EXHIBIT M1.3**COST FLOWS: MANUFACTURING FIRMS****Comparison to merchandising organisations**

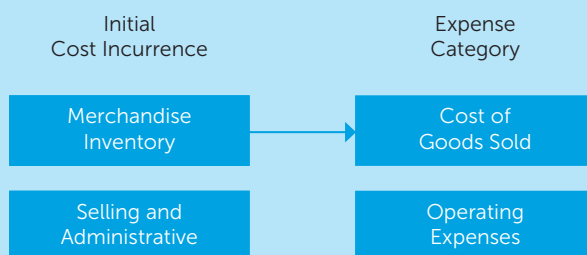
An income statement for a merchandising organisation is shown in Exhibit M1.4. Note that for a merchandising organisation, the two major functional cost classifications still exist but correspond to product costs and non-product costs. The concept of cost of goods sold also differs. In a merchandising organisation, cost of goods sold represents the acquisition cost of the goods, rather than the manufacturing cost. This acquisition cost is simply the amount paid for the goods being sold. This is more easily determined than is the cost of goods manufactured.

EXHIBIT M1.4**INCOME STATEMENT FOR A MERCHANDISING ORGANISATION**

	\$	\$
Sales		5,000,000
Less cost of goods sold:		
Beginning inventory	1,000,000	
Add: Purchases	3,000,000	
Goods available for sale	4,000,000	
Less: Ending inventory	<u>(850,000)</u>	(3,150,000)
Gross profit		1,850,000
Less operating expenses:		
Selling expenses	500,000	
Administrative expenses	<u>750,000</u>	<u>(1,250,000)</u>
Profit before tax		<u>600,000</u>

The cost flow pattern for a merchandising organisation is shown in Exhibit M1.5. Operating costs, as incurred, are immediately expensed. Merchandise, however, is acquired, and the acquisition cost is first assigned to the inventory account. Later, when the merchandise is sold, the costs flow, or are transferred, to an expense account, namely cost of goods sold.

When comparing the cost flows of manufacturing and merchandising organisations, we find that a manufacturing organisation possesses two additional categories of inventory: raw materials and work in progress. Since a merchandising organisation deals only with finished goods, these production-related inventories are not required. This difference manifests itself in two ways on the financial statements of the two entities. First, manufacturing organisations have a supporting schedule for the cost of goods manufactured figure appearing on the income statement. The second manifestation affects the balance sheet. A merchandising organisation will show only a merchandise inventory account in the asset section, whereas a manufacturing organisation will show three inventory accounts: raw materials, work in progress, and finished goods.

EXHIBIT M1.5**COST FLOWS: MANUFACTURING FIRMS****Comparison to service organisations**

An income statement for a service organisation is shown in Exhibit M1.6. For a service organisation, the functional classifications correspond to service and non-service categories. The cost of services sold is computed differently from the cost of goods sold in a manufacturing organisation. For example, for a dentist, the cost of services would include raw materials (e.g. amalgam for fillings), overhead (e.g. depreciation on dental equipment, electricity, and rent), and direct labour (e.g. salary of a dental assistant). But unlike a manufacturing organisation, the service organisation has no finished goods inventories – it is not possible to have opening and closing finished goods inventory. Thus, product costs for a service organisation expire in the period incurred.

EXHIBIT M1.6**INCOME STATEMENT FOR A SERVICE ORGANISATION**

	\$	\$
Sales		300,000
Less expenses:		
Cost of services sold:		
Direct materials	50,000	
Direct labour	100,000	
Overhead	100,000	(250,000)
Gross profit		50,000
Less operating expenses:		
Selling expenses	4,000	
Administrative expenses	17,500	(21,500)
Profit before tax		28,500

Since all product costs are effectively period costs in a service organisation, no distinction is usually made between the service and non-service categories when preparing the income statement. However, knowing the cost of services sold can provide valuable information for the managers or owners of service organisations. The need for

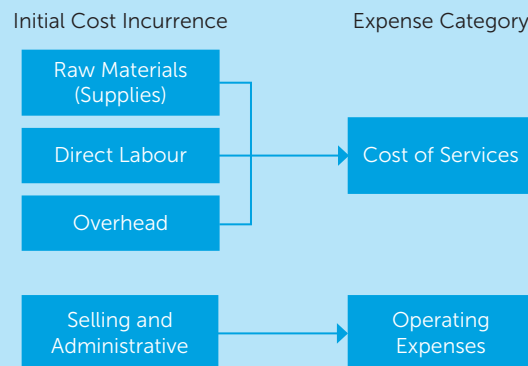
many service organisations to accurately assign costs to services has become even more critical because of the deregulatory movement that has taken place over the past five to ten years.

Deregulation has brought stiff competition, and managers in the affected industries (e.g. airlines and telecommunications) need to know the cost of each service being marketed to make pricing decisions and profitability assessments. According to some experts, deregulation in the service industry has unleashed an enormous demand for improved cost accounting. For example, banks have become very interested in the costs of their various services.

Understanding how income statements differ across the three different kinds of organisations provides some insight into the cost flows that occur within them. This, in turn, helps us to understand how cost accounting differs among the three types of organisations.

The cost flow pattern for a service organisation is shown in Exhibit M1.7. Raw materials, those materials directly involved in providing the service and often referred to as *supplies*, are purchased and their cost flows into the inventory account. As materials, direct labour, and overhead are used to provide the service, these costs are expensed immediately. The cost of materials flows from the inventory account to the expense account cost of services sold. As with service costs, the operating costs of selling and administration are expensed as they are incurred.

Comparing the manufacturing cost flows to the cost flows of service organisations reveals some significant differences. Service organisations use direct materials, direct labour, and overhead. However, service organisations cannot build inventories of services. Consequently, there are no work in progress or finished goods inventories and generally no work in progress. The exception would be a consulting firm that may be partway through a job at year-end.

EXHIBIT M1.7**COST FLOWS: SERVICE ORGANISATION**

PRACTICE PROBLEMS

Solutions to practice problems can be found online at <http://login.cengagebrain.com/>. These problems are intended to facilitate self-study and additional practice. Don't look at the solution for any of these without giving the problem a serious try first, because once you have seen the solution, it always looks easier than it is.

PRACTICE PROBLEM A

Cost Classification

Classify the following costs as product or period costs (for external reporting purposes). For those costs that are product costs, identify the costs as direct materials, direct labour, or overhead.

- 1 Legal fees paid by a corporation
- 2 Depreciation on the factory building
- 3 Advertising
- 4 Wages of a factory storeroom clerk
- 5 Wages of a sewing machine operator in a clothes factory
- 6 Lubricating oil for sewing machines
- 7 Overtime wages paid to the sewing machine operators
- 8 Corporate-level research and development costs
- 9 Sugar in a chocolate bar
- 10 Insurance on a warehouse and its inventory
- 11 Salary of a cleaner in a factory
- 12 Depreciation on office equipment (at corporate headquarters)

PRACTICE PROBLEM B

Cost of Goods Manufactured and Cost of Goods Sold

Using only the following account information for the year ending 31 December 2016, prepare an income statement (include a supporting schedule showing the cost of goods manufactured) for Smith Ltd:

	\$
Work in progress inventory, 1 January 2016	20,000
Work in progress inventory, 31 December 2016	4,000
Finished goods inventory, 1 January 2016	80,000
Finished goods inventory, 31 December 2016	24,000
Direct materials inventory, 1 January 2016	60,000
Direct materials inventory, 31 December 2016	10,000
Accounts receivable, 1 January 2016	100,000
Accounts receivable, 31 December 2016	60,000
Accounts payable, 1 January 2016	80,000
Accounts payable, 31 December 2016	40,000
Revenue	700,000
Direct manufacturing labour	80,000
Indirect manufacturing labour	40,000
Purchase of direct materials	160,000
Marketing and distribution costs	180,000
Plant electrical expenses	10,000
Depreciation of factory equipment and building	18,000



>>	Rates on factory	2,000
	Factory overheads	20,000
	Factory supplies used	12,000

KEY TERMS

Absorption-costing or full-costing	Cost object	Prime and conversion cost
Business strategy	Differential cost	Product and period cost
Capitalised	Direct and indirect cost	Product differentiation
Competitive advantage	External users	Product or service cost
Controllable and non-controllable cost	Internal users	Raw material, work in progress, finished goods
Corporate strategy	Management accounting system	Stakeholder value
Cost flows	Manufacturing, merchandising and service organisations	Sunk cost
Cost leadership	Performance measures	

HOMEWORK AND DISCUSSION TO DEVELOP UNDERSTANDING

DISCUSSION QUESTIONS

- 1 What is meant by the term 'accounting information system'?
- 2 Explain the role management accounting plays in an organisation.
- 3 Outline the differences between a financial accounting information system and a management accounting information system.
- 4 Define the basic elements of a management accounting information system.
- 5 Why do management accounting systems primarily focus on relevance, timeliness and flexibility rather than reliability?
- 6 Explain how a cost leadership strategy differs from a product differentiation strategy.
- 7 How has global competition affected an organisation's need for accounting information?
- 8 Describe the relationship between planning, control and feedback.
- 9 Distinguish between the three types of inventory a manufacturing organisation holds.
- 10 Define the term 'cost driver'.
- 11 Define what is meant by the following terms:
 - (a) Product cost
 - (b) Period cost
 - (c) Direct cost
 - (d) Indirect cost
 - (e) Prime cost
 - (f) Conversion cost
- 12 Outline the differences between product and period costs.
- 13 How does a direct cost differ from an indirect cost? Give an example of a cost that is both direct and indirect.
- 14 Explain how an organisation may add value to the following stakeholder groups:
 - (a) Shareholders
 - (b) Customers
 - (c) Community
 - (d) Employees
 - (e) Suppliers

- 15** In recent times you may have read that the manufacturing sector in Australia has contracted over the last couple of decades with many organisations opting to relocate to other countries throughout Asia. Why do you think this has happened and what do you think the implications of these relocations are on the information requirements of the management of the remaining Australian manufacturers?
- 16** Given that all merchandising organisations operating in Australia are coming under increasing pressure from consumers choosing to shop online, how do you think this trend will impact upon the information requirements of the management of these organisations?

PROBLEMS

PROBLEM M1.1

Cost Classification

Harvey Johnson is a maintenance worker in a garden hose plant. Harvey's annual salary is \$50,000. He maintains and repairs a special kind of machine located in each of the two production departments (Department 1 – Assembly, where plastic tubing is cut into 25m lengths and fitted with metal couplings; and Department 2 – Packaging, where the hoses are coiled and wrapped). Helen Hunaker, who works as a sales representative for the same company, is responsible for creating and servicing customer accounts. Helen is paid \$20,000 plus a 5% commission on new accounts.

Required:

- 1** Is Harvey's salary a manufacturing or non-manufacturing cost? If manufacturing, is it direct or indirect labour? If non-manufacturing, is it a selling or administrative cost?
- 2** Is Helen's salary a manufacturing or non-manufacturing cost? If manufacturing, is it direct or indirect labour? If non-manufacturing, is it a selling or administrative cost?

PROBLEM M1.2

Cost Classification

The Big Retail Group operates a large technology retailer in Sydney's western suburbs. The store has a computer section and an entertainment section. The management of the Big Retail Group require separate management reports from each of the two business units.

Required:

- 1** Classify each of these items as either a direct or indirect cost:
 - (a) An annual fee to music distributors Sony to allow the organisation to stock their music catalogue
 - (b) Electricity charges for the whole store
 - (c) Subscription to technology journals
 - (d) Lease payments for accounting software (used in the preparation of the organisation's management reports)
 - (e) Building insurance that covers the organisation's premises
 - (f) Shopping bags provided free to customers on the purchase of any goods
 - (g) Transportation cost associated with the purchase of inventory

PROBLEM M1.3

Cost of Goods Manufactured and Sold

Campwell Pty Ltd manufactures backpacks. At the beginning of August 2016, the following information was supplied by their accountant:

	\$
Raw materials inventory	185,000
Work in progress inventory	120,000
Finished goods inventory	102,000

During August 2016, direct labour cost was \$405,000, raw materials purchases were \$800,000, and the total overhead cost was \$1,050,750. The inventories at the end of August 2016 were:

	\$
Raw materials inventory	168,000
Work in progress inventory	235,000
Finished goods inventory	91,000

Required:

- 1 Prepare a cost of goods manufactured statement for August 2016.
- 2 Prepare a cost of goods sold statement for August 2016.

PROBLEM M1.4

Cost Classification

Classify each of the following items as (1) a direct or indirect product cost (or N/A if it is not a product cost) or (2) a product or period cost.

- 1 Nails in a large sofa
- 2 Salary of a plant security guard
- 3 Buttons on a shirt
- 4 Salary of a plant manager
- 5 Carpenters in a construction company
- 6 Salary of a warehouse clerk
- 7 Total overhead cost
- 8 Printing and postage for advertising circulars
- 9 Total selling costs
- 10 Wood in a new home being built
- 11 Depreciation on the company's executive jet plane
- 12 Wages of production workers
- 13 Fees paid for an annual audit
- 14 The total cost of operating a large machine in a factory
- 15 Pipelines for transporting crude oil to a refinery
- 16 The cost of a market research study
- 17 Pipelines for transporting crude oil to customers

PROBLEM M1.5

Cost Classification

Classify each of the following items as a product or period cost.

- 1 A food retailer purchases fruit juices for resale
- 2 The power used by a manufacturer to light its production line
- 3 Depreciation on computer equipment used by the sales force of a manufacturing organisation
- 4 Electricity used in the refrigeration of food in a retailer's stores
- 5 Depreciation on equipment used by a manufacturing organisation to quality test for faulty production units
- 6 Salaries of the marketing manager of a retailer. Her job primarily involves the promotion of the organisation's brand
- 7 An insurance policy purchased by a food retailer to protect the organisation from losses associated with power failures
- 8 Advertising expenses associated with trade shows that are used to promote a manufacturer's products
- 9 The cost of security guards at a manufacturer's factory during production night shifts

PROBLEM M1.6*Cost of Goods Manufactured and Sold*

The following information comes from the accounting records of a manufacturing organisation:

	\$
Direct labour cost	13,000
Purchases of raw materials	8,000
Supplies used	675
Factory insurance	350
Commissions paid	2,000
Factory supervision	1,230
Advertising	782
Material handling	2,745
Beginning work in progress inventory	12,500
Ending work in progress inventory	14,250
Beginning raw materials inventory	4,000
Ending raw materials inventory	2,000
Beginning finished goods inventory	5,685
Ending finished goods inventory	3,250

Required:

- 1 Prepare a cost of goods manufactured statement.
- 2 Prepare a cost of goods sold statement.

PROBLEM M1.7*Income Statement: Cost of Goods Manufactured*

Phillips Company produced 4,000 leather recliners during 2016. These recliners sell for \$400 each. Phillips had 500 recliners in finished goods inventory at the beginning of the year. At the end of the year there were 700 recliners in finished goods inventory. Phillip's accounting records provide the following information:

	\$
Purchases of raw materials	320,000
Raw materials inventory, 1 January 2016	46,800
Raw materials inventory, 31 December 2016	66,800
Direct labour	200,000
Indirect labour	40,000
Rent, factory building	42,000
Depreciation, factory equipment	60,000
Utilities, factory	11,956
Salary, sales supervisor	90,000
Commissions, salespersons	180,000
General administration	300,000
Work in progress inventory, 1 January 2016	13,040
Work in progress inventory, 31 December 2016	14,996
Finished goods inventory, 1 January 2016	80,000
Finished goods inventory, 31 December 2016	114,100

Required:

- 1 Prepare a cost of goods manufactured statement.
- 2 Compute the average cost of producing one unit of product in 2016.
- 3 Prepare an income statement on an absorption-costing basis.

PROBLEM M1.8*Cost Assessment: Service Company*

Harding Repair Pty Ltd does all the repair work for a medium-sized manufacturer of televisions. The repair work is all associated with warranty claims. Television sets are sent directly to Harding and, after the work is completed, Harding bills the television manufacturer for cost plus 30%. In the month of March 2017, purchases of materials (replacement parts) equalled \$90,000, the beginning inventory of parts was \$40,500, and the ending inventory of material was \$15,250. Payments to repair technicians during the month totalled \$63,000 (wages are paid monthly). Overhead incurred was \$113,000.

Required:

- 1 What was the cost of materials used for repair work during the month of March 2017?
- 2 What was the prime cost for March 2017?
- 3 What was the conversion cost for March 2017?
- 4 What was the total repair cost for March 2017? If this were a manufacturing organisation, what would the corresponding cost be called?

PROBLEM M1.9*Cost of Goods Manufactured and Cost of Goods Sold*

Using only the following account information for 2016, calculate Wollworks Ltd's cost of goods manufactured and the cost of goods sold.

	\$
Indirect manufacturing labour	46,000
Factory repairs and maintenance costs	32,000
Capital gains tax factory building sale	6,000
Indirect materials used	22,000
Marketing and distribution costs	72,000
Finished goods inventory, 1 January 2016	54,000
Plant electrical expenses	34,000
Work in progress inventory, 1 January 2016	40,000
Depreciation of factory building	18,000
Administrative and general costs	86,000
Direct materials used	174,000
Finished goods inventory, 31 December 2016	84,000
Depreciation of factory equipment	22,000
Work in progress inventory, 31 December 2016	52,000
Direct manufacturing labour	68,000
Factory overheads	8,000

PROBLEM M1.10*Cost of Goods Manufactured and Cost of Goods Sold*

Using only the following account information for the year ending 31 December 2016, prepare an income statement (include a supporting schedule showing the cost of goods manufactured) for Jones Ltd.

	\$
Revenue	1,900,000
Purchase of direct materials	650,000
Indirect manufacturing labour	120,000
Marketing and distribution costs	280,000
Finished goods inventory, 1 January 2016	140,000
Plant electrical expenses	60,000
Factory management labour	10,000
Work in progress inventory, 1 January 2016	20,000
Depreciation of factory equipment and building	160,000
Administrative and general costs	86,000
Direct materials inventory, 1 January 2016	30,000
Finished goods inventory, 31 December 2016	110,000
Work in progress inventory, 31 December 2016	10,000
Direct manufacturing labour	200,000
Factory overheads	70,000
Direct materials inventory, 31 December 2016	40,000
Factory supplies used	20,000

M2

Cost-volume-profit analysis

ON COMPLETION OF THIS CHAPTER YOU SHOULD BE ABLE TO:

- discuss the ways in which activities influence cost variability over time
- distinguish between fixed and variable costs
- determine, given a particular cost structure, at what level of operations an organisation breaks even
- use cost-volume-profit analysis to predict the effect on profit of changes in fixed costs, variable costs, selling prices and sales volumes, including the impact of tax
- evaluate cost-volume-profit analysis as a predictive model of organisation profitability.

M2.1 CHAPTER OVERVIEW

This chapter considers some methods that might be used by businesses to improve their return on assets. It considers businesses' needs to make decisions about the products and services they will offer, the markets and customers they will serve, and the processes by which the products and services will be produced and delivered. Since these decisions are all informed by the costs of products and services, the need to determine cost behaviour patterns is also addressed.

The following section discusses cost-volume-profit analysis (also called *break-even analysis*) as a technique to help to predict the profit consequences of alternative courses of action.

In Chapter 15 of the text, we introduced you to the concept of return on assets (ROA) as a measure of profitability. Recall that ROA can be expressed more fully as:

$$\text{ROA} = \frac{\text{Profit}}{\text{Assets}} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}}$$

ROA relates the profitability of a business enterprise (or an organisational unit of that enterprise) to the assets used to generate that profitability.

The above formula suggests various ways in which ROA can be improved. Among the more obvious are:

- increase sales volume (without a commensurate increase in costs or assets)
- increase sales price (without an offsetting reduction in volume)
- reduce costs (without an offsetting reduction in volume)
- reduce assets (without an offsetting reduction in sales volume)
- change to a more profitable mix of products

In most cases, sales, costs and assets are all related. Consider the first suggestion: if sales volume increases then it is likely that at least some, but probably not all, costs will increase. If selling price per unit can be maintained, ROA should increase, as total revenue will increase at a faster rate than total costs.

So, we need to be able to model these relationships to predict how changes are likely to affect ROA.

M2.2 Understanding Cost Behaviour

A common problem faced by all organisations relates to how changes in volume of goods or services sold affect revenues and costs. We need to consider 'How do costs behave?' and distinguish between fixed and variable costs.

Classification by cost behaviour

Cost behaviour deals with how costs change with respect to changes in activity levels. To assess cost behaviour, the activity and the changes in the activity level must be measured. The costs associated with an activity are those that are *caused* by the activity. Thus, in choosing a measure of activity-level changes, a measure must be chosen that is a *causal factor* for the activity's costs. A factor that causes (drives) activity costs is called a **cost driver**. For example, if work on the production line is the activity, then direct labour costs would be caused by the activity. Direct labour hours would then be a logical choice for a cost driver. Knowing how costs behave with respect to a relevant activity measure (cost driver) is essential for planning, control, decision-making, and accurate product costing.

Identifying cost behaviour is, perhaps, one of the most valuable contributions a management accountant can make to improve the overall management of an organisation. Typically, three major categories of cost behaviour are identified: fixed, variable, and mixed. Assume that the cost driver is defined as the number of units produced (for a service organisation this may be the number of hours of service provided). Because of the difficulty in estimating the cost function, accountants usually approximate the underlying cost behaviour by assuming a *linear relationship*. This means that total costs change at a constant rate.

Fixed costs

Fixed costs are costs that, *in total*, are constant within the relevant range as the level of the cost driver varies. To illustrate fixed cost behaviour, consider a company that produces cricket bats. Define the activity as producing bats and let the cost driver be the number of bats produced. The company operates one production line that can produce up to 5,000 cricket bats per year. The production workers are supervised by a production-line manager who is paid \$80,000 per year. The cost of supervision for several levels of production is given below.

NUMBER OF BATS		
Supervision \$	Produced	Unit Cost \$
80,000	1,000	80.00
80,000	2,000	40.00
80,000	3,000	26.66
80,000	4,000	20.00
80,000	5,000	16.00

The first step in assessing cost behaviour is defining a relevant cost driver (activity measure). In this case, the cost driver is the number of bats produced. The second step is defining what is meant by **relevant range**, the range over which the assumed fixed cost relationship is valid for the normal operations of an organisation. Assume that the relevant range is 0 to 5,000 bats. Notice that the *total* cost of supervision remains constant within this range as more bats are produced. The company pays \$80,000 for supervision regardless of whether it produces 1,000, 2,000 or 5,000 bats.

Pay particular attention to the words *in total* in the definition of fixed costs. While the total cost of supervision remains unchanged as more bats are produced, the unit cost changes as the level of the cost driver changes. As the example in the table shows, the unit cost of supervision decreases from \$80 to \$16. Because of the behaviour of per-unit fixed costs, it is easy to get the impression that fixed costs are affected by activity level changes when in reality they are not.

Another note of caution is needed. As more bats are produced, a second production line may be needed. This requirement, in turn, may produce the need for an additional production-line manager. Assume that this is true to produce more than 5,000 bats. The cost of supervision would then double to \$160,000 as production increased above the level of 5,000 bats.

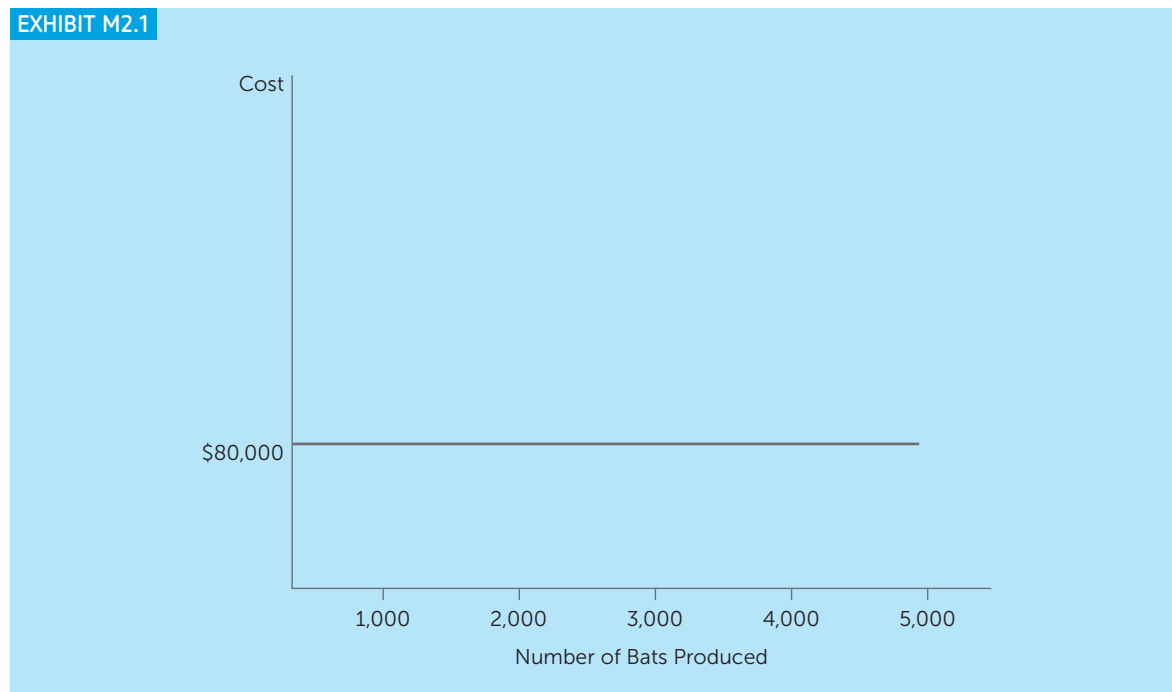
Graphical illustration of fixed costs

We can gain additional insight into the nature of fixed costs by portraying them graphically. In our example, supervision cost amounted to \$80,000 for any level of output between 1,000 and 5,000 bats. Thus, supervision is a fixed cost.

To graph the fixed costs, we need a horizontal axis to represent the cost driver (activity level) and a vertical axis to represent cost. For our example, production activity is measured in terms of units produced. The unit of measure for cost is dollars.

The graph representing fixed cost behaviour is given in Exhibit M2.1. As we can see, fixed cost behaviour is described by a horizontal line. Notice that at zero bats produced, supervision cost is \$80,000; at 1,000 bats produced, supervision is also \$80,000. This line visually demonstrates that cost remains unchanged as the level of the cost driver varies within the relevant range.

EXHIBIT M2.1



Variable costs

Variable costs are defined as costs that, in total, vary in direct proportion to changes in a cost driver. To illustrate, let's expand the example to include the cost of raw materials. As with supervision, the activity is producing bats and the

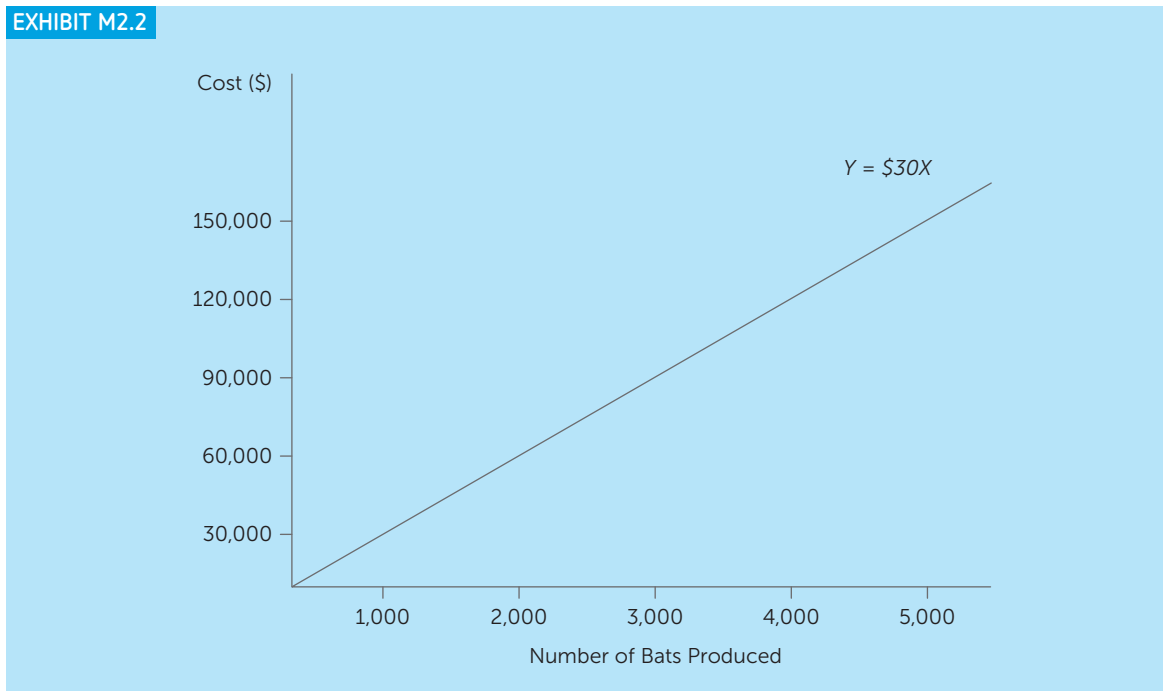
cost driver is the number of bats produced. Each bat requires \$30 of raw materials. The cost of raw materials for various levels of activity is given below.

Cost of Raw Materials	Number of Bats	Unit Cost
\$		\$
30,000	1,000	30
60,000	2,000	30
90,000	3,000	30
120,000	4,000	30
150,000	5,000	30

As more bats are produced, the total cost of raw materials increases in direct proportion. For example, as production doubles from 1,000 to 2,000 units, the *total* raw material cost doubles from \$30,000 to \$60,000. Notice also that the unit cost of raw materials is constant.

Exhibit M2.2 graphically illustrates a variable cost. Variable cost behaviour is represented as a straight line coming out of the origin. Notice that at zero units produced, total variable cost is zero. However, as units produced increase, the total variable cost also increases. Here it can be seen that total cost increases in direct proportion to increases in units of product (the cost driver); the rate of increase is measured by the slope of the line. At 1,000 bats produced, total raw material cost is \$30,000 (or $\$30 \times 1,000$ bats); at 2,000 bats produced, total raw material cost is \$60,000.

EXHIBIT M2.2



Mixed costs

Mixed costs are costs that have both a fixed and a variable component. For example, a rental car often has a flat rate plus a charge per kilometre (km) driven. Suppose the flat rate is \$45 per day plus \$0.20 per km driven. If the car is rented for one day and driven 100 km, the total rental is \$65 — the sum of the fixed charge of \$45 plus the variable component of \$20 ($\0.20×100). Similarly, electricity is often billed at a flat rate per period plus a charge per kilowatt hour used. Assume that this is the case for our bat example. Power is used to operate equipment used in

the production of bats. The cost of power is \$4,000 per year plus \$0.50 per bat produced. The \$0.50 charge per bat is based on the kilowatt hours used by each bat.

The linear equation for a mixed cost is given by:

$$\begin{aligned}\text{Total Cost} &= \text{Fixed Cost} + \text{Variable cost per unit} \times \text{Number of units} \\ &= \text{Fixed Cost} + \text{Total Variable Cost} \\ \text{or } Y &= F + VX \\ \text{where } Y &= \text{Total cost}\end{aligned}$$

The total power cost is represented by the following equation:

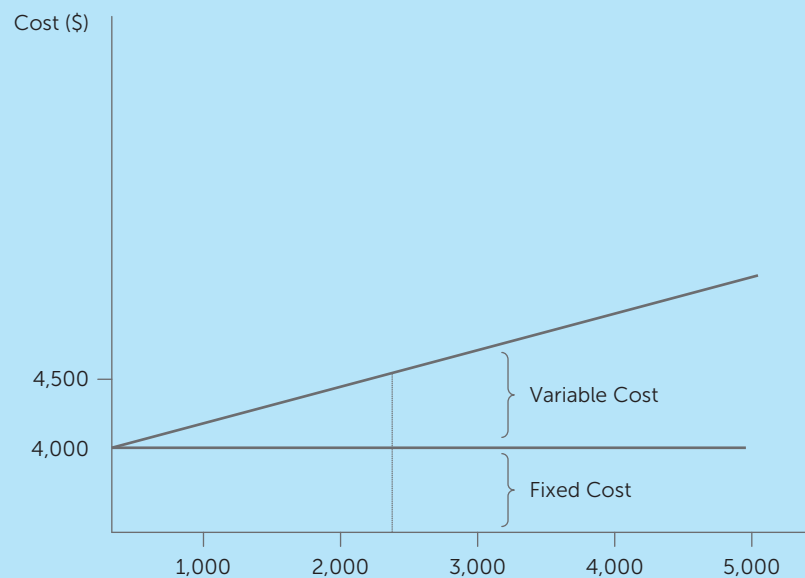
$$\begin{aligned}\text{Total Power Cost} &= \$4,000 + \$0.50 \times \text{Number of units produced} \\ Y &= \$4,000 + \$0.50X\end{aligned}$$

The following table shows the power cost associated with a variety of production levels.

Fixed Cost of Power \$	Variable Cost of Power \$	Total Cost \$	Number of Bats	Power Cost Per Unit \$
4,000	500	4,500	1,000	4.50
4,000	1,000	5,000	2,000	2.50
4,000	1,500	5,500	3,000	1.83
4,000	2,000	6,000	4,000	1.50
4,000	2,500	6,500	5,000	1.30

The graph of a mixed cost for our example is given in Exhibit M2.3 (the graph assumes that the relevant range is 0 to 5,000 units). Mixed costs are represented by a line that intercepts the vertical axis (at \$4,000 for this example). The intercept corresponds to the fixed cost component, and the slope of the line gives the variable cost per unit of cost driver (slope is \$0.50 for the example portrayed).

EXHIBIT M2.3



$$\begin{aligned}\text{Total power cost} &= \$4,000 + (\$0.50 \times \text{Number of Units}) \\ Y &= \$4,000 + \$0.50X\end{aligned}$$

The usual way to determine the slope of this line and where it intersects the vertical axis is to obtain information from the accounting system on what were past costs at various levels of activity. These points can be graphed (e.g. a scatter graph) to determine the slope of the line and where it intersects the vertical axis. Regression analysis, a topic you may have studied in a previous course, could also be used for a more accurate assessment.

M2.3 Income Statement: Classification by Cost Behaviour

Given an understanding of cost behaviour, it is now possible to examine an income statement based on a cost behaviour classification. This type of income statement plays an important role in planning and control. It forms the basis for many of the conventional management accounting planning and control models.

In Part A of Exhibit M2.4 the cost of goods sold (both variable and fixed) is deducted from sales to obtain the gross margin. Selling and administration costs (both variable and fixed) are then deducted from the gross margin to obtain profit before tax.

EXHIBIT M2.4

INCOME STATEMENT SHOWING GROSS AND NET PROFIT AND VARIABLE COSTING

Part A: Income Statement showing Gross and Net Profit		
	\$	\$
Sales (1,000,000 units at \$10)		10,000,000
Less cost of goods sold:		
Variable	5,750,000	
Fixed	<u>1,000,000</u>	<u>(6,750,000)</u>
Gross margin		3,250,000
Less selling expenses:		
Variable	700,000	
Fixed	<u>650,000</u>	<u>(1,350,000)</u>
Less administration expenses:		
Variable	150,000	
Fixed	<u>400,000</u>	<u>(550,000)</u>
Profit before tax		<u>1,350,000</u>
Part B: Variable Costing Income Statement		
	\$	\$
Sales (1,000,000 units at \$10)		10,000,000
Less variable expenses:		
Variable cost of goods sold	5,750,000	
Variable selling expenses	700,000	
Variable administration expenses	<u>150,000</u>	<u>(6,600,000)</u>
Contribution margin		3,400,000
Less fixed expenses:		
Fixed overhead	\$1,000,000	
Fixed selling expenses	650,000	
Fixed administration expenses	<u>400,000</u>	<u>(2,050,000)</u>
Profit before tax		<u>1,350,000</u>

An income statement based on a classification by cost behaviour is displayed in Part B of Exhibit M2.4. Notice that the expenses are categorised by whether they are fixed or variable using units sold as the cost driver. Manufacturing and non-manufacturing costs both appear in the same category if they have the same kind of cost behaviour.

In computing profit before tax in Part B, total variable expenses are first deducted from sales revenue to determine the **contribution margin**, the amount available to cover fixed costs and provide a profit. Deducting all fixed costs from the contribution margin yields profit before tax. Note that both forms of statements start with the same sales figure and end with the same net profit before tax.

The variable-costing income statement provides information that facilitates planning, control, and decision-making. For example, using the variable-costing income statement, a manager can assess the contribution each product line is making to cover the company's fixed costs. If a product line is making a positive contribution, it may be a wise decision to keep the product line even though it cannot cover its *full* cost. Why? Because dropping a product line that is providing some coverage of fixed costs may actually reduce a company's total profits. That is, when a company drops a product, some fixed costs may be eliminated (e.g. advertising), but others will continue on in the short-term (e.g. rent until the lease expires). Also, various contracts may have many months to run, and the fixed costs will be increased until the end of the contract. These insights are unavailable in the traditional income statement.

M2.4 Cost-Volume-Profit Analysis

Cost-volume-profit analysis (CVP) is a technique which allows us to predict what the profit consequences of alternative courses of action will be. It relies on a knowledge of cost behaviours as discussed in the previous section.

With respect to our earlier cricket bat example, most questions involving any of these areas or combinations can be addressed by CVP analysis.

The following list is a sample of the types of questions that can be raised and answered by CVP analysis.

- 1 How many units must be sold in order to break even?
- 2 How much sales revenue must be generated in order to break even?
- 3 How many units must be sold (or how much sales revenue must be generated) to earn a before-tax profit equal to \$6 million? A before-tax profit equal to 15% of revenues? An after-tax profit of \$4.5 million?
- 4 Will overall profits increase if the unit price is increased by \$2 and units sold decrease by 15%?
- 5 What is the effect on profits if advertising expenditures increase by \$400,000 and sales increase by 10%?
- 6 What is the effect on profits if the selling price is decreased from \$400 to \$375 per unit and sales increase from 16,000 units to 19,000 units?
- 7 What is the effect on profits if the selling price is decreased from \$400 to \$375 per unit, advertising expenditures are increased by \$200,000, and sales increase from 16,000 units to 23,000 units?
- 8 What is the effect on profits if the sales mix is changed? For example, for our cricket bat scenario, the company could have a range of bats including a deluxe adult bat and a standard adult bat. If the company increases sales of the deluxe bat with a related drop in the sales of the standard bat, what is the effect on the company's profits?

This list is by no means complete, but it should provide you with some insight into the power of CVP analysis. So far we have not mentioned anything about how CVP analysis is executed. Since we are interested in how revenues, expenses, and profits behave as volume changes, the variable-costing (or contribution) income statement is the logical basis of CVP analysis. The first step in CVP analysis is to express the variable-costing income statement as a narrative equation:

$$\text{Profit before tax} = \text{Sales revenues} - \text{Variable expenses} - \text{Fixed expenses}$$

There are two approaches to CVP analysis: the *units-sold approach* and the *sales-revenue approach*. The **units-sold approach** measures sales activity and answers CVP questions in terms of the number of units sold; the **sales-revenue approach** measures sales activity and answers CVP questions in terms of the total dollars of

revenue generated. This latter approach is particularly useful when units are difficult to identify (e.g. in the service industry). We will explore both approaches.

When we are dealing with a single-product organisation, the sales units approach is appropriate. However if we are dealing with a multi-product organisation, the notion of sales units becomes problematic.

We first illustrate the use of the sales units approach in a single-product situation.

M2.5 CVP Analysis: Units-Sold Approach

To illustrate the units-sold approach, the narrative equation for variable-costing profit must be converted to an analytical equation. We will use the following variables:

$$\begin{aligned} S &= \text{Selling price per unit} \\ X &= \text{Units sold} \\ V &= \text{Variable cost per unit sold} \\ F &= \text{Total fixed costs} \\ P_b &= \text{Profit before tax} \\ CM &= \text{Contribution margin per unit} \end{aligned}$$

Using the above notation, sales revenue is expressed as SX (the unit selling price times the units sold), and total variable costs are VX (the unit variable cost times units sold). With these expressions, the units-sold form of the variable-costing income statement is expressed as:

$$P_b = SX - VX - F$$

Suppose you were asked how many units must be sold in order to earn a before-tax profit of P_b . You could answer the question by solving the following equation for X :

$$P_b = (S - V)X - F$$

Rearrange as:

$$(S - V)X = F + P_b$$

and divide by $S - V$ to isolate X .

$$X = (F + P_b) / (S - V)$$

What is the meaning of $S - V$? S is the selling price per unit, and V is the variable cost per unit. Recall that the difference between revenues and variable expenses is called the *contribution margin*. Thus, $S - V$, the difference between unit revenue and unit variable cost, is the *contribution margin per unit*. Knowing this, the narrative version of the equation can be stated as follows:

$$\begin{aligned} \text{Units sold} &= (\text{Fixed costs} + \text{Profits before tax}) / (\text{Unit contribution margin}) \\ X &= F + P_b / \text{Unit CM} \end{aligned}$$

To make sure you understand each of these terms, refer back to Exhibit M2.4 and find each of them. You should get:

$$\begin{aligned} S &= \$10 \\ X &= 1,000,000 \\ V &= 6,600,000 \div 1,000,000 = \$6.60 \\ F &= 2,050,000 \\ P_b &= 1,350,000 \\ CM &= 10 - 6.60 = \$3.40 \\ \text{or } CM &= 3,400,000 \div 1,000,000 = \$3.40 \end{aligned}$$

Sample application: Break-even analysis

Assume that a small company sells stoves. For the coming year, the accountant has prepared the following projected income statement:

	\$
Sales (1,000 units @ \$400)	400,000
Less: Variable expenses	(325,000)
Contribution margin	75,000
Less: Fixed expenses	<u>(45,000)</u>
Profit before tax	<u>30,000</u>

A considerable amount of information can be extracted from this income statement. For example, it is based on sales of 1,000 units; the selling price is \$400 per unit; the variable cost per unit is \$325 (\$325,000/1,000); and total fixed expenses are \$45,000. The contribution margin per unit can be computed in one of two ways. One way is to divide the total contribution margin by the units sold for a result of \$75 per unit (\$75,000/1,000). A second way is to compute $S - V$. Doing so gives the same result, \$75 per unit (\$400 - \$325).

First, we calculate the **break-even point**. Recall that the break-even point is where total revenues equal total costs, the point of zero profits. The units-sold approach identifies the number of units that must be sold to break even. Setting $P_b = 0$ in our earlier equation, the following result is obtained:

$$\begin{aligned}
 X &= (F + P_b) / (S - V) \\
 &= (\$45,000 + \$0) / (\$400 - \$325) \\
 &= \$45,000 / \$75 \text{ per unit} \\
 &= 600 \text{ units}
 \end{aligned}$$

The company must sell exactly 600 stoves in order to break even. An income statement based on the sale of 600 stoves can be prepared to check the accuracy of this statement.

	\$
Sales (600 units @ \$400)	240,000
Less: Variable expenses	<u>(195,000)</u>
Contribution margin	45,000
Less: Fixed expenses	<u>(45,000)</u>
Profit before tax	<u>0</u>

Profit targets

Consider the following three questions related to this organisation:

- 1 How many stoves must be sold to earn a before-tax profit of \$60,000?
- 2 How many stoves must be sold to earn a before-tax profit equal to 15% of sales revenue?
- 3 How many stoves must be sold to earn an after-tax profit of \$45,000 assuming that the corporate tax rate is 40%?

To answer the first question, set $P_b = \$60,000$ and solve the following equation:

$$\begin{aligned}
 X &= (F + P_b) / (S - V) \\
 &= (\$45,000 + \$60,000) / (\$400 - \$325) \\
 &= \$105,000 / \$75 \\
 &= 1,400 \text{ units}
 \end{aligned}$$

The company must sell 1,400 stoves to earn a before-tax profit of \$60,000. The following income statement verifies this outcome:

	\$
Sales (1,400 units @ \$400)	560,000
Less: Variable expenses	(455,000)
Contribution margin	105,000
Less: Fixed expenses	(45,000)
Profit before tax	60,000

Another way to check this number of units is to use the break-even point. As was just shown, the company must sell 1,400 stoves (i.e. 800 more than the break-even volume of 600 units) to earn a profit of \$60,000. The contribution margin per stove is \$75. Multiplying \$75 by the 800 stoves above break-even produces the profit of \$60,000 (\$75 × 800).

In general, assuming that fixed costs remain the same, the impact on an organisation's profits resulting from a change in the number of units sold can be assessed by multiplying the unit contribution margin by the change in units sold. For example, if 1,500 stoves instead of 1,400 are sold, how much more profit will be earned? The change in units sold is an increase of 100 stoves, and the unit contribution margin is \$75. Thus, profits will increase by \$7,500 (\$75 × 100).

The second question requires that we determine the number of stoves that must be sold in order to earn a profit equal to 15% of sales revenue. Sales revenue is represented by SX . Thus, before-tax profit is 15% of SX ($0.15 SX$). Since S is \$400 per unit, before-tax profit (P_b) can be expressed as \$60X (or $0.15 \times \$400X$). Notice that the profit target is a function of X . Whenever the profit target is a function of X , using the equation $P_b = SX - VX - F$, is better than using $X = (P_b + F)/(S - V)$, since less algebraic manipulation is needed. Substituting $P_b = \$60X$ into the first equation and solving for X yields the following:

$$\begin{aligned}
 P_b &= SX - VX - F \\
 \$60X &= \$400X - \$325X - \$45,000 \\
 \$60X &= \$75X - \$45,000 \\
 \$15X &= \$45,000 \\
 X &= 3,000 \text{ units}
 \end{aligned}$$

Does a volume of 3,000 stoves achieve a profit equal to 15% of sales revenue? Remember that above break-even, the contribution margin per unit is the profit per unit. The break-even volume is 600 stoves. If 3,000 stoves are sold, then 2,400 (3,000 – 600) stoves above the break-even point are sold. The before-tax profit, therefore, is \$180,000 (\$75 × 2,400), which is 15% of sales (\$180,000/\$1,200,000).

Some additional development is needed to answer the third question. This question expresses the profit target in after-tax terms, but the profit target in earlier equations is expressed in before-tax terms. Therefore, to use either of the earlier equations, the after-tax profit target must first be converted to a before-tax profit target. If t represents the tax rate, then the tax paid on a before-tax profit of P_b is tP_b . The after-tax profit is computed by subtracting the tax from the before-tax profit.

$$\begin{aligned}
 \text{After-tax profit} &= \text{Before-tax profit} - \text{Tax} \\
 &= P_b - tP_b \\
 &= (1 - t)P_b
 \end{aligned}$$

Now divide both sides of the equation by $(1 - t)$:

$$\text{Before-tax profit} = (\text{After-tax profit}) / (1 - t)$$

Thus, to convert the after-tax profit to before-tax profit, simply divide the after-tax profit by $(1 - t)$.

The third question gives an after-tax profit target of \$52,500 and states that the tax rate is 30%. To convert the after-tax profit target into a before-tax profit target, divide it by 0.7 ($1 - 0.3$). Thus, the before-tax profit is \$75,000 ($\$52,500/0.7$). With this conversion, we can now calculate the units:

$$\begin{aligned} X &= (F + P_b)/(S - V) \\ &= (\$45,000 + \$75,000)/\$75 \\ &= \$120,000/\$75 \\ &= 1,600 \text{ units} \end{aligned}$$

To verify the accuracy of the analysis, an income statement based on sales of 1,600 stoves has been prepared.

	\$
Sales (1,600 units @ \$400)	640,000
Less: Variable expenses (1,600 × \$325)	<u>(520,000)</u>
Contribution margin	120,000
Less: Fixed costs	<u>(45,000)</u>
Profit before tax	75,000
Less: Tax (30% tax rate)	<u>(22,500)</u>
Profit after tax	<u>52,500</u>

Sample application: Changes in costs and prices

Let's extend the above example by considering the following possible results of a recently conducted market study that revealed two possible alternatives.

- 1 If advertising expenditures increase by \$8,000, sales will increase from 1,600 units to 1,725 units
- 2 A price decrease from \$400 per stove to \$375 per stove would increase sales from 1,600 units to 1,900 units.

Should the company maintain its current price and advertising policies, or should it select one of the three alternatives described by the marketing study?

Alternative 1: What is the effect on profits if advertising costs increase by \$8,000 and sales increase by 125 units? The new profit is the new number of units multiplied by the contribution margin less fixed costs, that is \$76,375 ($1,725 \times 75 - (45,000 + 8,000)$) or \$1,375 greater than the profit before tax of \$75,000 for 1,600 stoves.

This question can also be answered without using the equations but by employing the contribution margin per unit. We know that the unit contribution margin is \$75. Since units sold increase by 125, the incremental increase in total contribution margin is \$9,375 ($\75×125 units). However, since fixed costs increase by \$8,000, the incremental increase in profits is only \$1,375 ($\$9,375 - \$8,000$).

Alternative 2: For this alternative, fixed expenses do not increase. Thus, it is possible to answer the question by looking only at the effect on total contribution margin.

For the current price of \$400, the contribution margin per unit is \$75. If 1,600 units are sold, the total contribution margin is \$120,000 ($\$75 \times 1,600$). If the price is dropped to \$375, the contribution margin drops to \$50 per unit. If 1,900 units are sold at the new price, the new total contribution margin is \$95,000 ($\$50 \times 1,900$). Dropping the price results in a profit decline of \$25,000 ($\$120,000 - \$95,000$).

M2.6 CVP Analysis for Multi-Product Organisations

Most organisations produce more than one product or provide more than one service. We now expand the above analysis to consider this situation.

While the same general approach can be used for a business producing and selling several products, the calculations need to take account of the mix of products.

Assume that Retailer Limited sells two products, Deluxe and Standard. The yearly budget shows that Standard sells for \$90 and has variable costs of \$40 while Deluxe sells for \$170 with variable costs of \$70. Expected sales for Standard and Deluxe are 20,000 and 5,000 respectively (i.e. the product mix is 4:1 for standard and deluxe). Total fixed costs are budgeted to be \$750,000.

To calculate how many units of each product must be sold to break even, we need to know the weighted average contribution margin, reflecting the relative proportions of the two products. The budgeted product mix in units includes 80% of Standard (20,000 units out of a total of 25,000 units) and 20% of Deluxe (5,000 of the 25,000 units).

The weighted average contribution margin per unit is:

$$\begin{aligned}\text{Standard } & \$ (90 - 40) \times 0.80 = \$40 \\ \text{Deluxe } & \$ (170 - 70) \times 0.20 = \frac{\$20}{\$60} \\ \text{Break-even units} & = \frac{\$750,000}{\$60} = 12,500 \text{ units}\end{aligned}$$

Of these units, 80% are expected to be Standard (10,000 units) and 20% are expected to be Deluxe (2,500 units).

Assume that the management of Retailer Limited wishes to know how many units of each product must be sold in order to achieve a net profit after tax of \$1,093,750. If the tax rate is 30% then:

$$\begin{aligned}\text{Desired pre-tax profit} & = \frac{\$1,093,750}{(1 - 0.30)} = \$1,562,500 \\ & \text{and} \\ \text{Required units} & = \frac{750,000 + 1,562,500}{60} \\ & = 38,542\end{aligned}$$

To confirm that the profit target will be achieved if this many units are sold, Exhibit M2.5 shows the profit budget.

EXHIBIT M2.5

	Standard	Deluxe	Total
Units	30,834	7,708	
Total revenue	\$2,775,060	\$1,310,360	\$4,085,420
Total variable cost	<u>1,233,360</u>	539,560	<u>1,772,920</u>
Total contribution	<u>1,541,700</u>	<u>770,800</u>	2,312,500
Fixed cost			<u>750,000</u>
Operating profit before tax			1,562,500
Income tax (@ \$0.30)			<u>468,750</u>
Net profit			<u>\$1,093,750</u>

MULTI-PRODUCT CVP ANALYSIS ILLUSTRATIVE EXAMPLE

Ace Limited sells two types of tennis shoes, slow and quick. Its cost and price information for the current year appear below.

	Slow	Quick
Selling price per unit	\$45	\$84
Variable cost per unit	\$32	\$65
Proportion of sales	60%	40%

Total selling and administration fixed costs are expected to be \$220,000.

- 1 Calculate the break-even point in sales dollars and units.
- 2 Calculate sales volume required to achieve a pre-tax profit of \$180,000.

Suggested solution

- 1 The contribution margin per unit for products X and Y:

$$\begin{aligned}
 \text{CM for x} &= 45 - 32 \\
 &= 13 \\
 \text{CM for y} &= 84 - 65 \\
 &= 19
 \end{aligned}$$

The weighted average contribution margin per unit:

$$\begin{aligned}
 &= (13 \times 0.60) + (19 \times 0.40) \\
 &= 15.40
 \end{aligned}$$

$$\begin{aligned}
 \text{Break-even point} &= \frac{FC}{CM} \\
 &= \frac{\$220,000}{15.40} \\
 &= 14,286 \text{ units}
 \end{aligned}$$

Comprised as follows (based on 60/40% split):

$$\begin{array}{rcl}
 \text{Total} & & \text{Product x} & & \text{Product y} \\
 14,286 \text{ units} & = & 8,572 \text{ units} & + & 5,714 \text{ units} \\
 \$865,732 & = & \$385,740 & + & \$479,976
 \end{array}$$

$$\begin{aligned}
 \text{BE in sales dollars} &= \$8,572 \times 45 + \$5,714 \times 84 \\
 &= \$865,732
 \end{aligned}$$

$$\begin{aligned}
 2 \quad \text{Required sales volume} &= \frac{FC + \text{desired profit}}{CM} \\
 &= \frac{\$220,000 + \$180,000}{\$15.40} \\
 &= 25,974 \text{ units}
 \end{aligned}$$

Comprised as follows (based on 60/40% split):

$$\begin{array}{rcl}
 \text{Total sales} & = & \text{Product X} & + & \text{Product Y} \\
 \text{Units } 25,974 & = & 15,585 & + & 10,390
 \end{array}$$

M2.7 CVP Analysis: Sales-Revenue Approach

In some cases when using CVP analysis, managers may prefer to use sales revenues as the measure of sales activity instead of units sold. This method is particularly useful when individual units are not easily identifiable or when an organisation has a very large number of different products or services. For example, think about how many different books there are in your university's bookstore, most of which will have a different selling price.

This formula uses the following variables:

$$\begin{aligned}
 R &= SX(\text{Selling Price} \times \text{Units sold}) \\
 vr &= (V/S) \text{ or } (\text{Variable costs}/\text{Sales revenues}) \\
 F &= \text{Total fixed costs} \\
 P_b &= \text{Profit before tax}
 \end{aligned}$$

The sales-revenue form of variable-costing profit is expressed as follows:

$$P_b = R - F - (vr)R$$

Some immediate differences between the sales-revenue approach and the units-sold approach should be mentioned. First, sales activity is defined as sales revenues instead of units sold. Second, variable costs are defined as a percentage of sales rather than as an amount per unit sold. Logically, if costs vary in total with the units sold, the same costs should vary in total with sales in dollars. For example, assume that variable costs are \$6 per unit sold and 100 units are sold for \$10 each. Using the units-sold approach, total variable costs are \$600 (\$6 × 100 units sold). Alternatively, since each unit sold earns \$10 of revenue, we would say that for every \$10 of revenue earned, \$6 of variable costs are incurred, or, equivalently, 60% of each dollar of revenue earned is attributable to variable cost (\$6/\$10). Thus, using the sales-revenue approach, we would expect total variable costs of \$600 for revenues of \$1,000 (0.60 × \$1,000).

As you know, $(S - V)$ is the unit contribution margin, and S is the unit selling price. Thus, $(S - V)/S$ is the **contribution margin ratio** (CM ratio), the proportion of each sales dollar available to cover fixed costs and provide for profit.

To obtain the break-even point in sales dollars, we simply divide fixed costs by the contribution margin ratio. Therefore, BE in sales dollars:

$$\begin{aligned}
 \text{BE} &= \text{Fixed costs} / \text{CM ratio} \\
 \text{Sales dollars} &= (\text{Fixed costs} + \text{Profit before tax}) / (\text{CM ratio})
 \end{aligned}$$

Sample application: Break-even point

Assume a university bookstore sells a wide range of books with different mark-ups. Assume the bookstore has the following projected profit for the quarter:

	\$
Sales	400,000
Less: Variable expenses	<u>(325,000)</u>
Contribution margin	75,000
Less: Fixed costs	<u>(45,000)</u>
Profit before tax	<u>30,000</u>

From this statement, the information needed to carry out CVP analysis under the sales-revenue approach can be easily extracted. The fixed costs are \$45,000. The contribution margin ratio is 0.1875 (computed as \$75,000/\$400,000).

Given the information in this statement, how much sales revenue must be earned to break even? Setting $P_b = 0$, the following result is obtained:

$$\begin{aligned}
 \text{Sales dollars} &= (F + P_b) / \text{CM ratio} \\
 &= (\$45,000 + 0) / 0.1875 \\
 &= \$240,000
 \end{aligned}$$

Thus, the bookstore must earn revenues totalling \$240,000 in order to break even.

Sample application: Profit target

Consider the following question: How much sales revenue must the bookstore generate to earn a before-tax profit of \$60,000?

$$\begin{aligned}
 \text{Sales revenue} &= (F + P_b) / \text{CM ratio} \\
 &= (\$45,000 + \$60,000) / 0.1875 \\
 &= \$105,000 / 0.1875 \\
 &= \$560,000
 \end{aligned}$$

The bookstore must earn revenues equal to \$560,000 to achieve a profit target of \$60,000. Since break-even is \$240,000, additional sales of \$320,000 (\$560,000 – \$240,000) must be earned above break-even to earn a profit of \$60,000.

For a given level of sales, the bookstore will be able to calculate its fixed costs. These will be costs that do not vary with the level of sales (within a certain range). For example, it would include rent paid to the university and staff salaries. The main variable costs are likely to be the cost of the books it purchases. It may have a constant mark-up on books it sells (e.g. cost plus 40%) or it may vary the mark-up depending on the type of book (e.g. textbook versus novel).

In general, assuming that fixed costs remain unchanged, the contribution margin ratio can be used to find the profit impact of a change in sales revenue. To obtain the total change in profits from a change in revenues, simply multiply the contribution margin ratio times the change in sales. For example, if sales revenues are \$540,000 instead of \$560,000, how will the expected profits be affected? A decrease in sales revenues of \$20,000 will cause a decrease in profits of \$3,750 ($0.1875 \times \$20,000$).

If the contribution margin ratio is different depending on the type of book, the calculation of the contribution margin ratio would be impacted by the product mix (e.g. textbooks, novels, travel books, stationery, etc.) These complications will be addressed in more advanced management accounting courses.

M2.8 Limitations of CVP Analysis

A number of limitations are commonly mentioned with respect to CVP analysis.

- 1 The analysis assumes a linear revenue function and a linear cost function.
- 2 The analysis assumes that what is produced is sold.
- 3 The analysis assumes that fixed and variable costs can be accurately identified.
- 4 The selling prices and costs are assumed to be known with certainty.

Limitations 1 through 3 pose fewer problems than does the fourth limitation. It is virtually impossible to predict with certainty the selling prices and the costs for an upcoming period. However, the sensitivity of variables to changes in predicted values can be readily assessed. Furthermore, there are formal ways of explicitly building uncertainty into the CVP model. Exploration of these issues, however, is left to a more advanced course of study.

M2.9 Using Cost Behaviour in Sustainability Issues

As noted in Chapter 17 of the text, there is increased emphasis on energy costs in sustainability reporting. Increased sustainability reporting plus the rising prices of electricity in Australia (and internationally) has resulted in most companies attempting to reduce energy use. For successful energy costs programs, it is essential that accountants get involved in the process. In other words, if it is not measured there is likely to be little change.

One of the key concepts of this chapter has been that total costs can be broken down into fixed and variable elements:

$$\text{Total costs} = \text{Fixed costs} + \text{Units} \times \text{Variable cost per unit}$$

With respect to energy, it should also be noted that energy costs are made up of both a fixed and variable component. The fixed cost is incurred regardless of the production level; for example, a machine may be required to be turned on all day irrespective of the level of usage. The energy cost per unit is the amount of energy used to process each unit of production (or could be each kilogram of output). To reduce energy costs, it is necessary to either reduce the fixed cost or reduce the energy cost per unit.

It should also be noted that the two types of costs may be related. For example, it may be possible to have machinery with a higher fixed cost but lower per-unit cost. Consider two types of machines. Machine A needs to be connected all day and therefore uses up a constant flow of energy each week plus additional energy when the machine is actually operating. There is an alternative machine (Machine B) which can be turned to power saver when it is not being used; therefore its fixed costs for the week are much less, but variable costs are higher on this machine.

Let's consider the situation where the electricity costs of Machine A are comprised of a fixed cost of \$10,000 per week and a variable cost of \$6.00 per unit. Machine B's fixed costs are only \$6,000 per week but its variable costs are \$8.00 per unit. At what point would it be more energy efficient to use Machine A? To address this problem we solve the following equations:

$$\begin{aligned} \$10,000 + 6x &= \$6,000 + 8x \\ x &= 2,000 \end{aligned}$$

In other words, when up to 2,000 units are produced during the week, it is better to use Machine B; but beyond that point it is better to use Machine A from an energy efficiency perspective.

PRACTICE PROBLEMS

Solutions to practice problems can be found online at <http://login.cengagebrain.com/>. These problems are intended to facilitate self-study and additional practice. Don't look at the solution for any of these without giving the problem a serious try first, because once you have seen the solution, it always looks easier than it is.

PRACTICE PROBLEM A

Single Product CVP

	\$
Selling price	200
Variable manufacturing costs per unit	60
Variable selling costs per unit	20
Fixed manufacturing costs	180,000
Fixed selling costs	60,000

Required:

- 1 What is the break-even point in units?
- 2 If 3,000 units are produced and sold, what is profit before tax?
- 3 How does the answer to (2) change if the sales price increases by \$30 and costs remain constant?

PRACTICE PROBLEM B

Multi-product CVP

Ace Limited sells two types of tennis shoes, slow and quick. Its cost and price estimates for the current year appear below.

	Slow	Quick
Selling price per unit	\$45	\$84
Variable cost per unit	\$32	\$65
Proportion of sales	60%	40%

Total selling and administration fixed costs are \$220,000.

Required:

- 1 Calculate the break-even point in sales dollars and units.
- 2 Calculate sales volume required to achieve a pre-tax profit of \$180,000.

PRACTICE PROBLEM C

Sales Revenue Approach

TT Consulting is a service organisation specialising in engineering advice. The operating results for the company in 2017 are as follows:

	\$
Sales	802,429
Less: Variable costs	(430,102)
Contribution margin	372,327
Less: Fixed costs	(154,750)
Net profit	<u>217,577</u>

Required:

- 1 Compute TT's break-even point for 2017 in dollars.
- 2 How much revenue must be earned for TT to earn an after-tax profit of \$175,000? (Assume a tax rate of 30%.)

KEY TERMS

Break-even point
Contribution margin
Contribution margin ratio

Cost driver
Fixed costs
Mixed costs

Relevant range
Units-sold approach
Variable costs

HOMEWORK AND DISCUSSION TO DEVELOP UNDERSTANDING**DISCUSSION QUESTIONS**

- 1 Define fixed costs.
- 2 Define variable costs.
- 3 Provide an example of a cost that is variable under some circumstances and fixed under other circumstances.
- 4 If an airline changed the units measure from percentages to flights, provide an example of a cost that would be changed from fixed to variable.
- 5 Why do organisations need to know their break-even point?
- 6 Provide an example of how CVP analysis helps in planning.
- 7 If variable cost percentage decreases, what happens to the sales volume required to break even?

PROBLEMS**PROBLEM M2.1***Cost Classification*

Classify the costs below as variable, fixed, or mixed. Also identify the cost driver that allows you to define the cost behaviour. (*Hint:* Cost behaviour depends on the cost driver. For example, a receptionist's wage varies with the number of hours worked, but is fixed with respect to units sold. Give some thought to the kind of activity associated with the cost drivers you choose.) Prepare your answer in the following format:

Cost	Cost Behaviour	Cost Driver
Milk in ice cream	Variable	Units produced
(a) Screens for a television		
(b) Wages of a doctor's assistant		
(c) Advertising		
(d) Rental of a photocopier		
(e) Fuel for a commercial truck		
(f) Depreciation on a warehouse		
(g) Cost of electricity in a factory		
(h) Surgical gauze used in a hospital		
(i) Casual markers of exam papers		
(j) Needles used by a doctor		

>>

- >> (k) Salary for a moving van driver
 (l) The cost of leasing a building for a supermarket
 (m) Salary of a receptionist in a doctor's office
 (n) Commissions paid to sales personnel

PROBLEM M2.2

Simple Single Product CVP

A hotel has an average revenue of \$100 per room occupancy. Variable costs are \$20 per room occupancy and fixed costs are \$3,200,000 per year.

Required:

- 1 Calculate the number of rooms that must be let for the hotel to break even.
- 2 How many dollars of sales revenue are needed to earn \$320,000 per year?
- 3 If the variable costs drop to \$18, what increase in fixed costs can be tolerated without changing the break-even point determined above?

PROBLEM M2.3

Single Product CVP with Taxes

S Ltd sells product G for \$150 per unit. The variable cost per unit is \$105, the fixed costs are \$720,000, and the tax rate is 30%.

Required:

- 1 What is the break-even point in units?
- 2 What are the sales (dollars) required to earn a net profit (after tax) of \$40,000?

PROBLEM M2.4

Multi-Product CVP

Assume that CLY Ltd sold 8,000 units of Product A and 2,000 units of Product B during the past year. The unit contribution margins for Products A and B are \$20 and \$45 respectively. CLY Ltd has fixed costs of \$350,000.

Required:

- 1 What is the break-even point in units?

PROBLEM M2.5

Multi-Product CVP

Retailer Limited sells two products, Deluxe and Standard. The yearly budget shows that Standard sells for \$90 and has variable costs of \$40 while Deluxe sells for \$170 with variable costs of \$70. Expected sales for Standard and Deluxe are 20,000 and 5,000 respectively. Total fixed costs are budgeted to be \$750,000.

Required:

- 1 What is the weighted average contribution margin?
- 2 What is the break-even point in units?
- 3 Assume that the management of Retailer Limited wishes to know how many units of each product must be sold in order to achieve a net profit after tax of \$1,000,000. If the tax rate is 36%, how many units must be sold?

PROBLEM M2.6

Single Product CVP

XYZ plans to sell videos at \$599 each and at that price, demand is forecast to be 1,500 units. The videos cost \$240 per unit to buy and cost \$60 to assemble. Sales staff are paid \$79 commission per unit sold. Additional fixed overheads related to the showroom are expected to be \$120,000. Planned advertising costs are \$100,000.

Required:

- 1 What is the contribution margin?
- 2 What are the fixed costs?
- 3 What is the break-even point in units?
- 4 If 1,500 units are sold, what will be the profit before tax?

PROBLEM M2.7*Contribution Margin: Unit Amounts*

Information on four independent companies is given below. Calculate the correct amount for each question mark.

	A	B	C	D
Sales	\$5,000	?	?	\$9,000
Total variable cost	(4,000)	(11,700)	(9,750)	?
Contribution margin	\$1,000	\$3,900	?	?
Total fixed cost	?	(4,000)	?	(750)
Net profit	\$ 500	\$?	\$ 400	\$2,850
Units sold	?	1,300	125	90
Price/unit	\$5	?	\$130	?
Variable cost/unit	?	\$9	?	?
Contribution margin/unit	?	\$3	?	?
Contribution margin ratio	?	?	60%	?
Break-even in units	?	?	?	?

PROBLEM M2.8*Sales Revenue Approach*

Ace Consulting provides advice to farmers. The operating results for the organisation in 2016 are as follows:

	\$
Sales	802,429
Less: Variable costs	(430,000)
Contribution margin	372,429
Less: Fixed expenses	(154,750)
Net profit	217,679

Required:

- 1 What is the contribution margin ratio for 2016?
- 2 Compute Ace's break-even point for 2016 in dollars.
- 3 What level of sales dollars must be reached to earn a profit after tax of \$420,000? (Assume a tax rate of 30%.)
- 4 What issues could be raised about your analysis in (3) with respect to fixed costs?

PROBLEM M2.9*CVP Analysis with Target Profits*

Tom Flannery has developed a new recipe for grilled fish and plans to open a takeaway restaurant in Brisbane. His father-in-law has agreed to invest \$500,000 in the operation provided Tom can convince him that profits will be at least 20 per cent of sales revenues. Tom estimated that total fixed expense would be \$24,000 per year and that variable expenses would be approximately 40 per cent of sales revenues.

Required:

- 1 How much sales revenue must be earned to produce profits equal to 20 per cent of sales revenue? Prepare a contribution income statement to verify your answer.
- 2 If Tom plans on selling a 12-piece box of fish for \$10, how many boxes must he sell to earn a profit equal to 20 per cent of sales? 25 per cent of sales?
- 3 Suppose Tom's father-in-law meant that the after-tax profit had to be 20 per cent of sales revenue. Under this assumption, how much sales revenue must be generated by Tom's business? (Assume that the tax rate is 40 per cent).

PROBLEM M2.10*Sales-Revenue Approach: Variable-Cost Ratio; Contribution Margin Ratio*

Lambert produces and sells an economy line of ski parkas. The budgeted income statement for the coming year is:

	\$
Sales	600,000
Less: Variable expenses	(400,000)
Contribution margin	200,000
Less: Fixed expenses	(120,000)
Profit before tax	80,000
Less: Tax	(24,000)
Profit after tax	56,000

Required:

- 1 What is Lambert's variable cost ratio? Its contribution margin ratio?
- 2 Suppose Lambert's actual revenues are \$60,000 more than budgeted. By how much will before-tax profits increase?
- 3 How much sales revenue must Lambert earn in order to break even?
- 4 How much sales revenue must Lambert generate to earn a before-tax profit of \$100,000? An after-tax profit of \$84,000? Prepare a contribution income statement to verify the accuracy of your last answer.

PROBLEM M2.11*CVP Analysis: Sales-Revenue Approach; Service Organisation*

Kline Consulting is a service organisation that specialises in the design, installation, and servicing of mechanical, hydraulic, and pneumatic systems. For example, certain manufacturing organisations with machinery that cannot be turned off for servicing need some type of system to lubricate the machinery during use. To deal with this type of problem for a client, Kline designed a central lubricating system that pumps lubricants intermittently to bearings and other moving parts.

The operating results for the organisation in 2016 are as follows:

	\$
Sales	802,429
Less: Variable costs	(430,000)
Contribution margin	372,429
Less: Fixed costs	(154,750)
Net profit	217,679

In 2017, Kline expects variable costs to increase by 5 per cent and fixed costs by 4 per cent.

Required:

- 1 What is the contribution margin ratio for 2016?
- 2 Compute Kline's break-even point for 2016 in dollars.
- 3 Suppose that Kline would like to see a 6 per cent increase in net profit in 2017. By what percentage (on average) must Kline raise its bids to cover the expected cost increases and obtain the desired net profit? Assume that Kline expects the same mix and volume of services in 2017 as in 2016.
- 4 In 2017, how much revenue must be earned for Kline to earn an after-tax profit of \$175,000? (Assume a tax rate of 34%.)

PROBLEM M2.12*Basics of the Sales-Revenue Approach*

Kiltop Company sells takeaway food. The projected income statement for the coming year is as follows:

	\$
Sales	480,000
Less: Variable costs	<u>(249,600)</u>
Contribution margin	230,400
Less: Fixed costs	<u>(180,000)</u>
Net profit	50,400

Required:

- 1 Compute the contribution margin ratio for Kiltop.
- 2 How much revenue must Kiltop earn in order to break even?
- 3 What volume of sales must be earned if Kiltop wants to earn an after-tax profit equal to 8 per cent of sales? (Assume that the tax rate is 34 per cent).
- 4 What is the effect on the contribution margin ratio if the unit selling price and unit variable cost each increase by 10 per cent?
- 5 Suppose that management has decided to give a 3 per cent commission on all sales. The projected income statement does not reflect this commission. Recompute the contribution margin ratio, assuming that the commission will be paid. What effect does this have on the break-even point?
- 6 If the commission is paid as described in (5), management expects sales revenues to increase by \$80,000. Is it a sound decision to implement the commission? Support your answer with appropriate computations.

PROBLEM M2.13*CVP Analysis in Planning*

Fox Company produces a deluxe pen-and-pencil set. The selling price of the set is \$50. The variable cost per set is \$30. Total fixed costs are \$2.5 million. Expected sales for the coming year are 150,000 sets. Management is unhappy with the expected profits and is trying to find ways to increase overall performance. The marketing manager has proposed two alternatives: (1) increase advertising by \$100,000, which should produce additional sales of 10,000 units; or (2) decrease the selling price to \$45 per set, which should boost sales from 150,000 sets to 165,000 sets.

Required:

- 1 Prepare an income statement that reflects expected sales for the coming year. Ignore the proposals by the marketing manager.
- 2 Without preparing income statements, assess the impact on profits of each of the marketing manager's proposals. Which would you recommend?
- 3 Prepare income statements for the two proposals to verify your analysis in (2).

M3

Introduction to costing

ON COMPLETION OF THIS CHAPTER YOU SHOULD BE ABLE TO:

- describe the alternative approaches for measuring and assigning costs to products and services
- compare predetermined overhead rates and explain how they are used to assign overhead to production
- describe the purposes of overhead allocation
- calculate product costs using a job-order costing approach
- describe the cost flows and prepare the journal entries associated with job-order costing
- explain why departmental overhead rates may be preferred to a single, plant-wide overhead rate.

M3.1 CHAPTER OVERVIEW

This chapter will again consider how management accounting systems aid in the decision-making process. The specific objective of this chapter is to show how costs may be either traced or allocated to products or services. The chapter illustrates a job costing system and shows how overheads are allocated using a traditional volume-based approach. The chapter highlights the importance of allocating overheads in a way that provides decision makers with accurate unit cost information.

M3.2 Introduction

In the previous chapter, we discussed how management accounting systems collect and distribute data to the management of an organisation so as to assist in their organisational objective of increasing stakeholder value. You may recall that we suggested an important function of a management accounting system was that it allowed management to determine the actual unit cost of an organisation's products or services and that such data was particularly important in the implementation of an organisation's strategy.

You may remember that Chapter M1 briefly looked at two basic strategic models. These were cost leadership (a strategy adopted by an organisation whereby it competes in a market by having a lower product cost than its competitors) or product differentiation (a strategy adopted by an organisation whereby it competes by distinguishing its products from those of its competitors on a basis other than its relative cost). Irrespective of which of these approaches an organisation adopts, history tells us that the costing of products or services is a fundamentally important aspect of management and that there have been many examples of organisations that have failed because their management accounting systems did not accurately determine product cost.

If a product or service is to be accurately priced, management needs to allocate *all* the costs of doing business to individual products, services or customers. As a result, we need to understand the way in which organisations allocate all costs to their products and how that process of allocation can have a significant impact on the reported profitability of individual products. It can also have a significant impact on the performance evaluation (and thus motivation) of individuals throughout an organisation and therefore the successful implementation of its strategy and, ultimately, its capacity to add value to its stakeholders.

Knowledge of the cost of individual products or services may specifically aid management in *resources-allocation decisions* in a number of ways. For example, several practical examples of how management uses unit cost data include:

- determining the normal pricing of products
- judging or comparing the profitability of different products, services, market segments and customers
- aiding in product design
- making judgements about the efficiency of production processes (e.g. by comparing actual product costs with standardised product costs, target costs and known or estimated competitors' costs)
- submitting a tender for the supply of goods or services to a potential customer (tendering is a common approach to acquiring work in many industries). Particularly when pricing of products in special or unique situations; for example, whether to accept/reject any 'special' orders from customers
- whether to introduce or delete individual products and/or product lines
- whether to make or buy components and/or finished goods (outsourcing decisions)
- valuing inventory and cost of goods sold, and thus determining profit so as to comply with the financial reporting requirements that a firm faces at the end of each period.

In an earlier chapter, we defined some basic cost concepts. You will recall that within a multiple-product firm, some costs are associated directly with a particular product while others relate to all products offered by the organisation. Direct costs are those costs that can be traced in a convenient and cost-effective way to (a cost-object such as) a product. Alternatively, those costs that are common to several products and are not directly traceable to any one specific product are known as indirect costs. For example, most organisations will have a number of service departments that exist to support the primary function of the organisation. Accounting and Human Resources are typical examples of service departments. All products involve either direct or indirect labour, and also need to be accounted for, so the cost of both the Accounting and Human Resources departments are part of the total cost of all products. Given that the costs of such service departments may be very difficult to directly trace to each of the individual products (in a cost-effective way) they would need to be allocated across all of the products produced.

Chapter M1 suggested that these indirect costs are often aggregated into one category called overheads. Manufacturing overhead is also known as factory burden or indirect product costs. For simplicity, we will usually refer

to manufacturing overhead as overhead. The overhead cost category contains a wide variety of items. Accounting for these overhead costs is an important aspect of the management accounting system. As we have already suggested, decision makers need to know the 'true' costs of products and services, as they have implications for the decisions they make. The following sections will consider the need to allocate these indirect costs to cost objects, and then describe the 'traditional' ways of doing so. Chapter M4 will argue that *activity-based costing* (ABC) systems can sometimes provide a more accurate cost allocation.

M3.3 Two Issues: Cost Measurement and Cost Assignment

Conceptually, computing the unit manufacturing cost is simple. The unit cost is the total manufacturing cost associated with the units produced divided by the number of units produced. For example, if a company builds 100 homes during the year and the total cost of materials, labour, and overhead for these homes is \$6 million, then the cost of each home is \$60,000 (\$6 million/100 homes). Although the concept is simple, the practical reality of the computation can be somewhat more complex. The straightforward approach breaks down when there are products that differ from one another or when cost information for a product is needed before all of the actual costs associated with its production are known. We will discuss the implications of these issues in both this chapter and the following chapter.

Irrespective of such difficulties, total manufacturing costs must be *measured* and then these costs must be *associated* with the units produced. **Cost measurement** consists of determining the dollar amounts of direct materials, direct labour, and importantly, overhead used in production. The dollar amounts may be the actual amounts expended for the manufacturing inputs, or they may be estimated amounts. Often, estimated amounts are used to ensure timeliness of cost information or to control costs. The process of associating the costs, once measured, with the units produced is called **cost assignment**. The chapter will focus on these processes.

Before we discuss the measurement and assignment of costs it is important to remember that different unit costs may be needed for different purposes. Whether the unit cost information determined through the measurement and assignment processes should include all manufacturing costs, as opposed to only variable or incremental costs, depends on the setting and the purpose for which the information is going to be used. For example for financial reporting, *full* or *absorption* unit cost information is required. However, if a firm is operating below its production capacity, perhaps incremental cost information may be more useful in deciding whether to accept or reject a 'special' order. Simply put, unit cost information needed for external reporting may not supply the information necessary for a number of internal decisions, especially those decisions that are short-run in nature. (It should be pointed out, however, that full cost information is useful for a number of important internal decisions as well as for financial reporting. In the long run, for any product to be viable, its price must cover its full cost.)

Production of unit cost information

To produce unit cost information, both cost measurement and cost assignment are required. There are a number of different ways to measure and assign costs. This chapter introduces two measurement systems and two assignment systems and discusses one of each type in detail.

The two main systems for assigning costs are **job-order costing** and **process costing**. The two measurement systems introduced are **actual costing** and **normal costing**. Combinations of measurement and assignment approaches define a cost accounting system. For example, actual costing measurement with job-order cost assignment creates an *actual job-order cost* system. Alternatively, a process costing approach to assignment may be combined with actual cost measurement to create an *actual process costing* system. Given the two measurement systems and the two assignment systems, a total of four cost accounting systems are possible, with each system presenting a different way to compute unit costs. The four possible systems are summarised in Exhibit M3.1.

EXHIBIT M3.1 FOUR POSSIBLE COST ACCOUNTING SYSTEMS		
Cost Assignment	Cost Measurement	
	Job-order — Actual	Job-order — Normal
	Process — Actual	Process — Normal

Which system should be chosen depends on the type of cost data a manager needs for controlling and directing the activities of an organisation. Of the four systems, the two systems using actual costing are rarely chosen because they generally fail to supply product cost information on a timely basis.

M3.4 Job-Order and Process Costing: Two Cost Assignment Systems

Manufacturing firms can be divided into two major industrial types based on different manufacturing processes: job-order manufacturing and process manufacturing. Two different cost assignment or accumulation systems have been developed, each corresponding to one of these manufacturing processes. To understand the differences between these two cost assignment systems, we need to understand the differences in the two manufacturing processes.

Job-order manufacturing and costing

For job-order manufacturing systems, manufacturing costs are accumulated for each *job*. This approach to assigning costs is called a *job-order costing system*. Firms operating in job-order industries produce a wide variety of products or jobs that are usually quite distinct from each other. Customised or built-to-order products fit into this category. Examples of job-order processes include printing, construction, and furniture making. A job may be a single unit such as a house, or it may be a batch of units such as eight tables. Job-order systems may be used to produce goods for inventory that are subsequently sold in the general market. Often, however, a job is associated with a particular customer order.

In a job-order firm, collecting costs by job provides vital information for management. Once a job is completed, the unit cost can be obtained by dividing the total manufacturing costs by the number of units produced. For example, if the production costs for printing 100 wedding announcements total \$300, the unit cost for this job is \$3. Given the unit cost information, the manager of the printing firm can determine whether the prevailing market price provides a reasonable profit margin. If not, this may signal to the manager that the costs are out of line with other printing firms. He or she can then take action to reduce costs, if possible, or to emphasise other types of jobs for which the firm can earn a reasonable profit margin. In fact, the profit contributions of different printing jobs offered by the firm can be computed and this information can be used to select the most profitable mix of printing services to offer.

Process manufacturing and costing

Firms in process-based environments mass-produce large quantities of very similar or homogeneous products. Each product is essentially indistinguishable from its companion product. Examples of process manufacturers include food, cement, petroleum, and chemical firms. The important point here is that the cost of one product is identical to the cost of another. Therefore, service firms can also use a process costing approach. Discount stockbrokers, for example, incur much the same cost to execute a customer order for one stock as for another. Cheque clearing departments of banks incur a uniform cost to clear a cheque, no matter the size of the cheque or the name of the person to whom it is written.

Process firms accumulate production costs by *process* or by *department* for a *given period of time*. The output for the process for the same period of time is measured. Unit costs are computed by dividing the process costs for the given period by the output of the period. This approach to cost accumulation is known as a process costing system. Exhibit M3.2 summarises and contrasts the characteristics of job-order and process costing.

EXHIBIT M3.2

COMPARISON OF JOB-ORDER AND PROCESS COSTING

Job-Order Costing	Process Costing
1 Wide variety of distinct products	1 Homogeneous products
2 Costs accumulated by job	2 Costs accumulated by process or department
3 Unit cost computed by dividing total job costs by units produced on that job	3 Unit cost computed by dividing process costs of the period by the units produced in the period

M3.5 Actual Costing and Normal Costing: Two Cost Measurement Approaches

Cost measurement is concerned with determining the dollar amounts of manufacturing inputs used in production. An **actual cost system** uses actual costs for direct materials, direct labour, and overhead. These actual costs are then used to determine the unit cost. Strict actual cost systems are rarely used because they cannot provide accurate unit cost information on a timely basis. The main problem with using actual costs for calculation of unit cost is with manufacturing overhead. Overhead items do not have the direct relationship with units produced that direct materials and direct labour do. For example, how much of the security guard's salary should be assigned to a unit of product? Because overhead items are indirectly related to the units produced, per-unit overhead costs must be calculated by averaging, which requires totalling manufacturing overhead costs for a given period and then dividing this total by the number of units produced.

So that cost information can be produced in a timely manner if the time period chosen is relatively short (say, a month), averaging can yield per-unit overhead costs that fluctuate dramatically from month to month. This occurs for two major reasons. First, many overhead costs are not incurred uniformly throughout the year. Thus, they can differ significantly from one period to the next. Second, per-unit overhead costs can fluctuate dramatically because production levels are different across different months.

To illustrate, consider the following example. Assume a company produces a toy truck made of plastic. Each truck requires 60 grams of plastic and fifteen minutes of direct labour. For the technology used, this input-output relationship is reasonably stable. Thus, the quantity of raw materials and the direct labour used for each toy truck are essentially the same regardless of how many toy trucks are produced or when they are produced. The unit cost of these two inputs can be accurately computed.

If actual overhead costs for the manufacturer were \$200,000 in April and 40,000 trucks were produced, the per-unit overhead cost is $\$200,000/40,000$, or \$5.00 per truck. Unfortunately, this averaging approach has some severe limitations, as shown in the following figures:

	April	August	November
Actual overhead	\$200,000	\$400,000	\$400,000
Actual units produced	40,000	40,000	160,000
Per-unit overhead ¹	\$5.00	\$10.00	\$2.50

¹ Actual overhead/Actual production

Notice that the overhead cost per unit is different for each of the three months. April and August have the same production but different monthly overhead costs. The difference in overhead cost could be attributable to higher electricity costs due to increased heating requirements in the month of August. Thus, the toy trucks produced in August have a higher per-unit overhead cost (\$10.00 rather than \$5.00) just because they happened to be produced when heating was required. The difference in the per-unit overhead cost is because overhead costs were incurred non-uniformly.

Non-uniform production is the second reason for variability in per-unit overhead costs, as August and November figures show. Both months have the same total monthly overhead costs but different output levels. November's output may be much larger because of anticipation of Christmas sales. Whatever the reason, the higher output in November creates a lower per-unit overhead cost (\$2.50 compared to August's \$10.00).

Varying per-unit overhead costs do not signal differences in value. A toy truck produced in April is identical to one produced in August or November. The higher electricity costs in August may equal August electricity costs of the previous year. The problem of fluctuating per-unit overhead costs can be avoided if the firm waits until the end of the year to assign the overhead costs. For example, if April, August and November were the only months of operation for the toy truck manufacturer, the total overhead costs for the year are \$1,000,000 (\$200,000 + \$400,000 + \$400,000), and the total production is 240,000 trucks (40,000 + 40,000 + 160,000). The per-unit overhead cost is \$1,000,000/240,000, or \$4.17. By waiting until the end of the year, the firm eliminates the problems of non-uniform overhead cost incurrence and non-uniform production. The result is the same overhead cost per unit for every unit produced. Unfortunately, waiting until the end of the year to compute an overhead rate is unacceptable, as a company needs unit cost information throughout the year. This information is needed on a timely basis both for more frequent financial statements and to help managers make decisions such as pricing. Most decisions requiring unit cost information cannot wait until the end of the year.

Cost systems that measure overhead costs on a predetermined basis and use actual costs for direct materials and direct labour are called **normal costing systems**. Most firms adopt this approach. The principal difficulty with normal costing is that the predetermined rate is likely to differ from the actual rate. Either actual overhead costs differ from the estimated costs or the actual level of production differs from the expected level, or both. This causes a difficulty if the differences are large. Thus it is important to achieve as accurate estimates as possible because the costs calculated can affect prices to be charged to customers and in making decisions on what products to promote or eliminate.

Why is overhead allocation important?

This chapter describes a number of alternative ways in which overhead costs can be allocated in order to determine product costs. An important question for you to consider is why overhead costs need to be allocated to products.

From a management accounting perspective, the costs of products and services are useful in a number of settings, including assessing the profitability of different products, pricing, and product mix decisions (as described in Chapter M2).

From a financial accounting perspective, it is necessary to match the revenue received from selling a product to *all* of the costs associated with producing that product. A problem arises because some products produced during the period may not be sold during that period. Therefore, overhead costs for the period must be divided between units sold during the period and those that remain in inventory.

Manufacturing and service industries have moved towards more capital-intensive operations supported by an increasing number of activities that are not easily traced directly to products. The magnitude of these overhead costs (overhead often far exceeds direct costs) is turning attention to ways in which such costs can be allocated to products more accurately.

M3.6 Overhead Application

As noted above, in normal cost systems, overhead is assigned to production through the use of a predetermined overhead rate.

Predetermined overhead rates

A predetermined overhead rate is calculated using the following formula:

$$\text{Overhead rate} = \text{Budgeted overhead} / \text{Activity level}$$

Budgeted overhead is simply the estimated overhead costs for the coming year. The accountants of a firm are responsible for developing these estimates. The second input requires that the level for the activity be specified by first identifying a measure of production activity (e.g. direct labour hours) and, second, predicting the level of this activity.

Because a predetermined overhead rate is calculated in advance, usually at the beginning of the year, it is impossible to use actual overhead or actual activity level for the year. On 1 January, we do not know what actual levels will be; therefore, only estimated or budgeted amounts are used in calculating the predetermined overhead rate.

Measures of production activity

Production activity can be measured in many different ways. In assigning overhead costs, it is important to select an activity base that is correlated with overhead consumption. This will assure that individual products receive a more accurate allocation of overhead costs. While there are many choices available, four common measures are:

- 1 Units produced
- 2 Direct labour hours
- 3 Direct labour dollars
- 4 Machine hours

The most obvious measure of production activity is output (i.e. units produced). If there is only one product, overhead costs are clearly incurred to produce that product. In this case, units produced satisfy the cause-and-effect criterion. Most firms, however, produce more than one product. Since different products typically consume different amounts of overhead, this allocation method is inaccurate.

For example, suppose a company produces wood furniture. One type of dining room table has very simple round legs. Another style of table has very elaborately turned and carved legs. Both types of table leg require the use of a machine; therefore, both types should share the cost of using this machine (depreciation, electricity, maintenance, etc.) Suppose that the cost of operating the machine is \$20,000, and 10,000 units of each type of leg are produced. Using units produced, the overhead cost assigned to each product would be \$1 (\$20,000/20,000). But one product may spend sixty minutes on the machine, the other only fifteen. Since one product spends four times as much time on the machine as the other, many would argue that it should receive more of the machine's cost. Using the units produced method has not given a very accurate, meaningful, or fair assignment of overhead costs. How, then, should overhead be allocated?

The allocation of overhead costs should follow, as nearly as possible, a cause-and-effect relationship. Efforts should be made to identify those factors that cause the consumption of overhead. Once identified, these causal factors, or cost drivers, should be used to assign overhead to products. Measures such as machine hours and direct labour hours are useful for multiple-product settings. As we will discuss later, it may even be appropriate to use multiple rates.

M3.7 Basic Concept of Overhead Application

Predetermined overhead rates are used to apply overhead costs to production as the actual production activity unfolds. The total overhead assigned to actual production at any point in time is called **applied overhead**. Applied overhead is computed using the following formula:

$$\text{Applied overhead} = \text{Overhead rate} \times \text{Actual production activity}$$

The measure of production activity used to determine the overhead rate must be the same as the measure of actual production activity. That is, if the predetermined overhead rate is calculated on the basis of direct labour hours, overhead must be applied on the basis of direct labour hours.

In attempting to understand the concept of applied overhead, there are two points that should be emphasised.

- 1 Applied overhead is the basis for computing per-unit overhead cost.
- 2 Applied overhead is rarely equal to a period's actual overhead.

These points are best illustrated with an example. Phone Limited produces two telephones: a cordless phone and a regular model. The company has the following estimated and actual data for 2016:

Budgeted overhead	\$360,000
Budgeted activity (in direct labour hours)	120,000
Actual activity (in direct labour hours)	100,000
Actual overhead	\$320,000

Now assume that the firm bases its predetermined overhead rate on budgeted activity measured in direct labour hours (DLH). Thus, for 2016:

$$\begin{aligned}
 \text{Predetermined overhead rate} &= \text{Budgeted overhead} / \text{Budgeted activity} \\
 &= \$360,000 / 120,000 \text{ direct labour hours} \\
 &= \$3 \text{ per DLH}
 \end{aligned}$$

Using the overhead rate, applied overhead for 2016 is:

$$\begin{aligned}
 \text{Applied overhead} &= \text{Overhead rate} \times \text{Actual activity} \\
 &= \$3 \text{ per DLH} \times 100,000 \text{ DLH} \\
 &= \$300,000
 \end{aligned}$$

Underapplied and overapplied overhead

Notice that the amount of overhead applied to production (\$300,000) differs from the actual overhead (\$320,000). Since the predetermined overhead rate is based on estimated data, applied overhead will rarely equal actual overhead. Since only \$300,000 was applied in our example, the firm has *underapplied* overhead by \$20,000. If applied overhead had been \$330,000, too much overhead would have been applied to production. The firm would have *overapplied* overhead by \$10,000. The difference between actual overhead and applied overhead is called an **overhead variance**. If the difference is positive (i.e. if actual overhead is greater than applied overhead) the variance is called **underapplied overhead**. If the difference is negative (i.e. if applied overhead is greater than actual overhead) the variance is called **overapplied overhead**.

At year-end, however, costs must be stated at actual — *not* estimated — amounts. Accordingly, at the end of a reporting period, procedures must exist to deal with the overhead variances.

From an actual costing perspective, the overhead variance represents an error in assigning overhead costs to production. At the end of the reporting period, something must be done with the overhead variance.

The most common practice is to assign the entire overhead variance to cost of goods sold. Since the overhead variance is usually relatively small, the method of disposition is not a critical matter because all production costs should appear in cost of goods sold eventually. This method is reasonable if the variance is immaterial. If the amount is much larger, more sophisticated methods of allocating the underapplied or overapplied overhead are required. This involves allocating part to COGS and part to inventory accounts. This more elaborate process will be left to subsequent subjects.

Illustrative example

BTH Limited uses a normal costing system. The following data are available for 2016:

	Budgeted:
Overhead	\$675,000
Machine hours	25,000
Direct labour hours	75,000

Actual:	
Overhead	\$681,000
Machine hours	25,050
Direct labour hours	75,700
Prime cost	\$957,000
Number of units	400,000

Overhead is applied on the basis of direct labour hours.

- 1 What is the predetermined overhead rate?
- 2 What is the applied overhead for 2016?
- 3 Was overhead overapplied or underapplied, and by how much?
- 4 What is the normal cost per unit produced?
- 5 How would the answers in 1 to 4 above change if applied overhead production is on the basis of machine hours instead of direct labour hours?

Suggested solution

1 $\$675,000 / 75,000 = \9.00 per DLH

2 $\$9.00 \times 75,700 = \$681,300$

3 Applied overhead	\$681,300
Actual overhead	<u>681,000</u>
Overapplied overhead	\$ 300

4 Prime cost	\$957,000
Applied overhead	<u>681,300</u>
$\$1,638,300 / 400,000 = \4.10 (rounded)	

Prime costs = Direct material costs + Direct labour costs

5 Predetermined overhead rate = $\$675,000 / 25,000 = \27 per MHR

Applied overhead = $\$27 \times 25,050 = \$676,350$

Actual overhead	\$681,000
Applied overhead	<u>676,350</u>
Underapplied overhead	\$ 4,650
Prime cost	\$957,000
Applied overhead	<u>676,350</u>

$\$1,633,350 / 400,000 = \4.08 (rounded)

Traditional costing systems

Traditional costing systems for measuring the costs of products and services include job and process costing, and hybrids of these systems.

Process costing as an example

The simplest form of costing occurs when a company produces only one product or service. In this situation, process costing may be used. Under processing costing, the costs incurred in a period are all attributed to the output of that product, so that each unit of product bears the same average cost.

Assume that Big Red Winery produces one type of bottled red wine. Last month 5,000 bottles were produced. The following costs were incurred:

	\$
Direct materials (mainly grapes)	60,000
Direct labour	100,000
Overhead	<u>40,000</u>
Total manufacturing cost	200,000

The product cost per bottle of wine can be calculated as follows:

$$\frac{\text{Total manufacturing cost for the period (month)}}{\text{Total production for the period (month)}}$$

For this winery:

$$\begin{aligned}\text{Product cost per bottle of wine} &= \frac{\$200,000}{5,000} \\ &= \$40\end{aligned}$$

Job costing as an example of traditional costing

We now describe job costing as an example.

The actual costs of direct materials and direct labour are assigned to jobs together with a predetermined overhead rate. In order to assign these costs, it is necessary to identify each job and the direct materials and direct labour used on the job. Additionally, some mechanism must exist to allocate overhead costs to each job.

A job costing system needs to identify the quantity of direct materials, direct labour, and overhead consumed by each job. This need is satisfied through the use of materials requisitions for direct material, time recorded for direct labour, and predetermined rates for overhead.

Unit cost calculation

Once a job is completed, its total manufacturing cost is computed by first totalling the costs of direct materials, direct labour, and overhead, and then summing these individual totals. This total is divided by the number of units produced to obtain the unit cost.

Here is a further simple illustration of the calculations for job costing.

At the start of the month the work in progress consisted of three jobs:

	\$
Job 101	8,000
Job 102	10,000
Job 103	4,000

Material and labour information for the month are as follows:

	Job 101	Job 102	Job 103	Total
Direct material costs	\$ 8,000	\$ 2,000	\$ 5,000	\$20,000
Direct labour costs	\$12,000	\$12,000	\$18,000	\$42,000
Direct labour hours	600	600	900	2,100

Manufacturing overhead costs for the month:

Indirect labour	\$ 5,000
Indirect materials	\$ 4,000
Other factory overhead costs	\$13,500

Overhead is allocated on the basis of \$10 per direct labour hour.
Jobs 101 and 102 were completed during the month.

- 1 What are the costs of Job 101, 102 and 103?
- 2 Was overhead underapplied or overapplied for the month?

Suggested solution

1

	Opening WIP	Material	Labour	Overhead	Total
	\$	\$	\$	\$	\$
Job 101	8,000	8,000	12,000	6,000*	34,000
Job 102	10,000	2,000	12,000	6,000	30,000
Job 103	4,000	10,000	18,000	9,000	41,000

* $600 \times \$5$

- 2 Underapplied: $2,100 \times \$10 - 22,500 = \$1,500$

M3.8 Job-Order Costing: Specific Cost-Flow Description

Of principal interest in a job-order system is the flow of manufacturing costs. Accordingly, we begin with a description of how we account for the three manufacturing cost elements (direct materials, direct labour, and overhead).

A simplified job shop environment is used as the framework for this description. Better Works produces customised briefcases. It leased a small building and bought the necessary production equipment. For the first month of operation (January), it finalised two orders: one for 20 engraved briefcases for a local firm and a second for ten orange-and-black briefcases for the coaching staff of a local rugby league team. Both orders must be delivered 31 January and will be sold for manufacturing cost plus 50 per cent. It is expected to average two orders per month for the first year of operation.

Two job-order cost sheets are each assigned a number. Job 1 is the engraved briefcases and Job 2 is the orange-and-black briefcases.

Accounting for materials

Since the company is beginning business, it has no beginning inventories. To produce the 30 briefcases in January and have a supply of materials on hand at the beginning of February, the company purchases, on account, \$2,500 of raw materials. This purchase is recorded as follows:

1 DR Raw Materials	\$2,500	
CR Accounts Payable		\$2,500

Raw materials is an inventory account and therefore appears on a balance sheet. It also is the controlling account for all raw materials. When materials are purchased, the cost of these materials 'flows' into the raw materials account.

From 2 January to 19 January, the production supervisor used three requisition forms to remove \$1,000 of raw materials from the storeroom. From 20 January to 31 January, two additional requisition forms for \$500 of raw materials were used. The first three forms revealed that the raw materials were used for Job 1; the last two requisitions were for Job 2. Thus, for January, the cost sheet for Job 1 would have a total of \$1,000 in direct materials posted, and the cost sheet for Job 2 would have a total of \$500 in direct materials posted. In addition, the following entry would be made:

2 DR Work in Progress	\$1,500	
CR Raw Materials		\$1,500

This second entry captures the notion of raw materials flowing from the storeroom to work in progress. All such flows are summarised in the work in progress account as well as being posted individually to the respective jobs. Work in progress is a controlling account, and the job cost sheets are the subsidiary accounts. Exhibit M3.3 summarises the raw materials cost flows. Notice that the source document that drives the materials cost flows is the materials requisition form.

EXHIBIT M3.3

SUMMARY OF MATERIALS COST FLOWS

Raw Materials			
→ 1		2,500	2 1,500
Purchase of raw materials			

Work in Progress		
→ 2		1,500
Issue of materials		

SUBSIDIARY ACCOUNTS (COST SHEETS)

Job 1 Materials	
Req. No.	Amount
1	\$ 300
2	200
3	500
	<u>\$1,000</u>

Job 2 Materials	
Req. No.	Amount
4	\$250
5	250
	<u>\$500</u>

Accounting for direct labour cost

Since two jobs were in progress during January, time records filled out by direct labourers must be sorted by each job. Once the sorting is completed, the hours worked and the wage rate of each employee are used to assign the direct labour cost to each job. For Job 1, the time records showed 30 hours at an average wage rate of \$20 per hour, for a total direct labour cost of \$600. For Job 2, the total was \$250, based on 12.5 hours at an average hourly wage of \$20. In addition to the postings to each job's cost sheet, the following summary entry would be made:

3 DR Work in Progress	\$850	
CR Wages Payable		\$850

The summary of the labour cost flows is given in Exhibit M3.4. Notice that the direct labour costs assigned to the two jobs exactly equal the total assigned to work in progress. Note also that the time records filled out by the individual labourers are the source of information for posting the labour cost flows. Remember that the labour cost flows reflect only direct labour cost. Indirect labour is assigned as part of overhead.

EXHIBIT M3.4

SUMMARY OF DIRECT LABOUR COST FLOWS

Wages Payable		labour cost	Work in Progress	
	3 850		3 850	

WIP SUBSIDIARY ACCOUNTS (COST SHEETS)

Job 1 Labour				Job 2 Labour			
Record Number	Hours	Rate	Amount	Record Number	Hours	Rate	Amount
1	9	\$20	\$180	4	5	\$20	\$100
2	10	20	200	5	<u>7.5</u>	20	<u>150</u>
3	<u>11</u>	20	<u>220</u>		<u>12.5</u>		<u>\$250</u>
	<u>30</u>		<u>\$600</u>				

Accounting for overhead

Under a normal costing approach, actual overhead costs are *never* assigned to jobs. Overhead is applied to each individual job using a predetermined overhead rate. Even with this system, however, actual overhead costs incurred must be accounted for. Thus, first we will describe how to account for applied overhead, and then we will discuss accounting for actual overhead.

Accounting for overhead application

Assume that the company estimated overhead costs for the year at \$9,600. They also expect to use 1,200 direct labour hours. Accordingly, the predetermined overhead rate is:

$$\text{Overhead rate} = \$9,600 / 1,200 = \$8 \text{ per direct labour hour}$$

Overhead costs flow into work in progress via the predetermined rate. Since direct labour hours are used to load overhead onto production, the time records serve as the source documents for assigning overhead to individual jobs and to the controlling work in progress account.

For Job 1, with a total of 30 hours worked, the amount of overhead cost posted is \$240 (\$8 × 30). For Job 2, the overhead cost is \$100 (\$8 × 12.5). A summary entry reflects a total of \$340 (i.e. all overhead applied to jobs worked on in January) in applied overhead.

4 DR Work in Progress	\$340	
CR Overhead Control		\$340

The credit balance in the overhead control account equals the total applied overhead at a given point in time. In normal costing, only applied overhead ever enters the work in progress account.

Accounting for actual overhead costs

To illustrate how actual overhead costs are recorded, assume that Business Works incurred the following indirect costs for January:

	\$
Lease payment	200
Utilities	50
Equipment depreciation	100
Indirect labour	65
Total overhead costs	415

As indicated earlier, actual overhead costs never enter the work in progress account. The usual procedure is to record actual overhead costs on the debit side of the overhead control account. For example, the actual overhead costs would be recorded as follows:

5 DR Overhead Control	\$415	
CR Lease Payable		\$200
CR Utilities Payable		\$ 50
CR Accumulated Depreciation		\$100
CR Wages Payable		\$ 65

Thus, the debit balance in the overhead control account gives the total actual overhead costs at a given point in time. Since actual overhead costs are on the debit side of this account, and applied overhead costs are on the credit side, the balance in the overhead control account is the overhead variance at a given point in time. For Better Works at the end of January, the actual overhead of \$415 and applied overhead of \$340 produce underapplied overhead of \$75 (\$415 – \$340).

The flow of overhead costs is summarised in Exhibit M3.5. To apply overhead to work in progress, a company needs information from the time records and a predetermined overhead rate based on direct labour hours.

EXHIBIT M3.5

SUMMARY OF OVERHEAD COST FLOWS

Misc. Credits			Overhead Control				Work in Progress		
	5	415	5	415	4	340	4	340	
			Overhead cost incurrence		Application of overhead				

WIP SUBSIDIARY ACCOUNTS (COST SHEETS)

Job 1 Applied Overhead		
Hours	Rate	Amount
30	\$8	\$240

Job 2 Applied Overhead		
Hours	Rate	Amount
12.5	\$8	\$100

Accounting for finished goods

We have already seen what takes place when a job is completed. The columns for direct materials, direct labour, and applied overhead are totalled. These totals are then transferred to another section of the cost sheet where they

are summed to yield the manufacturing cost of the job. This job cost sheet is then transferred to a finished goods file. Simultaneously, the costs of the completed job are transferred from the work in progress account to the finished goods account.

For example, assume that Job 1 was completed in January with the completed cost sheet shown in Exhibit M3.6. Since Job 1 is completed, the total manufacturing costs of \$1,840 must be transferred from the work in progress account to the finished goods account. This transfer is described by the following entry.

6 DR Finished Goods	\$1,840	
CR Work in Progress		\$1,840

EXHIBIT M3.6**COMPLETED JOB-ORDER COST SHEET**

For Item Description Quantity Completed	Johnson Company Engraved Briefcases 20	Job Order Number 1 Date Ordered 1 January 2016 Date Completed 29 January 2016 Date Shipped 31 January 2016						
Materials		Direct Labour				Overhead		
Requisition Number	Amount	Record Number	Hours	Rate	Amount	Hours	Rate	Amount
1	\$ 300	1	9	\$20	\$180	9	\$8	\$ 72
2	200	2	10	20	200	10	8	80
3	500	3	11	20	220	11	8	88
	<u>\$1,000</u>				<u>\$600</u>			<u>\$240</u>
Cost Summary								
Direct Materials		<u>\$1,000</u>						
Direct Labour		<u>\$ 600</u>						
Overhead		<u>\$ 240</u>						
Total Cost		<u>\$1,840</u>						
Unit Cost		<u>\$ 92</u>						

A summary of the cost flows occurring when a job is finished is shown in Exhibit M3.7.

EXHIBIT M3.7**SUMMARY OF FINISHED GOODS COST FLOWS**

Work in Progress			Finished Goods	
	6	1,840	6	1,840
		Transfer of Finished Goods		

Completion of goods in a manufacturing process represents an important step in the flow of manufacturing costs. A schedule of the cost of goods manufactured is prepared periodically to summarise the cost flows of all production activity. This report is an important input for a firm's income statement.

The schedule of the cost of goods manufactured presented in Exhibit M3.8 summarises the production activity of Better Works for January. The key difference between this report and the one appearing in M1 is the use of applied overhead to arrive at the cost of goods manufactured. Finished goods inventories are carried at normal cost rather than actual cost.

Notice that ending work in progress is \$850. Where did we obtain this figure? Of the two jobs, Job 1 was finished and transferred to finished goods. Job 2 is still in progress, however, and the manufacturing costs assigned thus far are direct materials, \$500; direct labour, \$250; and overhead applied, \$100. The total of these costs gives the cost of ending work in progress.

Accounting for cost of goods sold

In a job-order firm, units can be produced for a particular customer or they can be produced with the expectation of selling the units as market conditions warrant. If a job is produced especially for a customer (as with Job 1), when the job is shipped to the customer, the cost of the finished job becomes the cost of the goods sold. When Job 1 is shipped, the following entries would be made (recall that the selling price is 150 per cent of manufacturing cost).

7 DR Cost of Goods Sold	\$1,840	
CR Finished Goods		\$1,840
8 DR Accounts Receivable	\$2,760	
CR Sales Revenue		\$2,760

EXHIBIT M3.8

BETTER WORKS COMPANY SCHEDULE OF COST OF GOODS MANUFACTURED FOR THE MONTH ENDED 31 JANUARY 2016

	\$	\$
Direct materials:		
Beginning raw materials inventory	0	
Purchases of raw materials	<u>2,500</u>	
Total raw materials available	2,500	
Ending raw materials	<u>1,000</u>	
Raw materials used		1,500
Direct labour		850
Overhead:		
Lease	200	
Electricity	50	
Depreciation	100	
Indirect labour	<u>65</u>	
	415	
Less: Underapplied overhead	<u>(75)</u>	
Overhead applied		<u>340</u>
Current manufacturing costs		2,690
Add: Beginning work in progress		<u>0</u>
Total manufacturing costs		2,690
Less: Ending work in progress		<u>(850)</u>
Cost of goods manufactured		<u>1,840</u>

In addition to these entries, a schedule of cost of goods sold usually is prepared at the end of each reporting period (e.g. monthly and quarterly). Exhibit M3.9 presents such a schedule for Better Works for January.

However, closing the overhead variance to the cost of goods sold account is not done until the end of the year. Variances are expected each month because of non-uniform production and non-uniform actual overhead costs. As the year unfolds, these monthly variances should, by and large, offset each other so that the year-end variance is small.

EXHIBIT M3.9**BETTER WORKS COMPANY STATEMENT OF COST OF GOODS SOLD**

	\$
Beginning finished goods inventory	0
Cost of goods manufactured	<u>1,840</u>
Goods available for sale	1,840
Less: Ending finished goods inventory	<u>(0)</u>
Normal cost of goods sold	1,840
Add: Underapplied overhead	<u>75</u>
Adjusted cost of goods sold	<u>1,915</u>

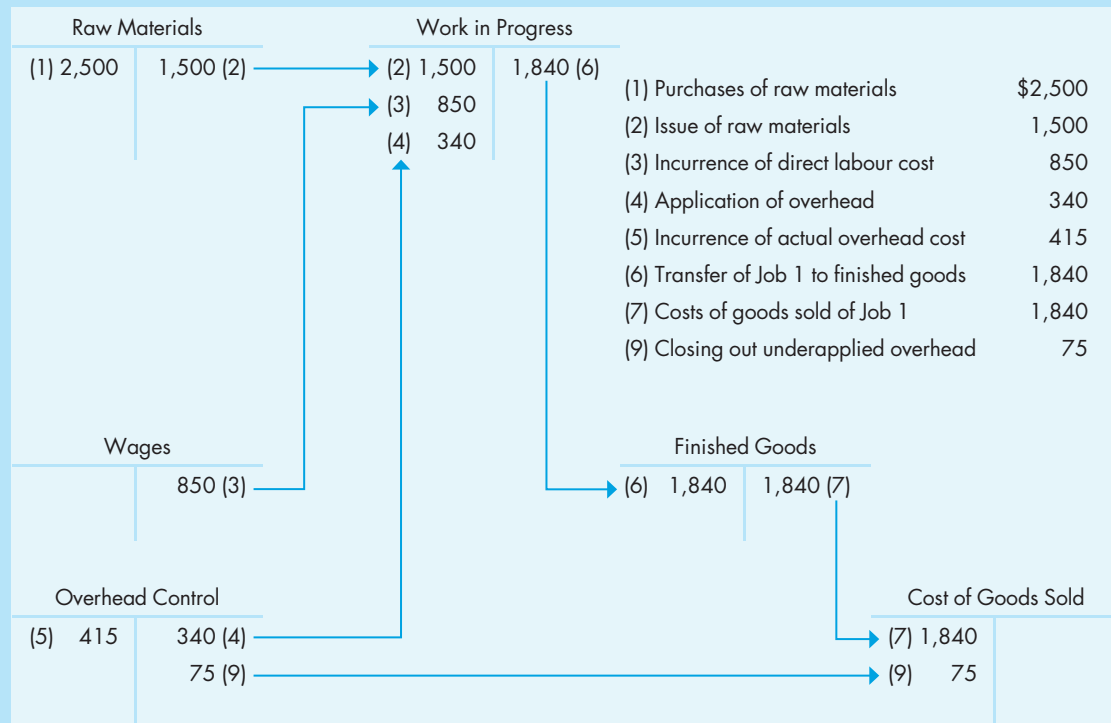
Nonetheless, to illustrate how the year-end overhead variance would be treated, we will close out the overhead variance experienced by Better Works in January.

Closing the underapplied overhead to cost of goods sold requires the following entry:

9 DR Cost of Goods Sold	\$75	
CR Overhead Control		\$75

Notice that debiting the cost of goods sold is equivalent to adding the underapplied amount to the normal cost of goods sold figure. If the overhead variance had been overapplied, the entry would reverse and cost of goods sold would be credited.

Closing out the overhead variance to cost of goods sold completes the description of manufacturing cost flows. To facilitate a review of these important concepts, Exhibit M3.10 shows a complete summary of the manufacturing cost

EXHIBIT M3.10**SUMMARY OF MANUFACTURING COST FLOWS**

flows for Better Works. Notice that these entries summarise information from the underlying job-order cost sheets. Although the description in this exhibit is specific to the example, the pattern of cost flows shown would be found in any manufacturing firm that uses a normal job-order cost system.

Manufacturing cost flows, however, are not the only cost flows experienced by a firm. Non-manufacturing costs are also incurred. A description of how we account for these costs follows.

Accounting for non-manufacturing costs

Recall that costs associated with selling and general administrative activities are classified as non-manufacturing costs. These costs are period costs and are *never* assigned to the product. They are not part of the manufacturing cost flows. They do not belong to the overhead category and are treated as a totally separate category.

To illustrate how these costs are accounted for, assume Better Works had the following additional transactions in January:

	\$
Advertising circulars	75
Sales commission	125
Office salaries	500
Depreciation, office equipment	50

The following compound entry could be used to record the above costs:

	\$	\$
DR Selling Expense Control	200	
DR Administrative Expense Control	550	
CR Accounts Payable		75
CR Wages Payable		625
CR Accumulated Depreciation		50

Control accounts accumulate all of the selling and administrative expenses for a period. At the end of the period, all of these costs flow to the period's income statement. An income statement for Better Works is shown in Exhibit M3.11.

With the description of the accounting procedures for selling and administrative expenses completed, the basic essentials of a normal job-order costing system are also complete. This description has assumed that a single plant-wide overhead rate was being used. The use of a single overhead rate, however, can distort product costs.

EXHIBIT M3.11

BETTER WORKS COMPANY INCOME STATEMENT FOR THE MONTH ENDED 31 JANUARY 2016

	\$	\$
Sales		2,760
Less: Cost of goods sold		<u>(1,915)</u>
Gross margin		845
Less: Selling and administrative expenses		
Selling expense	200	
Administrative expense	<u>550</u>	<u>(750)</u>
Net income		95

M3.9 Single Versus Multiple Overhead Rates

Using a single rate based on direct labour hours to assign overhead to jobs may result in unfair cost assignments (unfair in the sense that too much or too little overhead is assigned to a particular job). This can occur if direct labour hours do not correlate well with the consumption of overhead resources.

To illustrate, consider a company with two departments, one that is labour intensive (Department A) and the other machine intensive (Department B). The expected annual overhead costs and the expected annual usage of direct labour hours and machine hours for each department are shown in Exhibit M3.12.

EXHIBIT M3.12

DEPARTMENTAL OVERHEAD COSTS AND ACTIVITY

	Department A	Department B	Total
Overhead costs	\$60,000	\$180,000	\$240,000
Direct labour hours	15,000	5,000	20,000
Machine hours	5,000	15,000	20,000

Currently, the company uses a plant-wide overhead rate based on direct labour hours. Thus, the overhead rate used for product costing is \$12 per direct labour hour $[(\$60,000 + \$180,000) / (15,000 + 5,000)]$.

Now consider two recently completed jobs, Job 23 and Job 24. Exhibit M3.13 provides production-related data concerning each job. The data reveal that Job 23 spent all of its time in Department A while Job 24 spent all of its time in Department B. Using the plant-wide overhead rate, Job 23 would receive a \$6,000 overhead assignment ($\$12 \times 500$ direct labour hours) and Job 24 would receive a \$12 overhead assignment ($\12×1 direct labour hour). Thus, the total manufacturing cost of Job 23 is \$11,000 ($\$5,000 + \$6,000$), yielding a unit cost of \$11; the total manufacturing cost of Job 24 is \$5,012 ($\$5,000 + \12), yielding a unit cost of \$5.012. Clearly, something is wrong. Using a plant-wide rate, Job 23 received 500 times the overhead cost assignment that Job 24 received. Yet, as Exhibit M3.13 shows, Job 24 was produced in a department that is responsible for producing 75 per cent of the plant's total overhead. Imagine the difficulties that this type of costing distortion can cause for a company. Some products would be over-costed while others would be under-costed, and the result could be incorrect pricing decisions that adversely affect the firm's competitive position.

EXHIBIT M3.13

PRODUCTION DATA FOR JOBS 23 AND 24

	Job 23		
	Department A	Department B	Total
Prime costs	\$5,000	\$0	\$5,000
Direct labour hours	500	0	500
Machine hours	1	0	1
Units produced	1,000	0	1,000
	Job 24		
	Department A	Department B	Total
Prime costs	0	\$5,000	\$5,000
Direct labour hours	0	1	1
Machine hours	0	500	500
Units produced	0	1,000	1,000

The distortion in product costs is caused by the assumption that direct labour hours properly reflect the overhead consumed by the individual jobs. One cost driver for the firm as a whole does not seem to work here. This type of problem can be resolved by using **multiple overhead rates**, where each rate uses a different cost driver. For this example, a satisfactory solution might be to develop an overhead rate for each department. In the case of the machine-intensive Department B, the rate could be based on machine hours instead of direct labour hours. It seems reasonable to believe that machine hours relate better to machine-related overhead than direct labour hours do and direct labour hours would be a good cost driver for a labour-intensive department. If so, more accurate product costing can be achieved by computing two departmental rates instead of one plant-wide rate.

Using data from Exhibit M3.12, the overhead rate for Department A is \$4 per direct labour hour (\$60,000/15,000), and the overhead rate for Department B is \$12 per machine hour (\$180,000/15,000). Using these rates, Job 23 would be assigned \$2,000 of overhead (\$4 × 500 direct labour hours) and Job 24 \$6,000 of overhead (\$12 × 500 machine hours). Job 24 now receives three times as much overhead cost as Job 23, which seems more sensible since Department B incurs three times as much overhead cost as Department A.

	Department A	Department B
Overhead cost	\$60,000	\$180,000
Cost driver	15,000 DLH	15,000 MHrs
Department overhead rate	\$4 / DLH	\$12 / MHR
Overhead applied to:		
Job 23	\$2,000	–
Job 24	–	\$6,000

While moving to departmental rates may provide sufficient product-costing accuracy for some firms, even more attention to how overhead is assigned may be necessary for other firms. A discussion of the further refinements of overhead assignment is covered in the following chapter which introduces and considers the role activity-based costing may play in determining the cost of a firm's products or services.

M3.10 Costing of services

The costing of services uses the same techniques used in this chapter and normally includes the cost of labour and the cost of overhead. In some cases there will also be materials such as in a restaurant where the owner is determining the cost of providing meals.

Let's consider some examples.

- How does McDonalds calculate the cost of preparing a Big Mac? Calculating the cost of the ingredients and the amount of labour involved in cooking is likely to be reasonably easy. Overhead will have to be allocated to the product on a predetermined basis, as described earlier.
- How does a Big 4 accounting firm determine the cost of an audit? It can determine labour from the hours worked on the audit multiplied by the hourly rate of the staff working on the audit. I am sure it will not surprise you that the partners get paid more than the new assistants. Then the difficult part is allocating overheads to each job (i.e. an audit). Here the total overheads for the firm will be divided by an activity level, which could be total expected labour hours.
- A movie theatre may be interested in the cost of showing a particular movie on Sunday night. It would include the rental of the movie and the cost of the staff working at the theatre that night. Then it will need to add a share of overheads, which includes depreciation on the carpets, head office administration costs, etc.

Our list could go on to include the AFL or Rugby League Grand Final, a one-day cricket match, a concert at the Opera House, the cost of delivering a parcel, the cost of a telephone call, the cost of providing lectures to first-year accounting students, etc.

PRACTICE PROBLEMS

Solutions to practice problems can be found online at <http://login.cengagebrain.com/>. These problems are intended to facilitate self-study and additional practice. Don't look at the solution for any of these without giving the problem a serious try first, because once you have seen the solution, it always looks easier than it is.

PRACTICE PROBLEM A

Predetermined Overhead Rate: Applied Overhead; Unit Cost

Bethel Industries uses a normal costing system. The following data are available for 2016:

Budgeted:	
Overhead	\$675,000
Machine hours	25,000
Direct labour hours	75,000
Actual:	
Overhead	\$681,000
Machine hours	25,050
Direct labour hours	75,700
Prime cost	\$957,000
Number of units	400,000

Overhead is applied on the basis of direct labour hours.

Required:

- 1 What is the predetermined overhead rate?
- 2 What is the applied overhead for 2016?
- 3 Was overhead overapplied or underapplied and by how much?
- 4 What is the normal cost per unit produced?
- 5 How would the answers in (1) to (4) above change if applied overhead production is on the basis of machine hours instead of direct labour hours?

PRACTICE PROBLEM B

Journal Entries: T-Accounts; Cost of Goods Manufactured and Sold

During February, the following transactions were completed and reported by Bixby Products Pty Ltd.

- 1 Raw materials purchased on account, \$43,500
- 2 Materials issued to production to fill job order requisitions, \$35,000; supplies, \$12,200
- 3 Payroll for the month: direct labour, \$60,000; indirect labour, \$20,000; administrative, \$18,000; sales, \$9,000
- 4 Depreciation on factory plant and equipment, \$8,500
- 5 Property tax (on factory) accrued during the month, \$450
- 6 Insurance (on factory) expired with a credit to the prepaid account, \$6,200
- 7 Factory electricity, \$6,200
- 8 Advertising, \$5,000
- 9 Depreciation on office equipment, \$1,500; on sales vehicles, \$650
- 10 Legal fees for preparation of lease agreements, \$750
- 11 Overhead charged to production at a rate of \$6 per DLH. Records show 8,000 direct labour hours were worked during the month
- 12 Cost of jobs completed during the month, \$135,000

The company also reported the following beginning balances in its inventory accounts:

Raw materials	\$ 5,000
Work in progress	30,000
Finished goods	60,000

Required:

- 1 Prepare journal entries to record the transactions occurring in February.
- 2 Prepare T-accounts for raw materials, overhead control, work in progress, and finished goods. Post all relevant entries to these accounts.
- 3 Prepare a statement of cost of goods manufactured.
- 4 If the overhead variance is all allocated to cost of goods sold, by how much will cost of goods sold decrease or increase?

KEY TERMS

Activity level	Job-order costing	Process costing
Actual costing	Multiple overhead rates	Single overhead rates
Adjusted cost of goods sold	Normal cost of goods sold	Time record
Applied overhead	Normal costing	Underapplied overhead
Cause-and-effect relationship	Overapplied overhead	Work in progress file
Cost assignment	Overhead variance	
Cost measurement	Per-unit overhead cost	
Job-order cost sheet	Predetermined overhead rate	

HOMEWORK AND DISCUSSION TO DEVELOP UNDERSTANDING

DISCUSSION QUESTIONS

- 1 This chapter describes a number of alternative ways in which overhead costs can be allocated in order to determine product costs. Give three examples of the types of decisions managers make using total unit costs.
- 2 This chapter asserts that computing the unit manufacturing cost can be a simple process, with the calculation of unit cost determined by dividing the total manufacturing cost associated with the units produced by the number of units produced. However, in practice this calculation can be somewhat more complex. Explain why the calculation of unit cost is often a complicated process.
- 3 Explain the difference between cost measurement and cost assignment.
- 4 Explain why the process of cost measurement may use either the actual or estimated dollar amounts expended for the manufacturing inputs.
- 5 'Unit costs based on actual resources used must provide management with better information than those relying only on estimates!' Comment on this statement.
- 6 Describe the two main systems for assigning costs and explain how the two approaches differ.
- 7 Explain why firms are likely to employ a job-order based system of cost assignment. Support your response with an example.
- 8 Explain why firms are likely to employ a process cost based system of cost assignment. Support your response with an example.
- 9 A widely used approach to cost measurement is referred to as 'normal' costing. Do you believe this is an appropriate name for this approach? Explain your answer fully.
- 10 What is meant by the term 'predetermined overhead rate'? How is it calculated?
- 11 Explain why the cause-and-effect relationship is important to the accurate allocation of overhead costs.

- 12 Outline the four most common measures of production activity used in assigning overhead costs to units produced.
- 13 Define both underapplied and overapplied overhead. In an effective management accounting system why do these errors occur?
- 14 At the end of the reporting period, when actual overheads and estimated overheads do not equate, a variance exists. From an accounting perspective, what should be done with this overhead variance?
- 15 In what circumstances will firms adopt a multiple, rather than single, rate in the allocation of overheads?

PROBLEMS

PROBLEM M3.1

Predetermined Overhead Rate: Application of Overhead; Variances; Journal Entries

Harris Company uses a normal job-order cost system. Budgeted overhead for the coming year is \$600,000. Expected actual activity is 200,000 direct labour hours. During the year, Harris Company employees worked a total of 190,000 direct labour hours and actual overhead totalled \$562,000.

Required:

- 1 Compute the predetermined overhead rate for Harris Company.
- 2 How much overhead will the company assign to the work in progress account? Prepare the journal entry that corresponds to this assignment.
- 3 Compute the overhead variance and label the variance as underapplied or overapplied overhead. Assuming the variance is not material, write the journal entry that disposes of the variance at the end of the year.

PROBLEM M3.2

Predetermined Overhead Rate; Application of Overhead

Alpha Company and Beta Company both use predetermined overhead rates to apply factory overhead to production. Alpha's is based on direct labour hours and Beta's is based on materials cost. Budgeted production and cost data for Alpha and Beta are as follows:

	Alpha	Beta
Manufacturing overhead	\$240,000	\$300,000
Units	10,000	20,000
Direct labour hours	6,000	7,500
Material cost	\$150,000	\$400,000

At the end of the year, Alpha Company had incurred overhead of \$221,000 and produced 9,800 units using 6,100 direct labour hours and materials costing \$147,000.

Beta Company had incurred overhead of \$316,500, and produced 20,500 units using 7,550 direct labour hours and materials costing \$411,000.

Required:

- 1 Compute the predetermined overhead rates for Alpha Company and Beta Company.
- 2 Was overhead overapplied or underapplied for each company, and by how much?

PROBLEM M3.3

Predetermined Overhead Rate; Overhead Variances; Journal Entries

Rayburn Company uses a predetermined overhead rate to assign overhead to jobs. Because Rayburn's production is machine-dominated, overhead is applied on the basis of machine hours. The expected overhead for the year was \$2.5 million, and the practical level of activity is 50,000 machine hours.

During the year, Rayburn Company used 48,000 machine hours and incurred actual overhead costs of \$2 million. Rayburn Company also had the following balances of applied overhead in its accounts:

	\$
Work in progress	460,000
Cost of goods sold	1,440,000
Finished goods	500,000

Required:

- 1 Compute a predetermined overhead rate for Rayburn Company.
- 2 Compute the overhead variance and label it as underapplied or overapplied.
- 3 Assume the overhead variance is immaterial. Prepare the journal entry to dispose of the variance at the end of the year.
- 4 Assume the variance computed in (2) is material. Prepare the journal entry that appropriately disposes of the overhead variance at the end of the year.

PROBLEM M3.4

Journal Entries: Account Balances

Kaycee Limited manufactures brown paper grocery bags. During the month of May, the following occurred:

- 1 Raw materials were purchased on account for \$23,175
- 2 Raw materials totalling \$19,000 were requisitioned for use in production
- 3 Direct labour payroll for the month was \$17,850 with an average wage of \$8.50 per hour
- 4 Actual overhead of \$15,500 was incurred and paid
- 5 Factory overhead is charged to production at the rate of \$7 per direct labour hour
- 6 Completed units costing \$36,085 were transferred to finished goods
- 7 Bags costing \$30,000 were sold on account for \$36,000

Beginning balances as of 1 May were:

	\$
Raw materials	5,170
Work in progress	11,200
Finished goods	2,630

Required:

- 1 Prepare the journal entries for the above events.
- 2 Calculate the ending balances of:
 - (a) Raw materials
 - (b) Work in progress
 - (c) Overhead control
 - (d) Finished goods

PROBLEM M3.5

Journal Entries: T-Accounts

Porter Company uses job-order costing. During January 2017, the following data were reported:

- 1 Materials purchased: direct materials, \$82,000; indirect materials, \$10,500
- 2 Materials issued: direct materials, \$72,500; indirect materials, \$7,000
- 3 Labour cost incurred: direct labour, \$52,000; indirect labour, \$15,750
- 4 Other manufacturing costs incurred (all payables), \$49,000

- 5 Overhead applied on the basis of 125 per cent of direct labour cost
- 6 Work finished and transferred to finished goods cost \$160,000
- 7 Finished goods costing \$140,000 were sold on account for 150 per cent of cost

Required:

- 1 Prepare journal entries to record these transactions.

PROBLEM M3.6*Applied Overhead: Cost of Goods Manufactured*

Shariff Company provided the following data for the year 2016:

	\$
Labour:	
Direct labour cost (25,000 hours)	175,000
Indirect labour	35,000
Materials:	
Direct materials:	
Inventory, 1 January 2016	25,000
Purchases on account	200,000
Direct materials issued	190,000
Indirect materials issued	10,000
Other factory overhead costs:	
Depreciation	55,000
Maintenance	25,000
Miscellaneous	15,500
Work in progress:	
Beginning inventory	110,000
Ending inventory	80,250

The company uses a predetermined overhead rate based on direct labour hours. The rate for 2016 was \$5.20 per direct labour hour.

Required:

- 1 Compute the applied overhead for 2016. Is the overhead overapplied or underapplied? By how much?
- 2 Prepare a statement of cost of goods manufactured. Did you use actual or applied overhead when you prepared the statement of cost of goods manufactured? Explain.

PROBLEM M3.7*Overhead Assignment: Actual and Normal Activity Compared*

Reynolds Printing Company specialises in wedding announcements. Reynolds uses an actual job-order cost system. An actual overhead rate is calculated at the end of each month using actual direct labour hours and overhead for the month. Once the actual cost of a job is determined, the customer is billed at actual cost plus 50 per cent.

During April, Mrs Lucky, a good friend of owner Jane Reynolds, ordered three sets of wedding announcements to be delivered 10 May, 10 June, and 10 July, respectively. Reynolds scheduled production for each order on 7 May, 7 June, and 7 July, respectively. The orders were assigned job numbers 115, 116, and 117, respectively.

Jane Reynolds assured Mrs Lucky that she would attend each of the Lucky daughters' weddings. Out of sympathy and friendship, she also offered a lower price. Instead of cost plus 50 per cent, she gave her a special price of cost plus 25 per cent. Additionally, she agreed to wait until the final wedding to bill for the three jobs.

On 15 August, Reynolds Printing Company asked their accountant to bring the completed job-order cost sheets for Jobs 115, 116, and 117. They also gave instructions to lower the price as had been agreed upon. The cost sheets revealed the following information:

	Job 115	Job 116	Job 117
	\$	\$	\$
Cost of direct materials	250.00	250.00	250.00
Cost of direct labour (5 hours)	25.00	25.00	25.00
Cost of overhead	<u>200.00</u>	<u>400.00</u>	<u>400.00</u>
Total cost	<u>475.00</u>	<u>675.00</u>	<u>675.00</u>
Total price	<u>593.75</u>	<u>843.75</u>	<u>843.75</u>
Number of announcements	500	500	500

Jane Reynolds could not understand why the overhead costs assigned to Jobs 116 and 117 were so much higher than those for Job 115. She asked for an overhead cost summary sheet for the months of May, June, and July, which showed that actual overhead costs were \$20,000 each month. She also discovered that direct labour hours worked on all jobs were 500 hours in May and 250 hours each in June and July.

Required:

- 1 How do you think Mrs Lucky will feel when she receives the bill for the three sets of wedding announcements?
- 2 Explain how the overhead costs were assigned to each job.
- 3 Assume that Reynolds' average activity is 500 hours per month and that the company usually experiences overhead costs of \$240,000 each year. Can you recommend a better way to assign overhead costs to jobs? Recompute the cost of each job and its price given your method of overhead cost assignment. Which method do you think is best? Why?

PROBLEM M3.8

Departmental Overhead Rates

Bryan Company uses a normal job-order cost system. Currently, a plant-wide overhead rate based on machine hours is used. Peter Tan, the plant manager, has heard that departmental overhead rates can offer significantly better cost assignments than a plant-wide rate can offer. Bryan Company has the following data for its two departments for the 2017 year:

	Department A	Department B
Overhead costs (expected)	\$50,000	\$22,000
Normal activity (machine hours)	10,000	8,000

Required:

- 1 Compute a predetermined overhead rate for the plant as a whole based on machine hours.
- 2 Compute predetermined overhead rates for each department using machine hours.
- 3 Job 15 used 20 machine hours from Department A and 50 machine hours from Department B. Job 22 used 50 machine hours from Department A and 20 from Department B. Compute the overhead cost assigned to each job using the plant-wide rate computed in (1). Repeat the computation using the departmental rates found in (2). Which of the two approaches gives the fairer assignment? Why?
- 4 Repeat (3), assuming the expected overhead cost for Department B is \$40,000. For this company, would you recommend departmental rates over a plant-wide rate?

PROBLEM M3.9*Unit Cost; Journal Entries; Assignment Procedures*

Hystle Furniture received an order for ten specially designed sofas to be delivered by 30 September. The order was assigned Job 237 and work began on 1 September. During September, the following activity was associated with Job 237:

- 1 Purchased \$2,000 worth of wood, \$1,500 worth of fabric, and \$200 worth of foam on account
- 2 Issued \$2,000 of wood, \$1,500 of fabric, and \$200 of foam
- 3 Direct labour cost incurred: \$1,360
- 4 Overhead assigned using a rate of 125 per cent of direct labour cost
- 5 Completed units transferred to the warehouse
- 6 Completed units shipped to the customer. Selling price is 135 per cent of cost

Required:

- 1 Prepare the journal entries for the activity associated with Job 237.
- 2 What is the manufacturing cost per sofa?
- 3 Describe the procedures for identifying the materials issued to Job 237 and for identifying the cost of labourers who worked on the sofas.

PROBLEM M3.10*Predetermined Overhead Rates; Overhead Variances; Unit Costs*

Sanderson Company uses a predetermined overhead rate to apply overhead. Overhead is applied on the basis of direct labour hours in Department 1 and on the basis of machine hours in Department 2. At the beginning of 2016, the following estimates are provided for the coming year:

	Department 1	Department 2
Direct labour hours	100,000	20,000
Machine hours	10,000	30,000
Direct labour cost	\$750,000	\$160,000
Overhead cost	\$250,000	\$162,000

Actual results reported for all jobs during 2016 are as follows:

	Department 1	Department 2
Direct labour hours	98,000	21,000
Machine hours	11,000	32,000
Direct labour cost	\$748,000	\$168,000
Overhead cost	\$247,500	\$175,000

The accounting records of the company show the following data for Job 689:

	Department 1	Department 2
Direct labour hours	125	50
Machine hours	10	205
Direct labour cost	\$1,580	\$2,650
Overhead cost	\$ 937	\$ 400

Required:

- 1 Compute the predetermined overhead rate for each department.
- 2 Compute the applied overhead for all jobs during 2016. What is the underapplied or overapplied overhead for each department? For the firm?
- 3 Prepare the journal entry that disposes of the overhead variance, assuming it is not material in amount.
- 4 Compute the total cost of Job 689. If there are 50 units in Job 689, what is the unit cost?

PROBLEM M3.11*Departmental Overhead Rates; Unit Cost*

Stoney End Recordings Ltd produces cassette tapes, records, and compact discs on a job-order basis for individuals and groups who want their music recorded. In some cases, customers want one or two copies for family and friends. In others, several hundred LPs or CDs are ordered to send to radio stations across the country in hopes of getting air time. In still other cases, several thousand records may be ordered by fledgling bands to leave with record stores on a consignment basis.

Stoney End Recordings Ltd uses a normal costing system with departmental overhead rates for the use of the recording studio (based on direct labour hours), the vinyl pressing department (based on machine hours), and the CD recording department (based on machine hours).

Budgeted amounts for 2016 were:

Overhead:	
Recording studio	\$18,000
Vinyl pressing	\$ 8,000
CD	\$24,000
Direct labour hours:	
Recording studio	6,000
Vinyl pressing	4,000
CD	12,000
Machine hours:	
Recording studio	3,000
Vinyl pressing	1,600
CD	6,000
Average wage rates were:	
Recording studio	\$12 / DLH
Vinyl pressing	\$ 6 / DLH
CD	\$25 / DLH

In September, Billy Ryan and the Black Irish (a heavy metal rock band) ordered 300 LP records to distribute to radio stations and record company executives. Stoney End Recordings Ltd assigned this job the number 93-413. Job 93-413 used ten direct labour hours of recording studio time; as well as one direct labour hour and five machine hours in the vinyl department. Direct materials (tape, vinyl, cardboard sleeves for the records, etc.) amounted to \$372.

Required:

- 1 Calculate overhead rates for the recording, vinyl, and CD departments.
- 2 Determine the total cost of Job 93-413. What is the unit cost?

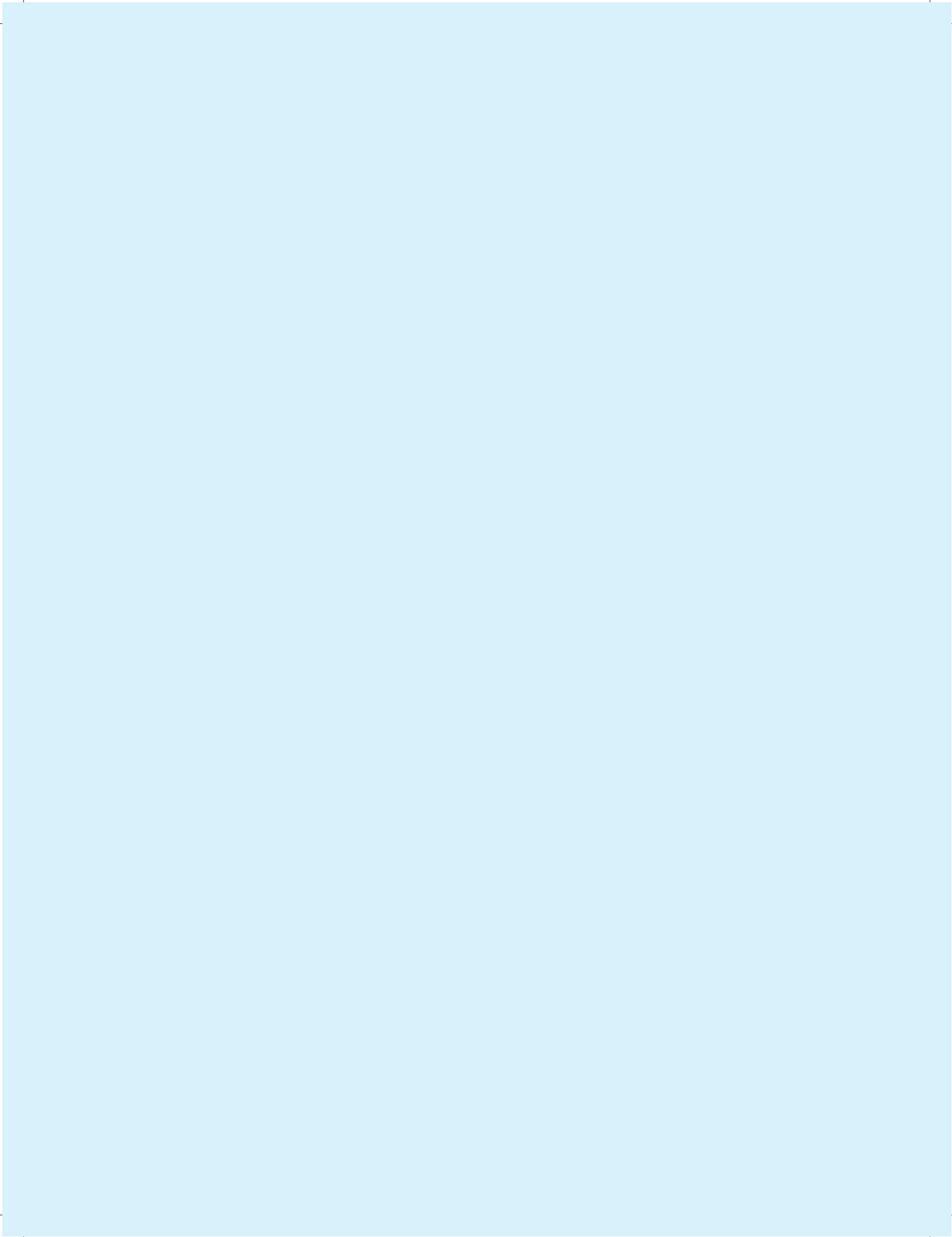
PROBLEM M3.12*Predetermined Overhead Rate; Departmental Overhead Rates; Job Cost*

Nick's Kwik-Print provides a variety of photocopying and printing services. On 5 June 2016 Nick invested in some computer-aided photography equipment that enables customers to reproduce a picture or illustration, input it digitally

into the computer, enter text into the computer, and then print out a four-colour professional-quality brochure. Prior to the purchase of this equipment, Kwik-Print's overhead averaged \$35,000 per year. After the installation of the new equipment, the total overhead increased to \$85,000 per year. Kwik-Print has always costed jobs on the basis of actual materials and labour, plus overhead assigned using a predetermined overhead rate based on direct labour hours. Budgeted direct labour hours for 2016 are 5,000, and the wage rate is \$6 per hour.

Required:

- 1 What was the predetermined overhead rate prior to the purchase of the new equipment?
- 2 What was the predetermined overhead rate after the new equipment was purchased?
- 3 Suppose Jim Hargrove brought in several items he wanted photocopied. The job required 100 sheets of paper at \$0.015 each, and 12 minutes of direct labour time. What was the cost of Jim's job on 20 May 2016? On 20 June 2016?
- 4 Suppose that Nick decides to calculate two overhead rates, one for the photocopying area based on direct labour hours as before, and one for the computer-aided printing area based on machine time. Estimated overhead applicable to the computer-aided printing area is \$50,000; forecast usage of the equipment is 2,000 hours. What are the two overhead rates? Which overhead rate system is better – one rate or two?



M4

Introduction to activity-based costing

ON COMPLETION OF THIS CHAPTER YOU SHOULD BE ABLE TO:

- explain why using only unit-based cost drivers to assign overhead may produce distorted product costs
- understand the characteristics of an activity-based costing system
- distinguish activity-based costing from traditional costing methods
- identify environments in which an activity-cost-based system would be most beneficial
- calculate product costs using an activity-based costing system
- explain why activity-based costing produces more accurate product costs
- apply the principles of activity-based costing to channel and customer profitability analysis.

M4.1 CHAPTER OVERVIEW

This chapter focuses on an alternative approach to costing the products and services offered by a business. This alternative method is referred to as **activity-based costing (ABC)**. Activities are undertaken to support the production and delivery of goods and services, but their costs do not vary directly with a measure of volume. In many cases, costs vary with the activities involved in the production process (for example, ordering of raw materials, setup of machines, quality control, handling). An activity-based costing system uses measures of the activities used in the production of a product or service to more accurately determine its cost. This chapter examines this process. We have been concerned with the uses to which information about the costs of products delivered and services provided may be put, and how these costs may be calculated. Previously, we examined the traditional distinction between product costs and period costs and pointed out that while this distinction may be appropriate for inventory valuation purposes, we need to consider the relationship between traditional period costs and the business's products or services to provide a more complete cost base to support management decisions. We also described a number of product costing systems and illustrated how these systems seek to provide a measure of the resources used in the activities that yield products and services. This chapter examines how an activity-based costing system may help in this process.

M4.2 Introduction

Chapter M3 described the traditional approaches available to management to measure and assign costs to individual products and services. That chapter highlighted how a predetermined overhead rate is computed and how it is used to assign overhead to individual products and services. It concluded by explaining why multiple departmental overhead rates may be preferred to a single, plant-wide overhead rate. The chapter briefly noted that such computations can be somewhat more complex in practice and that such approaches may not provide management with accurate data when their firm produces products that differ significantly from one another. We will discuss the implications of this issue in this chapter.

This chapter will argue that activity-based costing (ABC) systems can sometimes provide a means of overcoming these types of problems.

M4.3 Limitations of Conventional Product Costing

In a multiple-product setting, overhead costs are caused jointly by all products. The problem now becomes one of identifying the amount of overhead that each product consumes or causes. This is accomplished by searching for cost drivers, factors that measure the demands placed on overhead activities by individual products. As noted in Chapter M2 on CVP, in a conventional setting it is normally assumed that overhead consumption is highly correlated with the number of units produced, measured in terms of direct labour hours, machine hours, or material costs. These unit-based (volume-related) cost drivers assign overhead to products through the use of either plant-wide or departmental rates.

To illustrate the limitation of this conventional approach, assume that Sharp Paper Ltd has a plant that produces two products: white and blue Boxwrap. Product costing data are given in Exhibit M4.1. The units are three-ream rolls. Because the quantity of blue Boxwrap produced is five times greater than that of white Boxwrap, we can label white Boxwrap a low-volume product and blue Boxwrap a high-volume product.

For simplicity, only four types of overhead costs are assumed: setup, inspection, power, and on-costs for direct labour (for example, payroll taxes and superannuation) shown in Exhibit M4.1.

EXHIBIT M4.1 PRODUCT COSTING DATA			
	White Boxwrap	Blue Boxwrap	Total
Units produced per year	20,000	100,000	–
Direct materials and labour	\$50,000	\$250,000	\$300,000
Direct labour hours	20,000	100,000	120,000
Machine hours	10,000	50,000	60,000
Production runs	20	30	50
Inspection hours	800	1,200	2,000
Overhead costs:			
Setup costs			\$ 88,000
Inspection costs			74,000
Power			84,000
Direct labour on-costs			<u>78,000</u>
Total			<u>\$324,000</u>

A common method to assign overhead to products is to compute a rate using a unit-based cost driver. This approach assumes that all overhead cost variation can be explained by one cost driver. Assume that machine hours are chosen as the cost driver. (Direct labour hours would give the same assignment in this example, since labour hours

are used in the same proportion as machine hours.) The total overhead is \$324,000. Dividing the total overhead by the total machine hours yields the following overhead rate:

$$\begin{aligned}\text{Overhead rate} &= \$324,000 / 60,000 \\ &= \$5.40 \text{ per machine hour}\end{aligned}$$

Using this rate and other information from Exhibit M4.1, the unit cost for each product can be calculated (see Exhibit M4.2). For example, for white Boxwrap we multiply \$5.40 by 10,000 (the number of machine hours) and divide by 20,000 (the number of units).

EXHIBIT M4.2**UNIT COST COMPUTATION: PLANT-WIDE RATE**

White Boxwrap	\$
Direct materials and labour (\$50,000 / 20,000)	2.50
Overhead costs (\$5.40 × 10,000 / 20,000)	<u>2.70</u>
Unit cost	<u>5.20</u>
Blue Boxwrap	
Direct materials and labour (\$250,000 / 100,000)	2.50
Overhead cost (\$5.40 × 50,000 / 100)	<u>2.70</u>
Unit cost	<u>5.20</u>

Problems with costing accuracy

The accuracy of the overhead cost assignment can be challenged because there is the assumption that machine hours or direct labour hours drive or cause all overhead costs.

From Exhibit M4.1, we know that blue Boxwrap – with five times the volume of white Boxwrap – uses five times the machine hours and direct labour hours. Thus, if a unit-based overhead rate is used, blue Boxwrap will receive five times more overhead cost. But is this reasonable? Do unit-based cost drivers explain the consumption of all overhead? Does a product's consumption of overhead increase in direct proportion to the number of units produced?

Examination of the data in Exhibit M4.1 suggests that a significant portion of overhead costs is not driven or caused by the units produced. For example, setup costs are probably related to the number of production runs and inspection costs to the number of hours of inspection. Notice that blue Boxwrap has only 1.5 times as many runs as white Boxwrap (30/20) and only 1.5 times as many inspection hours (1,200/800). Use of a unit-based cost driver (machine hours or labour hours) assigns five times more overhead to the blue Boxwrap than to the white. For inspection and setup costs, blue Boxwrap is over-costed and the white is under-costed.

M4.4 Why Unit-Based Cost Drivers Fail

At least two major factors impair the ability of a unit-based cost driver to assign overhead costs accurately: (1) the proportion of non-unit-related overhead costs to total overhead costs and (2) the degree of consumption diversity.

Non-unit-related overhead costs

In the example under discussion, there are four overhead activities: inspection, setup, on-costs and power. Two of these activities, on-costs and power, are related to the number of units produced. As has already been shown, however, inspection and setup costs are not driven by the number of units produced. Setup costs, for example, are a function of the number of batches, a non-unit-based cost driver. Non-unit-based cost drivers are factors, other than the number of units produced, that drive costs. Thus, unit-based cost drivers cannot assign these costs accurately to products.

Using only unit-based cost drivers to assign non-unit-related overhead costs can create distorted product costs. The severity of this distortion depends on what proportion of total overhead costs these non-unit-based costs represent.

For our example, setup costs and inspection costs represent a substantial share (50 per cent) of total overhead (\$162,000/\$324,000). The percentage reflected by the simple example of Sharp Paper is representative of what can happen in real manufacturing environments. This suggests that some care should be exercised in assigning non-unit-based overhead costs. If non-unit-based overhead costs are only a small percentage of total overhead costs, the distortion of product costs would be quite small. In such a case, the use of unit-based cost drivers might be acceptable.

Consumption diversity

When products consume overhead activities in different proportions, a firm is said to have consumption diversity. There are several reasons that products might consume overhead in different proportions. For example, differences in product size, product complexity, setup time, and size of batches all can cause products to consume overhead at different rates. Regardless of the nature of the consumption diversity, product cost will be distorted whenever the quantity of unit-based input that a product consumes does not vary in direct proportion to the quantity of non-unit-based inputs consumed. To illustrate, the proportion of all overhead activities consumed by both blue and white Boxwrap is computed and displayed in Exhibit M4.3. The proportion of each activity consumed by a product is defined as the consumption ratio. If the quantity of the unit-based inputs consumed had varied in direct proportion to the quantity of non-unit-based inputs consumed, the consumption ratios would have been identical. As you can see from the exhibit, the consumption ratios for these two products differ for the unit-based and non-unit-based inputs. Recall that the volume of blue Boxwrap is five times the volume of white Boxwrap. However from Exhibit M4.3 we can observe that the consumption of setups and power is proportionately higher for white Boxwrap compared to blue.

Since the non-unit-based overhead costs are a significant proportion of total overhead, and the consumption ratios differ between unit-based and non-unit-based input categories, product costs can be distorted if a unit-based cost driver is used. In production settings, similar to that found in the Boxwrap example, **traditional cost systems** tend to attribute an excessive amount of support costs to standard, high-volume products and an inadequate amount to non-standard, low-volume products, so that the former appear less profitable and the latter appear more profitable. The solution to this costing problem is to use an activity-based costing approach.

EXHIBIT M4.3 CONSUMPTION DIVERSITY: PROPORTIONS OF CONSUMPTION

Overhead Activity	White Boxwrap Consumption Ratio	Blue Boxwrap Consumption Ratio	Consumption Measure
Setup	0.40 ^a	0.60 ^a	Production runs
Inspection	0.40 ^b	0.60 ^b	Inspection hours
Power	0.17 ^c	0.83 ^c	Machine hours
On-costs	0.17 ^d	0.83 ^d	Direct labour hours

^a 20/50 (white) and 30/50 (blue)
^b 800/2,000 (white) and 1,200/2,000 (blue)
^c 10,000/60,000 (white) and 50,000/60,000 (blue)
^d 20,000/120,000 (white) and 100,000/120,000 (blue)

M4.5 Activity-Based Product Costing: Basic Concepts

We have previously classified costs into *fixed* and *variable* with respect to volume. However, it is clear that cost behaviour is much more complex than this. In recent times, attention has been given to what might be described as *activity costs*. In addition to costs that vary with volume, there are costs which vary with other factors or business events, for example the number of transactions, the number of production runs scheduled, the number of purchase orders raised, the number of shipments of materials received or finished goods dispatched. Each of these business events can be referred to as an *activity*. An activity is therefore work performed within an organisation. An activity is also defined as an aggregation of actions performed within an organisation that is useful for the purposes of activity-based costing.

Such activities are undertaken to support the production and delivery of goods and services, but their costs do not only vary with a measure of volume. Rather their costs vary with measures of these events or activities, and the number and frequency of these activities depends in turn upon the complexity of production and distribution processes. As the diversity and complexity of the production process increases, additional support services tend to be required (e.g. more production support services to schedule production, set up production equipment, inspect production, and move inputs and outputs, negotiate with suppliers of resources and monitor and update technical specifications and bills of materials). Therefore, the greater the variety of goods and services produced and delivered, the greater will be the number of transactions or activities required to support these goods and services, other things being equal.

Since the overhead costs associated with such activities do not only vary with volume, it is necessary to determine what it is that causes the cost to be incurred; in other words, what the appropriate cost driver is. Cost-driver analysis endeavours to provide a more complete understanding of cost behaviour, and therefore a basis for attributing costs to activities and then to products, for making product-related decisions and judging a product's profitability.

An activity-based costing (ABC) system is one that first traces costs to activities and then to products. Conventional product costing also involves two stages, but in the first stage, costs are traced not to activities but to an organisational unit, such as the plant or departments. In both conventional and activity-based costing, the second stage consists of tracing costs to the product. The principal computational difference between the two methods concerns the nature and the number of cost drivers used. Activity-based costing uses both unit-based and non-unit-based cost drivers and generally the number of drivers is greater than the number of unit-based cost drivers commonly used in a conventional system. As a result, the ABC method produces increased product-costing accuracy. From a managerial perspective, however, an ABC system offers more than just accurate product cost information. It also provides information about activities and their costs. Knowing what activities are being performed and their associated costs allows managers to focus on those activities that might offer opportunities for cost savings – provided they are simplified, performed more efficiently, eliminated, and so on. The strategic insights and process improvement capabilities of an ABC system are extremely important and are explored in more advanced management accounting books. In this section, however, we will focus only on ABC's product-costing dimension, beginning with a discussion of the first-stage procedure.

First-stage procedure: Activity grouping and cost assignment

In the first stage of activity-based costing, activities are identified, costs are associated with individual activities, and activities and their associated costs are divided into homogeneous sets. Thus, activity identification requires a listing of all the different kinds of work, such as materials handling, inspections, process engineering, and product enhancement. A firm may have hundreds of different activities. Firms that adopted an activity-based costing system usually identify the activities inherent in their productive processes through observation, interview and survey. Many firms create an **activity dictionary** that lists both their activities and the activity drivers.

Once an activity is defined, the cost of performing the activity is determined. Using the data contained in the activity dictionary, we compute a cost rate for each activity. These cost rates, together with knowledge of the types and quantities of activities consumed by the various products, allows management to determine the cost driver associated with each activity and calculate individual activity overhead rates. For the average setting, this could literally produce hundreds of overhead rates, a cumbersome method of assigning overhead to products.

To reduce the number of overhead rates required and streamline the process, activities are grouped together based on two criteria: (1) they are logically related, and (2) they have the same consumption ratios for all products. These groups of activities should have an easy and clear physical interpretation and should correspond to manageable segments of the production process. Costs are associated with each of these sets by summing the costs of the individual activities belonging to the set. The collection of overhead costs associated with each set of activities is called a **homogeneous cost pool**.

Activities that have the same drivers are often pooled into one of four categories.

- **Unit level activities** are those that occur when a single unit of product is produced.
- **Batch level activities** are those associated with the production of whole batches of product.
- **Product level activities** are those related to a specific product produced by the firm.
- **Facility level activities** are those that relate to a specific location.

Since the activities within a homogeneous cost pool have the same consumption ratio, we know that the cost variations for this pool can be explained by a single cost driver. Once a cost pool is defined, the cost per unit of the cost driver is computed for that pool. This is called the pool rate. Computation of the pool rate completes the first stage. Thus, the first stage produces four outcomes: (1) activities are identified, (2) costs are assigned to activities, (3) related activities and their costs are grouped together to define homogeneous cost pools, and (4) pool (overhead) rates are computed.¹

To illustrate this process, consider once again the Sharp Paper example. Four overhead activities have been identified: setups, inspection, power, and on-costs for direct labour. Setup activities and inspection activities both occur each time a batch of products is produced. Thus, these two activities are logically related by the more general batch-level production activity. Similarly, on-costs and power activities occur each time a unit of product is produced. Thus, these two activities are logically related by the more general activity of producing a unit of product. Moreover, from Exhibit M4.3 we know that the setups and inspection grouping and the power and labour grouping have the same consumption ratios for both products. Thus, we are able to reduce four activities to two sets of activities. These two sets of activities can now be used to form homogeneous cost pools. Let's call the set with setups and inspections the batch-level pool and the set with power and on-costs the unit-level pool. The total cost associated with each pool is simply the sum of the related activities' costs. Using the data from Exhibit M4.1, the pool costs are given below:

Batch-Level Pool	\$	Unit-Level Pool	\$
Setups	88,000	Power	84,000
Inspections	<u>74,000</u>	On-Costs	<u>78,000</u>
	<u>162,000</u>		<u>162,000</u>

Now that we have identified homogeneous cost pools and determined their costs, we can assign the pool costs to each product. To do this, a pool rate must be calculated based on cost drivers. For the batch-level cost pool, the number of production runs or inspection hours could be the cost driver. Since the two cost drivers produce the same consumption ratios, they will assign the same amount of overhead to both products. For the unit-level cost pool (power and labour), machine hours or direct labour hours could be selected as the cost driver. Assume for purposes of illustration that the number of production runs and machine hours are the cost drivers chosen.² Using data from Exhibit M4.1, the first-stage outcomes are illustrated in Exhibit M4.4.

Second-stage procedure: Assigning costs to products

In the second stage, the costs of each overhead pool are traced to products. This is done using the pool rate computed in the first stage and the measure of the amount of activity resources consumed by each product. This measure is simply the quantity of the cost driver used by each product. In our example, that would be the number of production runs and machine hours used by each Boxwrap. Thus, the overhead assigned from each cost pool to each product is computed as follows:

$$\text{Applied overhead} = \text{Pool rate} \times \text{Cost driver units used}$$

To illustrate, consider the assignment of costs from the first overhead pool to white Boxwrap. From Exhibit M4.4, we know that the rate for this pool is \$3,240 per production run. We also know from Exhibit M4.1 that the white Boxwrap uses 20 production runs. Thus, the overhead assigned to white wrap from the batch-level cost pool is \$64,800 (\$3,240 \times 20 runs). Similar assignments would be made for the other cost pool and for the other product.

¹ This definition of the first stage in an activity-based cost system is found in H. Thomas Johnson and Robert S. Kaplan, *Relevance Lost: The Rise and Fall of Management Accounting* (Boston: Harvard Business Press, 1987), Chapter 10. A more detailed description of both the first-stage and second-stage procedures is found in the following sources: Robin Cooper, 'The Two-Stage Procedure in Cost Accounting – Part One', *Journal of Cost Management* (Summer 1987), pp. 43–51 and 'The Two-Stage Procedure in Cost Accounting – Part Two', *Journal of Cost Management* (Fall 1987), pp. 39–45; and George J. Beaujon and Vinod R. Singhal, 'Understanding the Activity Costs in an Activity-Based Cost System', *Journal of Cost Management* (Spring 1990), pp. 51–72; Peter B.B. Turney, 'Using ABC to Support Continuous Improvement', *Management Accounting* (September 1992), pp. 46–50. Most of the discussion of the two stages of activity-based costing is based on these five sources.

² You may want to recalculate pool rates using number of inspection hours and direct labour hours to prove that the choice of cost drivers does not affect the assignment of costs to the individual products.

EXHIBIT M4.4**FIRST-STAGE PROCEDURE: ACTIVITY-BASED COSTING**

Batch-level pool:	
Setup costs	\$ 88,000
Inspection costs	<u>74,000</u>
Total costs	<u>\$162,000</u>
Production runs	50
Pool rate (Cost per run): (\$162,000 / 50)	\$3,240
Unit level pool:	
Power cost	\$ 84,000
Direct labour on-costs	<u>78,000</u>
Total costs	<u>\$162,000</u>
Machine hours	60,000
Pool rate (Cost per machine hour): (\$162,000 / 60,000)	\$2.70

The total overhead cost per unit of product is obtained by first tracing the overhead costs from the pools to the individual products. This total is then divided by the number of units produced. The result is the unit overhead cost. Adding the per-unit overhead cost to the per-unit prime cost yields the manufacturing cost per unit. In Exhibit M4.5, the manufacturing cost per unit is computed using activity-based costing.

EXHIBIT M4.5**UNIT COSTS: ACTIVITY-BASED COSTINGS**

White Boxwrap		
Overhead:		
Batch-level pool: $\$3,240 \times 20$ runs	\$64,800	
Unit-level pool: $\$2.70 \times 100,000$ machine hours	<u>27,000</u>	
Total overhead costs		\$ 91,800
Direct materials and labour		50,000
Total manufacturing costs		\$141,800
Units produced		20,000
Unit cost		\$ 7.09
Blue Boxwrap		
Overhead:		
Batch-level pool: $\$3,240 \times 30$ runs	\$ 97,200	
Unit-level pool: $\$2.70 \times 50,000$ machine hours	<u>135,000</u>	
Total overhead costs		\$ 232,200
Direct materials and labour		<u>250,000</u>
Total manufacturing costs		<u>\$482,200</u>
Units produced		100,000
Unit cost		\$ 4.82

Comparison of product costs

In Exhibit M4.6, the unit cost from activity-based costing is compared with the unit costs produced by conventional costing. This comparison clearly illustrates the effects of using only unit-based cost drivers to assign overhead costs. The activity-based cost reflects the correct pattern of overhead consumption and is, therefore, the more accurate of the two costs shown in Exhibit M4.6. Activity-based product costing reveals that the conventional method under-costs the white Boxwrap significantly and over-costs the blue Boxwrap.

Using only unit-based cost drivers can lead to one product subsidising another. This subsidy could create the appearance that one group of products is highly profitable and adversely impacts the pricing and competitiveness of another group of products. In a highly competitive environment, accurate cost information is critical for sound planning and decision-making.

EXHIBIT M4.6 COMPARISON OF UNIT COSTS			
	White Boxwrap \$	Blue Boxwrap \$	Source
Activity-based cost	7.09	4.82	Exhibit M4-5
Conventional cost	5.20	5.20	Exhibit M4-2

The choice of cost drivers

At least two major factors should be considered in selecting cost drivers:

- 1 the cost of measurement
- 2 the degree of correlation between the cost driver and the actual consumption of overhead.

The cost of measurement

In an activity-based costing system, a large number of cost drivers can be selected and used. Accordingly, where possible, it is important to select cost drivers that use information that is readily available. Information that is not available in the existing system must be produced, and this production will increase the cost of the firm's information system. A homogeneous cost pool could offer a number of possible cost drivers. For this situation, any cost driver that can be used with existing information should be chosen. This choice minimises the costs of measurement.

In the Sharp Paper example, for instance, inspection and setup costs were placed in the same cost pool, giving the choice of using either inspection hours or number of production runs as the cost driver. If the inspection hours and production runs used by the two products are already being collected by the company's information system, the choice is unimportant. Assume, however, that inspection hours by product are not tracked, but data for production runs are available. In this case, production runs should be chosen as the cost driver, avoiding the need to produce any additional information.

Indirect measures and the degree of correlation

The existing information structure can be exploited in another way to minimise the costs of obtaining cost-driver quantities. It is sometimes possible to replace a cost driver that directly measures the consumption of an activity with a surrogate driver – one that indirectly measures that consumption. For example, inspection hours could be replaced by the actual number of inspections associated with each product; this number is more likely to be known. This replacement works, of course, only if hours used per inspection are approximately equal for each product.

A list of potential cost drivers is given in Exhibit M4.7. Surrogate drivers indirectly measure the consumption of an activity and usually measure the number of transactions associated with that activity. Remember that it is possible to replace a cost driver that directly measures consumption with one that only indirectly measures it without loss of accuracy, provided that the quantities of activity consumed per transaction are approximately equal for each product. In such a case, the surrogate driver has a high correlation and can be used.

EXHIBIT M4.7**POTENTIAL COST DRIVERS**

Number of setups	Number of direct labour hours
Number of material moves	Number of vendors
Number of units reworked	Number of subassemblies
Number of orders placed	Number of labour transactions
Number of orders received	Number of units scrapped
Number of inspections	Number of parts
Number of schedule changes	Number of machine hours

In reading the above, note that an activity-based costing system can do more than just provide more accurate product cost information. Because it involves gaining an understanding of the activities performed within an organisation, activity-based costing can be used to manage those activities more efficiently. Doing this analysis may be informative, as you may find some activities turn out to be very costly but the actual benefit may not match the cost. As an example, many domestic airlines around the world no longer provide food. Such decisions are often based on the discovery that the costs of providing a service are greater than the perceived benefits.

One thing that you should notice when you compare the traditional approach to an activity-based costing approach is that the level of accuracy depends on the number of cost pools and the choice of an appropriate cost driver. Determining how many cost pools you actually need will be a matter of judgement. The accuracy of an additional cost pool needs to be weighed against the costs associated with having a more complex costing system.

M4.6 Activity-Based Costing and Service Organisations

Although most of the discussion of activity-based costing has focused on manufacturing, activity-based costing can also be useful to service organisations. All service organisations have activities and output that places demands on these activities. There are, however, some fundamental differences between service and manufacturing organisations. Activities within manufacturing organisations tend to be of the same type and performed in a similar way. The same cannot be said of service organisations. Imagine, for example, how dissimilar activities are for a bank and a hospital!

Another basic difference between service and manufacturing organisations is output definition. For manufacturing firms, output is easily defined (as the tangible products that are manufactured), but for service organisations output definition is more difficult.³ Output for service organisations is less tangible. Yet output must be defined so that it can be costed.

Consider, for example, a hospital. What is the output of a hospital? The product of a hospital is commonly defined as a patient's stay and treatment. If we accept this definition, it immediately becomes obvious that a hospital is a multi-product firm because there are many different kinds of 'stays and treatments'. During the stay, a patient will consume many different services. To the extent that this consumption of services is homogeneous, product groups can be defined. For example, all maternity patients without complications would stay about the same time in the hospital and consume essentially the same services.

To illustrate the potential of activity-based costing, we will focus on one type of service provided to each patient: daily care. Daily care is made up of three activities: occupancy, feeding, and nursing. We will define output as patient days (the 'stay' part of the output only). Hospitals have traditionally assigned the cost of daily care

³ For a more complete discussion on ABC and potential applications to service organisations see John Antos, 'Activity-Based Management For Service, Not-For Profit, and Governmental Organisations', *Journal of Cost Management* (Summer 1992), pp. 13–23; William Rotch, 'Activity-Based Costing in Service Industries', *Journal of Cost Management* (Summer 1990), pp. 4–14. The discussion in this chapter is based on these two articles.

by using a daily rate (a rate per patient day). There are actually different kinds of daily care and rates are structured to reflect these differences. For example, a higher daily rate is charged for an intensive care unit than for a maternity care unit.

Within units, however, the daily rates are the same for all patients. Under the traditional approach, the daily rate is computed by dividing the annual costs of occupancy, feeding, and nursing of a unit by the unit's capacity expressed in patient days. A single cost driver (patient days) is used to assign the costs of daily care to each patient.

But what if the costs of the three care activities are consumed in different proportions by patients? This would imply consumption diversity and a possible requirement to use more than one cost driver to assign daily care costs accurately to patients. To illustrate, assume that the demands for nursing care vary within the maternity unit, depending on the severity of a patient's case. Specifically, demand for nursing services per day increases with severity. Assume that within the maternity unit there are three levels of increasing severity: normal patients, Caesarean patients, and patients with complications. Now suppose that a hospital has provided the following activity and cost information:

Activity	Annual Cost \$	Cost Driver	Annual Quantity
Occupancy and feeding	1,100,000	Patient days	11,000
Nursing care	1,100,000	Hours of nursing care	55,000

The activity pool rates are \$100 per patient day and \$20 per nursing hour.

To see how activity costing can affect patient charges, assume that the three types of patients have the following annual demands:

Patient Type	Patient Days Demanded	Nursing Hours Demanded
Normal	8,000	30,000
Caesarean	2,000	13,000
Complications	<u>1,000</u>	<u>12,000</u>
Total	<u>11,000</u>	55,000

The traditional approach for charging daily care would produce a rate of \$200 per patient day ($\$2,200,000 / 11,000$) – the total cost of care divided by patient days. Every maternity patient – regardless of type – would pay the daily rate of \$200. Using the pool rates for each activity, however, produces a different daily rate for each patient – a rate that reflects the different demands for nursing services:

Patient Type	Daily Rate ^a \$
Normal	175
Caesarean	230
Complications	340

^a $[(\$100 \times 8,000) + \$20 \times 30,000] / 8,000$;
 $[(\$100 \times 2,000) + (\$20 \times 13,000)] / 2,000$;
 $[(\$100 \times 1,000) + (\$20 \times 12,000)] / 1,000$

This example illustrates that ABC can produce significant product costing improvements in service organisations that experience consumption diversity. Although ABC has not yet had the same reception in service organisations compared to manufacturing organisations, it has been adopted by some.

M4.7 Customer and Channel Profitability Analysis

Just as products can subsidise each other, so too can customers and channels. For simplicity, many organisations allocate these selling and administrative costs on the basis of volume. However I'm sure you can think of many examples where the customers who buy the most do not require the most service. When customers are being charged for services that they do not require, they will be easily tempted away by other firms.

Knowing the true profitability of customers and/or distribution channels⁴ is also important to guide the strategic thrust of the firm (i.e. which customers to seek).

For decision-making purposes, some managers are now using activity-based approaches to assign post-manufacturing costs to customers or channels, or even products (such as advertising). Allocating these costs reflects the different ways in which customers consume resources. For example, one customer may frequently call a vendor's technical support hotline because they have no in-house technical staff. Another customer may not require the hotline support at all because that customer does have in-house staff.

Differences such as these have an overall impact on the profitability of serving different customers or channels of distribution. Examples of other activities for which customers or channels may have different resource demands are shown in Exhibit M4.8.

EXHIBIT M4.8

Activity	High Cost Customer/Channel	Low Cost Customer/Channel
Shipping policies	Customer requires overnight shipping.	Customer is satisfied with 3-day shipping.
Inventory carrying requirements	Customer requires safety stocks close to their plant.	Customer does not require safety stocks.
Post-sale technical support	Customer requires specialised training to use product.	Customer provides their own in-house training to use product.
Field sales support	Customer requires shelf stocking from supplier's sales force.	Customer performs shelf stocking with their own work force.
Promotional support	Channel requires promotional displays.	Channel requires no promotional displays.
Order entry	Customer uses supplier's salesperson to submit an order.	Customer uses electronic data interchange (EDI) to submit an order.
Credit and collection	Customer pays accounts in 90 days.	Customer pays accounts in 15 days.
Field service	Customer requires support from supplier's field service staff.	Customer requires no post-sale service.

Many Australian banks have developed customer profitability reporting systems which have helped them determine the relative profitability of various types of customers. This has led to the elimination of some unprofitable customers, and the introduction of certain bank charges to influence the behaviour of other customers in order to increase profitability.

Consider recent changes in the airline industry and the changes made by budget carriers. Customer profitability analysis indicated that some customers were using a lot more of certain services than others (phone bookings, food, baggage, etc.). One solution is to unbundle the pricing; a price for travel plus additional costs for food (food for purchase), baggage (\$x per bag), additional costs for phone booking, etc.

⁴ A distribution channel is the means through which goods pass from the producer to the consumer. It can be direct or can include one or more wholesalers, retailers, distributors and/or other intermediaries.

The following example shows how customer profitability would be determined using activity-based costing.

Example

RST Ltd manufactures one product, Product A. The price and cost of goods sold per unit are as follows:

Price per unit	\$120
Cost of goods sold per unit	<u>70</u>
Gross profit per unit	<u>\$ 50</u>

In addition, the company incurs sales and administrative expenses of \$300,000.

The company wishes to assign these costs to its three major retail customers: Customers 1, 2, and 3. These expenses are related to three major post-manufacturing activities: customer service, sales order processing, and advertising support. The advertising support is in the form of advertisements that are placed by RST to support the retailer's further sale of RST's products to consumers. The full-time employees (FTEs) and activity drivers associated with these activities are:

	FTE	Activity Driver
Customer Service	25	Number of service requests
Sales order processing	100	Number of sales orders
Advertising support	<u>75</u>	Number of ads placed
Total	<u>200</u>	

Customer 3 requires extensive support compared to the other customers for all activities, as can be seen from the following activity information:

Cost Pools	Customer 1	Customer 2	Customer 3	Total
Number of service requests	10	20	120	150
Number of sales orders	5	25	270	300
Number of ads placed	15	20	40	75
Unit Volume	10,000	8,000	6,000	24,000

- 1 Determine the split-up of the sales and administrative overheads across the three cost pools.
- 2 Determine the activity rates for each activity pool in (1).
- 3 Determine the activity costs for the three customers, using the activity rates in (2). What is the net profit for each of the three customers?
- 4 Interpret the profitability reports in (3).

The following solutions will lead you through the required steps.

- 1 FTE stand for full-time employees and it provides the basis for allocating the \$300,000 into three cost pools. Thus, the costs associated with customer service are $25/200 \times \$300,000 = \$37,500$. Similarly, sales order processing costs equal \$150,000 and advertising support is \$112,500. (Be sure you understand how each of these was calculated.)
- 2 Customer service costs are allocated on the basis of number of service requests. Therefore the cost of each service request is $\$37,500/150$ (the total number of service requests) = \$250 per service request. Now calculate the rates for the other two activities (see table on the next page).

- 3 The overhead costs can now be allocated to each customer as follows:

Cost Pool	Activity Driver	Customer 1	Customer 2	Customer 3	Total
Gross Profit (unit volume × gross profit per unit)		500,000	400,000	300,000	1,200,000
Less Overhead: Customer Service (\$37,500)	Service requests (\$250 per request)	2,500	5,000	30,000	37,500
Sales order processing (\$150,000)	Sales orders (\$500 per order)	2,500	12,500	135,000	150,000
Advertising support (\$112,500)	Ads placed (\$1,500 per ad)	22,500	30,000	60,000	112,500
Net Profit		\$ 472,500	\$ 352,500	\$ 75,000	900,000

Note: The amounts allocated for customer service must add up to the total of the cost pool (\$37,500). This is a good way to check for simple mathematical errors in allocation.

- 4 This type of analysis makes a big difference in the perceived profitability. In this case, Customer 1 purchases the most units but places the least demand on selling and administrative expenses. Customer 3, on the other hand, makes extensive demands on selling and administrative resources. Before jumping to the conclusion that Customer 3 should be dropped, you should first consider ways to make this customer more profitable. While this may involve increasing the price, it might also be achieved in a number of other ways, including charging them separately for service requests (which may reduce the number of requests) or encouraging them to make fewer sales orders or sales orders for larger amounts.

Also consider Customer 1. This customer is subsidising the other customers. If something is not done, Customer 1 may well change to another supplier who can charge less, if that supplier differentiates between high and low cost customers.

M4.8 When to Use an Activity-Based Costing System

An activity-based costing system offers significant benefits, including the following: greater product-costing accuracy, improved decision-making, enhanced strategic planning, and better ability to manage activities. These benefits, however, are not obtained without costs. An activity-based costing system is more complex, and it requires a significant increase in measurement activity – and measurement can be costly. Although each manager will have to assess the benefits and costs associated with implementing an activity-based costing system, there are some reasonably good guidelines that can be followed.

Two fundamental requirements must be met before an activity-based costing system is even considered as a possibility. First, the non-unit-based costs should be a significant percentage of total overhead costs. If they are immaterial, it simply doesn't matter how they are allocated to individual products. Second, the consumption ratios of unit-based and non-unit-based activities must differ. If products consume all overhead activities in roughly the same ratios, it doesn't matter if unit-based cost drivers are used to allocate all overhead costs to individual products. The same cost assignment will be produced by either a conventional or an activity-based costing system. Thus, firms with product homogeneity (low consumption diversity) may be able to use a conventional system without any problems.

Assuming that the non-unit-based costs are significant and that consumption diversity is high, should a manager implement an activity-based costing system? Not necessarily. In deciding whether to implement an activity-based costing system, a manager must assess the trade-off between the cost of measurement and the cost of errors. *Measurement costs* are the costs associated with the measurements required by the cost system. *Error costs* are the costs associated with making poor decisions based on inaccurate product costs. An *optimal cost system* is the one

that minimises the sum of measurement costs and error costs. Note, however, that the two costs conflict. More complex cost systems produce lower error costs but have higher measurement costs. For some organisations, the optimal cost system may not be an activity-based costing system even though it is a more accurate system. Depending on the trade-offs, the optimal cost system may very well be a simpler, traditional, unit-based system. This could explain, in part, why most firms still maintain a conventional system.

In summary, activity-based costing is most useful where:

- overhead costs are a significant component of product cost
- products make differential use of major activities
- the management accounting systems are sophisticated enough to collect cost data related to various cost drivers
- cost drivers can be clearly identified
- the entity needs highly accurate product costs in order to make effective decisions regarding such issues as pricing and product mix; for example, this may be the case where the company has very tight margins.

There are some changes that are taking place in the manufacturing environment that are increasing the attractiveness of more complex and accurate cost systems. New information technology, for example, is decreasing the cost of measurement. Computerised production planning systems make it easier to collect data and perform calculations.

Over the last few years, there has been a substantial increase in the use of activity-based costing in service organisations in Australia. The use of activity-based costing has been increasing in areas such as communications, state and Commonwealth government departments, hospitals, banking and local government councils. One of the key benefits of activity-based costing has been the organisation's better understanding of its cost drivers.

PRACTICE PROBLEMS

Solutions to practice problems can be found online at <http://login.cengagebrain.com/>. These problems are intended to facilitate self-study and additional practice. Don't look at the solution for any of these without giving the problem a serious try first, because once you have seen the solution, it always looks easier than it is.

PRACTICE PROBLEM A

Activity-Based Costing

The Canning Company provides an on-site processing service to farmers throughout a number of rural areas across Australia. The firm packs and preserves various fruit into containers and has identified the following overhead cost pools and cost drivers:

Overhead item	Expected Cost (\$)	Cost Driver	Practical Level
Packing machine setups	143,000	Number of setups	110 setups
Fruit handling	124,800	Number of containers	7,800 containers
Quality control	316,200	Number of inspections	1,020 inspections
Other overhead cost	172,500	Number of machine hrs	11,500 machine hrs

An order of 800 fruit containers used:

Packing machine setups	10 setups
Fruit handling	780 containers
Quality inspections	104 inspections
Packing machine hours	980 Packing machine hours

Required:

- 1 What is the overhead rate per packing machine hour if the number of packing machine hours is used as a single cost driver under a traditional costing system?
- 2 Utilising traditional costing, how much overhead is assigned to the order based on packing machine hours as a single cost driver?
- 3 Utilising ABC, how much total overhead is assigned to the order?

PRACTICE PROBLEM B

Activity-Based Costing

Clarkeville Company manufactures wooden furniture. The firm has recently received a request to produce 40 custom-made bookshelves at a price lower than it normally accepts.

The firm has traditionally had a policy not to accept any order that did not provide revenues at least equal to its full manufacturing cost plus 10 per cent, but this order is from a very well-known retailer whom they hope to do more business with in the future. The price offered was \$2,500 per unit. This situation has caused the firm to re-examine its furniture's costs. Clarkeville Company's accountant had suggested that the firm should investigate the implementation of an activity-based costing system for the allocation of its overheads.

As a result the following data was assembled. The plant-wide overhead rate is based on expected volume of 450,000 direct labour hours and the following budgeted overhead (all figures are annual):

	\$
Depreciation: building	600,000
Depreciation: equipment	300,000
Material handling	800,000
Power (machine usage)	700,000
Rework costs	250,000
Purchasing	118,000
Plant supervision	200,000
Scrap	640,000
Other plant-wide overheads	<u>460,000</u>
Total	<u>4,068,000</u>
Expected activity for activity drivers (annual):	
Material moves	10,000
Kilowatt hours	100,000
Units reworked	2,000
Units scrapped	1,000
Machine hours	100,000
Purchase orders	20,000
Estimated data for potential job (40 units):	
Direct labour (4,100 hours)	\$36,900
Direct material	\$24,000
Number of material moves	6
Number of kilowatt hours	1,000
Number of units reworked	2
Number of units scrapped	3
Number of machine hours	1,000
Number of purchase orders	20

Required:

- 1 Compute the estimated unit cost for the potential job using the existing method to assign overheads on a plant-wide basis. Given this unit cost, compute the total gross profit earned by the job.
- 2 Classify overhead activities as unit level, batch level, product level or facility level. Calculate pool rates using the activity driver given. The rate for facility level overheads is based on direct labour hours.
- 3 Compute the estimated unit cost for the potential job using the pool rates computed in (2). Given this cost per unit, calculate the total gross margin earned by the job.

KEY TERMS

Activity dictionary
Activity-based costing
Batch level activities

Cost drivers
Facility level activities
Homogeneous cost pools

Product level activities
Traditional cost systems
Unit level activities

HOMEWORK AND DISCUSSION TO DEVELOP UNDERSTANDING

DISCUSSION QUESTIONS

- 1 What is meant by the term 'activity management'?
- 2 Complete the following statement: 'Companies are likely to benefit from activity-based costing systems if _____'.
- 3 Provide two situations where an activity-based costing may be more difficult to implement in a service business.
- 4 Consider the following statement: 'The optimal product costing system is the most accurate system'. Discuss.
- 5 Define the following concepts:
 - (a) activity cost pool
 - (b) homogeneity of cost pools
 - (c) activity drivers.
- 6 Provide an example of each of the following:
 - (a) unit level activities
 - (b) batch level activities
 - (c) product level activities
 - (d) facility level activities.
- 7 Complete the following statement: 'Conventional product costing systems result in inaccurate product costs when _____'.
- 8 Provide three indicators of problems with product cost systems.
- 9 Are the benefits arising from the introduction of activity-based costing likely to be greater where overheads are a larger or smaller proportion of total cost?
- 10 Despite a large body of research identifying the advantages of activity-based costing, many Australian organisations have been reluctant to implement it. What are the reasons for this reluctance?
- 11 Do you agree with the following statements?
 - (a) Both conventional cost systems and activity-based costing focus on resources supplied.
 - (b) Plant and equipment is an example of a committed resource under an ABC system.
 - (c) Committed resources always equal resources used.
- 12 What do you believe are the limitations of activity-based costing?
- 13 List the steps involved in implementing an activity-based costing system.
- 14 Describe how assigning overhead costs differs under a simple activity-based product costing system from a conventional volume-based costing system.
- 15 Explain the term 'volume-based cost driver'. What types of problems arise if a firm applies a volume-based cost driver inappropriately when allocating manufacturing overhead costs to products?

PROBLEMS

PROBLEM M4.1

Activity-Based Costing; Homogeneous Cost Pools; Cost Drivers

A company has identified the following overhead costs and cost drivers for the coming year:

Overhead Item	Expected Cost \$	Cost Driver	Practical Level
Setup costs	120,000	Number of setups	300
Ordering costs	90,000	Number of orders	4,500
Machine costs	90,000	Machine hours	18,000
Power	25,000	Kilowatt hours	50,000

The following two jobs were completed during the year:

	Job 125	Job 128
Direct materials	\$1,050	\$1,750
Direct labour (100 hours)	\$ 800	\$ 800
Units completed	100	100
Number of setups	2	8
Number of orders	40	160
Machine hours	200	300
Kilowatt hours	200	400

The company's normal activity is 5,000 direct labour hours. The company sells goods at cost plus 5%.

Required:

- 1 Determine the unit cost for each job using direct labour hours to apply overhead.
- 2 Determine the unit cost for each job using the four cost drivers.
- 3 Which method produces the more accurate cost assignment? Why?
- 4 Discuss whether the company should change from a traditional costing system to an activity-based costing system.

PROBLEM M4.2

Activity-Based Costing; Homogeneous Cost Pools; Cost Drivers

Eagle Ltd manufactures one product, Product H. The price and cost of goods sold per unit are as follows:

	\$
Price per unit	1,200
Cost of goods sold per unit	<u>950</u>
Gross profit per unit	<u>250</u>

In addition, the company incurs sales and administrative expenses of \$840,000. The company wishes to assign these costs to their three major customers, Customers 1, 2 and 3. These expenses are related to three major non-manufacturing activities: customer service, sales order processing and engineering support. The engineering support is in the form of engineering changes that are placed by the customer to change the design of a product. The full-time equivalents and activity drivers associated with these activities are:

	FTE	Activity Driver
Customer service	45	Number of service requests
Sales order processing	30	Number of sales orders
Engineering support	<u>75</u>	Number of customer design changes
Total	<u>150</u>	

Customer 1 requires extensive support in the form of sales order processing, service and engineering support, as can be seen from the following activity information:

	Customer 1	Customer 2	Customer 3	Total
Number of service requests	160	50	90	300
Number of sales orders	280	80	140	500
Number of customer design changes	80	40	30	150
Unit volume	1,800	2,000	2,200	6,000

Required:

- 1 Determine the activity costs for each of the three components of sales and administrative overhead.
- 2 Determine the activity rates for each activity pool in (1).
- 3 Determine the activity costs for the three customers using the activity rates in (2).
- 4 Construct customer profitability reports for the three customers, using the activity costs in (3).
- 5 Interpret the profitability reports in (4).

PROBLEM M4.3*Activity-Based Costing; Homogeneous Cost Pools; Cost Drivers*

Choko Manufacturing produces two types of thermometers: A and B. The thermometers are produced using one continuous process. Four activities have been identified: machining, setups, receiving, and packing. Costs have been assigned to each activity. The overhead activities, their costs, and the other related data are as follows:

Product	Machine Hours	Setups	Receiving Orders	Packing Orders
A	10,000	100	100	800
B	10,000	50	200	400
Costs	\$200,000	\$7,500	\$4,500	\$30,000

Required:

- 1 Classify the overhead activities as unit level, batch level, product level, or facility level.
- 2 Create homogeneous cost pools. Identify the activities that belong to each pool.
- 3 Identify the cost driver for each pool and compute the pool rate.
- 4 Assign the overhead costs to each product using the pool rates computed in (3).

PROBLEM M4.4*Selection of an Activity-Based Costing System*

In 2016, Sterling Company changed its cost system. It went from using a single, plant-wide overhead rate based on direct labour hours to a system using departmental overhead rates. The departmental overhead rates used direct labour hours, machine hours, and direct material dollars to assign overhead to products.

In 2016, the general manager of Sterling, Pamela Jones, was mulling over the possibility of changing to an activity-based costing system. She had heard that the life of a cost system was about ten years and was worried that the current system was no longer serving the needs of the company. She was also convinced, however, that a change to activity-based costing simply because it was a 'hot' topic was not the right approach. Any change had to be in the best economic interests of the company.

Required:

- 1 As a consultant to Pamela, identify the factors that should be considered in changing to an activity-based costing system. In your discussion, include a definition of an outmoded or obsolete cost system.

PROBLEM M4.5*Cost Drivers and Product Costing Accuracy*

For years, Indio Company produced only one product: bath towels. Recently, the company decided to add a line of dinner serviettes. With this addition, the need to allocate service costs to the producing departments became necessary. Surprisingly, the costs to produce the towels increased and their profitability dropped.

The marketing manager and the production manager both complained about the increase in the production cost of towels. The marketing manager was concerned because the increase in unit costs led to pressure to increase the unit price of towels. She was resisting this pressure because she was certain that the increase would harm the company's market share. The production manager also was receiving pressure to cut costs; yet, he was convinced that nothing different was being done in the way the towels were produced. He was also convinced that further efficiency in the manufacture of the towels was unlikely. After some discussion, the two managers decided that the problem had to be connected with the addition of the serviette line.

Upon investigation, they were informed that the only real change in product-costing procedures was in the way overhead costs were assigned. They were informed that a two-stage procedure was used. First, the service department costs were allocated directly to the two producing departments (patterns and finishing). Second, the costs accumulated in the producing departments were allocated to the two products using direct labour hours as a base. The managers were assured that great care was taken to associate overhead costs with individual products. So that they could construct their own example of cost assignment, the controller made the following information available for one of the company's service departments (the accounting department):

	Department		
	Accounting	Pattern	Finishing
Service cost	\$220,000	–	–
Transactions processed	–	40,000	60,000
Total direct labour hours	–	20,000	40,000
Direct labour hours per towel ¹	–	0.4	0.8
Direct labour hours per serviette ¹	–	0.1	0.2

¹ Hours required to produce one set, where a set has four units

The controller remarked that the cost of operating the accounting department had doubled with the addition of the new product line. The increase came because of the need to process transactions, the number of which had also doubled.

During the first year of producing serviettes, the company produced and sold 30,000 sets of towels and 80,000 sets of serviettes. The 30,000 sets of towels matched the prior year's output for that product.

Required:

- 1 Compute the amount of accounting cost assigned to each set of towels and serviettes, using the two-stage allocation process described by the controller.
- 2 Compute the amount of accounting cost assigned to a set of towels before the serviette line was added.
- 3 Suppose that the company decided to allocate the accounting costs directly to the product lines using the number of transactions as the allocation base. What is the accounting cost for a set of towels? For a set of serviettes?
- 4 Which way of assigning overhead does the best job, the conventional two stage approach or the activity based approach using transactions processed for each product? Explain. Discuss the benefits of using cost drivers to assign overhead costs directly to individual products. Was it necessary to form manufacturing cells to carry out the cost-driver allocation?

PROBLEM M4.6

Product-Costing Accuracy; Corporate Strategy; Activity-Based Costing

Ogden Metal Manufacturing is engaged in the production of machine parts. One division specialises in the production of two machine parts: Part 12A and Part 18B. Historically, the profitability of the division had been tied to Part 12A. In the last two years, however, the division had been facing intense competition, and its sales of this part had dropped. Much of the competition was from foreign sources, and the divisional manager was convinced that the foreign producers were guilty of dumping. The following conversation between Ken Larson, divisional manager, and Martha Jones, marketing manager, reflects the concerns of the division's top management and some possible solutions that were being considered.

Martha: "I just received a call from one of our major customers concerning Part 12A. He said that a sales representative from another firm had offered the part at \$20 per unit – \$11 less than what we ask."

Ken: "It's costing about \$21 to produce that part. I don't see how these companies can afford to sell it so cheaply. I'm not convinced that we should meet the price. Perhaps a better strategy is to emphasise producing and selling more of Part 18B. Our margin is high on this product, and we have virtually no competition for it."

Martha: "You may be right. I think we can increase the price significantly and not lose business. I called a few customers to see how they would react to a 25 per cent increase in price, and they all said that they would still purchase the same quantity as before."

Ken: "It sounds promising. However, before we make a major commitment to Part 18B, I think we had better explore other possible explanations. I want to know how our production costs compare to our competitors. Perhaps we could be more efficient and find a way to earn a good return on Part 12A."

After his meeting with Martha, Ken requested an investigation of the production costs and comparative efficiency. The controller reported that as far as he could determine, the division's efficiency was similar to that of other competitors. The controller did mention the possibility of using activity-based costing, a method that might improve product costing. To assist Ken in understanding the production activities and costs associated with the two products, the controller prepared the following data:

	Part 12A	Part 18B
Production	50,000	10,000
Selling price	\$31.86	\$24.00
Overhead per unit	\$12.71	\$ 6.36
Direct materials and labour per unit	\$ 8.53	\$ 6.26
Number of production runs	10	20
Receiving orders	40	100
Machine hours	12,500	6,000
Direct labour hours	25,000	2,500
Engineering hours	5,000	5,000
Material moves	50	40

Upon examining the data, Ken decided that he wanted to know more about the overhead costs since they were such a high proportion of total production costs. Ken was provided the following list of pooled overhead costs and was told that total overhead costs were assigned to products using a plant-wide rate based on direct labour hours. The controller also indicated that he had pooled the overhead costs on the basis of what he called activity level and driver classification. He indicated to Ken that it may be possible to improve product costing by assigning the costs using each activity pool instead of one plant-wide pool.

	\$
Overhead pool: ¹	
Setup costs	24,000
Machine costs	175,000
Receiving costs	210,000
Engineering costs	200,000
Material handling costs	<u>90,000</u>
Total	<u>699,000</u>

¹ The pools are named for the major activities found within them. All overhead costs within each pool can be assigned using a single cost driver (based on the major activity after which the pool is named).

Required:

- 1 Verify the overhead cost per unit reported by the controller using direct labour hours to assign overhead. Compute the per unit gross margin for each product.
- 2 After learning of the activity based costing, Ken asked the controller to compute the product cost using this approach. Recompute the unit cost of each product using activity based costing. Compute the per unit gross margin for each product.
- 3 Should the company switch its emphasis from the high volume product to the low-volume product? Comment on the validity of the divisional manager's accusation that competitors are dumping.
- 4 Explain the apparent lack of competition for Part 18B. Comment also on the willingness of customers to accept a 25 per cent increase in price for Part 18B.
- 5 Assume that you are the manager of the division. Describe what actions you would take based on the information provided by the activity based unit costs.

PROBLEM M4.7*Product-Costing Accuracy; Departmental Rates; Pool Rates*

Maxwell Company produces two small engines for model boats (Engine A and Engine B). Both products pass through two producing departments. Engine B is by far the most popular of the two engines. The following data have been gathered for these two products:

	Product-Related Data	
	Engine A	Engine B
Units produced per year	30,000	300,000
Direct materials and labour	\$100,000	\$1,000,000
Direct labour hours	40,000	400,000
Machine hours	20,000	200,000
Production runs	40	60
Inspection hours	800	1,200

	Departmental Data	
	Department 1	Department 2
Direct labour hours:		
Engine A	30,000	10,000
Engine B	<u>45,000</u>	<u>355,000</u>
Total	<u>75,000</u>	<u>365,000</u>

	Departmental Data	
	Department 1	Department 2
Machine hours:		
Engine A	10,000	10,000
Engine B	<u>160,000</u>	<u>40,000</u>
Total	<u>170,000</u>	<u>50,000</u>
Overhead costs:	\$	\$
Setup costs	90,000	90,000
Inspection costs	70,000	70,000
Power	100,000	60,000
Maintenance	<u>80,000</u>	<u>100,000</u>
Total	<u>340,000</u>	<u>320,000</u>

Required:

- 1 Compute the overhead cost per unit for each product using a plant-wide per-DL hour, unit-based rate.
- 2 Compute the overhead cost per unit for each product using departmental rates. In calculating departmental rates, use machine hours for Department 1 and direct labour hours for Department 2. Repeat using direct labour hours for Department 1 and machine hours for Department 2.
- 3 Compute the overhead cost per unit for each product using activity based costing (use overhead pools where possible).
- 4 Comment on the ability of departmental rates to improve the accuracy of product costing.

PROBLEM M4.8*Activity-Based Costing; Service Industry*

Alva Hospital operates an intensive care unit. Currently, patients are charged the same rate per patient day for daily care services. Daily care services are broadly defined as occupancy, feeding, and nursing care. A recent study, however, revealed several interesting outcomes. First, the demands patients place on daily care services varies with the severity of the case being treated. Second, the occupancy activity is a combination of two activities: lodging and use of monitoring equipment. Since some patients require more monitoring than others, these activities should be separated. Third, the daily rate should reflect the difference in demands resulting from differences in patient type. To compute a daily rate that reflected the difference in demands, patients were placed in three categories according to illness severity, and the following annual data were collected:

Activity	Cost of Activity \$	Cost Driver	Quantity
Lodging	900,000	Patient days	6,000
Monitoring	1,200,000	No. of monitoring devices used	10,000
Feeding	100,000	Patient days	4,000
Nursing care	945,000	Nursing hours	63,000
	<u>3,145,000</u>		

The demands associated with patient severity are also provided:

Severity	Patient Days	Monitoring Devices	Nursing Hours
High	2,000	5,000	40,000
Medium	3,000	4,000	18,000
Low	1,000	1,000	5,000

Required:

- 1 Suppose that the costs of daily care are assigned using only patient days as the cost driver (which is also the measure of output). Compute the daily rate using this traditional unit based approach of cost assignment.
- 2 Compute pool rates using the given cost drivers.
- 3 Compute the charge per patient day for each patient type using the pool rates from (2) and the demands on each activity.
- 4 Comment on the value of activity-based costing in service industries.

PROBLEM M4.9*Implementing an Activity-Based Costing System*

Jan Booth, financial controller, was reviewing the responses to her suggestion that the company's cost system be replaced with an activity-based costing system. She had sent a detailed memo to all the company's divisional managers, outlining the proposed new system and providing a brief summary of the benefits. She had also sent a copy of the memo to the divisional controllers. In her memo, she had requested a written reaction and set a meeting to discuss the issue. All the managers and controllers had responded, but she was somewhat disappointed in the reactions. Most of the responses had been negative and unsupportive of the change. Yet, she knew the company was having problems.

Bids were being lost at a greater rate than ever before. The company was having a difficult time matching competitors' prices, even with aggressive pricing. Furthermore, a recent study commissioned by the company revealed that the company was not out of line with others in terms of its overall efficiency. Also, there was the decision by one division to drop a major product line, one that had been produced successfully for years. The traditional cost system had indicated that it was the right thing to do. Yet, the profits of the division had declined dramatically the following year. Something was wrong! Based on her research, she was convinced that a major

problem existed with the cost system. Her problem now was to convince these divisional types that their objections were unfounded. From the memos, she had built a list of the most common objections to the new system.⁵

- 1 An ABC system would be too expensive to operate.
- 2 An ABC system is too complicated and would be difficult to understand.
- 3 Improving our current system is all that's needed; for example, we can use rates based on machine hours as well as direct labour hours.
- 4 More accurate product costs are not needed – we know what our products cost.
- 5 The market sets prices, so why worry about product costs?
- 6 Cost systems aren't very important. Anyway, most of our manufacturing costs are fixed, and we cannot do much with fixed costs.
- 7 Only manufacturing costs are product costs. Why worry about tracing non-manufacturing costs to products?
- 8 Product costs are not useful for managing overhead activities. In fact, product costs are not very useful for most managerial decisions.

Required:

- 1 Prepare a memo to the divisional managers addressing each of the objections.

PROBLEM M4.10

Cost Drivers; Product Costing; Ethical Considerations

Consider the following conversation between Len Bryner, managing director of a firm engaged in job manufacturing, and Peter Davis, CMA, the firm's financial controller.

Len: "Peter, as you know, our firm has been losing market share over the past three years. We have been losing more and more bids, and I don't understand why. At first, I thought other firms were undercutting simply to gain business, but after examining some of the public financial reports, I believe that they are making a reasonable rate of return. I am beginning to believe that our costs and costing methods are at fault."

Peter: "I can't agree with that. We have good control over our costs. Like most firms in our industry, we use a normal job costing system. I really don't see any significant waste in the plant."

Len: "After talking with some other managers at a recent industrial convention, I'm not so sure that waste by itself is the issue. They talked about conversion of overhead costs to direct manufacturing costs, and the use of something called cost drivers to allocate overhead. They claimed that these new procedures produce better control of overhead, and more accurate product costing. Maybe our bids are too high because these other firms have found ways to decrease their overhead and to increase the accuracy of their product costing."

Peter: "I doubt it. For one thing, I don't believe overhead costs can be made into direct manufacturing costs. That seems absurd to me. Furthermore, everyone uses some measure of production activity to assign overhead costs. I imagine that what they are calling cost drivers is just some new buzzword for measures of production volume. Fads in costing come and go. I wouldn't worry about it. I'll bet that our problems with decreasing sales are temporary. You might recall that we experienced a similar problem about 12 years ago. It took 2 years before it straightened out."

Required:

- 1 Do you agree with Peter Davis and the advice that he gave Len Bryner? Explain.
- 2 Was there anything wrong or unethical in the behaviour that Peter Davis displayed? Explain your reasoning.
- 3 Do you think that Peter was well informed? That he was aware of what was meant by cost drivers? Should he have been?

⁵ This list is taken from Peter B.B. Turney, 'Ten Myths About Implementing an Activity-Based Cost System', *Journal of Cost Management* (Spring 1990), pp. 24–32.

M5

Budgeting and the planning process

ON COMPLETION OF THIS CHAPTER YOU SHOULD BE ABLE TO:

- describe the role of budgeting and how budgets are used in the planning process of organisations
- describe a master budget and its components
- prepare an operating budget and industry-appropriate component budgets
- prepare a cash budget and budgeted financial statements
- identify differences between a static and flexible budget
- interpret budget variances
- understand the importance of behavioural dimensions of budgets.

M5.1 CHAPTER OVERVIEW

The basic objectives of this chapter are to provide an introduction to the nature and terminology of budgets and provide the skills to allow you to prepare and interpret budgets as well as an understanding of the context in which budgets operate.

M5.2 Description of Budgeting

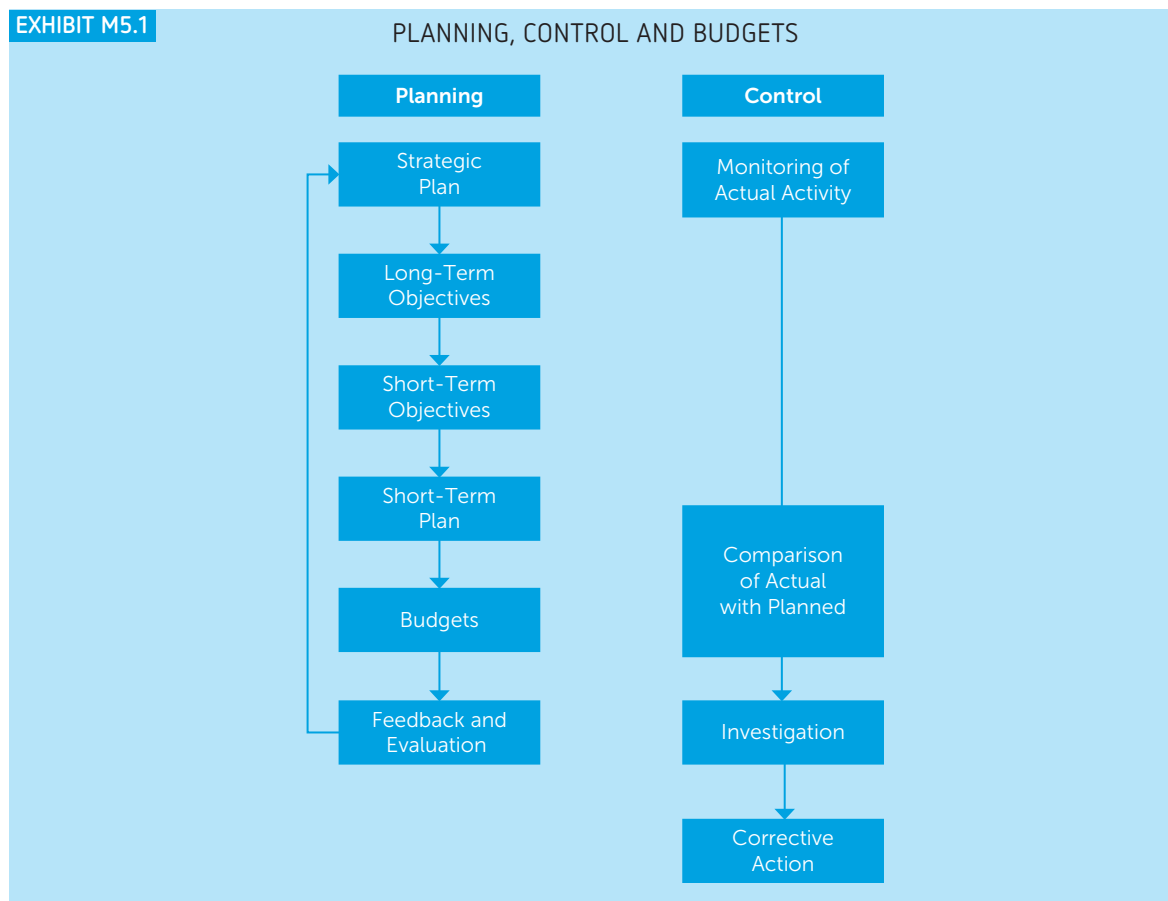
Failure to plan, either formally or informally, can lead to financial disaster. Managers of businesses, whether small or large, must know their resource capabilities and have a plan that details how these resources will be used. Careful planning is vital to the health of any organisation, whether it is a listed company, family business, government department or not-for-profit organisation.

Definition and role of budgeting

What role does budgeting play in planning and control? Plans identify objectives and the actions needed to achieve them. **Budgets** are the quantitative expressions of these plans, stated in either physical or financial terms or both. Thus, a budget is a method for translating the goals and strategies of an organisation into operational terms. As a plan of action, budgets can be used to control by comparing actual outcomes, as they happen, with the planned outcomes. If actual results differ significantly from the plan, actions can be taken to put the plans back on track if necessary.

Exhibit M5.1 shows the relationship between planning and control and the role that budgets play in the overall process. Before a budget is prepared, an organisation should develop a **strategic plan**. The strategic plan identifies strategies for future activities and operations, often over a period of five years or more.

Once an organisation has developed an overall strategy, the next step is to translate this strategy into long-term and short-term objectives. From these objectives, the individual units of a company create short-term plans on which to build the budget. These short-term plans should be compatible with the overall direction of the firm itself. The management of the company should develop a tight linkage between the budget and the strategic plan. In developing this linkage, however, management should take care that all attention is not focused on the short run. This is important because budgets, as one-period plans, are short-run in nature.



To illustrate the process, consider the case of Dr Jones, a dentist (Refer to Exhibit M5.1 as you read this example.) Assume that Dr Jones' strategic plan is to increase the size and profitability of his business by building a practice that has the reputation for quality and timely service. A key element in achieving this strategy is the addition of a dental laboratory to his building so that crowns, bridges, and dentures can be made in-house to a high standard and more quickly than using an outside supplier. This is his long-term objective. This addition would increase the quality and timeliness of his services while simultaneously increasing profitability. In order to add the laboratory, he needs additional capital. His financial status dictates that the capital must be obtained by increasing revenues. After some careful calculation, Dr Jones concludes that annual revenues must be increased by 10 per cent; this is a short-term objective.

How are these long-term and short-term objectives to be achieved? Assume that Dr Jones discovers that his fees for fillings and crowns are below the average in his community, and decides that the 10 per cent increase can be achieved by increasing these fees. He now has a short-term plan. A sales budget would outline the quantity of fillings and crowns expected for the coming year, the per-unit fee reflecting the increase, and the total fees expected. Thus, the sales budget becomes the quantitative expression of the qualitative plan of action needed to achieve the objective of a 10 per cent increase in revenues. As the year unfolds, Dr Jones can compare the actual revenues being received with the budgeted revenues (monitoring and comparing). If actual revenues are falling short of planned revenues, steps should be taken to find out why (investigation). Then he can take action to remedy the shortfall, such as working longer hours or increasing fees for other dental services (corrective action). The reasons for the shortfall may also lead to an alteration of future plans (feedback).

Purposes of budgeting

Budgets are usually prepared for areas within an organisation (departments, plants, divisions, and so on) and for activities (sales, production, and so on). The **master budget** is the collection of all individual area and activity budgets. It serves as the comprehensive financial plan for the organisation as a whole.

A budgetary system gives an organisation several advantages.

- 1 It forces managers to plan.
- 2 It provides resource information that can be used to improve decision-making.
- 3 It aids in the use of resources and employees by setting a benchmark that can be used for subsequent evaluation of performance.
- 4 It improves the functions of communication and co-ordination.

Budgeting forces management to plan for the future. Budgets force managers to develop an overall direction for the organisation, foresee problems, and develop future policies. For example, by developing a budget, a company may be able to see that it will have a cash shortage in five months' time. This will give the firm plenty of time to take corrective action; for example, they could apply now for increased overdraft facilities from the bank.

Budgets convey significant information about the resource capabilities of an organisation, making better decisions possible. For example, knowledge of expected revenues and expenses and cash flows can lead to more informed decisions regarding salary increases, loans, and acquisition of equipment. These better decisions, in turn, might prevent the financial difficulties that can arise when companies overcommit themselves.

Budgets also set standards that can control the use of a company's resources and control and motivate employees. For example, if a company knows how much raw material should be used in a product and what the expenditure level should be, it can evaluate its use of this resource and its level of efficiency. If more raw materials are being used than expected, the company may discover that employees are often careless in their use, and that extra care will produce savings. The same principle applies to other resources used by the company. In total, the savings could be significant.

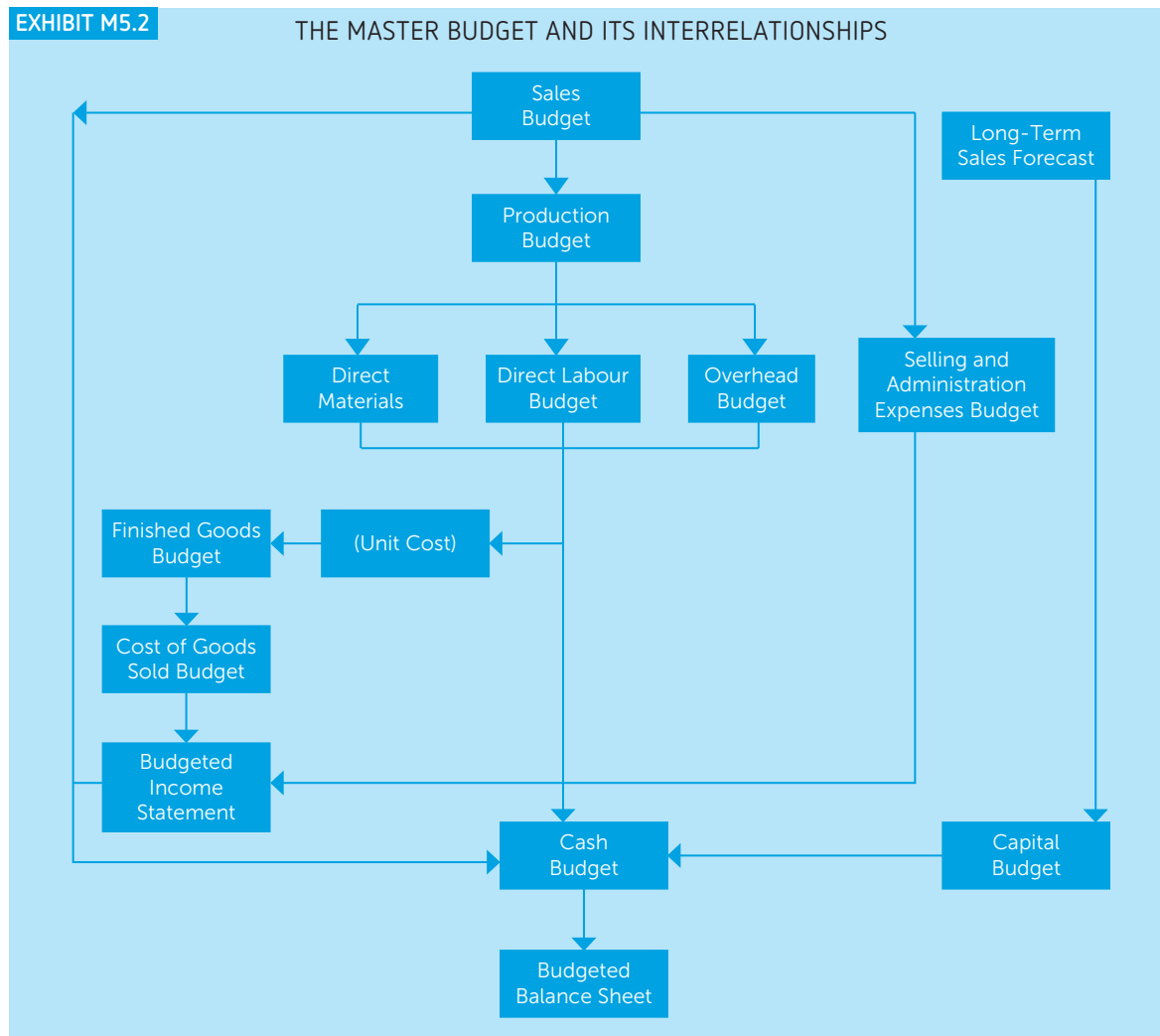
Control is fundamental to the overall success of a budgetary system. It takes more than just creating a budget to improve resource allocation within an organisation. **Control** ensures that steps are being taken to achieve the objectives outlined in an organisation's master plan. Control is achieved by comparing actual results with budgeted

results on a periodic basis (e.g. monthly). If there is a significant deviation from planned results, that deviation is feedback revealing that the system is out of control. Steps should be taken to find out why. Once the reasons are known, corrective action can be taken.

Budgets also serve the functions of communication and co-ordination. Budgets formally communicate the plans of the organisation to each employee. Accordingly, all employees can be aware of their role in achieving those objectives. Since budgets for the various areas and activities of the organisation must all work together to achieve the stated objectives of the organisation, co-ordination is promoted. Managers are forced to view the needs of other areas and are encouraged to subordinate their individual interests to those of the organisation. The role of communication and co-ordination becomes more significant as an organisation increases in size.

The master budget

The **master budget** has many elements, ranging from operational considerations (such as the **sales plan**) to financial considerations (e.g. the **cash budget**). These elements are not independent of each other. The interdependencies in the master budget are shown in Exhibit M5.2. Please refer to this exhibit during the following discussion. In this instance, we will use a manufacturing and a retail organisation to illustrate the technical aspects of these budgets.



As you can see, the master budget is a comprehensive financial plan made up of various individual budgets. A master budget can be divided into operating budgets, cash budgets and budgeted financial statements. **Operating budgets** are concerned with the profit-generating activities of a firm: sales, production, and finished goods inventories. Note that our emphasis here is on retail and manufacturing settings. For service organisations, the operating budgets are less complex than for manufacturing or merchandising organisations due to the absence of inventory; however, determining capacity (for example, professional staff hours) is often very important. Since many of the financing activities are not known until the operating budgets are known, the preparation of the operating budget should precede the preparation of the financial budget. They specify how operations will be carried out, including the use of inputs (material, labour and overhead) to produce the good or service. Cash budgets show expected cash receipts and payments for the period. They include cash receipts from operations (e.g. receipts from customers) and payments (such as wages). Also included are major cash outflows related to capital expenditures and inflows relating to sales of assets, borrowing or share issues.

The time factor

Most of the component budgets contained in the master budget are for a one-year period usually corresponding to the fiscal year of the company. Yearly budgets are broken down into quarterly budgets, and quarterly budgets are broken down into monthly budgets. The use of smaller time periods allows managers to compare actual data with budgeted data as the year unfolds and to take corrective actions whenever necessary so that overall objectives are attained as planned. Because progress can be checked more frequently with monthly budgets, problems are less likely to become too serious.

The master budget also contains a plan for acquisition of long-term assets – assets that have a time horizon much greater than the one-year operating period. Some of these assets may be purchased during the coming year; plans to purchase others may be detailed for future periods. This part of the master budget is typically referred to as the **capital budget**. Most organisations prepare the budget for the coming year during the last four or five months of the current year. However, some organisations have developed a continuous budgeting philosophy. A **continuous budget** is a moving twelve-month budget. As a month expires in the budget, an additional month in the future is added so that the company always has a twelve-month plan on hand. Proponents of continuous budgeting maintain that it encourages managers to continuously plan ahead.

Directing and co-ordinating

Every organisation must have someone responsible for directing and co-ordinating the overall budgeting process. This **budget director** is usually the financial controller or someone who reports to the controller. The budget director works under the direction of the budget committee. The **budget committee** has the responsibility to review the budget, provide policy guidelines and budgetary goals, resolve differences that may arise as the budget is prepared, approve the final budget, and monitor the actual performance of the organisation as the year unfolds. The budget committee also has the responsibility to ensure that the budget is linked to the strategic plan of the organisation.

The two dimensions of budgeting

There are two main dimensions to budgeting: (1) how the budget is prepared and (2) how the budget is used to implement the organisation's plans. The first dimension concerns the mechanics of budget preparation.

The second, and extremely important consideration, involves how individuals within an organisation react to a budgetary system. The use of budgets to exercise control, evaluate performance, communicate, and encourage co-ordination suggests that budgeting is a human activity. As such, it carries a strong behavioural dimension. Accordingly, if budgets are expected to motivate and encourage behaviour consistent with organisational objectives, care must be exercised in implementing a budgetary system within an organisation. In fact, the success or failure of budgeting depends on how well management considers its behavioural implications.

The remainder of this chapter is primarily concerned with these two dimensions, with preparation being covered in sections M5.3 to M5.5 and behavioural considerations in sections M5.6 and M5.7.

M5.3 Preparation of an Operating Budget for a Retail Organisation

For a retail organisation, the operating budget consists of a budgeted income statement accompanied by the following:

- 1 Sales budget
- 2 Purchases budget
- 3 Cost of goods sold budget
- 4 Other expenses budget

Depending on the nature and size of the other expense budget, it could be divided up further (e.g. an administration budget and selling and distribution budget). Alternatively, the labour costs could be separated into a separate budget.

The sales forecast is the basis for the sales budget, which, in turn, is the basis for all of the other operating budgets and most of the financial budgets. Accordingly, the accuracy of the sales forecast strongly affects the soundness of the entire master budget.

Creating the sales forecast is usually the responsibility of the marketing department. One approach to forecasting sales is the *bottom-up approach*. In this approach, the chief sales executive requests that individual salespeople submit sales predictions, which are aggregated to form a total sales forecast. The accuracy of this sales forecast may be improved by considering other factors, such as the general economic climate, competition, advertising, pricing policies, and so on. Other approaches also exist. Some companies supplement the bottom-up approach with other, more formal approaches, such as time-series analysis, correlation analysis, and econometric modelling.

Sales budget

Once a sales forecast is generated, a sales budget is prepared. The sales budget and the sales forecast are not necessarily synonymous. The sales forecast is merely the initial estimate. The sales budget is the projection approved by the budget committee, and it describes expected sales in units and dollars.

While the sales budget is the normal starting point for a retailer, it is possible that there can be other starting points, such as the purchase budget, where there is a shortage of goods or only a limited number of goods (for example, concert tickets) available for sale.

The sales forecast is presented to the budget committee for consideration. The budget committee may decide that the forecast is too pessimistic or too optimistic and revise it appropriately. For example, if the budget committee decides that the forecast is too pessimistic and not in harmony with the strategic plan of the organisation, it may recommend specific actions to increase sales beyond the forecast level, such as increasing promotional activities and hiring additional salespeople.

To see how budgets are prepared for a retailer, we will now prepare the budgets for Jonathon Pty Ltd, a retailer of household paints. Jonathon Pty Ltd has the following data in relation to its operation as background information. This is Jonathon's opening balance sheet.

BALANCE SHEET AS AT 30 JUNE 2017

	\$	\$		\$	\$
Current Assets			Current Liabilities		
Cash	10,000		Accounts payable	63,000	
Accounts receivable	60,000		Accrued expenses	<u>7,000</u>	70,000
Inventory	<u>85,000</u>	155,000			
Non-Current Assets			Shareholders' Equity		
At cost	300,000		Issued capital	220,000	
Less: Acc Dep'n	<u>(50,000)</u>	<u>250,000</u>	Retained earnings	<u>115,000</u>	<u>335,000</u>
		<u>405,000</u>			<u>405,000</u>

Most of Jonathon's sales are made on credit. Typically 30 per cent of its sales are cash sales or are collected in the month in which the sale is made; the remaining 70 per cent are collected in the month following the month of sale.

Jonathon has the following sales budget for the first six months of the financial year commencing on 1 July 2017.

	\$		\$
July	100,000	October	130,000
August	120,000	November	120,000
September	110,000	December	80,000

Typically, Jonathon's cost of goods sold amount to 65 per cent of sales revenue. The management of Jonathon has adopted a policy of keeping an inventory level equal to the budgeted sales requirement for the next two months. Jonathon pays for its purchases in the month following the month of purchase. Jonathon has \$10,000 monthly fixed costs, of which \$4,000 is depreciation. The other monthly fixed costs are paid in the month in which they are incurred. In addition, Jonathon pays a 7 per cent commission on sales and this is paid in the month following the month in which it is earned. The sales commissions accrued but unpaid at 30 June 2017 amounted to \$7,000.

Jonathon has arranged an overdraft facility with its bank. The interest rate is 12 per cent per annum. For budgeting purposes, it is assumed that interest is levied monthly on the higher of the opening balance or closing balance before interest for that month, if in overdraft.

The sales budget for Jonathon would appear as follows:

July	August	September	Quarter
\$100,000	\$120,000	\$110,000	\$330,000

Using the sales, inventory and expenses data, we can now prepare Jonathon Pty Ltd's purchases budget and other expenses budget.

	July \$	August \$	September \$	Quarter Total \$
Purchases Budget				
COGS (65% of Sales)	65,000	78,000	71,500	214,500
Desired closing inventory	<u>149,500</u>	<u>156,000</u>	<u>162,500</u>	<u>162,500</u>
Requirements	214,500	234,000	234,000	377,000
Budgeted opening inventory	<u>85,000</u>	<u>149,500</u>	<u>156,000</u>	<u>85,000</u>
Budgeted purchases	<u>129,500</u>	<u>84,500</u>	<u>78,000</u>	<u>292,000</u>
Other Expenses Budget				
Depreciation	4,000	4,000	4,000	12,000
Other fixed expenses	6,000	6,000	6,000	18,000
Sales commission (7% of Sales)	<u>7,000</u>	<u>8,400</u>	<u>7,700</u>	<u>23,100</u>
Total other expenses	<u>17,000</u>	<u>18,400</u>	<u>17,700</u>	<u>53,100</u>

Note that the desired closing inventory is equal to the next two months' cost of sales (e.g. $78,000 + 71,500 = 149,500$). The budgeted opening inventory for July of \$85,000 comes from the opening balance sheet, and the opening inventory for August and September is the same as the closing balances for July and August respectively. When calculating the budget for the quarter, note that the opening desired inventory balance is from 30 June (that is, \$85,000) and the closing desired inventory balance is from 30 September (that is, \$162,500).

M5.4 Cash Budget and Budgeted Financial Statements

Cash budget

Knowledge of cash flows is critical to managing a business. Often a business is successful in producing and selling a product or service but fails because of timing problems associated with cash inflows and outflows. By knowing when cash deficiencies and surpluses are likely to occur, a manager can plan to borrow cash when needed and repay the loans during periods of excess cash. When approaching a bank, the manager can use the cash budget to document the ability to repay as well as the need for cash. Because cash flow is the lifeblood of an organisation, the cash budget is one of the most important budgets in the master budget. The cash budget is, put simply, the detailed plan that shows all expected sources and uses of cash. Schedules of cash receipts and cash payments are major inputs to the cash budget.

The cash budget has the following six main sections:

- 1 Beginning cash balance
- 2 Cash collections
- 3 Cash disbursements
- 4 Cash excess or deficiency
- 5 Financing
- 6 Ending cash balance

The beginning cash balance is last period's closing cash balance, and the cash collection section is the current period's expected cash receipts. Expected cash receipts include all sources of cash for the period being considered. However, the principal source of cash is from sales. Because a significant proportion of sales are usually on credit, a major task of an organisation is to determine the pattern of collection for its accounts receivable.

The cash disbursements section lists all planned cash outlays for the period except for interest payments on short-term loans (these payments appear in the financing section). All expenses not resulting in a cash outlay are excluded from the list (depreciation, for example, is never included in the disbursements section).

The cash excess or deficiency section is a function of the cash needs and the cash available. Cash needs are determined by the total cash disbursements plus the minimum cash balance required by company policy. If the total cash available is less than the cash needs, a deficiency exists. In such a case, a short-term loan will be needed or the company goes into overdraft. On the other hand, where there is a cash excess (that is, the cash available is greater than the firm's cash needs), the firm has the ability to repay loans and perhaps make some temporary investments.

In the event of a deficiency, the cash budget must show the amount to be borrowed so that the cash needs are satisfied. Also, the cash budget should reveal planned repayments. Thus, the financing section discloses the planned borrowings and repayments, including interest. Where a company such as Jonathon uses an overdraft system, it is not necessary to show borrowings and repayments; an overdraft is an agreement with the bank that the balance can go negative up to a certain limit.

The final section of the cash budget simply reveals the planned ending cash balance.

To continue the Jonathon example, we can use the budgeted sales and cash receipt patterns to prepare Jonathon Pty Ltd's cash receipts budget as follows.

	July \$	August \$	September \$	Quarter Total \$
Cash Receipts Budget				
Month of sale	30,000 ^a	36,000	33,000	99,000
Following month	<u>60,000^b</u>	<u>70,000^c</u>	<u>84,000</u>	<u>214,000</u>
Total	<u>90,000</u>	<u>106,000</u>	<u>117,000</u>	<u>313,000</u>

^a 30% of current month's sales revenue (\$100,000 × 30%)

^b Accounts receivable outstanding as at 30 June, 2017

^c 70% of previous month's sales revenue (\$100,000 × 70%)

The other side of the cash flow statement is the anticipated outflows of cash. Cash outflows are associated with purchases and other payments made by the organisation during the period. The two main components are purchases of inventory and infrastructure-related expenses such as lease payments or electricity bills.

From the purchases budget and other expenses budget constructed above, the payment policy in regard to each item can be reviewed. Here we have permanent differences and timing differences. The permanent differences relate to such items as depreciation, which is an expense but it is not cash related. Timing differences arise, where the items purchased now are not paid until some later date. Once all items have been reviewed they are brought together in the **cash payment budget**.

Jonathon Pty Ltd's cash payment budget follows:

	July \$	August \$	September \$	Quarter Total \$
Cash Payments				
Inventory suppliers	63,000 ^a	129,500 ^b	84,500	277,000
Other fixed expenses	6,000	6,000	6,000	18,000
Sales commission	<u>7,000^c</u>	<u>7,000</u>	<u>8,400</u>	<u>22,400</u>
Total payments	<u>76,000</u>	<u>142,500</u>	<u>98,900</u>	<u>317,400</u>

^a Accounts payable outstanding as at 30 June 2017

^b Purchases from accounts payable in previous month

^c Unpaid commission as at 30 June 2017 (shown as accrued expenses in the balance sheet)

The cash receipt and cash payment budgets are brought together in the **cash budget**. This plan shows the net cash flow.

$$\text{Net cash flow} = \text{budgeted cash receipts} - \text{budgeted cash payments}$$

The impact of the net cash flow on cash at bank balances can be established. Organisations can then establish whether they need to pay interest on overdrafts. Jonathon Pty Ltd's cash budget can now be prepared as follows:

	July \$	August \$	September \$	Quarter Total \$
Cash Budget				
Budgeted receipts	90,000	106,000	117,000	313,000
Budgeted payments	<u>76,000</u>	<u>142,500</u>	<u>98,900</u>	<u>317,400</u>
Net cash flow	14,000	(36,500)	18,100	(4,400)
Opening balance	<u>10,000</u>	<u>24,000</u>	<u>(12,625)</u>	<u>10,000</u>
Closing balance before interest	24,000	(12,500)	5,475	5,600
Interest paid	<u>0</u>	<u>125^a</u>	<u>126^a</u>	<u>251</u>
Closing balance after interest	<u>24,000</u>	<u>(12,625)</u>	<u>5,349</u>	<u>5,349</u>

^a 1% of higher of opening or closing overdraft balance

Note the expected drop in cash by Jonathon Pty Ltd for August. This drop is not expected to reverse until sometime in September. As a result, Jonathon Pty Ltd pays interest for August and September at 1 per cent per month (12 per cent per year).

Once the cash implications of the sales and purchase activities of the organisation have been established, the anticipated financial statements can be constructed. These include the budgeted income statement and the budgeted balance sheet. They show the results of the planned operations for the budget period (e.g. month, quarter or year). Using the preceding budgets, we can now prepare Jonathon Pty Ltd's budgeted income statement and balance sheet as follows:

BUDGETED INCOME STATEMENT
Quarter Ending 30 September 2017

	\$	\$
Sales		330,000
Less: Cost of Goods Sold		
Opening Inventory	85,000	
Purchases	<u>292,000</u>	
	377,000	
Less: Closing Inventory	<u>162,500</u>	<u>214,500</u>
Gross Margin		115,500
Less: Other Expenses		
Interest	251	
Depreciation	12,000	
Other Fixed Expenses	18,000	
Sales Commission	<u>23,100</u>	<u>53,351</u>
Net Profit		<u>62,149</u>
Budgeted Balance Sheet		
As at 30 September 2017		
Current Assets		
Cash	5,349	
Accounts Receivable	77,000 ^a	
Inventory	<u>162,500</u>	244,849
Non-Current Assets		
At Cost	300,000	
Less: Accumulated Depreciation	<u>62,000^b</u>	<u>238,000</u>
Total Assets		<u>482,849</u>
Current Liabilities		
Overdraft	0	
Accounts Payable	78,000	
Accrued Commission	<u>7,700^d</u>	85,700
Shareholders' Equity		
Issued Capital	220,000	
Retained Earnings	<u>177,149^c</u>	<u>397,149</u>
Total Liabilities and Shareholders' Equity		<u>482,849</u>

^a 70% of September sales revenue (\$110,000 × 70%)

^b Balance as at 30 June 2017 plus quarter's depreciation as shown in budgeted income statement (\$50,000 + \$12,000)

^c Balance as at 30 June 2017 plus quarter's net income as shown in budgeted income statement (\$110,000 + \$62,149)

^d 7% of September sales revenue (\$110,000 × 7%)

M5.5 Preparation of an Operating Budget for a Manufacturing Organisation

Operating budgets for manufacturing firms are more complex than for retail or service firms. There is a need for a production budget which indicates the number of units to be produced. Based on the production budget and after making allowances for opening and closing inventory, a direct material purchases budget together with direct labour and manufacturing overhead budgets are produced.

Based on the above, ending finished goods inventory and cost of goods sold budgets can be developed. Also a selling and administration budget (or two or more separate budgets) including cost of running support areas such as marketing, advertising, human resources, accounting, etc. will be developed.

The operating budget consists of the following schedules:

- 1 Sales budget
- 2 Production budget
- 3 Direct material purchases budget
- 4 Direct labour budget
- 5 Manufacturing overhead budget
- 6 Selling and administrative budget
- 7 Ending finished goods inventory budget
- 8 Cost of goods sold budget

Sales budget

The sales budget for a manufacturing company is similar to that of a retail company. Again, it should also be noted that while the sales budget is the normal starting point in most industries, some industries face other constricting factors. For example, in mining it may be the amount of ore that can be extracted from the mine given existing equipment. In other cases, spare or lack of skilled labour may mean that production is the constraining factor. In this case, the company may start with the production budget.

Schedule 1 illustrates the sales budget for a concrete block manufacturer, Blocker. For simplicity's sake, we assume that Blocker has only one product: a standard block. (For a multiple-product firm, the Blocker sales budget reflects sales for each product in units and sales dollars.)

Notice that the sales budget reveals that Blocker's sales fluctuate seasonally. Most sales (75 per cent) take place in the second and third quarters. Also note that the budget reflects an expected increase in selling price beginning in the third quarter (from \$0.70 to \$0.80). Because of the price change within the year, an average price must be used for the column that describes the total year's activities ($\$0.75 = \$12,000 / 16,000$ units).

SCHEDULE 1
Blocker Ltd
Sales Budget
For the Year Ended 30 June 2017
(in thousands)

	Quarter				Year
	1	2	3	4	
Units	2,000	6,000	6,000	2,000	16,000
Unit selling price	$\times \$0.70$	$\times \$0.70$	$\times \$0.80$	$\times \$0.80$	$\times \$0.75$
Sales	<u>\$1,400</u>	<u>\$4,200</u>	<u>\$4,800</u>	<u>\$1,600</u>	<u>\$12,000</u>

Production budget

The **production budget** describes how many units must be produced in order to meet sales needs and satisfy ending inventory requirements. From Schedule 1, we know how many concrete blocks are needed to satisfy sales demand for each quarter and for the year. In the absence of beginning or ending inventories, the concrete blocks to be produced would correspond exactly to the units to be sold.

Usually, however, the production budget must consider the existence of beginning and ending inventories, since traditional manufacturing firms use inventories as a buffer against demand or production line fluctuations. Assume that company policy dictates that 100,000 concrete blocks be available in inventory at the beginning of the first and fourth quarters and 500,000 blocks at the beginning of the second and third quarters. The policy is equivalent to budgeting 100,000 concrete blocks as ending inventory for the third and fourth quarters and 500,000 concrete blocks as ending inventory for the first and second quarters.

To compute the units to be produced, both sales requirements and finished goods inventory information are needed.

$$\text{Units to be produced} = \text{Units, ending inventory} + \text{Expected sales} \\ - \text{Units, beginning inventory}$$

The formula is the basis for the production budget in Schedule 2. Notice that the production budget is expressed in terms of units.

SCHEDULE 2
Blocker Ltd
Production Budget
For the Year Ended 30 June 2017
(in thousands of units)

	Quarter				Year
	1	2	3	4	
Sales (Schedule 1)	2,000	6,000	6,000	2,000	16,000
Desired ending inventory	<u>500</u>	<u>500</u>	<u>100</u>	<u>100</u>	<u>100</u>
Total needs	2,500	6,500	6,100	2,100	16,100
Less: Beginning inventory	<u>(100)</u>	<u>(500)</u>	<u>(500)</u>	<u>(100)</u>	<u>(100)</u>
Units to be produced	<u>2,400</u>	<u>6,000</u>	<u>5,600</u>	<u>2,000</u>	<u>16,000</u>

Direct materials budget

After the production schedule is completed, it is possible to prepare budgets for direct materials, direct labour, and overhead. The **direct materials budget** reveals the expected usage of materials in production and the purchasing needs of the firm. Expected usage is directly related to production requirements, but purchases depend on both expected usage and the inventories of direct materials.

The expected usage of direct materials is determined by the technological relationship existing between direct materials and output (called the *inputs-output relationship*). For example, a concrete block (a single unit of output) could require 26 kgs of raw materials (e.g. concrete mix). Thus, it is relatively easy to determine expected usage for each raw material from the production budget. It is simply a matter of multiplying the units of raw material needed per unit of output times the units of output.

Once expected usage is computed, the purchases (in units) can be computed as follows:

$$\text{Purchases} = \text{Desired direct materials, ending inventory} + \text{Expected usage} \\ - \text{Direct materials, beginning inventory}$$

The quantity of direct materials in inventory is determined by the firm's inventory policy. Assume Blocker's policy is to have 5 million kgs of concrete raw materials in ending inventory for the third and fourth quarters and 8 million kgs of raw materials in ending inventory for the first and second quarters.

The direct materials budget for Blocker concrete mix is presented in Schedule 3. For simplicity, we have assumed there is only one raw material input. In reality, a separate schedule would be needed for each kind of raw material. Also the cost per kg is \$0.01.

SCHEDULE 3
Blocker Ltd
Direct Materials Budget
For the Year Ended 30 June 2017
(in thousands)

	Quarter				Year
	1	2	3	4	
Units to be produced (Schedule 2)	2,400	6,000	5,600	2,000	16,000
Direct materials per unit (kgs)	× 26	× 26	× 26	× 26	× 26
Production needs (kgs)	62,400	156,000	145,600	52,000	416,000
Desired ending inventory (kgs) ¹	8,000	8,000	5,000	5,000	5,000
Total needs	70,400	164,000	150,600	57,000	421,000
Less: Beginning inventory	(5,000)	(8,000)	(8,000)	(5,000)	(5,000)
Direct materials to be Purchased (kgs)	65,400	156,000	142,600	52,000	416,000
Cost per kg	× \$0.01	× \$0.01	× \$0.01	× \$0.01	× \$0.01
Total purchase cost	\$ 654	\$ 1,560	\$ 1,426	\$ 520	\$ 4,160

¹ Follows the inventory policy of having 8 million kgs of raw materials on hand at the end of the first and second quarters and 5 million kgs on hand at the end of the third and fourth quarters.

Direct labour budget

The **direct labour budget** shows the total direct labour hours needed and the associated cost for the number of units in the production budget. As with direct materials, the usage of direct labour is determined by the technological relationship between labour and output. For example, if a batch of 100 concrete blocks requires 1.5 direct labour hours, then the direct labour time per block is 0.015 hours. Assuming that the labour is used efficiently, this rate is fixed for the existing technology. The relationship will change only if a new approach to manufacturing is introduced.

Given the direct labour used per unit of output and the units to be produced from the production budget, the direct labour budget is computed as shown in Schedule 4. In the direct labour budget, the wage rate used (\$10 per hour in this example) is the average wage paid the direct labourers associated with the production of the concrete blocks. Since it is an average, it allows for the possibility of differing wage rates paid to individual labourers.

SCHEDULE 4
Blocker Ltd
Direct Labour Budget
For the Year Ended 30 June 2017
(in thousands)

	Quarter				Year
	1	2	3	4	
Units to be produced (Schedule 2)	2,400	6,000	5,600	2,000	16,000
Direct labour time per unit (hours)	× 0.015	× 0.015	× 0.015	× 0.015	× 0.015
Total hours needed	36	90	84	30	240
Wage per hour	× \$10	× \$10	× \$10	× \$10	× \$10
Total direct labour cost	\$ 360	\$ 900	\$ 840	\$ 300	\$ 2,400

Overhead budget

The **overhead budget** shows the expected cost of all indirect manufacturing items. Unlike direct materials and direct labour, there is no readily identifiable input-output relationship for overhead items. Recall, however, that in a unit-level cost system, overhead consists of two types of costs: overhead costs that vary in level as activity level changes (variable overhead) and costs that remain unchanged as activity level changes (fixed overhead). These relationships can be exploited to facilitate budgeting.

Past experience can be used as a guide to determine how overhead varies with activity level. Individual items that will vary are identified (e.g. supplies and utilities), and the amount that is expected to be spent for each item per unit of activity is estimated. Individual rates are then totalled to obtain a variable overhead rate. For our example, assume that the variable overhead rate is \$6 per direct labour hour.

A similar process takes place for fixed overhead. Since fixed overhead does not vary with the activity level, however, total fixed overhead is simply the sum of all amounts budgeted. Assume that fixed overhead is budgeted at \$1.28 million (\$320,000 per quarter). Using this information and the budgeted direct labour hours from the direct labour budget, the overhead budget in Schedule 5 is prepared.

SCHEDULE 5
Blocker Ltd
Overhead Budget
For the Year Ended 30 June 2017
(in thousands)

	Quarter				Year
	1	2	3	4	
Budgeted direct labour hours (Schedule 4)	36	90	84	30	240
Variable overhead rate	× \$6	× \$6	× \$6	× \$6	× \$6
Budgeted variable overhead	\$216	\$540	\$504	\$180	\$1,440
Budgeted fixed overhead ¹	320	320	320	320	1,280
Total overhead	\$536	\$860	\$824	\$500	\$2,720

¹ Includes \$200,000 of depreciation in each quarter

Selling and administrative expense budget

The next budget to be prepared – the **selling and administrative expense budget** – outlines planned expenditures for non-manufacturing activities. As with overhead, selling and administrative expenses can be broken into fixed and variable components. Such items as sales commissions, freight, and supplies vary with sales activity. The selling and administrative expense budget is illustrated in Schedule 6.

SCHEDULE 6
Blocker Ltd
Selling and Administrative Expense Budget
For the Year Ended 30 June 2017
(in thousands)

	Quarter				Year
	1	2	3	4	
Planned sales in units (Schedule 1)	2,000	6,000	6,000	2,000	16,000
Variable selling and administrative expense per unit	× \$0.05	× \$0.05	× \$0.05	× \$0.05	× \$0.05
Total variable expense	\$ 100	\$ 300	\$ 300	\$ 100	\$ 800

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Fixed selling and administrative expenses:					
Salaries	35	35	35	35	140
Advertising	10	10	10	10	40
Depreciation	15	15	15	15	60
Insurance	-	-	15	-	15
Travel	5	5	5	5	20
Total fixed expense	<u>\$65</u>	<u>\$65</u>	<u>\$80</u>	<u>\$65</u>	<u>\$275</u>
Total selling and administrative expense	<u>\$165</u>	<u>\$365</u>	<u>\$380</u>	<u>\$165</u>	<u>\$1,075</u>

Ending finished goods inventory budget

The **ending finished goods inventory budget** supplies information needed for the balance sheet and also serves as an important input for the preparation of the cost of goods sold budget. To prepare this budget, the unit cost of producing each concrete block must be calculated using information from Schedules 3, 4, and 5. The unit cost of a concrete block and the cost of the planned ending inventory are shown in Schedule 7.

SCHEDULE 7
Blocker Ltd
Ending Inventory Budget
For the Year Ended 30 June 2017

\$				
Unit cost computation:				
Direct materials (26 kgs @ \$0.01)	0.26			
Direct labour (0.015 hrs @ \$10)	0.15			
Overhead:				
Variable (0.015 hrs @ \$6)	0.09			
Fixed (0.015 @ \$5.33 ^a)	<u>0.08</u>			
Total unit cost	<u>0.58</u>			
		Units	Unit Cost	Total
Finished goods: Concrete blocks		100	\$0.58	\$58

^a Budgeted fixed overhead (Schedule 5) / Budgeted direct labour hours (Schedule 4)
= \$1,280 / 240 = \$5.33

Budgeted cost of goods sold

Assuming that the beginning finished goods inventory is valued at \$55,000, the budgeted cost of goods sold schedule can be prepared using Schedules 3, 4, 5, and 7. The cost of goods sold schedule is the last schedule needed before the budgeted income statement can be prepared (see Schedule 8).

SCHEDULE 8
Blocker Ltd
Cost of Goods Sold Budget
For the Year Ended 30 June 2017
(in thousands)

	\$
Direct materials used (Schedule 3) ^a	4,160
Direct labour used (Schedule 4)	2,400
Overhead (Schedule 5)	<u>2,720</u>
Budgeted manufacturing costs	9,280
Beginning finished goods	<u>55</u>
Goods available for sale	9,335
Less: Ending finished goods (Schedule 7)	<u>(58)</u>
Budgeted cost of goods sold	<u>9,277</u>

^a Production needs \times \$0.01 = 416,000 \times \$0.01

To illustrate the cash budget, assume the following for Blocker Ltd:

- 1 A \$100,000 minimum cash balance is required for the end of each quarter.
- 2 Money can be borrowed and repaid in multiples of \$100,000. Interest is 12 per cent per year. Interest payments are made only for the amount of the principal being repaid. All borrowing takes place at the beginning of a quarter and all repayment takes place at the end of a quarter.
- 3 Half of all sales are in cash, 70 per cent of credit sales are collected in the quarter of sale, and the remaining 30 per cent are collected in the following quarter. The sales for the fourth quarter of 2016 were \$2 million.
- 4 Purchases of raw materials are on credit; 80 per cent of purchases are paid for in the quarter of purchase. The remaining 20 per cent are paid in the following quarter. The purchases for the fourth quarter of 2016 were \$500,000.
- 5 Budgeted depreciation is \$200,000 per quarter for overhead and \$15,000 per quarter for selling and administration (see Schedules 5 and 6).
- 6 The capital budget for 2017 revealed plans to purchase additional equipment to handle increased demand at a small plant in Newcastle. The cash outlay for the equipment, \$600,000, will take place in the first quarter. The company plans to finance the acquisition of the equipment with operating cash, supplementing it with short-term loans as necessary.
- 7 Corporate income taxes are approximately \$650,000 and will be paid at the end of the fourth quarter.
- 8 The opening cash balance is \$120,000.

Given the above information, the cash budget for Blocker is shown in Schedule 9 (all figures are rounded to the nearest thousand).

Much of the information needed to prepare the cash budget comes from the operating budgets. In fact, Schedules 1, 3, 4, 5, and 6 all supply essential input. However, these schedules by themselves do not supply all of the needed information. The collection pattern for revenues and the payment pattern for materials must be known before the cash flow for sales and purchases on credit can be found.

Look at the revenues from credit sales for the second quarter, for example. Remember that for a given quarter, half of the sales are in cash and half are on credit but that only 70 per cent of credit sales are collected in that quarter. Thus, second quarter credit sales are \$2.1 million (the same as cash sales), but only \$1.47 million is received in the second quarter ($0.70 \times \$2,100,000$). The remaining \$630,000 ($0.30 \times \$2,100,000$) is received in the following quarter. Similarly, the second quarter includes revenues from first-quarter credit sales. Total first-quarter sales

of \$1.4 million are multiplied by 0.5 to yield the amount of first-quarter credit sales (\$700,000). This amount is multiplied by 0.3 to find the portion not collected until the second quarter, which is \$210,000. As a check on the quarterly sales figures in Schedule 9, add the cash sales and the credit sales for one quarter to the credit sales collected in the next quarter that appear on the 'prior quarter' line. The result is the total sales revenue for the quarter as shown in Schedule 1.

SCHEDULE 9
Blocker Ltd
Cash Budget
For the Year Ended 30 June 2017
(in thousands)

	Quarter				Year	Source ¹
	1	2	3	4		
	\$	\$	\$	\$	\$	
Beginning cash balance	120	141	102	1,421	120	
Collections:						
Cash sales	700	2,100	2,400	800	6,000	c,1
Credit sales:						
Current quarter	490	1,470	1,680	560	4,200	c,1
Prior quarter	<u>300</u>	<u>210</u>	<u>630</u>	<u>720</u>	<u>1,860</u>	c,1
Total cash available	<u>1,610</u>	<u>3,921</u>	<u>4,812</u>	<u>3,501</u>	<u>12,180</u>	
Less disbursements:						
Raw materials:						
Current quarter	(523)	(1,248)	(1,141)	(416)	(3,328)	d,3
Prior quarter	(100)	(131)	(312)	(285)	(828)	d,3
Direct labour	(288)	(720)	(672)	(240)	(1,920)	4
Overhead	(408)	(840)	(792)	(360)	(2,400)	e,5
Selling and administrative	(150)	(350)	(365)	(150)	(1,015)	e,6
Income taxes	-	-	-	(650)	(650)	g
Equipment	<u>(600)</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>(600)</u>	f
Total disbursements	(2,069)	(3,289)	(3,282)	(2,101)	(10,741)	
Minimum cash balance	<u>(100)</u>	<u>(100)</u>	<u>(100)</u>	<u>(100)</u>	<u>(100)</u>	a
Total cash needs	(2,169)	(3,389)	(3,382)	(2,201)	(10,841)	
Excess (deficiency) of cash available over needs	(559)	532	1,430	1,300	\$1,339	
Financing:						
Borrowings	600	-	-	-	600	
Repayments	-	(500)	(100)	-	(600)	b
Interest ²	<u>-</u>	<u>(30)</u>	<u>(9)</u>	<u>-</u>	<u>(39)</u>	b
Total financing	600	(530)	(109)	-	(39)	
Ending cash balance ³	141	102	1,421	1,400	1,400	

¹ Letters refer to the information in the question. Numbers refer to schedules already developed

² Interest payments are $6/12 \times 0.12 \times \500 and $9/12 \times 0.12 \times \100 , respectively. Since borrowings occur at the beginning of the quarter and repayments at the end of the quarter, the first principal repayment takes place after six months, and the second principal repayment takes place after nine months

³ Total cash available minus total disbursements plus (or minus) total financing

Similar computations are done for purchases. In both cases, patterns of collection and payment are needed in addition to the information supplied by the schedules.

Additionally, all non-cash expenses, such as depreciation, need to be removed from the total amounts reported in the expense budgets. Thus, the budgeted expenses in Schedules 5 and 6 were reduced by the budgeted depreciation for each quarter. Overhead expenses in Schedule 5 were reduced by depreciation of \$200,000 per quarter. Selling and administrative expenses were reduced by \$15,000 per quarter. The net amounts are what appear in the cash budget.

The cash budget shown in Schedule 9 underscores the importance of breaking the annual budget down into smaller time periods. The cash budget for the year gives the impression that sufficient operating cash will be available to finance the acquisition of the new equipment. Quarterly information, however, shows the need for short-term borrowing because of both the acquisition of the new equipment and the timing of the firm's cash flows. Breaking down the annual cash budget into quarterly time periods conveys more information. Even smaller time periods often prove to be useful. Most firms prepare monthly cash budgets, and some even prepare weekly and daily budgets.

Another significant piece of information emerges from Blocker's cash budget. By the end of the third quarter, the firm has a considerable amount of cash on hand (\$1,421,000). A similar amount is also on hand at the end of the year. It is certainly not wise to allow this much cash to sit idly in a bank account. The management of Blocker should consider making long-term investments. At the very least, the excess cash should be invested in short-term marketable securities. Once plans are finalised for use of the excess cash, the cash budget should be revised to reflect those plans. Budgeting is a dynamic process. As the budget is developed, new information becomes available and better plans can be formulated.

Budgeted balance sheet

The budgeted balance sheet depends on information contained in the current balance sheet and in the other budgets in the master budget. The balance sheet for the beginning of the year is given in Exhibit M5.3. The budgeted balance sheet for 30 June 2017 is given in Schedule 11. Explanations for the budgeted figures follow the schedule.

Budgeted income statement

Now that we have the interest expense, this information can be combined with budgeted sales, budgeted cost of goods sold and budgeted selling and administrative expenses to prepare the budgeted income statement.

SCHEDULE 10
Blocker Ltd
Budgeted Income Statement
For the Year Ended 30 June 2017
(in thousands)

	\$
Sales (Schedule 1)	12,000
Less: Cost of goods sold (Schedule 8)	<u>(9,277)</u>
Gross margin	2,723
Less: Selling and administrative expenses (Schedule 6)	(1,075)
Operating profit	1,648
Less: Interest expense (Schedule 9)	<u>(39)</u>
Profit before taxes	1,609
Less: Income taxes	<u>(650)</u>
Net profit	<u>959</u>

EXHIBIT M5.3**BLOCKER LTD BALANCE SHEET 30 JUNE 2016 (IN THOUSANDS)**

Assets		
	\$	\$
Current assets		
Cash	120	
Accounts receivable	300	
Raw materials inventory	50	
Finished goods	<u>55</u>	
Total current assets		525
Property, plant and equipment:		
Land	2,500	
Building and equipment	9,000	
Less: Accumulated depreciation	<u>(4,500)</u>	
Total property, plant and equipment		<u>7,000</u>
Total assets		<u>7,525</u>
Liabilities and Shareholders' Equity		
Current liabilities:		
Accounts payable		100
Shareholders' equity:		
Issued capital	600	
Retained earnings	<u>6,825</u>	
Total shareholders' equity		<u>7,425</u>
Total liabilities and shareholders' equity		<u>7,525</u>

SCHEDULE 11

Blocker Ltd
Budgeted Balance Sheet
As at 30 June 2017
(in thousands)

Assets		
	\$	\$
Current assets:		
Cash	1,400 ^a	
Accounts receivable	240 ^b	
Raw materials	50 ^c	
Finished goods	<u>58^d</u>	
Total current assets		1,748
Property, plant and equipment:		
Land	2,500 ^e	
Building and equipment	9,600 ^f	
Accumulated depreciation	<u>(5,360)^g</u>	
Total property, plant and equipment		<u>6,740</u>
Total assets		<u>8,488</u>

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Liabilities and Shareholders' Equity		
Current liabilities:		
Accounts payable		104 ^b
Shareholders' equity:		
Issued capital	600 ⁱ	
Retained earnings	<u>7,784ⁱ</u>	
Total shareholders' equity		<u>8,384</u>
Total liabilities and shareholders' equity		<u>8,488</u>

^a Ending balance from Schedule 9
^b 30 per cent of fourth-quarter credit sales ($0.30 \times \$800,000$) – see Schedules 1 and 9
^c From Schedule 3
^d From Schedule 8
^e From the 30 June 2016 balance sheet
^f 30 June 2016 balance (\$9,000,000) plus new equipment acquisition of \$600,000 (see the 2016 ending balance sheet and Schedule 9)
^g From the 30 June 2016 balance sheet, Schedule 5, and Schedule 6 (\$4,500,000 + \$800,000 + \$60,000)
^h 20 per cent of fourth-quarter purchases ($0.20 \times \$520,000$) – see Schedules 3 and 9
ⁱ From the 30 June 2016, balance sheet \$6,825,000 + \$959,000 (30 June 2015 balance plus net profit from Schedule 10)

Budgeting for service organisations

For service organisations, the emphasis in operating budgets is on sales budgets, labour budgets and expense budgets. The financial budgets will include a cash budget, budgeted income statement, and a budgeted balance sheet.

M5.6 The Behavioural Dimension of Budgeting

Budgets are often used to judge the performance of managers. Bonuses, salary increases, and promotions are all affected by a manager's ability to achieve or beat budgeted goals. Since a manager's financial status and career can be affected, budgets can have a significant behavioural effect. Whether that effect is positive or negative depends to a large extent on how budgets are used.

Positive behaviour occurs when the goals of individual managers are aligned with the goals of the organisation and the manager has the drive and ability to achieve them. The alignment of managerial and organisational goals is often referred to as **goal congruence**. In addition to goal congruence, however, a manager must also exert effort to achieve the goals of the organisation.

If the budget is considered by managers as being impossible to achieve or imposed upon the organisation without consultation, the reaction of subordinate managers may be negative. This negative behaviour can be manifested in numerous ways, but the overall effect is subversion of the organisation's goals. **Dysfunctional behaviour** is individual behaviour that is in basic conflict with the goals of the organisation. An **ideal budgetary system** is one that achieves complete goal congruence, and, simultaneously, creates a positive drive in managers to achieve the organisation's goals. Whilst the formula to design and operate a perfect budgetary system does not exist, research and practice have identified a number of key features that a budgetary system should have to promote a reasonable degree of positive behaviour. These features emphasise human considerations.

- 1 Frequent feedback on performance
- 2 Flexible budgeting capabilities
- 3 Monetary and non-monetary incentives
- 4 Participation
- 5 Realistic standards
- 6 Controllability of costs

One other important principle should be noted in relation to evaluating managerial performance using budgets. Regardless of how important a budget is in evaluating managerial performance, it should not be the only evaluation means. Multiple measures of performance should be used in the evaluation process.

Frequent feedback on performance

Managers need to know how they are doing on a regular basis over the financial year. Providing them with frequent performance reports allows them to know how successful their efforts have been, to take corrective actions, and change plans as necessary. Frequent performance reports can reinforce positive behaviour and give managers the time and opportunity to adapt to changing conditions.

In a budgetary setting, performance reports compare actual costs and revenues with budgeted costs and revenues. Deviations of actual results from planned results are computed and labelled as variances. Analysis of the significance of these variances allows managers to focus only on areas that need attention. This process is called *management by exception*. An example of a performance report is given in Exhibit M5.4.

EXHIBIT M5.4 PERFORMANCE REPORT: QUARTERLY PRODUCTION COSTS (IN THOUSANDS)

	Actual	Budget	Variance
Units produced	3,000	2,400	600 F ^a
Direct materials cost	927.30	624.00 ^b	303.30 U ^c
Direct labour cost	360.00	288.00 ^d	72.00 U
Overhead: ^e			
Variable:			
Supplies	80.00	72.00	8.00 U
Indirect labour	220.00	168.00	52.00 U
Power	40.00	48.00	(8.00) F
Fixed:			
Supervision	90.00	100.00	(10.00) F
Depreciation	200.00	200.00	0.00
Rent	30.00	20.00	10.00 U
Total	\$1,947.30	\$1,520.00	\$427.30 U

^a F means the variance is favourable

^b From Schedule 3 (62,400 kgs × \$0.01)

^c U means the variance is unfavourable

^d From Schedule 4

^e Schedule 5 provides the aggregate amount of budgeted overhead (e.g. the aggregate variable overhead is $0.015 \times 2,400,000 \times \$8 = \$288,000$, and the total budgeted fixed overhead is \$320,000)

Static budgets

The budget developed for Blocker in our worked example is an example of a **static budget**. A static budget is a budget locked into a particular level of activity. For Blocker, budgets were developed based on expected annual sales of 16 million units. Quarterly budgets were also developed based on particular levels of activity. Because static budgets depend on a particular level of activity, they are not very useful when it comes to preparing performance reports.

To illustrate, suppose that Blocker has decided to provide quarterly performance reports. Further suppose that sales activity was greater than expected in the first quarter; 2.6 million concrete blocks were sold instead of the 2 million budgeted in Schedule 1. Because of increased sales activity, production was increased over the planned level. Instead of producing 2.4 million units (Schedule 2), Blocker produced 3 million units.

A performance report comparing the actual production costs for the first quarter with the original planned production costs is given in Exhibit M5.4. In contrast to Schedule 5, budgeted amounts for individual overhead items

are provided. Thus, the individual budgeted amounts for each overhead item are new information (except for depreciation). Usually, this information would be detailed in an overhead budget.

According to the report, unfavourable variances occur for direct materials, direct labour, all variable overhead items, and supervision. However, there is something fundamentally wrong with the report. Actual costs for production of 3 million concrete blocks are being compared with planned costs for production of 2.4 million. Because direct materials, direct labour, and variable overhead are unit-level variable costs, we would expect them to be greater at a higher activity level. Thus, even if cost control were perfect for the production of 3 million units, unfavourable variances would be produced for all variable costs.

To create a meaningful performance report, actual costs and expected costs must be compared at the *same* level of activity. Since actual output often differs from planned output, some method is needed to compute what the costs should have been for the actual output level.

Flexible budgets

The budget that provides a firm with the capability to compute expected costs for a range of activity is called a **flexible budget**. Flexible budgeting has three major uses.

- 1 The flexible budget can be used to prepare the budget before the fact for the expected level of activity.
- 2 The flexible budget can be used after the fact to calculate what costs should have been for the actual level of activity. This can then be used to prepare a performance report that compares those expected costs to actual costs on which management can be fairly evaluated.
- 3 Flexible budgeting can be used to help managers deal with uncertainty by allowing them to see the expected outcomes for a range of activity. It can be used to generate financial results for a range of plausible scenarios.

In other words, flexible budgeting is the key to providing the frequent feedback that managers need to exercise control and effectively carry out the plans of an organisation.

To compute the expected cost at different levels of activity, flexible budgeting exploits the cost behaviour patterns of each item in the budget. Thus, before a flexible budget can be prepared, the cost behaviour of each item in the budget must be known. This means that the cost formula $Y = F + VX$ is needed for each item in the budget. In this formula, Y is the item's total cost, X is a measure of unit-level activity level, F is the item's fixed costs, and V is the item's variable cost per unit of activity.

To illustrate the power of flexible budgeting, we will now develop a flexible production budget for Blocker. Let activity level be measured by the number of concrete blocks produced. From Schedule 7, we know the variable cost formulas for direct materials (\$0.26 per unit), direct labour (\$0.12 per unit), and variable overhead (\$0.12 per unit). To increase the detail of the flexible budget, let us assume the variable costs per unit for supplies (\$0.03), indirect labour (\$0.07), and power (\$0.02). The three individual formulas sum to \$0.12. From Schedule 5, we also know that fixed overhead is budgeted at \$320,000 per quarter. Exhibit M5.5 displays a flexible budget for production costs at three levels of activity.

Notice in Exhibit M5.5 that total budgeted production costs increase as the activity level increases. Budgeted costs change because of variable costs.

Flexible budgets are powerful control tools because they allow management to compute what the costs should be for any level of activity. Exhibit M5.5 reveals what the costs should have been for the actual level of activity (3 million units). With this information, a performance report can be prepared that communicates useful information to management. A revised performance report that compares actual and budgeted costs for the actual level of activity is given in Exhibit M5.6.

The revised performance report in Exhibit M5.6 paints a much different picture than the one in Exhibit M5.4. By comparing budgeted costs for the actual level of activity with actual costs for the same level, a problem area can be immediately identified – expenditures for direct materials are excessive. (The other unfavourable variances seem relatively small.) With this knowledge, management can search for the causes of the excess expenditures and implement corrective measures to prevent the same problems from occurring in future quarters.

EXHIBIT M5.5**FLEXIBLE PRODUCTION BUDGET (IN THOUSANDS OF DOLLARS)**

	Range of Production (Units)		
	2,400	3,000	3,600
Variable Cost Per Unit			
	\$	\$	\$
Production costs:			
Variable:			
Direct materials	0.26	624	780
Direct labour	0.12	288	360
Variable overhead:			
Supplies	0.03	72	90
Indirect labour	0.07	168	210
Power	0.02	48	60
Total variable costs	0.50	<u>1,200</u>	<u>1,500</u>
Fixed overhead			
Supervision		100	100
Depreciation		200	200
Rent		<u>20</u>	<u>20</u>
Total fixed costs		<u>320</u>	<u>320</u>
Total production costs		<u>1,520</u>	<u>1,820</u>

EXHIBIT M5.6**ACTUAL VERSUS FLEXIBLE PERFORMANCE REPORT
QUARTERLY PRODUCTION COSTS (IN THOUSANDS)**

	Actual	Budget ¹	Variance
Units produced	3,000	3,000	-
Production costs:	\$	\$	\$
Direct materials	927.30	780.00	147.30 U
Direct labour	360.00	360.00	0.00
Variable overhead:			
Supplies	80.00	90.00	(10.00) F
Indirect labour	220.00	210.00	10.00 U
Power	<u>40.00</u>	<u>60.00</u>	<u>(20.00) F</u>
Total variable costs	<u>1,627.30</u>	<u>1,500.00</u>	<u>127.30 U</u>
Fixed overhead			
Supervision	90.00	100.00	(10.00) F
Depreciation	200.00	200.00	0.00
Rent	<u>30.00</u>	<u>20.00</u>	<u>10.00 U</u>
Total fixed costs	<u>320.00</u>	<u>320.00</u>	<u>0.00</u>
Total production costs	<u>1,947.30</u>	<u>1,820.00</u>	<u>127.30 U</u>

¹ From Exhibit M5-5

Differences in the actual amount and the flexible budget amount are attributable to one of two causes: differences in the budgeted costs of the inputs, or differences in the number of inputs planned and the number actually used to produce the actual output. The first difference is referred to as a *price variance* and the second as an *efficiency variance*. The **flexible budget variance** is the sum of the price variances and the efficiency variances. (The flexible budget variance can be decomposed into price and efficiency variances; this discussion is reserved for future management accounting courses). Thus, the flexible budget provides the capability to assess the efficiency of a manager.

Any differences between the flexible budget and the static budget are attributable to differences in volume. They are called *volume variances*. A five-column performance report that reveals both the flexible budget variances and the volume variances can be used. Exhibit M5.7 provides an example of this report using the Blocker data. As the report in Exhibit M5.7 reveals, production volume was 600,000 units greater than the original budgeted amount. Thus, the manager exceeded the original budgeted goal. This volume variance is labelled *favourable* because it exceeds the original production goal. (Recall that the *reason* for the extra production was because the demand for the product was greater than expected. Thus, the increase in production over the original amount was truly favourable.) On the other hand, the budgeted variable costs are greater than expected because of the increased production. This difference is labelled *unfavourable* because the costs are greater than expected; however, the increase in costs is because of an increase in production. Thus, it is totally reasonable.

EXHIBIT M5.7 MANAGERIAL PERFORMANCE REPORT QUARTERLY PRODUCTION
(IN THOUSANDS)

	Actual Results	Flexible Budget	Flexible Budget Variances ¹	Static Budget	Volume Variance ²
Units produced	3,000	3,000	-	2,400	600 F
Production costs	\$	\$	\$	\$	\$
Direct materials	927.30	780.00	147.30 U	624.00	156.00 U
Direct labour	360.00	360.00	0.00	288.00	72.00 U
Supplies	80.00	90.00	(10.00) F	72.00	18.00 U
Indirect labour	220.00	210.00	10.00 U	168.00	42.00 U
Power	40.00	60.00	(20.00) F	48.00	12.00 U
Supervision	90.00	100.00	(10.00) F	100.00	-
Depreciation	200.00	200.00	-	200.00	-
Rent	30.00	20.00	10.00 U	20.00	-
Total costs	<u>1,947.30</u>	<u>1,820.00</u>	<u>127.30 U</u>	<u>1,520.00</u>	<u>300.00 U</u>

¹ Actual results minus flexible budget variances

² Flexible budget minus static budget

Participative budgeting

Rather than imposing budgets on subordinate managers, **participative budgeting** allows subordinate managers considerable say in how the budgets are established. Typically, overall objectives are communicated to the manager, who helps develop a budget that will accomplish these objectives. In participative budgeting, the emphasis is on the accomplishment of the broad objectives, not on individual budget items.

The budget process described earlier for Blocker uses participative budgeting. The company provides the sales forecast to its profit centres and requests a budget that shows planned expenditures and expected profits for a given level of sales. The managers of the profit centres are fully responsible for preparing the budgets by which they will later be evaluated.

Participative budgeting communicates a sense of responsibility to subordinate managers and fosters creativity. Since the subordinate manager creates the budget, it is more likely that the budget's goals will become the manager's

personal goals, resulting in a higher degree of goal congruence. Advocates of participative budgeting claim that the increased responsibility and challenge inherent in the process provide non-monetary incentives that lead to a higher level of performance. They argue that individuals involved in setting their own goals will work harder to achieve them. In addition to the behavioural benefits, participative budgeting has the advantage of involving individuals whose knowledge of local conditions may enhance the entire planning process.

Participative budgeting has three potential problems that should be mentioned.

- 1 Setting standards that are either too high or too low
- 2 Building slack into the budget (often referred to as padding the budget)
- 3 Pseudo participation

Setting standards

Some managers may tend to set the budget either too loose or too tight. Since budgeted goals tend to become the manager's goals when participation is allowed, making this mistake in setting the budget can result in decreased performance levels. If goals are too easily achieved, a manager may lose interest and performance may actually drop. Challenge is important to aggressive and creative individuals. Similarly, if a manager sets the budget too tight, failing to achieve the standards may frustrate him or her. This frustration, too, can lead to poorer performance. The trick is to get managers in a participative setting to set high but achievable goals.

Top management needs to know their subordinate managers well to be able to guide them properly as they set their budgets. Then, those top managers will know when the budgets reflect the right level of challenge. Furthermore, top management must have the ability to provide guidance without dictating the budget. A fine balance is needed. Top management must supply sufficient input to ensure a high but achievable level of performance, yet their input must be limited so that subordinate managers also have significant input. Participative budgeting means that budgets are not dictated – either from above or from below.

Budgetary slack

Participative budgeting also creates the opportunity for managers to build slack into the budget. **Budgetary slack** (or *padding the budget*) exists when a manager deliberately underestimates revenues or overestimates costs. Either approach increases the likelihood that the manager will achieve the budget; therefore, the risk that the manager faces of not meeting budget is reduced. Padding the budget also unnecessarily ties up resources that might be used more productively elsewhere.

Slack in budgets can be virtually eliminated by having top management dictate lower budgets, but this approach eliminates the behavioural benefits that come from participative budgeting. The benefits gained from allowing participation may far exceed the costs associated with padding the budget. Even so, top management should carefully review budgets proposed by subordinate managers and provide input, where needed, in order to decrease the effects of building slack into the budget. Again, it should be emphasised that participation is not equivalent to complete autonomy. Both top management and lower management should have input.

Pseudo participation

When top management assumes total control of the budgeting process and simultaneously seeks only superficial participation from lower-level managers, **pseudo participation** exists. This participation is nothing more than endorsing the budget. Top management is simply obtaining formal acceptance of the budget from subordinate managers, not consulting or seeking genuine input. Accordingly, none of the behavioural benefits of participatory budgeting will be realised when this occurs.

Realistic standards

Budgeted objectives are used to gauge performance; accordingly, they should be based on realistic conditions and expectations. Budgets should reflect operating realities, such as actual levels of activity, seasonal variations,

efficiencies, and general economic trends. Flexible budgets, for example, are used to ensure that the budgeted costs provide standards that are compatible with the actual activity level. Another factor that should be considered is that of seasonality. Some businesses recognise revenues and incur costs uniformly throughout the year; thus, spreading the annual revenues and costs evenly over quarters and months is reasonable for interim performance reports. However, for businesses with seasonal variations, this practice would result in distorted performance reports.

Such factors as efficiency and general economic conditions are also important. Occasionally, top management makes arbitrary cuts in prior-year budgets with the belief that the cuts will reduce fat or inefficiencies that allegedly exist. In reality, some units may be operating efficiently and others inefficiently. An across-the-board cut without any formal evaluation may impair the ability of some units to carry out their missions. General economic conditions also need to be considered. Budgeting for a significant increase in sales when a recession is projected is not only foolish but potentially dangerous.

Multiple measures of performance

Often organisations make the mistake of using budgets as their only measure of managerial performance. Overemphasis on this measure can lead to a form of dysfunctional behaviour called *myopic behaviour*. **Myopic behaviour** occurs when a manager takes actions that improve budgetary performance in the short run but bring long-run harm to the firm.

There are numerous examples of myopic behaviour. To meet budgeted cost objectives or profits, managers can reduce expenditures for preventive maintenance, for advertising, and for new product development. Managers can also fail to promote employees – in order to keep the cost of labour low – and choose to use lower quality materials to reduce the cost of raw materials. In the short run, these actions will lead to improved budgetary performance, but in the long run, productivity will fall, market share will decline, and capable employees will leave for more attractive opportunities.

Managers can engage in this kind of behaviour because most have a short tenure. In most cases, managers spend two to three years before being promoted or moving to a new area of responsibility. Their successors are the ones who pay the price for their myopic behaviour. The best way to prevent myopic behaviour is to measure the performance of managers on several dimensions, including some long-run attributes. Market share, productivity, quality, and personnel development are examples of other areas of performance that could be evaluated. Financial measures of performance are important, but overemphasis on them can be counterproductive. Methods that use multiple measures of performance include balanced scorecards.

M5.7 Responsibility Accounting

As organisations increase in size, top management typically creates areas of responsibility, which are known as **responsibility centres**, and assigns subordinate managers to those areas. There are three major types of responsibility centres.

- 1 **Cost centre:** A responsibility centre in which a manager is responsible only for costs
- 2 **Profit centre:** A responsibility centre in which a manager is responsible for both revenues and costs
- 3 **Investment centre:** A responsibility centre in which a manager is responsible for revenues, costs, and investments

A production department is an example of a cost centre. The manager of a production department has no ability to control pricing and marketing decisions; however, he or she does have the ability to control production costs. Some retail department managers, however, often are given the responsibility to price and market products they purchase. These managers control both costs and revenues, putting them in control of a profit centre. Finally, some divisions are cited as examples of investment centres. In addition to having control over cost and pricing decisions, divisional managers have the power to make investment decisions, such as plant closings and openings, and decisions to keep or drop a product line.

Responsibility usually entails accountability. Cost centre managers are accountable for controlling costs, profit centre managers are accountable for profit levels, and investment centre managers are accountable for profit levels

and efficient use of investment resources. Accountability implies performance measurement, which, in turn, implies the existence of an expected outcome or standard against which actual outcomes can be compared. Budgets are often used to set the expected outcomes for managers of responsibility centres, which become the benchmarks to evaluate actual performance and to reward the managers.

The approach described above is often referred to as **responsibility accounting** because of the key role that accounting measures and reports play in the process. The traditional system includes five aspects. First, a responsibility centre is identified, with the responsibility defined in accounting terms (e.g. costs or profits). Second, an accounting standard or benchmark is set, usually through budgeting. Third, a reward system is established to encourage managers to provide good performance. Fourth, a manager's performance is measured by comparing actual performance with budgeted performance. Fifth, managers are rewarded or penalised according to the policies and discretion of higher management.

Example of responsibility accounting

To illustrate the concepts of responsibility accounting, department performance reports and flexible budgeting, we will consider the performance reports of Scenic Views Golf Limited, a company that was established to build luxury golf courses accompanied by first-class restaurants. At this stage it has two courses in Queensland (Surf Views and Lake Views) and two courses in Victoria (Ocean Views and Mountain Views). Each golf course has a restaurant attached and a fully equipped 'pro shop'. The general manager at each course has control over investment decisions up to \$1 million. These could include additions to the premises, remodelling of the course, etc. As a result, each of the four golf courses is a separate investment centre, as the manager has responsibility for profit in relation to investments made.

Each of the four courses has three departments: pro shop, catering and ground maintenance. The pro shop is a profit centre whose major revenues result from green fees, sale of golf equipment and tuition. Its major expenses are the salaries of the professional golfers and cost of equipment sold. The catering department includes revenue from the main dining room, the club house bar and snack room and the Halfway Watering Hole restaurant. Major expenses relate to the kitchen and bar. The catering department is also a profit centre. Staff are interchangeable between the restaurant, bar and Halfway Watering Hole, rotating depending on how busy each area gets. All food is prepared in a central kitchen and delivered to other areas. Kitchen costs include the cook and casual helpers. The third department, the ground maintenance department, does not receive revenues and is a cost centre. Major costs include ground staff wages, soil and grass, fuel and depreciation on plant.

A monthly performance report covering profits, revenues and expenses is prepared monthly for each responsibility centre. These performance reports compare the actual results for the months to the flexible budget figures to give a favourable (F) or unfavourable (U) variance for the month. An extract of April's performance report is shown for the kitchen area at Mountain Views and how it relates to the other responsibility accounting areas.

The performance report indicates that two of the restaurants (Surf Views and Lake Views) had small favourable profit variances, while Ocean Views had a small unfavourable profit variance and Mountain Views had a large unfavourable profit variance of \$12,000.

The performance report for Mountain Views shows how this variance is made up. Both the pro shop and the ground maintenance budgets had unfavourable variances of \$2,000 each, while the catering department had an unfavourable variance of \$8,000.

Further analysis of the Mountain Views catering department figures shows that this \$8,000 was caused by \$1,000 unfavourable variances in each of the three areas receiving revenue, and by kitchen costs and wage costs being over budget by \$4,000 and \$1,000 respectively.

Analysis of the performance report of the kitchen area shows that the costs of part-time staff and the costs of food are the reasons for this unfavourable variance. Further explanations would be needed to explain these variances. For example, it could be that there has been a change in menu resulting in the purchase of more expensive food (e.g. seafood) which requires more assistance in preparation. Alternatively, it could be a problem of food wastage and lack of control over the hiring of part-time staff. The reasons for the decreases in revenue would also need to be followed up.

EXHIBIT M5.8**MANAGERIAL PERFORMANCE REPORT EXTRACTS FROM
APRIL 2017 REPORT (IN THOUSANDS)**

	Actual	Flexible Budget	Variance
Company profit	100	110	10 U
Surf Views profit	32	30	2 F
Lake Views profit	27	24	3 F
Ocean Views profit	25	28	3 U
Mountain Views profit	16	28	12 U
	100	110	10 U
Mountain Views			
Pro shop profit	12	14	2 U
Catering profit	11	19	8 U
Grounds maintenance costs	(7)	(5)	2 U
	16	28	12 U
Mountain Views Catering			
Dining room revenue	26	27	1 U
Clubhouse Bar revenue	34	35	1 U
Halfway Watering Hole revenue	44	45	1 U
Kitchen costs	(24)	(20)	4 U
Liquor costs	(30)	(30)	-
Wage costs	(39)	(38)	1 U
	11	19	8 U
Kitchen			
Cook's wages	5	5	-
Part-time staff	7	5	2 U
Food	9	7	2 U
Other costs	3	3	-
	24	20	4 U

M5.8 Conclusion

Working through this chapter will enable you to gain an understanding of the planning process used in organisations, including the reasons for planning, the types of planning tools available and the steps in the planning process. You should now be able to construct operating and financial budgets as part of the master budget. You should also be aware of the behavioural implications of budgets and be able to develop a flexible budget.

PRACTICE PROBLEMS

Solutions to practice problems can be found online at <http://login.cengagebrain.com/>. These problems are intended to facilitate self-study and additional practice. Don't look at the solution for any of these without giving the problem a serious try first, because once you have seen the solution, it always looks easier than it is.

PRACTICE PROBLEM A

Sales Budget

Milan Cereal Company produces wheat flakes and corn flakes. Both products are sold in 375 gm boxes. Wheat flakes sell for \$3.50 per box and corn flakes sell for \$3.30 per box. Projected sales (in boxes) for the coming four quarters are given below.

	Wheat Flakes	Corn Flakes
First quarter	500,000	600,000
Second quarter	600,000	600,000
Third quarter	700,000	700,000
Fourth quarter	750,000	800,000

The managing director of the company believes that the projected sales are realistic and can be achieved by the company.

Required:

- 1 Prepare a sales budget for each quarter and for the year in total. Show sales by product and in total for each time period.

PRACTICE PROBLEM B

Flexible Budget

Roxanne Johnson, controller for Mix and Feed Company, has been instructed to develop a flexible budget for overhead costs. The company produces two fertilisers called Ferone and Fertwo that use common raw materials in different proportions. The company expects to produce 100,000 fifty-kilogram bags of each product during the coming year. Ferone requires 0.25 direct labour hours per bag and Fertwo requires 0.30. Roxanne has developed the following cost formulas for each of the four overhead items (X is measured in direct labour hours):

	Cost Formula		
Maintenance	\$10,000	+	0.3X
Power			0.5X
Indirect labour	\$24,500	+	1.5X
Rent			\$18,000

Required:

- 1 Prepare an overhead budget for the expected activity level for the coming year.
- 2 Prepare an overhead budget that reflects production that is 10 per cent higher than expected (for both products) and one for production that is 20 per cent lower than expected.

KEY TERMS

Budget committee	Dysfunctional behaviour	Participative budgeting
Budget director	Ending finished goods inventory	Production budget
Budgetary slack	budget	Profit centre
Budgets	Flexible budget	Pseudo participation
Capital budget	Flexible budget variance	Responsibility accounting
Cash budget	Goal congruence	Responsibility centres
Cash payment budget	Ideal budgetary system	Sales budget
Continuous budget	Investment centre	Sales plan
Control	Master budget	Selling and administrative expense
Cost centre	Myopic behaviour	budget
Direct labour budget	Operating budget	Static budget
Direct materials budget	Overhead budget	Strategic plan

HOMEWORK AND DISCUSSION TO DEVELOP UNDERSTANDING

DISCUSSION QUESTIONS

- 1 What is a budget?
- 2 When are budgets used in the planning process?
- 3 Who prepares the budget? Who should be involved in the budget preparation process?
- 4 What is a master budget? What are its components?
- 5 How do budgetary requirements differ between industries?
- 6 What is an operating budget? What are its components?
- 7 Why is cash budgeting important?
- 8 What are the limitations of budgeting?
- 9 What is a flexible budget? How are these useful?
- 10 What is a favourable budget variance? What is an unfavourable budget variance? Once calculated, what should managers do with identified budget variance information?
- 11 What are the key behavioural considerations associated with the budget process?
- 12 What is a profit centre? What is a cost centre? What is an investment centre? How do the budget requirements for these types of responsibility centres differ?

PROBLEMS

PROBLEM M5.1

Production Budget

Whiskers Products Ltd produces a variety of products for cats. Among them is a 500 gm can of cat food. The sales budget for the first four months of the year is presented below.

	Unit Sales	Dollar Sales (\$)
January	100,000	50,000
February	120,000	60,000
March	110,000	55,000
April	100,000	50,000

Company policy requires that ending inventories for each month be 20 per cent of next month's sales. At the beginning of January, the inventory of cat food is 20,000 cans.

Required:

- 1 Prepare a production budget for the first quarter of the year. Show the number of units that should be produced each month as well as for the quarter in total.

PROBLEM M5.2*Direct Materials Purchases Budget; Direct Labour Budget*

Dulce Company produces a 600 gm chocolate bar. Each 600 gm bar contains 300 gm of sugar, which costs \$0.025 per 100 gm. Dulce has budgeted production of the chocolate bar for the next four months as follows:

	Units
October	400,000
November	800,000
December	500,000
January	600,000

Inventory policy requires that sufficient sugar be in ending monthly inventory to satisfy 15 per cent of the following month's production needs. Inventory of sugar at the beginning of October equals exactly the amount needed to satisfy the inventory policy. Each chocolate bar produced requires (on average) 0.01 direct labour hours. The average cost of direct labour is \$9 per hour.

Required:

- 1 Prepare a direct materials purchases budget for the last quarter of the year showing purchases in units and in dollars for each month and for the quarter in total.
- 2 Prepare a direct labour budget for the last quarter of the year showing the hours needed and the direct labour cost for each month and for the quarter in total.

PROBLEM M5.3*Purchases Budget*

Alison's Car Parts carries a variety of car parts, including oil filters. The sales budget for oil filters for the first six months of the year is presented below.

	Unit Sales	Dollar Sales (\$)
January	200	900
February	180	810
March	220	990
April	250	1,125
May	300	1,350
June	260	1,170

Alison believes that ending inventories should be sufficient to cover 30 per cent of the next month's projected sales. On January 1, 84 oil filters were in inventory.

Required:

- 1 Prepare a purchases budget in units of oil filters for as many months as you can.
- 2 If oil filters are priced at 50 per cent above cost, what is the dollar cost of purchases for each month of your purchases budget?

PROBLEM M5.4*Production Budget; Materials Purchases Budget*

Jenna Mitchell, owner of Jenna's Jams Pty Ltd, produces homemade-style jams using fruits indigenous to her local area. Jenna has estimated the following sales of 500 gm jars of fruit jam for the rest of the year and January of next year.

September	100
October	150
November	170
December	225
January	100

Jenna likes to have 20 per cent of the next month's sales needs on hand at the end of each month. This requirement was met on August 31.

Materials needed for each jar of fruit jam are as follows:

Fruit	500 gm
Sugar	500 gm
Pectin	100 gm
Jar set	1

The materials inventory policy is to have 5 per cent of the next month's fruit needs on hand as well as 50 per cent of the next month's production needs for all other materials. (The relatively low inventory amount for fruit is designed to prevent spoilage.) Materials inventory on September 1 met this company policy.

Required:

- 1 Prepare a production budget for September, October, November and December for fruit jam.
- 2 Prepare a purchases budget for all materials used in the production of fruit jam for the months of September, October and November.
- 3 Why can't you prepare a purchases budget for December?

PROBLEM M5.5

Cash Budget

The owner of a small mining supply company has requested a cash budget for June. After examining the records of the company, you find the following:

- (a) Cash balance on June 1 is \$1,000.
- (b) Actual sales for April and May are as follows:

	April	May
	\$	\$
Cash sales	10,000	15,000
Credit sales	<u>25,000</u>	<u>35,000</u>
Total sales	<u>35,000</u>	<u>50,000</u>

- (c) Credit sales are collected over a three-month period: 50 per cent in the month of sale, 30 per cent in the second month, and 15 per cent in the third month. The remaining sales are uncollectable.
- (d) Inventory purchases average 60 per cent of a month's total sales. Of those purchases, 40 per cent are paid for in the month of purchase. The remaining 60 per cent are paid for in the following month.
- (e) Salaries and wages total \$8,000 a month, including a \$4,500 salary paid to the owner.
- (f) Rent is \$1,000 per month.
- (g) Taxes to be paid in June are \$5,000.

The owner also tells you that he expects cash sales of \$20,000 and credit sales of \$40,000 for June. There is no minimum cash balance required. The owner of the company does not have access to short-term loans.

Required:

- 1 Prepare a cash budget for June. Include supporting schedules for cash collections and cash payments.
- 2 Did the business show a negative cash balance for June? Assuming that the owner has no hope of establishing a line of credit for the business, what recommendations would you give the owner for dealing with a negative cash balance?

PROBLEM M5.6*Budgeted Cash Collections; Budgeted Cash Payments*

Information pertaining to Yerskey Corporation's sales revenue is presented below.

	November 2016 (Actual) \$	December 2016 (Budget) \$	January 2017 (Budget) \$
Cash sales	80,000	100,000	60,000
Credit sales	<u>240,000</u>	<u>360,000</u>	<u>180,000</u>
Total sales	<u>320,000</u>	<u>460,000</u>	<u>240,000</u>

Management estimates that 5 per cent of credit sales are uncollectable. Of the credit sales that are collectible, 60 per cent are collected in the month of sale and the remainder in the month following the sale. Purchases of inventory each month are 70 per cent of the next month's projected total sales. All purchases of inventory are on account; 25 per cent are paid in the month of purchase, and the remainder are paid in the month following the purchase.

Required:

- 1 What are Yerskey's budgeted cash collections in December 2016 from November 2016 credit sales?
- 2 What are total budgeted cash receipts in January 2017?
- 3 What is Yerskey budgeting for total cash payments in December 2016 for inventory purchases?

PROBLEM M5.7*Cash Budgeting*

The controller of Gardner Company is gathering data to prepare the cash budget for April 2016. He plans to develop the budget from the following information:

- (a) Of all sales, 30 per cent are cash sales.
- (b) Of credit sales, 60 per cent are collected within the month of sale. Half of the credit sales collected within the month receive a 2 per cent cash discount (for accounts paid within 10 days). Twenty per cent of credit sales are collected in the following month; remaining credit sales are collected the month thereafter. There are virtually no bad debts.
- (c) Sales for the first six months of the year are given below. (The first three months are actual sales and the last three months are estimated sales.)

	Sales (\$)
January	230,000
February	300,000
March	500,000
April	565,000
May	600,000
June	567,000

- (d) The company sells all that it produces each month. The cost of raw materials equals 20 per cent of each sales dollar. The company requires a monthly ending inventory equal to the coming month's production requirements. Of raw materials purchases, 50 per cent are paid for in the month of purchase. The remaining 50 per cent is paid for in the following month.
- (e) Wages total \$50,000 each month and are paid in the month of incurrence.
- (f) Budgeted monthly operating expenses total \$168,000, of which \$22,000 is depreciation and \$3,000 is expiration of prepaid insurance. (The annual premium of \$36,000 is paid on January 1.)
- (g) Dividends of \$65,000, declared on March 31, will be paid on April 15.

- (h) Old equipment will be sold for \$13,000 on April 3.
- (i) On April 10, new equipment will be purchased for \$80,000.
- (j) The company maintains a minimum cash balance of \$10,000.
- (k) The cash balance on April 1 is \$12,500.

Required:

- 1 Prepare a cash budget for April. Give a supporting schedule that details the cash collections from sales.

PROBLEM M5.8*Managerial Decision Case: Cash Budget*

According to the analysis of a local consultant, the financial difficulties facing Dr Roger Jones have been caused by the absence of proper planning and control. Budgetary control is sorely needed. To assist you in preparing a plan of action that will help his dental practice regain financial stability, Dr Jones has made available the following financial information that describes a typical month:

Revenues		
	Average Fee \$	Quantity
Fillings	50	90
Crowns	300	19
Root canals	170	8
Bridges	500	7
Extractions	45	30
Cleaning	25	108
X-rays	15	150

Costs		
	\$	\$
Salaries:		
Two dental assistants	1,900	
Receptionist/bookkeeper	1,500	
Hygienist	1,800	
Public relations (Mrs Jones)	1,000	
Personal salary	<u>6,500</u>	
Total salaries		12,700
Benefits		1,344
Building lease		1,500
Dental supplies		1,200
Cleaning		300
Electricity		400
Phone		150
Office supplies		100
Lab fees		5,000
Loan payments		570
Interest payments		500
Miscellaneous		500
Depreciation		<u>700</u>
Total costs		<u>24,964</u>

Employee benefits include superannuation and medical benefits for all employees. Although all revenues billed in a month are not collected, the cash flowing into the business is approximately equal to the month's billings because of collections from prior months. The dental office is open Monday through Thursday from 8:30 a.m. to 4:00 p.m. and on Friday from 8:30 a.m. to 12:30 p.m. A total of 32 hours are worked each week. Additional hours could be worked, but Dr Jones is reluctant to do so because of other personal endeavours that he enjoys.

Dr Jones has noted that the two dental assistants and the receptionist are not fully utilised. He estimates that they are busy about 65–70 per cent of the time. Dr Jones' wife spends about five hours each week on a monthly newsletter that is sent to all patients; she also maintains a birthday list and sends cards to the patients on their birthdays.

Dr Jones spends about \$2,400 yearly on informational seminars. These seminars, targeted especially for dentists, teach them how to increase their revenues. It is from one of these seminars that Dr Jones decides to invest in promotion and public relations (the newsletter and the birthday list).

Required:

- 1 Prepare a monthly cash budget for Dr Jones. Does Dr Jones have a significant cash flow problem? How would you use the budget to show Dr Jones why he is having financial difficulties?
- 2 Using the cash budget prepared in (1) and the information given in the case, prepare some recommendations to solve Dr Jones' financial problems. Prepare a cash budget that reflects these recommendations and demonstrates to Dr Jones that the problems can be corrected. Do you think that Dr Jones will accept your recommendations? Do any of the behavioural principles discussed in the chapter have a role in this type of setting? Explain.

PROBLEM M5.9

Operating Budget; Comprehensive Analysis

The Morgan Division of Smith Manufacturing produces a handle assembly used in the production of kitchen cabinets. The assembly is sold to various kitchen manufacturers throughout Australia. Projected sales for the coming four months are given below.

January	20,000
February	25,000
March	30,000
April	30,000

The following data pertain to production policies and manufacturing specifications followed by the Morgan Division:

- (a) Finished goods inventory on January 1 is 16,000 units. The desired ending inventory for each month is 80 per cent of the next month's sales.
- (b) The data on materials used are as follows:

Direct Material	Per-Unit Usage	Unit Cost \$
Number 325	5	8
Number 326	3	2

Inventory policy dictates that sufficient materials be on hand at the beginning of the month to produce 50 per cent of that month's estimated sales. This is exactly the amount of material on hand on January 1.

The direct labour used per unit of output is two hours. The average direct labour cost per hour is \$9.25.

- (c) Overhead each month is estimated using a flexible budget formula. (Activity is measured in direct labour hours.)

	Fixed Cost Component \$	Variable Cost Component \$
Supplies	–	1.00
Power	–	0.50
Maintenance	15,000	0.40
Supervision	8,000	–
Depreciation	100,000	–
Taxes	6,000	–
Other	40,000	1.50

- (d) Monthly selling and administrative expenses are also estimated using a flexible budgeting formula. (Activity is measured in units sold.)

	Fixed Costs \$	Variable Costs \$
Salaries	25,000	–
Commissions	–	1.00
Depreciation	20,000	–
Shipping	–	0.50
Other	10,000	0.30

- (e) The unit selling price of the handle assembly is \$90.
 (f) All sales and purchases are for cash. Cash balance on January 1 equals \$200,000. If the firm develops a cash shortage by the end of the month, sufficient cash is borrowed to cover the shortage. Any cash borrowed is repaid one month later, as is the interest due. The interest rate is 12 per cent per annum.

Required:

- 1 Prepare a monthly operating and financial budget for the first quarter with the following schedules:

- (a) Sales budget
- (b) Production budget
- (c) Direct materials purchases budget
- (d) Direct labour budget
- (e) Overhead budget
- (f) Selling and administrative expense budget
- (g) Ending finished goods budget
- (h) Cost of goods sold budget
- (i) Budgeted income statement
- (j) Cash budget

PROBLEM M5.10*Overhead Budget; Flexible Budgeting*

Toolson Manufacturing Ltd has developed the following flexible budget for overhead for the coming year. Activity level is measured in direct labour hours.

	Variable Cost Formula	Activity Level (hours)		
		10,000	15,000	20,000
	\$	\$	\$	\$
Variable costs:				
Maintenance	1.50	15,000	22,500	30,000
Supplies	0.50	5,000	7,500	10,000
Power	0.10	1,000	1,500	2,000
Total variable costs	2.10	21,000	31,500	42,000
Fixed costs:				
Depreciation		6,000	6,000	6,000
Salaries		60,000	60,000	60,000
Total fixed costs		66,000	66,000	66,000
Total overhead costs		87,000	97,500	108,000

Toolson produces two different types of hammers. The production budget for April is 12,000 units for hammer A and 15,000 units for hammer B. Hammer A requires three minutes of direct labour time and hammer B requires two minutes. Fixed overhead costs are incurred uniformly throughout the year.

Required:

- 1 Prepare an overhead budget for April.

PROBLEM M5.11*Master Budget; Comprehensive Review*

Electra Company is a high-technology organisation that produces gaming consoles. The design of Electra's system is unique and represents a breakthrough in the industry. The company is completing its fifth year of operations and is preparing to build its master budget for the coming year (2017). The budget will detail each quarter's activity and the activity for the year in total. The master budget will be based on the following information:

- (a) Fourth quarter sales for 2016 are 55,000 units
- (b) Console sales in units by quarter (for 2017) are projected as follows:

First quarter	60,000
Second quarter	65,000
Third quarter	75,000
Fourth quarter	90,000

The selling price is \$400 per console. All sales are credit sales. Electra collects 85 per cent of all sales within the quarter in which they are realised; the other 15 per cent are collected in the following quarter. There are no bad debts.

- (c) There is no beginning inventory of finished goods. Electra is planning the following ending finished goods inventories for each quarter:

First quarter	13,000 units
Second quarter	15,000 units
Third quarter	20,000 units
Fourth quarter	10,000 units

- (d) Each console uses five hours of direct labour and three units of direct materials. Labourers are paid \$10 per hour, and one unit of materials costs \$80.
- (e) There are 65,700 units of direct materials in beginning inventory as of January 1, 2017. At the end of each quarter, Electra plans to have 30 per cent of the raw materials needed for next quarter's unit sales. Electra will end the year with the same level of raw materials found in this year's beginning inventory.
- (f) Electra buys raw materials on account. One-half of the purchases are paid for in the quarter of acquisition, and the remaining half is paid for in the following quarter. Wages and salaries are paid on the 15th and 30th of each month.
- (g) Fixed overhead totals \$1 million each quarter. Of this total, \$350,000 represents depreciation. All other fixed expenses are paid for in cash in the quarter incurred. The fixed overhead rate is computed by dividing the year's total fixed overhead by the year's expected actual units produced.
- (h) Variable overhead is budgeted at \$6 per direct labour hour. All variable overhead expenses are paid for in the quarter incurred.
- (i) Fixed selling and administrative expenses total \$250,000 per quarter, including \$50,000 depreciation.
- (j) Variable selling and administrative expenses are budgeted at \$10 per unit sold. All selling and administrative expenses are paid for in the quarter incurred.
- (k) The balance sheet as of December 31, 2016, is as follows:

Assets	
	\$
Cash	250,000
Accounts receivable	3,300,000
Raw materials	5,256,000
Plant and equipment	<u>33,500,000</u>
Total assets	<u>42,306,000</u>

Liabilities and Equity	
	\$
Accounts payable	7,248,000 ^a
Share capital	27,000,000
Retained profits	<u>8,058,000</u>
Total liabilities and equity	<u>42,306,000</u>

^a For purchase of materials only

- (l) Electra will pay quarterly dividends of \$300,000. At the end of the fourth quarter, \$2 million of equipment will be purchased.

Required:

- 1 Prepare a master budget for Electra Company for each quarter of 2017 and for the year in total. The following component budgets must be included:
- (a) Sales budget
- (b) Production budget

- (c) Direct materials purchases budget
- (d) Direct labour budget
- (e) Overhead budget
- (f) Selling and administrative expense budget
- (g) Ending finished goods inventory budget
- (h) Cost of goods sold budget
- (i) Cash budget
- (j) Pro forma income statement (using absorption costing)
- (k) Pro forma balance sheet

PROBLEM M5.12

Performance Report

Refer to the information given in Practice Problem B. Assume that Mix and Feed actually produced 120,000 bags of Ferone and 110,000 of Fertwo. The actual overhead costs incurred were:

	\$
Maintenance	26,700
Power	34,000
Indirect labour	108,000
Rent	18,000

Required:

- 1 Prepare a performance report for the period.
- 2 Based on the report, would you judge any of the variances to be significant? Can you think of some possible reasons for the variances?

PROBLEM M5.13

Flexible Budgeting

Budgeted overhead costs for two different levels of activity are given below.

	Direct Labour Hours	
	1,000	2,000
	\$	\$
Maintenance	10,000	16,000
Depreciation	5,000	5,000
Supervision	15,000	15,000
Supplies	1,400	2,800
Power	750	1,500
Other	8,100	8,200

Required:

- 1 Prepare a flexible budget for an activity level of 1,500 direct labour hours.

PROBLEM M5.14

Performance Reporting; Behavioural Considerations

Berwin Pty Ltd is a manufacturer of small industrial tools with annual sales of approximately \$3.5 million. Sales growth has been steady during the year, and there is no evidence of cyclical demand. Production has increased

gradually during the year and has been evenly distributed throughout each month. The company has a sequential processing system. The four manufacturing departments – casting, machining, finishing, and packaging – are all located in the same building. Fixed overhead is assigned using a plant-wide rate.

Berwin has always been able to compete with other manufacturers of small tools. However, its market has expanded only in response to product innovation. Thus, research and development is very important and has helped Berwin to expand as well as maintain demand.

Margaret Viller, controller, has designed and implemented a new budget system in response to concerns voiced by George Berwin, general manager. Margaret prepared an annual budget that has been divided into 12 equal segments; this budget can be used to assist in the timely evaluation of monthly performance. George was visibly upset upon receiving the May performance report for the machining department. George exclaimed, “How can they be efficient enough to produce 9 extra units every working day and still miss the budget by \$300 per day?” Jim Jordan, supervisor of the machining department, could not understand “all the red ink” when he knew that the department had operated more efficiently in May than it had in months. Jim stated, “I was expecting a pat on the back and instead the boss tore me apart. What’s more, I don’t even know why!”

BERWIN PTY LTD
Machining Department Performance Report
For the Month Ended May 31, 2016

	Budget	Actual	Variance
Volume in units	3,000	3,185	185 F
Variable manufacturing costs:	\$	\$	\$
Direct materials	24,000	24,843	843 U
Direct labour	27,750	29,302	1,552 U
Variable overhead	<u>33,300</u>	<u>35,035</u>	<u>1,735</u> U
Total variable costs	85,050	89,180	4,130 U
Fixed manufacturing costs:			
Indirect labour	3,300	3,334	34 U
Depreciation	1,500	1,500	–
Taxes	300	300	–
Insurance	240	240	–
Other	<u>930</u>	<u>1,027</u>	<u>97</u> U
Total fixed costs	6,270	6,401	131 U
Corporate costs:			
Research and development	2,400	3,728	1,328 U
Selling and administrative	<u>3,600</u>	<u>4,075</u>	<u>475</u> U
Total corporate costs	6,000	7,803	1,803 U
Total costs	<u>97,320</u>	<u>103,384</u>	<u>6,064</u> U

Required:

- 1 Review the May performance report. Based on the information given in the report and elsewhere:
- 2 Discuss the strengths and weaknesses of the new budgetary system.
 - (a) Identify the weaknesses of the performance report and explain how it should be revised to eliminate each weakness.
 - (b) Prepare a revised report for the machining department using the May data.
 - (c) What other changes would you make to improve Berwin’s budgetary system?

PROBLEM M5.15*Flexible Budgeting*

Jim Bingham, controller of Thorpe Pty Ltd prepared the following budget for manufacturing costs at two levels of activity for 2017:

	Direct Labour Hours	
	100,000	120,000
	\$	\$
Supervision	180,000	180,000
Utilities	18,000	21,000
Depreciation	25,000	25,000
Supplies	25,000	30,000
Direct labour	1,000,000	1,200,000
Direct materials	220,000	264,000
Maintenance	240,000	284,000
Rent	12,000	12,000
Other	60,000	70,000
Total manufacturing cost	<u>1,780,000</u>	<u>2,086,000</u>

During the year, the company worked a total of 112,000 direct labour hours and incurred the following actual costs:

	\$
Supervision	190,000
Utilities	20,500
Depreciation	25,000
Supplies	24,640
Direct labour	963,200
Direct materials	248,000
Maintenance	237,000
Rent	12,000
Other	60,500

Thorpe applies overhead on the basis of direct labour hours. Normal volume of 120,000 direct labour hours is the activity level to compute the predetermined overhead rate.

Required:

- 1 Prepare a performance report for Thorpe's manufacturing costs in the year 2017. Should any cost item be given special attention? Explain.
- 2 Assume that the product produced by Thorpe uses two direct labour hours. Calculate the normal unit manufacturing cost.
- 3 Compute the total applied overhead for 2017. Compute the overhead variance for the year.

PROBLEM M5.16*Budgeting and Behavioural Consequences*

Sarah Daniels is production manager of the Alomalloy Division of WRT. Alomalloy has limited contact with outside customers and no sales staff. Most of its customers are handled by other corporate divisions. Therefore, Alomalloy is treated as a cost centre rather than a profit centre.

Sarah perceives the accounting department as the unit that generates historical numbers but provides little useful information. The accounting department creates the budgets at the beginning of the year and then gathers the actual costs incurred by production.

Sarah wonders whether the accountants even understand the nature of the production process. It seems all they are concerned with are numbers – whether they mean anything or not. In her opinion, the whole accounting process is a negative motivational device that does not reflect how hard or efficiently she has worked as a production manager. Sarah tried to discuss these perceptions and concerns with John Scott, the controller for Alumalloy. Sarah told John, “I know I’ve had better production over a number of operating periods, but the cost report still says I have excessive costs. Look, I’m not an accountant, I’m a production manager. I know how to get a good quality product out. Over a number of years, I’ve even cut the raw materials used to do it. But the cost report doesn’t show any of this. It’s always negative no matter what I do. There is no way you can win with accounting or those people at corporate who use those reports.”

John gave Sarah little consolation. John stated that the accounting system and the cost reports generated by headquarters are just part of the corporate game and almost impossible for an individual to change. “Although these reports are the basis for evaluating the efficiency of your division and the means for corporate to determine whether you have done the job it wants, you shouldn’t worry too much. You haven’t been fired yet! Besides, these cost reports have been used by WRT for the last 25 years.”

From talking to the production manager of the Zinc Division, Sarah perceived that most of what John said was true. However, some minor cost reporting changes for Zinc had been agreed to by corporate headquarters. She also knew from the trade grapevine that the turnover of production managers was considered high at WRT, even though relatively few managers were fired. Most seemed to end up quitting, usually in disgust, out of the belief that they were not being evaluated fairly.

A recent copy of the cost report prepared by corporate headquarters for Alumalloy is shown below. Because of an unexpected increase in demand for the final product, Alumalloy produced 10,000 units more than the 40,000 originally budgeted. Sarah does not like this report because she believes that it fails to reflect the division’s operations properly, thereby resulting in an unfair evaluation of performance.

ALUMALLOY DIVISION
Cost Report
For the Month of April 2016
(in thousands)

	Master Budget	Actual Cost	Variance
	\$	\$	\$
Aluminium	400	477	77 U
Labour	560	675	115 U
Overhead	<u>100</u>	<u>110</u>	<u>10</u> U
Total	<u>1,060</u>	<u>1,262</u>	<u>202</u> U

Required:

- 1 Comment on Sarah’s perception of:
 - (a) John Scott, the controller
 - (b) Corporate headquarters
 - (c) The cost report
 - (d) Herself as a production manager
- 2 Discuss how her perception of these items affects her performance as a production manager of WRT.
- 3 List the deficiencies of WRT’s budgetary system. Prepare a list of recommendations to improve the system so that the process and the reports produced are more useful and less threatening to the production managers.

PROBLEM M5.17*Flexible Budgeting*

Wilson Company employs flexible budgeting techniques to evaluate the performance of several of its activities. The selling expense flexible budgets for three representative monthly activity levels are below

Activity Measures:			
Unit sales volume	400,000	425,000	450,000
Dollar sales volume	\$10,000,000	\$10,625,000	\$11,250,000
Number of orders	4,000	4,250	4,500
Number of salespersons	75	75	75
Monthly Expenses:			
Advertising and promotion	\$ 1,200,000	\$ 1,200,000	\$ 1,200,000
Administrative salaries	57,000	57,000	57,000
Sales salaries	75,000	75,000	75,000
Sales commissions	200,000	212,500	225,000
Salesperson travel	170,000	175,000	180,000
Sales office expense	490,000	498,750	507,500
Shipping expense	<u>675,000</u>	<u>712,500</u>	<u>750,000</u>
Total	<u>\$ 2,867,000</u>	<u>\$ 2,930,750</u>	<u>\$ 2,994,500</u>

The following assumptions were used to develop the selling expense flexible budgets:

- (a) The average size of Wilson's sales force during the year was planned to be 75 people.
- (b) Salespersons are paid a monthly salary plus commission on gross dollar sales.
- (c) The travel costs are best characterised as a step-variable cost. The fixed portion is related to the number of salespersons; the variable portion tends to fluctuate with gross dollar sales.
- (d) Sales office expense is a mixed cost with the variable portion related to the number of orders processed.
- (e) Shipping expense is a mixed cost with the variable portion related to the number of units sold.

A sales force of 80 persons generated a total of 4,300 orders, resulting in a sales volume of 420,000 units during November. The gross dollar sales amounted to \$10.9 million. The selling expenses incurred for November were as follows:

	\$
Advertising and promotion	1,350,000
Administrative salaries	57,000
Sales salaries	80,000
Sales commissions	218,000
Salesperson travel	185,000
Sales office expense	497,200
Shipping expense	<u>730,000</u>
Total	<u>3,117,200</u>

Required:

- 1 Explain why the selling expense flexible budgets presented above would not be appropriate for evaluating Wilson Company's November selling expenses; indicate how the flexible budget would have to be revised.
- 2 Prepare a selling expense report for November that Wilson Company can use to evaluate its control over selling expenses. The report should have a line for each selling expense item showing the appropriate budgeted amount, the actual selling expense, and the monthly dollar variation.

PROBLEM M5.18*Budgetary Performance: Rewards; Ethical Behaviour*

Linda Ellis, manager of a division that is treated as a profit centre, is evaluated and rewarded on the basis of budgetary performance. She, her assistants, and the plant managers are all eligible to receive a bonus if actual divisional profits are between budgeted profits and 120 per cent of budgeted profits. The bonuses are based on a fixed percentage of actual profits. Profits above 120 per cent of budgeted profits earn a bonus at the 120 per cent level (in other words, there is an upper limit on possible bonus payments). If the actual profits are less than budgeted profits, no bonuses are awarded. Now consider the following actions taken by Linda:

- (a) Linda tends to overestimate expenses and underestimate revenues. This approach facilitates the ability of the division to attain budgeted profits. Linda believes the action is justified because it increases the likelihood of receiving bonuses and helps keep the morale of the managers high.
- (b) Suppose that towards the end of the fiscal year, Linda saw that the division would not achieve budgeted profits. Accordingly, she instructed the sales department to defer the closing of a number of sales agreements to the following fiscal year. She also decided to write off some inventory that was nearly worthless. Deferring revenues to next year and writing off the inventory in a no-bonus year increased the chances of a bonus for next year.
- (c) Assume that towards the end of the year, Linda saw that actual profits would likely exceed the 120 per cent limit. She took actions similar to those described in (b).

Required:

- 1 Comment on the ethics of Linda's behaviour. Are her actions right or wrong? What role does the company play in encouraging her actions?
- 2 Suppose that you are the marketing manager for the division and you receive instructions to defer the closing of sales until the next fiscal year. What would you do?
- 3 Suppose that you are a plant manager and you know that your budget has been padded by the divisional manager. Further suppose that the padding is common knowledge among the plant managers and is generally supported because it increases the ability to achieve budget and receive a bonus. What would you do?
- 4 Suppose that you are divisional controller and you receive instructions from the divisional manager to accelerate the recognition of some expenses that legitimately belong to a future period. What would you do?