

# Product Costing Concepts and Systems




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## Learning Objectives

*After completing this chapter, you should be able to:*

- LO 1** Understand and apply the concepts of cost and opportunity cost.
- LO 2** Understand and explain the concept and measurement of out-of-pocket or cash cost.
- LO 3** Understand and explain variable cost, committed cost, fixed cost, sunk cost and the accounting or accrual cost.
- LO 4** Understand and explain product cost, period cost, expense, direct cost and indirect cost.
- LO 5** Analyse the product costs of typical manufacturing, retail and service firms for decision making and evaluations.
- LO 6** Prepare a schedule of cost of goods manufactured and sold using a flexible financial model.



Cost reductions required by Mountain Sports - M..

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**From...** Marianne Chapuis, President

**To...** Jacques Cournot, Vice President of Finance;  
Annette Carlyse, Vice President of Manufacturing;  
François Charles, Vice President of Marketing and Sales

**Cc...**

**Subject:** Cost reductions required by Mountain Sports


Dear All,

Our largest customer, Mountain Sports of the PleinAir Group, has notified us today that we must reduce our prices to them for our specialty backpacks by at least 17 per cent, beginning with orders for the next fiscal year. This notice is within the requirements of our supply contract, and it is clear from their recent action with other suppliers that without such a price reduction Mountain Sports will reclaim its designs and obtain the backpacks from a lower-cost source. We have 30 days to respond.

For our executive committee meeting next week please prepare the following analyses and be ready to discuss our alternatives.

1. Analysis of our current costs of manufacturing
2. Opportunities for cost reductions that will allow us to maintain our current profitability
3. New customer and market opportunities that have the potential to replace lost sales, if we cannot reduce prices and costs sufficiently to keep Mountain Sports' business.

Marianne Chapuis  
President, Sacs Chameaux SA



**SACS CHAMEAUX**

## Cost Management and Cost Concepts

Information technology and open markets create worldwide competition. All organizations must learn to produce high-quality goods and services, and to do so either at the lowest possible cost or in a distinctive way that others cannot imitate. Success in this global environment demands that a company has an effective cost management programme. Cost management helps organizations compete by identifying and validating ways to create more value for customers at lower cost. An organization finds competitive solutions by configuring and managing its value chain of activities, processes and functions more efficiently. Our focus company, Sacs Chameaux SA, faces a serious challenge to its viability, and we will introduce how the company uses cost management tools to meet its cost-reduction challenge.

Recall that the basic cost management goal is to create more value at lower cost. The second part of this goal (lower cost) concerns many chapters in this book. In this chapter we develop the basic tools to measure cost, which after all must be done before one can assess whether business alternatives lower or increase costs from the status quo. Some costs are relatively easily traced to products or processes; we will call these **direct costs**, and they typically include (direct) materials and labour. Other costs may be needed to build and deliver a product to customers, but they are more difficult or are impossible to trace to products and processes; we will call these **indirect costs** (or overhead or **burden**). Indirect costs are often common infrastructure or support costs such as building rent or supervisory salaries. In general, total costs may be expressed as:

$$\text{Total costs} = \text{Direct costs} + \text{Indirect costs}$$

Cost analysis uses a form of this general equation, but the types of costs described within the direct and indirect categories will meet specific needs and conditions. You will find that different measures of cost exist for different reporting and decision-making needs.<sup>1</sup> Assigning these different costs to business units and their products presents challenges to cost analysts and to the managers that they support. We will illustrate these costing challenges in this chapter in the context of Sacs Chameaux, but these examples and lessons can be applied to nearly every organization and situation.



### 2.1 Cost Management in Practice

Firms that have met the challenges of global competition successfully by using tools of cost management include the following:

- **EasyJet, Ryan Air and Flybe** (western Europe) enjoy the cost savings from being low-cost, no-frills airlines and the benefits of partnering with others in the travel industry to increase the value of their no-frills approach. These airlines have identified what bargain flyers really value (that is, what these flyers will pay for), and they have used cost management to design services and schedules that meet passengers' needs at lowest cost.
- **Royal Dutch Philips** (the Netherlands) uses cost management techniques to understand and successfully control the costs of using many outsourced suppliers for global services and products that Philips formerly provided internally. Philips has identified the valued characteristics of outsourced items and ensures through detailed contacts that outsourcing providers deliver quality, timeliness and innovation - at lower cost.
- **Whirlpool Sweden's** engineers have learned how assemblers, maintenance technicians and customers value Whirlpool's (and competitors') products. They design microwave ovens for ease of manufacturability and assembly to reduce the development time, number of parts, defects and assembly time of its products, which improves performance, reliability and ease of repair.

This list could be many times longer but, as these examples show, cost management activities help organizations in various ways to be successful in achieving their goals. In each case, these organizations are using cost management to identify the activities and processes they can perform better than their competitors (and outsource the rest) and to build durable advantages. It is clear that cost management spans multiple, traditional business disciplines, and a successful cost management analyst must work effectively with accounting, finance, marketing, manufacturing and logistics specialists.

# The Role of Cost Management at Sacs Chameaux SA

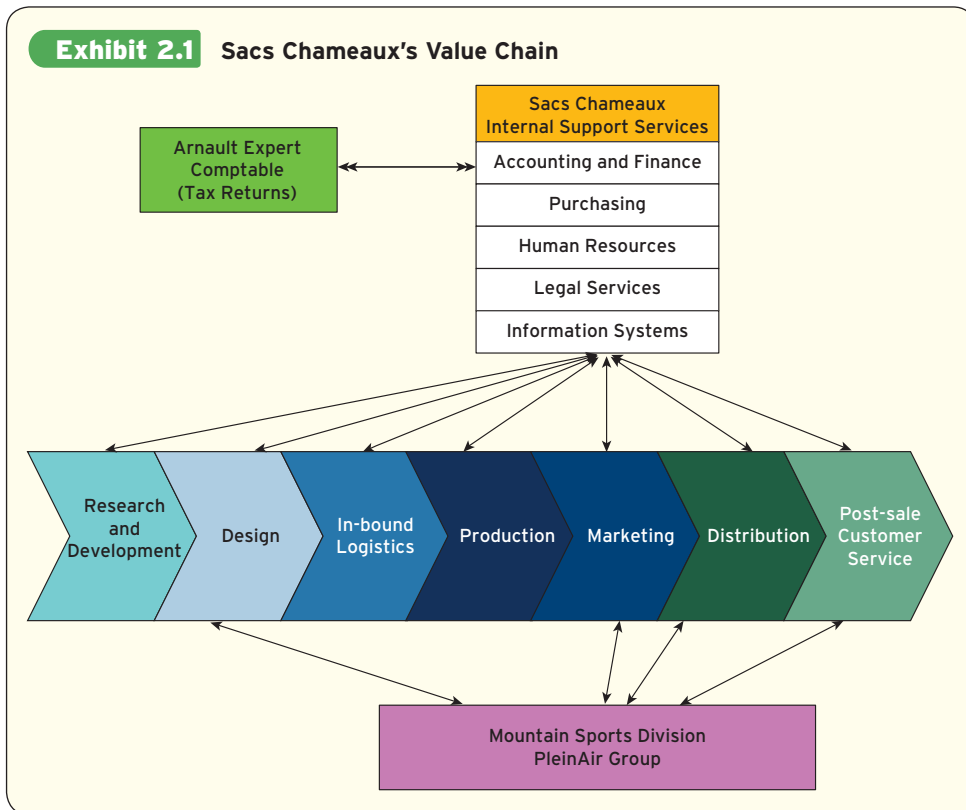
The opening memorandum from the president of Sacs Chameaux to the company's executive officers requests urgent cost analyses, cost reduction opportunities and alternative market opportunities. Ordinarily these are recurring strategic and operational activities, but the current context is urgent because sales to its major customer are at risk. Therefore, the entire company is at risk. Before participating in the analysis, however, let's learn more about the chapter's focus company, Sacs Chameaux.<sup>2</sup>

Sacs Chameaux manufactures specialty backpacks that alpinists and hiking enthusiasts have praised for their functional design, minimal weight and durability for more than 20 years. Sacs Chameaux started by selling a small number of backpacks under its own name, but soon the design and quality of its products attracted the attention of the Mountain Sports division of the PleinAir Group. Sacs Chameaux now sells almost all of its products to Mountain Sports, which then sells the backpacks through its own retail stores and discount factory outlets under the Mountain Sports label.

M. Dupuis has learned from colleagues in the industry that the Mountain Sports division's profitability is lagging behind the rest of the PleinAir Group, and has been ordered to improve its financial performance by at least 17 per cent or face serious restructuring imposed by top management. The managers of the Mountain Sports division decided to require all of its suppliers who are facing contract renewals to reduce prices by at least 17 per cent, or be replaced. So far this year, more than half of Mountain Sports' domestic suppliers have been replaced with lower cost Asian or North African suppliers.

Sacs Chameaux has been profitable every year since its founding. The company's continued success is from four factors: (1) reliable, durable, and functional products; (2) a successful marketing approach that focuses directly on the needs of alpinists, mountaineers, and (now) its major customer; (3) capable employees from the top management team to the product assemblers; and (4) a strong commitment to ethical and effective management practices (including a commitment to cost management).

Sacs Chameaux's value chain in Exhibit 2.1 depicts its internal processes: product design, in-bound logistics (purchasing and material handling), production, marketing, distribution and customer service. Although some companies perform nearly all of their value-chain activities, Sacs





Chameaux, like most companies, outsources some services to others who can do them more efficiently. One of the service firms in Sacs Chameaux's value chain is Arnault Expert Comptable, a professional accounting firm, which Sacs Chameaux uses for preparation of its tax returns.<sup>3</sup> Also integrated in the value chain is Sacs Chameaux's primary customer, PleinAir Group's Mountain Sports Division. Sacs Chameaux collaborates with Mountain Sports to design its backpacks and focuses most of its marketing, distribution and post-sale service on Mountain Sports. Sacs Chameaux has not outsourced its manufacturing processes because design for manufacturability and control of costs and quality are what it does best. Maintaining its advantages does not just happen, however, and Sacs Chameaux must work diligently to manage its quality and costs – especially now.

## Concepts and Measures of Cost

### LO 1

Understand and apply the concepts of cost, opportunity cost, committed cost, fixed cost, variable cost and sunk cost.

An important first step in studying cost management is to gain an understanding of the meaning of the concept of 'cost'. At a basic level, a **cost** is the sacrifice made, measured by the value of the resources given up, to achieve a particular purpose. Costs can have different definitions and values for different purposes. For example, a cost can be a **cash** or **out-of-pocket cost**, the incremental money price paid, when deciding whether it is worthwhile to buy incremental resources needed now. A cost can be an accounting or **accrual cost**, which is a historical measure of the value of resources used, when reporting results of operations or estimating long-run costs. A cost can be an **opportunity cost**, which is the highest foregone value that could be obtained from the sacrifice of a resource, for example, when considering the foregone value of lost leisure time compared to working. Cost management

employs cash, accrual and opportunity costs (and other definitions of cost), depending on (a) the availability of reliable information and (b) the needs of managers who must make cost-based decisions.



### 2.1 You're the Decision Maker

You have won a free ticket to see Radiohead in concert (which has no resale value). Lady Gaga is performing on the same night and is your next-best alternative activity. Tickets to see Lady Gaga that night cost €40. On any given day, you would be willing to pay up to €50 to see her show. Assume there are no other costs of seeing either performer. Based on this information, what is the opportunity cost of seeing Radiohead? (a) €0, (b) €10, (c) €40, or (d) €50.<sup>4</sup> What is the accounting cost of seeing Radiohead?

(Solutions begin on p. 82.)

If we look carefully, we find that a 'cost' can have more complexities that are not immediately obvious, for example, the cost of acquiring raw materials. Consider the cost to purchase, €8 per square metre, charged by the wholesale supplier of the nylon fabric that Sacs Chameaux uses in its backpacks.<sup>5</sup> We could observe the transaction of cash (or credit) for fabric, and €8 per square metre is an apparently straightforward concept and measure of 'cost'. Or is it? Now we learn that €8 per square metre is the cost if the company picks up the fabric at the wholesaler's location, which is 20 km away. To measure all of the resources given up to obtain the fabric it seems we should measure the cost of picking up the fabric. We proceed by identifying the resources that Sacs Chameaux uses for this purpose. The company employs several drivers and owns several trucks for the pick up of raw materials from suppliers and delivery of finished products to Mountain Sports. The decision to acquire these additional resources results in real sacrifices and costs for labour, vehicles, fuel, insurance, and so on.

Doesn't the decision to acquire these resources and use them to pick up nylon fabric mean that we should attribute some of these costs to the cost of the fabric? This is getting complicated.<sup>6</sup> Some would say 'yes', others would say 'no' and still others would say, 'It depends on how you want to use the cost information'. Cost management is consistent with the last response, 'it depends', and uses different meanings and measures depending on the context in which 'cost' is used. Understanding these differences enables the cost management analyst to provide the appropriate cost data to the

managers who need it. The purpose of this chapter is to guide you through the various meanings and measures of costs.

## Applying Concepts of Cost to Decision Making

Let us explore further the cost of Sac Chameaux's nylon fabric for both how and why we can measure the cost per square metre differently, specifically knowing that the company must reduce its costs to keep its primary customer. Consider the data in Exhibit 2.2, which contains Sac Chameaux's costs of resources related to the acquisition of nylon fabric. We will use this data to construct different costs of nylon fabric for different contexts.

### Exhibit 2.2 Resources and Costs Related to Acquiring Nylon Fabric



Costs of nylon fabric		
Wholesale cost to buy nylon fabric	€8.00	per square metre
Nylon fabric required per backpack	1.00	square metre
Annual (20xx) usage of nylon fabric	24,500	square metres
Cost for delivery by wholesaler	€50.00	per order, up to 1,000 sq. m
Costs of delivery trucks (2)		
Purchase cost (each)	€25,000	per truck (purchased 5 years ago)
Useful lives (each), years	10	years
Useful lives (each), kilometres driven	400,000	km over useful life in years
Annual maintenance (each)	€2,000	per year
Annual licence and insurance (each)	€3,000	per year
Fuel usage	6.00	km per litre
Fuel cost	€1.35	per litre
Costs of truck drivers (2)		
Annual salary (each)	€30,000	per year
Annual benefits (each)	€15,000	per year

To know how best to use this data for cost management purposes, we first need to know the decision context. Suppose the decision alternatives are whether Sacs Chameaux should (a) pay the wholesale supplier to deliver the *next* fabric order or (b) pick up the *next* order itself. To meet the needs of its primary customer, Sacs Chameaux must assure itself that the transaction of obtaining fabric materials supports its goal of creating more value for its customer at the lowest cost. Receiving the wrong fabric, or the right fabric damaged or late, will make it difficult to meet Mountain Sports' on-time delivery requirements and will increase Sacs Chameaux's costs. We have seen that the company must reduce its total costs, so reliability of transport is important.

Choosing between delivery or pick up seems like a straightforward business problem, but we need several key pieces of information to decide properly. The first information is the answer to the qualitative question: *Are the two methods of obtaining the order (pick up or delivery) equally reliable? Can Sacs Chameaux be sure that the ordered goods will arrive on time and without damage? For purposes of our discussion, let's assume that the answer is 'yes, either will be reliable' (an answer of 'no' might rule out an option).* The second information is the answer to the quantitative question: *Is one method*

(pick up or delivery) less costly? To answer this question, we need to determine which of the costs in Exhibit 2.2 will be affected by the decision and compare the costs of the two methods.

Exhibit 2.2 contains quite a diversity of costs that we will use to build a dictionary or taxonomy of costs that we will view from the perspective of managers at Sacs Chameaux as they choose whether to pick up the next fabric order or pay to have it delivered.

## Cash or Out-of-pocket Cost

### LO 2

Understand and explain the concept and measurement of the out-of-pocket or cash cost and the accounting or accrual cost.

Because the decision at hand applies to the next fabric order, the appropriate cost information to support this decision is the **cash** or **out-of-pocket cost**, which is the incremental cost paid by cash or credit to achieve a particular purpose: The calculations are shown in Exhibit 2.3.

- a.** *The delivered cost of the order charged by the wholesaler:* The wholesaler has quoted a cost of €50 to deliver an order for up to 1,000 square metres of fabric to Sac Chameaux's location. Larger orders require multiple deliveries. Thus, the *cash cost* of the next delivered 500 square metre order is  $\text{€}8/\text{sq. m} \times 500 \text{ sq. m} + \text{€}50 = \text{€}4,050$ . No other costs must be paid to acquire this order; therefore, other costs are irrelevant to the delivery alternative.
- b.** *The out-of-pocket or cash cost incurred by Sacs Chameaux to pick up the order:* The wholesaler will charge €8 per square metre, or  $\text{€}8 \times 500 = \text{€}4,000$ , but Sacs Chameaux will incur another cash cost, that of the fuel consumed by the company's truck, which has the same capacity as the wholesaler's truck. The wholesaler is 20 km away, so the fuel cost will be the fuel consumed multiplied by the fuel's cost per litre,  $((2 \times 20 \text{ km}) / 6 \text{ km/litre}) \times \text{€}1.35/\text{litre} = \text{€}9$ . Thus, the total *cash cost* to pick up the next order is €4,009. As before, this decision applies to the next order, and the other costs will not change (more on this a bit later).



### Exhibit 2.3 Out-of-pocket (Cash) Cost of Nylon Fabric

Quantity purchased	500 square metres
Purchase price	€8.00 per square metre, Exhibit 2.2
Wholesaler's delivery price for orders up to 1,000 square metres	€50.00 per order
Kilometres driven to pick up (return)	40 km
Fuel usage	6.00 km per litre, Exhibit 2.2
Fuel cost	€1.35 per litre, Exhibit 2.2
<b>a. Delivery by wholesaler</b>	
Purchase cost of fabric order	€4,000.00 = 500 sq. m × 8.00 per sq. m
Delivery cost	<u>€50.00</u>
Total cost for delivered fabric order	<u>€4,050.00</u>
<b>b. Pick up by Sacs Chameaux</b>	
Purchase cost of fabric order	€4,000.00
Fuel cost to pick up fabric order	<u>€9.00</u> = (40 km/6 km per litre) × 1.35 per litre
Total cost of fabric order, with pickup	<u>€4,009.00</u>
Cost difference	€41.00 more for delivered order

## Variable, Committed and Fixed Costs

The cash-cost analysis in Exhibit 2.3 analyses only Sacs Chameaux's fabric and pick-up or delivery costs. Each additional square metre purchased will cost an incremental €8, and each order picked up or delivered will cost either €9 or €50, respectively. These are **variable costs**, which vary in direct proportion to production values, such as the fabric purchase and pick-up or delivery activities. The analysis in Exhibit 2.2 also assumes that the other costs are not out-of-pocket costs, and can be ignored for the next order because they will not change, regardless of the delivery alternative chosen. Rather, the other costs are **committed costs** that are incurred because of policies or contractual obligations. In the example of the cost of acquiring nylon fabric, Sacs Chameaux has committed to owning two trucks and employing two salaried truck drivers. Picking up one more or one less order from the wholesaler will not relieve Sacs Chameaux from incurring these committed costs. However, these costs do not simply happen and are not committed forever. Committed costs reflect management decisions, and any decision can be changed – at some cost. Other committed costs could include lease obligations, licences and various taxes. In contrast, 'discretionary costs', such as some costs for advertising, remodelling or charitable giving, could be changed quickly and easily. This is a difference of degree; that is, both committed and discretionary costs can be changed, but changing committed costs is more difficult. Exhibit 2.4 details the costs to purchase, pick up or have delivered orders of different amounts of fabric. Note how the costs change with increasing order sizes.

### LO 3

Understand and explain variable cost, committed cost, fixed cost and sunk cost.

**Exhibit 2.4** Fabric Costs

Square metres ordered	Prices per unit of activity		
	€8.00	€9.00	€50.00
	Fabric purchase cost	Fabric pick-up cost	Fabric delivery cost
1	€8	€9	€50
2	16	9	50
3	24	9	50
4	32	9	50
5	40	9	50
6	48	9	50
7	56	9	50
8	64	9	50
9	72	9	50
10	80	9	50
100	800	9	50
200	1,600	9	50
300	2,400	9	50
400	3,200	9	50
500	4,000	9	50
1,000	8,000	9	50
2,000	16,000	18	100
3,000	24,000	27	150





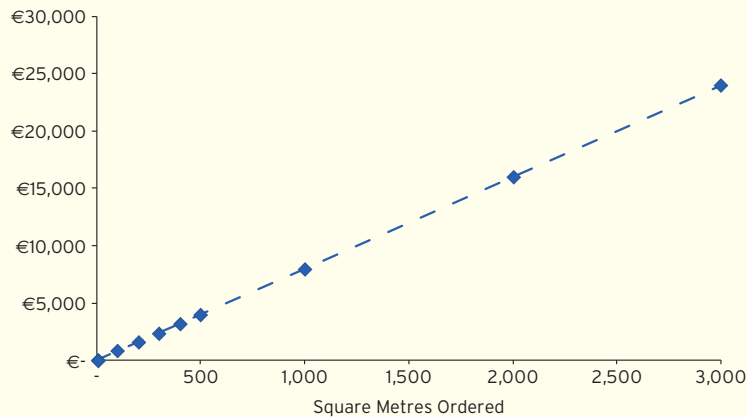
Exhibits 2.5 (a) and 2.5 (b) graph the fabric purchase and delivery costs. The total purchase cost in 2.5a displays the linear, proportional behaviour of a variable cost because the purchase of each unit of fabric (a square metre) adds the purchase price of €8 to the total. More precisely in this case, fabric can be ordered in fractional amounts, and the total variable cost is the amount ordered multiplied by €8. Some resources, as we will soon see, must be purchased in whole units, so the next graph will not be as smooth.

Exhibit 2.5b graphs delivery costs that are variable with respect to the number of fabric orders placed by Sacs Chameaux, which are shown in the lower  $x$ -axis. Each order adds €50 to the total delivery cost, and fractional orders obviously cannot be placed (note that pick-up costs would display similar behaviour). This gives rise to the lumpy, or 'step-cost' nature of Exhibit 2.5b.

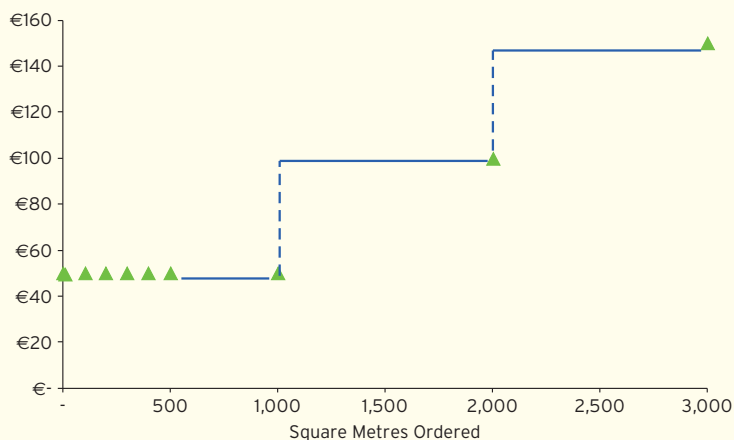
Exhibit 2.5b displays a different cost behaviour than 2.5a because the upper  $x$ -axis, which is the quantity of fabric ordered, is not the only determinant of delivery cost. This exhibit shows that the delivery cost does not vary for orders between 1 and 1,000 square metres, and is constant at higher levels for higher increments of 1,000 square metres. The total delivery cost does not change with respect to the quantity ordered *within each 1,000 square metre range*. This is a **fixed cost** that is a matter of the scale of decision-making and the divisibility of the resource, which does not change in total within a defined range of underlying productive activity, such as ordering the



**Exhibit 2.5a** Fabric Purchase Costs



**Exhibit 2.5b** Fabric Delivery Costs



needed amount of fabric. Thus, a fixed cost reflects a capacity decision, such as which size of delivery truck to purchase or hire, a decision that reflects the normal range of fabric-order quantities. In this case, the truck size must reflect that most orders are less than 1,000 square metres of fabric.

Decisions cause costs – and we stress again that costs do not just happen – but no resource decisions are irreversible. Because all future costs are variable with respect to some decision, no future cost really can be truly fixed. It might be costly to change a resource cost in the future (e.g., replace a small truck with a larger one, renegotiate or nullify a resource contract), but it can be changed. For example, labour can be a committed cost in many countries and for many organizations with unionized labour or strong employment policies. This commitment to employment means that conducting more or fewer productive activities (such as picking up orders) might not affect the cost paid for labour. If this is so, spending for labour resources is not different from spending for other physical capacity resources. Again, the decision to acquire the capacity can be changed, but at a cost. Acquiring and using capacity resources complicates Sacs Chameaux's decision whether to pick up or pay for the delivery of all future fabric orders.

The analysis in Exhibit 2.3 shows that picking up the *next* order is less costly by €41 than paying to have it delivered. One might ask whether this conclusion is valid for all future orders or only for the next order? This question creates a decision context with a larger, more complicated set of resources to consider. We need to determine which resources would be affected if Sacs Chameaux considered paying the wholesaler to deliver all future orders, and what costs would be incurred or saved to switch from picking up to delivery.

## Sunk and Accrual Costs

We have seen that the cash costs of a fabric order include the purchase price of €8 per square metre plus either the fuel cost to pick up of €9 per order or the delivery cost of €50 per order. We also have determined that the costs of truck drivers and non-fuel truck costs in Exhibit 2.2 are committed costs that appear to be fixed in nature. Maintenance, licence and insurance costs for Sacs Chameaux's trucks might be more flexible, but still would be largely fixed annual costs. Because of union contracts, Sacs Chameaux probably could not change drivers' annual salaries and benefits to variable, hourly wages. If the company wanted to change its capacity decisions to hire salaried drivers and own trucks by terminating the drivers and selling the trucks, it easily could eliminate the truck-related costs. However, the company would face union opposition and severance costs if it scaled back or eliminated the driver-related costs. The uncertainties of managing these costs and 'what if?' issues are interesting and challenging. The only certainty in these cost data is that the €25,000 purchase price of each truck is irrelevant to the decision to pick up or pay for delivery. The historical price paid for each truck is a **sunk cost** that cannot be changed by any future decision.<sup>7</sup>

The complete analysis, which we defer to Chapter 8, of the more complicated decision whether to indefinitely continue resources related to picking up fabric orders or to pay the wholesaler for each delivery should consider (a) several alternative scenarios and (b) the effects over a long period of time (e.g., the ordering activity over the life of a truck). These are common and important complications in cost management analysis. As it happens, sometimes managers use an accounting measure of cost that incorporates a wide variety of accounting costs across time – not always wisely for many decisions, however. We turn to this accounting cost measure next.

A short cut for the complete cost implications of the opportunity cost of picking up or delivering fabric is the accounting or **accrual cost**, which is an average cost. This average, accrual cost for the pick up of fabric can be computed by dividing the total cost of resources used during an extended time period (e.g., a year) divided by a measure of the resources used to pick up orders. The total accrual cost includes the previously calculated, out-of-pocket fuel costs plus the previously left-out committed costs for trucks and drivers. Exhibit 2.6 presents one reasonable approach to measuring the purchase and pick-up cost of a 500 square metre order.

Costs committed to picking up fabric are costs of trucks and drivers. The cost of purchasing a truck can be spread or amortized over the useful life of the truck. The analysis in Exhibit 2.6 uses


**Exhibit 2.6** Accrual Cost of an Order for Nylon Fabric

Annual uses of committed resources		
Delivery trucks (each)		
Annual amortization of purchase cost	€2,500	straight-line depreciation, Exhibit 2.2
Annual maintenance, licence and insurance	€5,000	Exhibit 2.2
Truck drivers (each)		
Annual salary and benefits	<u>€45,000</u>	Exhibit 2.2
Total annual costs of committed resources	€52,500	
Normal annual kilometres available	<u>40,000</u>	kilometres, Exhibit 2.2
Committed cost per kilometre	€1.3125	per kilometre driven
Kilometres driven to pick up fabric order (return)	<u>40</u>	km
Accrued, committed cost of fabric order	€52.50	
Out-of-pocket (cash) cost of fuel to pick up order	<u>9.00</u>	fuel from Exhibit 2.3
Total cost to pick up an order	61.50	
Out-of-pocket (cash) cost of fabric order	<u>4,000.00</u>	purchase price from Exhibit 2.3
Total accrual cost of fabric order	<u>€4,061.50</u>	

an annual, straight-line or equal measure of the purchase cost. The cost of a driver includes salary and benefits. Because these resources can be used for other purposes, finding a common measure of activity, such as kilometres driven annually, is a more flexible measure than the number of orders picked up. Dividing the total cost of a truck and a driver by the normal kilometres driven in a year yields an average committed cost of €1.3125 per kilometre. The distance driven to pick up a fabric order is 40 kilometres, so the accrual cost of committed resources is €52.50 per order. Adding the previously computed, cash fuel cost of €9.00 measures the total accrual cost of an order at €61.50, which is greater than the wholesaler's cost to deliver of €50. This does not mean, however, that Sacs Chameaux should outsource the pick-up of fabric to the wholesaler because we have not considered all of the complexities and scenarios of such a switch. We will defer these important considerations until Chapter 8, which addresses the time-impact of decision making.

## Reporting Product Costs, Period Costs and Expenses

**LO 4**

Explain product cost, period cost, expense, direct cost and indirect cost.

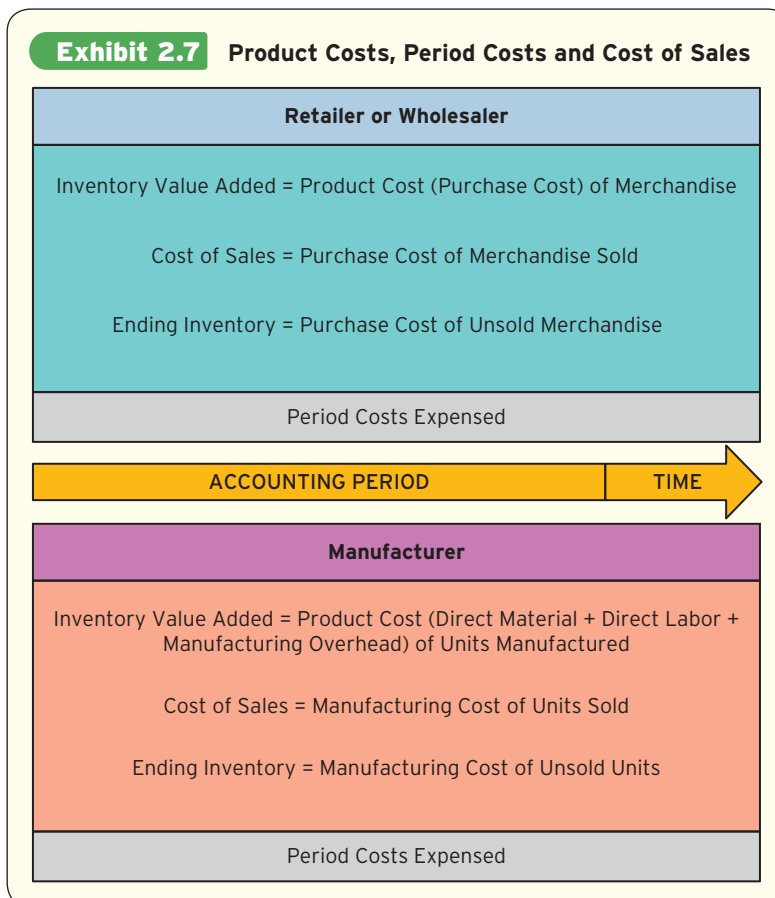
The primary function of cost management is to help managers create more customer value at lower cost. Rather than spend scarce time and funds to create new cost information, reusing information prepared for financial or tax reporting might be a less costly short cut, because this information normally is already available. Reusing accounting cost information has the advantage of lower cost, but the disadvantage of possibly obscuring key information details. The concept of cost used most often for financial and tax reporting is accrual cost. It is important for cost management to understand when one may safely use accrual cost and when one should not. For this key insight

we need to explore a typical **cost accounting system**, which accumulates and reports accrual costs for external reporting.

Both financial and tax reporting are concerned with the timing when the costs to acquire resources are recognized as *expenses*.<sup>8</sup> An **expense** is the measure of the cost incurred when a resource is consumed or sold for the purpose of generating revenue. Expenses are matched to revenues to measure income. The terms 'product cost' and 'period cost' reflect the business transactions that cause their conversion into expenses.

A **product cost** is a cost assigned to goods that were either purchased or manufactured for resale. Product cost is the historical cost of the inventory of manufactured or purchased goods until the goods are sold. In the period of the sale, the costs of products sold are recognized as an expense called **costs of sales**. The cost of product inventory acquired by a retailer or wholesaler from a manufacturer for resale consists of the purchase cost of the inventory plus any shipping charges. The product cost of manufactured inventory includes all manufacturing costs. Product costs are added to the values of inventories (or stocks as they are known in the UK), until the goods are sold and the product costs are expensed as cost of sales. For example, the labour cost of a production employee at Sacs Chameaux is included as a product cost of the backpacks manufactured. To that, the company would add materials costs (fabric, zippers, other hardware) and other costs of the manufacturing facility (e.g., depreciation, maintenance, supervision). The accumulated costs of the inputs to production that are used on products become the products' cost.

For external reporting purposes, any cost that is not a product cost is a **period cost**. These costs are recognized as expenses during the time period in which they are incurred rather than with units of purchased or produced goods. Thus, period costs are *not* included in the cost of inventory. Common period costs include administrative costs, marketing costs and other costs of doing business that cannot be associated strongly with manufacturing processes. Exhibit 2.7 illustrates the



relationship between product costs cost-of-sales expense and period costs for a retailer, such as the Mountain Sports division, and for its supplier, a manufacturer such as Sacs Chameaux.

Reporting the relationship between cash outflows and costs can be complicated by the somewhat arbitrary boundaries of reporting periods. For example:

- The cash outflow and cost take place in the same period, such as when Sacs Chameaux pays for and receives nylon-fabric orders from its suppliers within the same reporting period (say, a month).
- The cash outflow occurs earlier, but the cost is capitalized (e.g., nylon fabric is put into inventory), and the cost follows in a later period when the nylon fabric is used to make backpacks.
- The cash outflow occurs later, but cost is charged to an earlier period because an accrual was created, such as when Sacs Chameaux creates a provision for future warranty cost for products sold to Mountain Sports.

## Cost Analysis

### LO 5

Analyse the product costs of typical manufacturing, retail and service firms for decision making and evaluations.

Recall the value chain in Exhibit 2.1. Our focus company is linked to its suppliers and customers by transactions and the strategies of each firm in its extended value chain. Their separate strategic goals might be in tension. In particular the competitive necessity for Mountain Sports to improve its profitability by 17 per cent has led it to require that its suppliers, Sacs Chameaux included, must reduce their prices by 17 per cent. All firms at all times should be managing their costs; however, Sacs Chameaux now has an urgent need to manage costs quickly and effectively or find another major customer. Let's analyse how the costs and profits of these entities are linked.

Mountain Sports Division can improve its profitability by increasing its sales turnover, reducing its costs or a combination of the two. Mountain Sports' threat to seek lower cost suppliers if Sacs Chameaux does not reduce its prices by 17 per cent seems credible in this age of global competition. Jacques Cournot, VP of Finance, was able to obtain public information about the PleinAir Group that verifies the credibility of the threat. His analysis of PleinAir is in Exhibit 2.8, which reflects typical gross margins (sales turnover less cost of products sold) of retail or wholesale companies that sell goods manufacture by others.<sup>9</sup>

Cournot's analysis used the actual 20xx sales turnover and gross margin figures for the entire group and its major divisions that were disclosed by PleinAir in its annual report. Note that PleinAir did not disclose period expenses for the divisions, so Jacques cannot construct complete statements of income for all of the group's business units. This is not an issue for this analysis because Cournot is most interested in Mountain Sports' cost of sales, which is partly Sacs Chameaux's sales turnover.

Cournot expressed the elements of gross margin as a percentage of sales to allow profitability comparisons. One of these percentages is the **gross margin ratio**, which is a measure of income contributed before period expenses, interest and taxes divided by sales turnover:

**Gross margin ratio = Gross margin/Sales turnover**

**Gross margin ratio = (Sales turnover – Cost of sales)/Sales turnover**

Mountain Sports' 20xx gross margin ratio, 44 per cent lagged behind the rest of the PleinAir group, which earned a 53.423 per cent gross margin ratio. Jacques reasoned that Mountain Sports was using the leverage of its exclusive relationships with Sacs Chameaux and other suppliers to obtain a cost-reduction solution to its business problem. This meant that Mountain Sports intended to improve its profitability (i.e., gross margin ratio) by decreasing its cost of sales. For Mountain Sports to achieve the same gross margin ratio as the other divisions of PleinAir (53.423 per cent), it must reduce its cost of sales by 17 per cent (rounded up). Hence the insistence on reduced sales prices for its products purchased from Sacs Chameaux. The calculations of Mountain Sports' cost reductions are based on



**Exhibit 2.8** Analysis of PleinAir and Mountain Sports

<b>a. PleinAir Group performance</b>	<b>20xx (actual)</b>	<b>Percentage of sales (actual)</b>	
Sales turnover	€254,855,000	100%	
Cost of products sold	<u>123,349,820</u>	<u>48.400%</u>	
Gross margin	<u>€131,505,180</u>	<u>51.600%</u>	
<b>b. Other divisions performance</b>			
Sales turnover	€205,542,000	100%	
Cost of products sold	<u>95,734,540</u>	<u>47.577%</u>	
Gross margin	<u>€109,807,460</u>	<u>53.423%</u>	
<b>c. Mountain Sports Division performance</b>			
Sales turnover	€49,313,000	100%	
Cost of products sold	<u>27,615,280</u>	<u>56.000%</u>	
Gross margin	<u>€21,697,720</u>	<u>44.000%</u>	
<b>d. Mountain Sports performance requirement</b>	<b>20xx (adjusted)</b>	<b>Percentage of sales (adjusted)</b>	<b>Improvement required</b>
Sales turnover (same as 20xx)	€49,313,000	100%	
Cost of sales	<u>22,968,368</u>	<u>46.577%</u>	-16.827%
Gross margin	<u>€26,344,632</u>	<u>53.423%</u>	

maintaining its 20xx sales turnover, achieving the rest of the Group's gross margin ratio, but reducing cost of sales, as follows:

$$\begin{aligned} \text{Mountain Sports' Desired cost of sales} &= (1 - 0.53423) \times \text{€}49,313,000 \\ &= \text{€}22,968,368 \end{aligned}$$

$$\begin{aligned} \text{Percentage cost reduction} &= (22,968,368 - 27,615,280) / 27,615,280 \\ &= -16.827\% \\ &= -17\% \text{ (rounded)} \end{aligned}$$

Cournot next analysed Sacs Chameaux's 20xx results to see the impacts of accepting a 17 per cent reduction of sales prices on its 20xx operations. Of course, gross margin and **operating income** (gross margin less period expenses) would be lower; in fact, without cost reductions this would cause the company's first loss in 20 years. Jacques expected that the company's officers and owners would prefer to maintain prior levels of profitability (he certainly did), which meant that Sacs Chameaux must reduce its cost of sales and period expenses. Jacques' prospective ('pro forma') analysis is in Exhibit 2.9.

Sacs Chameaux's 20xx actual operating results and income were consistent with the performance of recent years. The gross margin ratio of 60 per cent and **return on sales ratio** (operating income/sales) were what the company's officers and owners considered to be consistent with their opportunity costs of effort and capital. To maintain those ratios with a 17 per cent reduction in sales prices on the same units sold (nearly all to Mountain Sports), Sacs Chameaux would need to effect 17 per


**Exhibit 2.9 Sacs Chameaux Cost Improvement Required**

Sacs Chameaux performance	20xx (actual)	Changes required	20xx (adjusted)
Sales units	20,130		20,130
Sales turnover	€2,856,000	-17%	€2,370,480
Cost of sales	<u>1,142,400</u>	-17%	<u>948,192</u>
Gross margin	1,713,600		1,422,288
Period expenses	<u>1,245,000</u>	-17%	<u>1,033,350</u>
Operating income	<u>€468,600</u>		<u>€388,938</u>
Gross margin ratio	60%		60%
Return on sales ratio	16%		16%
<b>Cost reductions required</b>			
Cost of sales	€(194,208)		
Per unit manufacturing cost	€(9.65)		
Period expenses	<u>€(211,650)</u>		

cent reductions in cost of sales (in total €194,208) and period expenses (in total €211,650). Jacques believed that sufficient reductions might be achieved by the following actions:

1. Improve the efficiency of internal manufacturing processes by reducing wasted time, effort and materials.
2. Improve the efficiency of internal business services similarly or by purchasing services from other sources (i.e., outsourcing more than tax services).
3. Reduce costs of purchased materials and services by negotiating reduced purchase prices from suppliers (such as the fabric wholesaler and Arnault Expert Comptable).

Failing these, the officers and owners might have to reassess their opportunity costs.



## 2.2 You're the Decision Maker

1. Compute a statement of income like Exhibit 2.9 that features:
  - a. A 17 per cent reduction in sales turnover on the same units as sold in 20xx
  - b. No reductions in either cost of sales or period expenses.
2. Explain how the impact of the price reduction being forced by Mountain Sports might cascade through all of Sacs Chameaux's internal processes and suppliers. What are the likely outcomes to all concerned?

(Solutions begin on p. 82.)

## Costs of Manufacturing

More detailed analysis of the reported manufacturing costs will yield more information about how Sacs Chameaux can achieve its required cost reductions. A manufacturing company such as Sacs Chameaux has a more complex statement of income than do service or retail companies. Whereas the retailer *purchases* the goods for sale, the manufacturer *makes* them. Sacs Chameaux purchases materials (for example, fabric and thread), hires employees to convert the materials into finished

products, and then offers the products for sale. These additional activities add to the complexity of Sacs Chameaux's cost structure and financial reports.

An important aspect of cost incurrence is the ease with which the cost of a resource can be traced to a decision or set of decisions, such as deciding to manufacture a product or provide a service. Cost analysts often ask, 'If we make this particular decision, what resources must we obtain or use, and what will they cost?' The acquisition and use of all resources is caused by management decisions, but the ease of tracing the costs of these resources to specific decisions is important for analysing the cost effects to those decisions of the organization.

Manufacturing costs include **direct costs**, which are the costs of resources that are physically observed being used to create specific products. These include direct materials and direct labour, which are easily traced to products being made. Manufacturing costs also include **indirect costs** that cannot be feasibly traced to object, such as products.

## Direct Costs

**Direct materials** are resources such as raw materials, parts and components that one can observe being used to make a specific product. For example, observing the use of fabric, thread, buckles and other fasteners that Sacs Chameaux uses to make backpacks is easy; therefore, the costs of these resources are all direct material costs. The cost of raw material that is *observably used in or traced to* production equals the direct material cost.

**Direct labour** is the cost of compensating employees who convert direct material into a finished product. The cost of fringe benefits for direct labour personnel, such as employer-paid health-insurance premiums, workers' compensation, and the employer's pension contribution, are also included in direct labour cost. These costs are just as much a part of the employees' compensation as are their regular wages and salaries.

## Indirect Costs

**Manufacturing overhead cost** is an indirect cost that includes resources necessary for the manufacturing process, but which cannot be easily traced to specific units of product. Manufacturing overhead includes indirect material, indirect labour and other manufacturing costs that are shared resources for multiple products or cannot be traced. **Indirect material cost** includes all materials that either (1) are not a part of the finished product but are necessary to manufacture it or (2) are part of the finished product but are insignificant in cost. ('Insignificant in cost' means that the cost of collecting information about the use of these materials exceeds the value of the information collected.) Some examples include lubricants for Sacs Chameaux's production machinery and cleaning materials, repair parts and light bulbs for the production area. **Indirect labour cost** is the wages of production employees who do not work directly on the product yet are required for the manufacturing facility's operation. These employees include supervisors, maintenance workers, purchasing managers and material-handling employees. When all of labour cost is a small part of total manufacturing costs, some companies include labour with overhead and term the total indirect cost as a **conversion cost**.

Manufacturing overhead also includes *other manufacturing costs*, such as depreciation on the factory building and equipment, insurance on the factory building and equipment, heat, light, power and other support costs incurred to keep the manufacturing facility operating. Increasing the automation of manufacturing processes has resulted in dramatic increases in these other manufacturing costs. Support departments represent a significant source of manufacturing overhead costs and include supplier relations, machine maintenance, production scheduling, engineering, purchasing, material handling and quality assurance. Notice that many of the indirect labour employees mentioned earlier actually work in a support department. Note that the costs of outsourced support for production also should be counted as part of overhead costs.

Other manufacturing overhead costs also include overtime premiums and the cost of idle time. An **overtime premium** is the extra hourly compensation paid to an employee who works beyond the time normally allowed by regulation or labour contracts. **Idle time** is time that an employee does not spend productively because of events such as equipment breakdowns or new set-ups of

production runs. Idle time is an unavoidable feature of most manufacturing processes. The costs of employees' overtime premiums and idle time are classified as overhead so that they can be spread across all products rather than being associated with a particular product or batch of products.

## Non-manufacturing Costs

Non-manufacturing costs include selling and administrative costs, which are not used to produce products. Sacs Chameaux also incurs selling costs to obtain customer orders and provide finished products to customers. **Selling costs** include costs such as sales commissions, sales personnel salaries, and the sales departments' building occupancy costs. Sacs Chameaux also incurs **administrative costs**, which are the costs incurred to manage the organization and provide staff support, including executive and clerical salaries; costs for legal, computing and accounting services; and building space for administrative personnel.



### 2.1 Research Insight

The calculation of divisional profits, as in the case of Sacs Chameaux, is fraught with practical and theoretical measurement difficulties, as we shall see later, and particularly in Chapters 14 and 15. These difficulties almost always centre on the shares of central administrative and sunk costs that are apportioned (or 'allocated') to divisions. Despite the difficulties, the use of divisional profits to make decisions about divisions and evaluate divisions' performance is globally widespread. Surveys, such as the one conducted by R.C. Skinner, confirm the practice but also seek to explain variations in how divisional profits are computed. Some firms do and others do not allocate central costs to divisions. Reasons for allocating full accrual costs include (a) the belief that these costs are the best estimates of future cash costs, (b) full accrual costs promote shared decision making between central and divisional managers, (c) full accrual costs lead divisions to press central administrators to improve internal service efficiency, and (d) profits thus computed promote inter-divisional performance comparisons. Reasons for not including central costs include (a) uncontrollability of these costs by divisional managers, and (b) irrelevance of allocated sunk costs for divisional decision making.

Source: Skinner (1990).

**Period costs** are non-manufacturing costs that are expensed in the period incurred for external reporting purposes. For cost management purposes, however, one often wants to associate non-manufacturing costs with specific products or organizational subunits. For example, the PleinAir Group allocates the central costs of advertising, promotion and supplier management to its business divisions, including Mountain Sports, so that divisions can measure the total costs of their products. Chapter 4 presents activity-based costing, which is a method to observe how most, if not all, costs of the value chain are used to manufacture products (or serve customers and provide services). Chapter 10 describes multiple methods for allocating costs to organizational subunits.

Sometimes distinguishing between manufacturing costs and non-manufacturing costs is conceptually difficult. For example, are the salaries of staff in the human resources department that handle factory payrolls manufacturing or non-manufacturing costs? What about the costs of offices for the manufacturing vice president and her staff? Some of these costs have no clear-cut classification, so companies usually set their own guidelines and follow them consistently. This can make comparing the reported results of different companies difficult, however, particularly because firms rarely disclose these practices.

## Stages of Production and the Flow of Costs

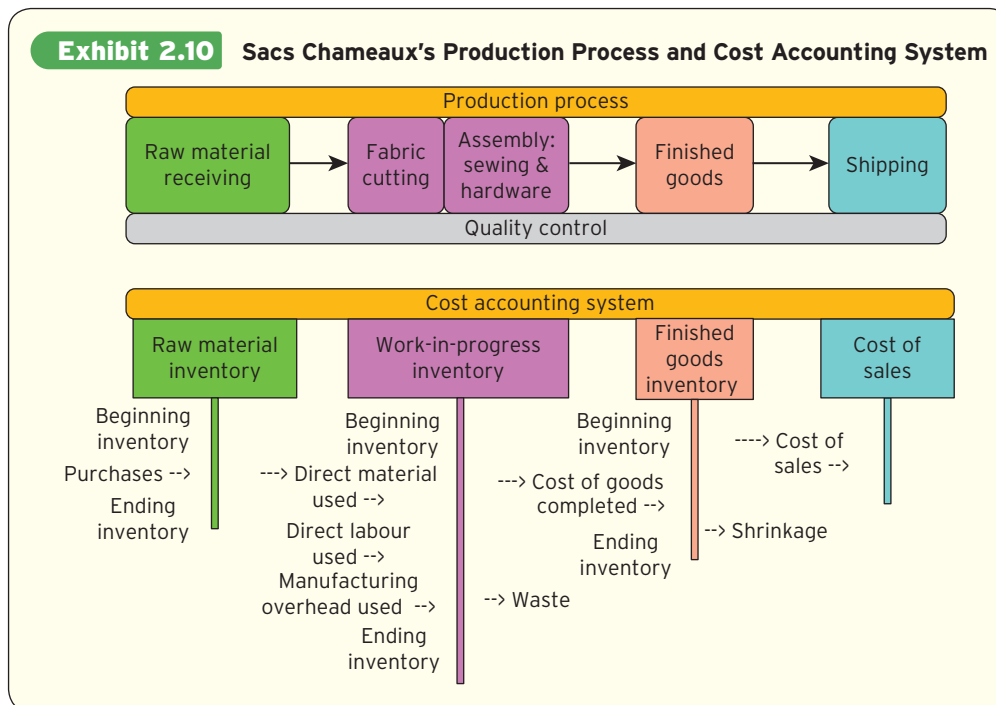
Suppose that we are able to tour Sacs Chameaux's Savoie production facility. We would encounter the following stages of production:

- We would observe the ordering and delivery of raw materials (e.g., nylon fabric, straps and fasteners) from suppliers. Payment (cash or credit) might be made with the order or upon

delivery. Credit purchases create an accounts-payable liability to the supplier, which later cash payments extinguish.

- We might see **raw materials inventory**, which are costs of materials that have not yet been put into production. Some firms try to minimize inventory levels with frequent, timely deliveries.
- Next we would find **work in progress (WIP) inventory**, which is the cost of partially completed products in process.
- Finally, past the end of the production process, perhaps in storage or in a shipping area, we would find **finished goods inventory**, which is the cost of products ready for sale or delivery to customers. Some firms try to minimize finished goods inventory by quickly selling and delivering completed products to customers.

Each inventory or stock account typically has a beginning inventory amount, transfers-in and transfers-out during the period, and an ending inventory based on what is still on hand at the end of the period. Recall that costs added to inventory accounts are called product costs. Exhibit 2.10 illustrates how a basic cost accounting system (below) mirrors the production process (above) at Sacs Chameaux's Savoie factory.



The cost accounts record and collect the costs of resources as they flow through the process. As products are built, their costs accumulate in the Work-in-progress inventory account. As products are completed, they and their costs flow to the Finished goods inventory account. Finally, when products are sold, customers take possession and the product costs are expensed as cost of sales. The firm's accounting system guarantees that the balancing relation for any inventory account is always:

$$\text{Beginning balance} + \text{Transfers-in} - \text{Transfers-out} = \text{Ending balance}$$

$$\text{BB} + \text{TI} - \text{TO} = \text{EB}$$

Work-in-progress transfers-out include cost of goods completed and waste. **Waste** is the cost of unrecovered resources applied to defective products that cannot be sold. Similarly, transfers-in to finished goods include cost of goods completed, and transfers-out include cost of sales and **shrinkage**, which is the cost of unrecovered stolen or mis-shipped finished products. Both waste and shrinkage are considered period costs so that these costs are not buried in costs of goods completed or cost of sales. The



costs of any backpacks that are finished but have not yet been sold to customers are included in the Finished goods inventory account at the end of an accounting period.

## Schedule of Costs of Goods Completed and Sold

### LO 6

Prepare a schedule of cost of goods completed and sold using a flexible financial model.

Sacs Chameaux's statement of income for 20xx is shown in the first numerical column of Exhibit 2.9. This is a typical statement of income for a manufacturer. Sacs Chameaux has a business imperative to reduce its costs sufficiently to support a 17 per cent reduction in its sales turnover. We are now interested in exploring its cost of goods completed and sold for indications of ways to reduce these costs. To proceed, we will construct a detailed statement of costs of goods completed and sold. This statement quantifies or realizes the stylized cost accounting system in the lower portion of Exhibit 2.10, and is shown in Exhibit 2.11. This statement derives the original cost of sales figure of €1,142,400 in the 20xx statement of income of Exhibit 2.9.



### Exhibit 2.11 Statement of Costs of Goods Completed and Sold

	A	B	C	D	E
1	<b>Sacs Chameaux, SA</b>				
2	<b>Manufacturing data input</b>				
3	<b>Data input</b>				
4	Beginning raw-material inventories, 1 January	€ 20,000			
5	Ending raw-material inventories, 31 December	15,000			
6	Beginning work-in-process inventories, 1 January	15,000			
7	Ending work-in-process inventories, 31 December	10,000			
8	Beginning finished-goods inventories, 1 January	22,000			
9	Ending finished-goods inventories, 31 December	14,600			
10	Purchases of raw materials	240,000			
11	Use of direct labour	300,000			
12	Manufacturing overhead	585,000			
13					
14	<b>Financial Analysis</b>				
15	<b>Sacs Chameaux, SA</b>				
16	<b>Schedule of Costs of Goods Completed and Sold</b>				
17	<b>For the Year Ended 31 December 20xx</b>				
18					<b>Formulas</b>
19	Beginning work-in-process inventory, January 1			€ 15,000	= B7
20	Manufacturing costs during the year:				
21	Direct material:				
22	Beginning raw-material inventories, January 1	€ 20,000			= B5
23	Add: Purchases of raw materials	240,000			= B11
24	Raw materials available for use	260,000			= B22+B23
25	Less: Ending raw-material inventories, December 31	15,000			= B6
26	Direct materials used		€ 245,000		
27	Direct labour used		300,000		= B12
28	Manufacturing overhead used		585,000		= B13
29	Total manufacturing costs incurred			1,130,000	= SUM(C26:C28)
30	Total cost of work in process during the year			1,145,000	= D19+D29
31	Less: Ending work-in-process inventory, December 31			10,000	= B8
32	<b>Cost of goods completed during the year</b>			<b>1,135,000</b>	<b>= D30-D31</b>
33	Beginning finished-goods inventory, January 1			22,000	= B9
34	Finished-goods inventory available for sale			1,157,000	= D32+D33
35	Less: Ending finished-goods inventory, December 31			14,600	= B10
36	<b>Cost of sales</b>			<b>€ 1,142,400</b>	<b>= D34-D35</b>

## Financial Modelling

Observe that Exhibit 2.11 was created with spreadsheet software. Virtually everyone who conducts financial analyses uses this software (typically the ubiquitous Microsoft Excel). Thus, it is important for future analyses that we introduce basic financial modelling techniques now. Future chapters will

use more complex techniques, but they are variations on the basic techniques we will now use. Sound spreadsheet analysis is an important, indispensable skill.

Before explaining the accounting analysis in Exhibit 2.11, let's focus on the construction of this spreadsheet. This spreadsheet is a **financial model**, which is a flexible calculation of financial outcomes that exploits (some of) the vast power of current spreadsheet software, such as Microsoft Excel. We will use these models on many occasions in this textbook, so it is necessary to set some expectations for their construction and use. First, notice that the financial model has two related but separate sections: data input and financial analysis. The data input section contains all the numerical 'facts' or parameters of the model. It is very important that this is the *only* place where these parameters exist as numbers. This is for two reasons: (1) entering these data only once reduces the opportunities for data-entry errors, and (2) referring to these parameters by cell location everywhere else creates a model that is flexible and reliable. For example, column E of the spreadsheet displays the formulas used to compute the figures in the financial analysis section of the model (note that displaying formulas this way is not typical of actual models). For this exposition the cells that refer directly to data input parameters are highlighted. If one wanted to change any of the parameters, say for analysing the outcomes in a different time period, one only needs to change a parameter in the data input section without worrying where the parameter might be used. The entire spreadsheet model will recalculate automatically to reflect this data change. Flexibility and reliability are especially important in models that are more complex than Exhibit 2.11.

## Statement of Cost of Goods Completed and Cost per Unit

Let's analyse the construction of 20xx's statement of goods completed and sold in Exhibit 2.11, which throughout uses a form of the inventory balancing equation introduced previously,  $BB + TI - EB = TO$ .

### Work in progress

The first financial outcome that we want to compute is the accrual cost of goods completed, which is the 'transfer-out' of the Work-in-progress (WIP) inventory, so we begin the statement with the opening WIP inventory balance. This is computed in cell D19 by reference to the data input section (= B7). During the period 20xx, raw materials were added. We compute the direct materials transferred into production (cell C26) by starting with the opening Raw materials (RM) inventory balance (B22), adding purchases (B23), and subtracting the closing Raw materials inventory balance (B25). This transfer-out must be the total materials used to produce backpacks, which might include waste (we will discuss waste later in this text).

$$\text{Cost of direct materials used, } TO_{RM} = BB_{RM} + TI_{RM} - EB_{RM}$$

$$\text{Cost of direct materials used} = \text{€}20,000 + 240,000 - 15,000 = \text{€}245,000$$

We next add to direct materials the other product costs consumed (transferred-in) to build products during 20xx: Direct labour (cell C27) and Manufacturing overhead (cell C28). This sum is the total product cost incurred in 20xx (cell D29), which is added to the opening WIP balance to measure the total cost of products in process during 20xx (D30). We subtract the closing WIP balance (D31) to obtain the *cost of goods completed* in 20xx (D32).

$$\text{Cost of goods completed, } TO_{WIP} = BB_{WIP} + TI_{WIP} - EB_{WIP}$$

$$\begin{aligned} \text{Cost of goods completed} &= \text{€}15,000 + (245,000 + 300,000 + 585,000) - 10,000 \\ &= \text{€}1,135,000 \end{aligned}$$

We have solved the WIP balancing equation,  $BB + TI - EB = TO$ , in the typical statement format to find the cost of goods completed as €1,135,000. For the 20,000 backpacks completed, this averages to €56.75 per backpack.

Cost of goods completed	€1,135,000
Units produced	÷ 20,000
Cost per unit	€56.75

Achieving a 17 per cent reduction means cutting  $0.17 \times €56.75 = €9.65$  from the average cost of each backpack, or approximately €193,000 in total from 20xx's annual product costs consumed.

## Finished goods

The calculation of 20xx's cost of sales (€1,142,400; shown first in Exhibit 2.9) also follows the format of  $BB + TI - EB = TO$  within the Finished goods (FG) inventory account. This is accomplished in rows 32 through 36. Note that the transfer-out from the WIP inventory, cost of goods completed (cell D32), is the transfer-in for the Finished goods inventory. The transfer-out from finished goods is the *cost of sales* in cell D36. If any shrinkage were detected, it would be shown separately.

$$\text{Cost of sales, } TO_{FG} = BB_{FG} + TI_{FG} - EB_{FG}$$

$$\text{Cost of sales} = €22,000 + 1,135,000 - 14,600 = €1,142,000$$

The average cost of the 20,130 backpacks sold to Mountain Sports in 20xx was €56.75, which because these units include partially completed backpacks from the previous year's ending WIP indicates that Sacs Chameaux's production costs are quite stable. In a way, that is bad news for cost cutting, because it might be easier to prevent a recurrence of a short-term spike in costs. It appears that solving the company's cost-reduction problem must entail structural changes in the costs of resources used (direct materials, direct labour and manufacturing overhead). Where would you begin?



## 2.2 Research Insight

A common structural change in production processes is to 'outsource' some or all parts of the process to other manufacturers that might be more efficient. Firms that outsource expect lower total costs without reductions in quality and on-time deliveries. Thus, the decision to outsource is often called the 'make or buy' decision, for which the comparison of the cost to make versus the cost to buy is crucial. The cost to buy is a cash cost, but the cost to make is often an accrual cost. Is this comparing apples to oranges? A 2006 survey by Brierly et al. revealed that practice varies - some practising experts use only direct manufacturing costs, but others use total accrual costs - contrary to the authors' expectations. These authors call for more research to explain why many practitioners appear to believe that sunk accrual costs are appropriate for this decision. Perhaps (as in Research Insight 2.1) the decisions faced by respondents vary as to their short or long-term nature. This issue is covered in detail in Chapter 7.

Source: Brierly et al. (2006).



## 2.3 You're the Decision Maker

Place yourself in the position of Jacques Cournot, the VP of Finance, who will analyse the cost results in Exhibit 2.11 for opportunities to reduce total production costs by 17 per cent, or a total of €192,237 retrospectively from 20xx's production.

- Which product costs in Exhibit 2.11 can Sacs Chameaux reduce for the next year?
- By how much would the average cost of a backpack need to be reduced?
- What strategies would you recommend for the process(es) of achieving cost reductions in the costs identified in part (a)?
- If the costs in part (a) can be reduced, would you recommend revaluing the next year's beginning inventories? Why? How?

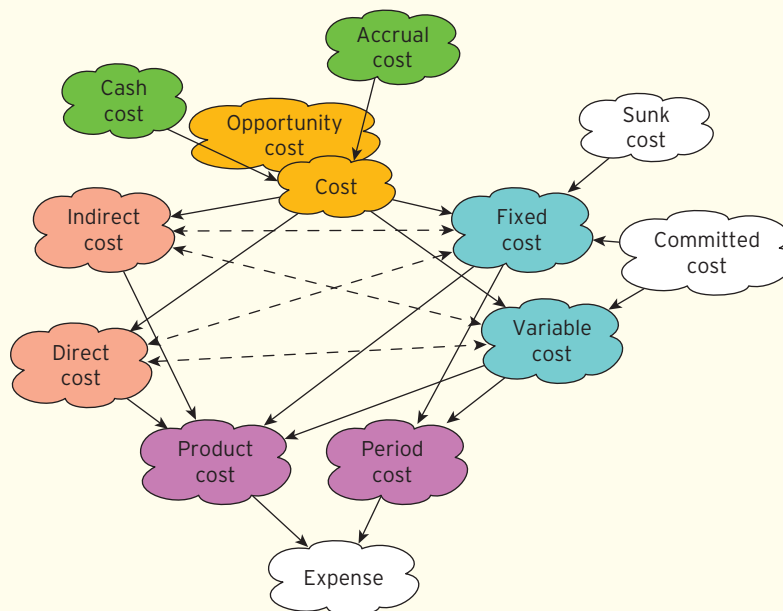
(Solutions begin on p. 82.)

## Chapter Summary

Cost management helps an organization's management create more value at lower cost by efficiently managing the organization's value chain of activities, processes and functions. An important step in studying cost management is to gain an understanding of the various concepts of cost and the types of costs that organizations incur and the way that the organizations actively manage those costs. Moreover, the ability to view different managerial situations from the appropriate decision-making perspective is important. An important cost concept is *cost behaviour*, which refers to the way in which costs respond to changes in decisions and activities. Another key concept is the difference between cash or out-of-pocket cost and accrual cost. The former reflects cost behaviour and timing, while the latter reflects average costs that show up in financial statements for external reporting.

Exhibit 2.12 summarizes relations among various concepts of cost that are oriented toward measuring the cost of a product (the exercise could be broadened to the cost of a business unit or a project). Spend a few moments reflecting on the related concepts of costs in this exhibit. The central concept, 'cost' should be measured as 'opportunity cost', but managers often must substitute measures of 'cash' or 'accrual' cost, which are useful but have different shortcomings compared to the ideal measure of opportunity cost. The choice between cash or accrual cost then leads to considerations of 'fixed' or 'variable' costs, which might be 'committed'. A 'sunk' cost is a special type of cost that is historical and unchangeable, but may become part of accrual cost measurement. Fixed and variable costs may be 'direct' or 'indirect' depending on whether their consumption can be feasibly observed and measured. These costs combine to become 'product' or 'period' costs depending on whether one wants to attach them to a product or to the operations of the period. (Recall that direct material, direct labour and manufacturing overhead are product costs for external reporting; other costs are period costs.) When products are sold, their costs become a cost of sales expense. When time expires, period costs become period expenses.

**Exhibit 2.12** Summary of Related Cost Concepts



Cost accounting systems track the flow of costs using period expense accounts and three product accounts: *Work-in-Progress inventory*, *Finished goods inventory* and *Cost of sales*; the last is an expense on the statement of income. A manufacturing company has a more complex cost of sales statement than do service or retail companies. Whereas the retailer purchases goods for sale, the manufacturer makes them, and the statement reflects the tracking of all product costs through the product accounts.

## Key Terms

*For each term's definition, refer to the indicated page, or turn to the glossary at the end of the text.*

accrual cost,	50, 55	indirect costs,	48, 61
administrative costs,	62	indirect labour cost,	61
burden,	48	indirect material cost,	61
cash or out-of-pocket cost,	50, 52	manufacturing overhead cost,	61
committed cost,	53	operating income,	59
conversion cost,	61	opportunity cost,	50
cost,	50	overtime premium,	61
cost accounting system,	57	period costs,	57, 62
cost of sales,	57	product cost,	57
direct cost,	48, 61	raw materials inventory,	63
direct labour,	61	return on sales ratio,	59
direct material,	61	selling cost,	62
expense,	57	shrinkage,	63
financial model,	65	sunk cost,	55
finished goods inventory,	63	variable cost,	53
fixed cost,	54	waste,	63
gross margin ratio,	58	work-in-progress inventory,	63
idle time,	61		

*Review Questions are mostly written at a **basic** level; Critical Analysis questions and Exercises are **intermediate**, and Problems and Cases are **advanced**.*

## Review Questions

- 2.1** What is the difference between the meanings of the terms 'cost' and 'expense'?
- 2.2** What is the difference between product costs and period costs?
- 2.3** Why is cost of sales an expense? Explain.
- 2.4** What are the three categories of product cost in a manufacturing operation? Describe each element briefly.
- 2.5** What does the term 'variable cost' mean?
- 2.6** What does the term 'fixed cost' mean?
- 2.7** Distinguish between material resources, conversion resources and operating resources.
- 2.8** Distinguish between production and non-production resources. Give examples of each.
- 2.9** Explain the concept of classifying resources as direct or indirect.
- 2.10** Is a resource always either direct or indirect? Explain.
- 2.11** Define and give an example of each of the following costs:
  - a.** Opportunity cost
  - b.** Cash cost
  - c.** Product cost
  - d.** Period cost



- e. Direct cost
- f. Indirect cost

**2.12** Is a committed cost the same as a fixed cost? Explain.

## Critical Analysis

- 2.13** Evaluate this statement: Issues of product costing are irrelevant for service organizations since they cannot build up inventories of services, and all costs for providing services are expensed in the period they are used.
- 2.14** Evaluate this statement: Issues of product costing are unimportant for virtual organizations that outsource their production operations.
- 2.15** Prepare a diagram that illustrates how the following resources – headquarters, facilities, division managers, information systems personnel – can be considered both direct and indirect in a company that has four operating divisions, each of which provides multiple services.
- 2.16** Respond to this comment from an economist friend: You cost management analysts use an overabundance of cost terms to cover up the fact that you really do not understand opportunity costs. You create jobs for yourselves based on unintelligible jargon. Not that that's a bad thing.
- 2.17** A colleague challenges you: What do you mean that there is no such thing as a *fixed cost*? Pick up any microeconomics or cost accounting book, and you will see the term used all the time. We have lots of fixed costs in our organization, don't we? What about your salary and the depreciation of your computer? Why do you want to replace *fixed cost* with *committed cost*?
- 2.18** Individually or as a group, prepare written arguments for and against the following proposition. (Be prepared to present your arguments.) The company needs to use accrual costing for financial and tax reporting. We make so many products in so many places that it would be too expensive to develop a separate accounting system based on cash or opportunity costs in addition to the system we are required to have. Our divisions should maintain minimum inventories to avoid committing scarce resources to products that might become obsolete. The way to keep divisions from making more than they can sell is to charge them interest on any inventories they maintain. If divisions want to tie up the company's resources in inventory, then they should pay the company at least the interest it could be earning if the treasurer had the same amount of cash.
- 2.19** Evaluate this criticism of the financial management of processes: All this emphasis on operating income, regardless of how you measure it, contributes to our continuing, short-term outlook. If we focus only on operating income, managers will do whatever they can to increase that measure, regardless of long-term impacts. This is what is wrong with modern business. We need to look beyond this period's operating income and focus on the long term.

## Exercises

### Exercise 2.20 [LO 6] Statement of Cost of Sales

The following items appeared in the records of Zodiac Cooperative for the last year:

Supervisory and indirect labour	€127,000
Supplies and indirect materials	14,000
Work-in-progress inventory, 1 January	135,000
Work-in-progress inventory, 31 December	142,000
Administrative costs	304,000
Depreciation, manufacturing	103,000
Direct labour	482,000
Finished goods inventory, 1 January	160,000
Finished goods inventory, 31 December	147,000
Heat, light and power (plant)	87,000

Marketing costs	272,000
Miscellaneous manufacturing costs	12,000
Plant maintenance and repairs	74,000
Raw material purchases	313,000
Raw material inventory, 1 January	102,000
Raw material inventory, 31 December	81,000
Sales revenue	2,036,000

**Required**

Build a spreadsheet to prepare a statement of income with a supporting schedule of cost of sales.

**Exercise 2.21 [LO 3] Direct Labour: Variable or Fixed Cost**

Recent articles in the business press have reported that many employers are treating direct labour as a true variable cost. Employees are hired and laid off regularly as the employer's needs dictate. One article referred to this practice as 'tapping and zapping employees'. Another article made reference to the new 'just-in-time workforce'.

**Required**

As a group, discuss whether direct labour is a fixed or a variable cost. What are the pros and cons of management treatment of direct labour as a variable cost? Are there ethical issues here?

**Exercise 2.22 [LO 1, 4] Basic Concepts**

Indicate whether each of the following costs incurred in a manufacturing operation is fixed or variable (F or V) and whether it is a period cost or product cost (P or R) under accrual costing.

- a. Sales commissions
- b. Office rent for sales personnel
- c. Salaries for sales supervisors
- d. Office rental for cost management staff
- e. Administrative office heating and air conditioning
- f. Transportation-in costs on materials purchased
- g. Assembly-line workers' wages
- h. Property taxes on office buildings for administrative staff
- i. Salaries of the company's top executives
- j. Overtime pay for assembly workers.

**Exercise 2.23 [LO 1, 3, 4] Basic Concepts**

Indicate whether each of the following costs incurred in a manufacturing operation is included in direct costs (D), conversion costs (C), or both (B).

- a. Assembly-line worker's salary
- b. Direct material used in production
- c. Indirect material used in production
- d. Factory heating and air conditioning
- e. Production supervisor's salary
- f. Transportation-in costs on materials purchased.

**Exercise 2.24 [LO 1, 4] Basic Concepts**

Indicate whether each of the following costs incurred in a manufacturing operation is fixed or variable (F or V) and whether it is a period cost or product cost (P or R) under accrual costing.

- a. Utilities in cost management analysts' office
- b. Factory security personnel
- c. Factory heating and air conditioning
- d. Power to operate factory equipment
- e. Depreciation on furniture for company executives.

### Exercise 2.25 [LO 4, 5] Statements for a Merchandising Company

DigiTech sells computers. On 1 January of this year, it had a beginning product inventory of €500,000, including transportation-in costs. It purchased €2,600,000 of product, had €260,000 of transportation-in costs, and had marketing and administrative costs of €1,600,000 during the year. The ending inventory of product on 31 December of this year was €300,000, including transportation-in costs. Sales revenue was €5,000,000 for the year.

#### Required

Build an Excel spreadsheet to prepare a statement of income with a supporting schedule of cost of sales.

### Exercise 2.26 [LO 6] Statements for a Manufacturing Company

The following balances appeared in the accounts of Osaka Machine Tool Company during the current year. (¥ denotes Japanese yen.)

	1 January	31 December
Raw material inventory	¥328,000	¥366,000
Work-in-progress inventory	¥362,000	¥354,000
Finished goods inventory	¥146,000	¥150,000

During the year, ¥1,732,000 of direct material was used in production, and the year's cost of sales was ¥6,000,000.

#### Required

Prepare a schedule of cost sales, and fill in the following missing data.

- Cost of raw material purchased during the year
- Cost of goods manufactured during the year
- Total manufacturing costs incurred during the year.

### Exercise 2.27 [LO 6] Statements for a Manufacturing Company

The following information appears in Rotterdam Communication Company's records for last year:

Sales revenue	€418,000
Administrative costs	87,500
Manufacturing building depreciation	54,000
Indirect materials and supplies	12,600
Sales commissions	29,000
Raw material inventory, 1 January	36,800
Direct labour	71,200
Raw material inventory, 31 December	38,000
Finished goods inventory, 1 January	21,800
Finished goods inventory, 31 December	17,000
Raw material purchases	44,600
Work-in-progress inventory, 31 December	26,200
Supervisory and indirect labour	28,800
Property taxes, manufacturing plant	16,800
Plant utilities and power	47,000
Work-in-progress inventory, 1 January	30,800

#### Required

Build a spreadsheet to prepare a statement of income with a supporting schedule of cost of sales.

### Exercise 2.28 [LO 1, 2] Statements for a Manufacturing Company

The following information appears in Billund Toy Company's records for last year (DKK million):

Sales revenue	9,930 DKK
Administrative costs	1,970

Manufacturing building depreciation	1,175
Indirect materials and supplies	215
Sales commissions	680
Raw material inventory, 1 January	820
Direct labour	1,630
Raw material inventory, 31 December	900
Finished goods inventory, 1 January	445
Finished goods inventory, 31 December	390
Raw material purchases	1,015
Work-in-progress inventory, 31 December	555
Supervisory and indirect labour	620
Property taxes, manufacturing plant	370
Plant utilities and power	1,150
Work-in-progress inventory, 1 January	660

**Required**

Build a spreadsheet to prepare a statement of income with a supporting schedule of cost of sales.

**Exercise 2.29 [LO 3, 5] Cost Behaviour for Decision Making**

Scafell Pike Company manufactured 1,000 units of product last year and identified the following costs associated with the manufacturing activity (variable costs are indicated with V, fixed costs with F):

Direct material used (V)	£69,000
Direct labour (V)	134,400
Supervisory salaries (F)	61,200
Indirect materials and supplies (V)	15,500
Plant utilities (other than power to run plant equipment) (F)	19,200
Power to run plant equipment (V)	14,700
Depreciation on plant and equipment (straight-line, time basis) (F)	9,600
Property taxes on building (F)	14,000

Per unit variable costs and total fixed costs are expected to remain unchanged next year.

**Required**

Calculate the per-unit variable cost and the average total cost per unit if 1,400 units are produced next year.

**Exercise 2.30 [LO 3] Cost Behaviour**

Refer to the information in the preceding exercise.

**Required**

Construct graphs of total fixed and variable costs.

**Exercise 2.31 [LO 6] Operating Profit**

Or de Paris Mustard Company produces a specialty mustard product, which it sells over the Internet for €22 per case. The company produced 120,000 units (cases) and sold 104,000 units last year. There were no beginning inventories or ending Work-in-progress inventories last year. Manufacturing costs and selling and administrative costs for last year follow:

Direct material	€780,000
Direct labour	450,000
Manufacturing overhead (variable)	180,000

Manufacturing overhead (fixed)	180,000
Selling and administrative (variable)	140,000
Selling and administrative (fixed)	120,000

**Required**

Build a spreadsheet to complete requirements (a) and (b).

- Compute the per unit product (manufacturing) accrual cost.
- Compute the operating profit using accrual costing.

**Problems****Problem 2.32 [LO 3-5] Unknown Account Balances**

Each of the following columns is independent and for a different company. Use the data given, which refer to one year for each company, to find the unknown account balances.

Account	Company		
	1	2	3
Sales revenue	€70,100	€1,088,000	€3,359,900
Raw material inventory, 1 January	8,000	24,600	45,000
Raw material inventory, 31 December	12,400	20,000	(d)
Work-in-progress inventory, 1 January	12,560	11,600	(e)
Work-in-progress inventory, 31 December	12,560	12,000	85,200
Finished goods inventory, 1 January	2,800	254,200	334,480
Finished goods inventory, 31 December	4,600	(b)	367,400
Purchases of raw material	(a)	262,000	248,400
Cost of goods manufactured during the year	58,000	679,200	1,518,220
Total manufacturing costs	58,000	679,600	1,526,800
Cost of sales	56,200	760,000	(f)
Gross margin	13,900	328,000	1,874,600
Direct labour	23,200	173,000	(g)
Direct material used	15,000	(c)	234,200
Manufacturing overhead	19,800	240,000	430,600

**Problem 2.33 [LO 3, 5, 6] Impact of a Decision on Statements of Income**

You have been appointed manager of an operating division of Espoo Technology SE, a manufacturer of products using the latest developments in microprocessor technology. Your division manufactures the chip assembly, CH-1. On 1 January of this year, you invested €1 million in automated processing equipment for the chip assembly. At that time, your expected statement of income for this year was as follows:

Sales revenue	€1,590,000
Operating costs:	
Variable (cash expenditures)	190,000
Fixed (cash expenditures)	750,000
Equipment depreciation	150,000
Other depreciation	125,000
Total operating costs	€1,215,000
Operating profit (before taxes)	€375,000



On 15 November of this year, a sales representative for Hasegawa Machine Company approaches you. Hasegawa wants to rent to your division a new assembly machine that would be installed on 31 December for an annual rental charge of €230,000. The new equipment will enable your division to produce a higher quality product with a sales price 10 per cent higher. Therefore, your division's annual revenue will be 10 per cent higher. (There will be no change in variable costs.) The new machine would decrease fixed cash expenditures by 5 per cent. You will have to write off the cost of the automated processing equipment this year because it has no salvage value. Equipment depreciation shown on the statement of income is for the automated processing equipment.

Your bonus is determined as a percentage of your division's operating profit before taxes. Equipment losses are included in the bonus and operating profit computation.

Ignore taxes and any effects on operations on the day of installation of the new machine. Assume that the data given in your expected statement of income are the actual amounts for this year and next year if you keep the current equipment.

### Required

- What is the difference in this year's divisional operating profit if the new machine is rented and installed on 31 December of this year?
- What would be the effect on next year's divisional operating profit if the new machine is rented and installed on 31 December of this year?
- Would you rent the new equipment? Why or why not?

### Problem 2.34 [LO 6] Schedules of Cost of Goods Manufactured and Sold; Statement of Income

The following data refer to Ferruccio Fashions Company for the year 20x2:

Sales revenue	€945,000
Work-in-progress inventory, 31 December	30,000
Work-in-progress inventory, 1 January	40,000
Selling and administrative expenses	145,000
Income tax expense	80,000
Purchases of raw material	180,000
Raw material inventory, 31 December	25,000
Raw material inventory, 1 January	40,000
Direct labour	200,000
Utilities: plant	40,000
Depreciation: plant and equipment	60,000
Finished goods inventory, 31 December	50,000
Finished goods inventory, 1 January	20,000
Indirect material	11,000
Indirect labour	16,000
Other manufacturing overhead	78,000

### Required

Build a spreadsheet to complete requirements (a) through (c).

- Prepare Ferruccio Fashions' schedule of cost of goods manufactured for the year.
- Prepare Ferruccio Fashions' schedule of cost of sales for the year.
- Prepare Ferruccio Fashions' statement of income for the year.

### Problem 2.35 [LO 3] Fixed and Variable Costs; Forecasting

UK Electronics CIC incurred the following costs during 20x1. The company sold all of its products manufactured during the year.

Direct material	£2,900,000
Direct labour	1,950,000

Manufacturing overhead:	
Utilities (primarily electricity)	140,000
Depreciation on plant and equipment	230,000
Insurance	150,000
Supervisory salaries	300,000
Property taxes	220,000
Selling costs:	
Advertising	195,000
Sales commissions	90,000
Administrative costs:	
Salaries of top management and staff	369,000
Office supplies	40,000
Depreciation on building and equipment	75,000

During 20x1, the company operated at about half of its capacity due to a slowdown in the economy. Prospects for 20x2 are slightly better. The marketing manager forecasts a 20 per cent growth in sales over the 20x1 level.

### Required

Categorize each of the preceding costs as most likely variable or fixed. Forecast or predict the 20x2 amount for each cost item.

### Problem 2.36 [LO 2-4] Characteristics of Costs

The following terms are used to describe various characteristics of costs.

1. Opportunity cost
2. Out-of-pocket cost
3. Sunk cost
4. Direct cost
5. Conversion cost
6. Average cost

### Required

Choose one of the terms to characterize each of the following amounts.

- a. The cost to build an automated assembly line in a factory was €800,000 when the line was installed three years ago.
- b. The management of a high-rise office building using 2,500 square feet of space in the building for its own management functions but could be rented for €250,000.
- c. The direct material and direct labour cost incurred by a mass customizer such as **Dell** to produce its most popular line of laptop computers.
- d. The cost of feeding 500 children in a public school cafeteria is £800 per day, or £1.60 per child per day.
- e. The cost of product inventory purchased two years ago, which is now obsolete.
- f. The cost of direct labour and manufacturing overhead incurred in producing frozen fish fillets.
- g. The €1,000 cost of offering a computer workshop for a group of 20 students, or €50 per student.

### Problem 2.37 [LO 3] Variable Costs; Graphical and Tabular Analyses

Tungsten Metallwerk AG incurs a variable cost of €40 per kilogram for direct material to produce a special alloy used in manufacturing aircraft.

### Required

- a. Draw a graph of the firm's direct material cost, showing the total cost at the following production levels: 10,000 kilograms, 20,000 kilograms and 30,000 kilograms.
- b. Prepare a table that shows the unit cost and total cost of direct material at the following production levels: 1 kilograms, 10 kilograms and 1,000 kilograms.

**Problem 2.38 [LO 3] Fixed Costs; Graphical and Tabular Analyses**

SkyAide SA manufactures a special fabric used to upholster the seats in small aircraft. The company's annual fixed production cost is €100,000.

**Required**

- Graph the company's fixed production cost showing the total cost at the following production levels of upholstery fabric: 10,000 m<sup>2</sup>, 20,000 m<sup>2</sup>, 30,000 m<sup>2</sup> and 40,000 m<sup>2</sup>.
- Prepare a table that shows the unit cost and the total cost for the firm's fixed production costs at the following production levels: 1 m<sup>2</sup>, 10 m<sup>2</sup>, 10,000 m<sup>2</sup> and 40,000 m<sup>2</sup>.
- Prepare a graph that shows the unit cost for the company's fixed production cost at the following production levels: 10,000 m<sup>2</sup>, 20,000 m<sup>2</sup>, 30,000 m<sup>2</sup> and 40,000 m<sup>2</sup>.

**Problem 2.39 [LO 6] Reconstructed Financial Statements**

The following data appeared in Dublin Flooring's records on 31 December of last year:

Sales revenue	€812,500
Direct material used	191,050
Work-in-progress inventory, 31 December	12,300
Raw material inventory, 31 December	42,500
Raw material purchased during the year	180,000
Finished goods inventory, 31 December	45,000
Indirect labour	16,000
Direct labour	195,000
Plant heat, light and power	22,600
Building depreciation (7/9 is for manufacturing)	40,500
Administrative salaries	24,900
Miscellaneous factory cost	16,950
Selling costs	19,300
Maintenance on factory machines	6,050
Insurance on factory equipment	9,500
Distribution costs	800
Taxes on manufacturing property	6,550
Legal fees on customer complaint	4,100

On 1 January, last year, the Finished goods inventory account had a balance of €40,000, and the Work-in-progress inventory account had a balance of €12,950.

**Required**

Build a spreadsheet to prepare a schedule of cost of sales and a statement of income.

**Problem 2.40 [LO 5] Unknown Account Balances**

Each of the following columns is independent and for a different company. Use the data given, which refer to one year for each example, to find the unknown account balances.

Account	Company		
	1	2	3
Finished goods inventory, 1 January	€1,900	(d)	€17,200
Finished goods inventory, 31 December	300	€4,400	28,400
Work-in-progress inventory, 1 January	2,700	6,720	82,400
Work-in-progress inventory, 31 December	3,800	3,100	76,730
Raw material inventory, 1 January	(a)	3,500	16,000

Raw material inventory, 31 December	3,600	2,900	14,100
Purchases of raw materials	16,100	12,000	64,200
Cost of goods manufactured during the year	(b)	27,220	313,770
Total manufacturing costs	55,550	23,600	308,100
Cost of sales	56,050	27,200	302,570
Gross margin	(c)	16,400	641,280
Direct material used	15,300	(e)	66,100
Direct labour	26,450	3,800	124,700
Manufacturing overhead	13,800	7,200	(g)
Sales revenue	103,300	(f)	943,850

### Problem 2.41 [LO 3-5] Cost Concepts

The following data pertain to the Photon Gizmo manufactured by Geneva Gizmos AG:

Sales price	CHF 175 per unit
Fixed costs:	
Selling and administrative	CHF 20,000 per period
Manufacturing overhead	CHF 15,000 per period
Variable costs:	
Selling and administrative	CHF 5 per unit
Manufacturing overhead	CHF 30 per unit
Direct labour (manufacturing)	CHF 10 per unit
Direct material (manufacturing)	CHF 40 per unit
Number of units produced and sold during the period	1,000 units

#### Required

- How much is the variable *manufacturing cost* per unit?
- How much is the *variable cost* per unit?
- How much is the *accrual cost* per unit?
- How much is the *direct cost* per unit?
- How much is the *conversion cost* per unit?
- How much is the *profit margin* per unit?
- How much is the *gross margin* per unit?
- If the number of units increases from 1,000 to 1,200, which is within the company's relevant range of activity, will the *fixed manufacturing cost* per unit decrease, increase, or stay the same? Why?

### Problem 2.42 [LO 1, 4] Cost Concepts

Items (a) through (e) are to be based on the following data pertaining to Atlántico's manufacturing operations:

Inventories	1 November	30 November
Raw material	€9,000	€8,500
Work-in-progress	4,500	3,000
Finished goods	13,500	18,000

Additional information for the month of November:

Raw material purchased	€22,000
Direct labour costs	14,000
Manufacturing overhead	20,000
Selling and administrative expenses	11,000
Sales revenue	99,000

**Required**

Calculate the following amounts for the month of November:

- a. Direct costs
- b. Conversion costs
- c. Total manufacturing costs
- d. Cost of goods manufactured
- e. Cost of sales

[CPA adapted]

**Cases****Case 2.43 [LO 2-5] Cost Data for Managerial Purposes**

Florida Fruits Inc. agreed to sell 40,000 cases of Fang, a dehydrated fruit drink, to **NASA** for use on the international space station at 'cost plus 10 per cent'. The company operates a manufacturing plant that can produce 120,000 cases per year, but it normally produces 80,000. The costs to produce 80,000 cases are as follows:

	Total	Per case
Direct material	\$960,000	\$12.00
Direct labour	1,520,000	19.00
Supplies and other costs that vary with production	640,000	8.00
Costs that do not vary with production	440,000	5.50
Variable selling costs	160,000	2.00
Administrative costs (all fixed)	<u>160,000</u>	<u>2.00</u>
Total	<u>\$3,880,000</u>	<u>\$48.50</u>

Based on these data, company management expects to receive \$53.35 (that is,  $\$48.50 \times 110$  per cent) per case for those sold on this contract. After completing 10,000 cases, the company sent a bill (invoice) to the government for \$533,500 (that is, 10,000 cases at \$53.35 per case).

The president of the company received a call from a NASA representative, who stated that the per-case cost should be as follows:

Material	\$12
Labour	19
Supplies and other costs that vary with production	<u>8</u>
Total	<u>\$39</u>

Therefore, the price per case should be \$42.90 (that is,  $\$39 \times 110$  per cent). NASA ignored selling costs because the contract bypassed the usual sales channels.

**Required**

What price would you recommend? Why? Write a memo to management explaining your reasoning. (*Note:* You need not limit yourself to the costs selected by the company or by the NASA representative.)

**Case 2.44 [LO 2, 4, 5] Cost Analysis for Decision Making**

Le Vin Plus Ordinaire is a start-up winery that purchases excess grapes at a discount from established wineries in several regions of France. Le Vin owns a small fleet of trucks that picks up grapes from wineries and delivers wine to its distributor. On average the return distance of a pick up or delivery is 100 km. Consider the data below to complete the required analyses.

<i>Costs of excess grapes</i>		
Average discount price paid to growers for grapes	€2,000	per metric ton
Annual purchases of grapes	500	metric tons
Average cost for delivery by vineyard	€100.00	per delivery, up to 2 metric tons
<i>Costs per delivery truck</i>		
Purchase cost	€30,000	per truck (purchased 2 years ago)
Useful life, years	10	years
Useful life, kilometres driven	300,000	km over complete useful life
Annual maintenance	€2,100	per year
Annual licence and insurance	€3,200	per year
Fuel usage	7.00	km per litre
Fuel cost	€1.40	per litre
<i>Costs of a truck driver</i>		
Annual salary	€28,000	per year
Annual benefits	€14,000	per year

### Required

- Compute the out-of-pocket or cash cost to make an average pick up of 1.5 metric tons of grapes.
- Compare the cash cost to the average delivery price charged by a vineyard.
- Should Le Vin Plus Ordinaire continue to own and operate its trucks? Explain.
- Le Vin Plus Ordinaire is considering whether to get rid of its trucks and rely on deliveries from vineyards.
  - Compute the accrual cost to pick up 1.5 metric tons of excess grapes from a vineyard that is 50 km distant.
  - Is the accrual cost of the pick-up a reliable guide to whether Le Vin should continue to own and operate its trucks? Explain.
  - What qualitative considerations should Le Vin also consider before switching to deliveries by vineyards?

### Case 2.45 [LO 2, 4, 5] Cost Analysis for Decision Making

The Green Thumb Landscaping Company prepares lawns and gardens in the spring, mows lawns and tends ornamental gardens in the summer, rakes leaves in the autumn, and clears snow in the winter. Green Thumb is located centrally but performs jobs for customers along the Front Range of the Rocky Mountains in Colorado USA, along an approximately 100 mile corridor.

Green Thumb owns all the necessary vehicles and equipment, which are billed to customers by the mileage driven to and from the job and by the hours of services provided, respectively. A vehicle that carries the service crew and its equipment cost \$40,000 to purchase and typically is driven 20,000 miles per year (400,000 miles over its lifetime) and costs \$6,000 per year for depreciation, insurance, etc. Fuel in the US costs approximately \$4.00 per gallon, and Green Thumb's vehicles average 16 miles per gallon of fuel. Equipment on average has a useful life of 4,000 hours of use, and equipment for an entire crew costs approximately \$5 to operate per hour. The purchase cost for equipment for an entire crew is approximately \$10,000.

The company hires workers at an hourly rate of \$20 per hour, including taxes and benefits. The company employs 4 crews year round. The company has 'home office' costs for salaries and facilities of approximately \$200,000 per year.

### Required

- Compute the out-of-pocket cost(s) of completing jobs.
- Compute the accrual cost(s) of completing jobs. Should you include a portion of home office costs? Why or why not? If so, how?
- Compute the out-of-pocket cost to complete a job that is 40 miles distant and will take 40 hours of work.
- Compute the accrual cost to complete a job that is 40 miles distant and will take 40 hours of work.
- If the company has idle time, what is the opportunity cost of taking a job that is 50 miles distant and that will take 10 hours of work?



### Case 2.46 [LO 1] Inventory Turnover

Campus Bookstore is a profit-making organization that reports to the Student Council. Marta Nováková, a part-time student employee, noticed that the managers at the bookstore seemed unconcerned about the costs of carrying large inventories. For example, several times a year the manager of the General Merchandise Department (one of six departments) bought large quantities of product (clothing, gift items, etc.) with the university and sports team logos to get quantity discounts. The General Merchandise manager also had argued successfully for more warehouse space for the products, for which the bookstore pays rent to the university. Inevitably, several months later, the manager would mark down the unsold products to purchase cost or less to make room for the next purchase. This seemed very inefficient to Nováková, and she began to analyse the bookstore's purchases and sales for the past year. She gathered the following data.

Department	Cost of sales	Average inventory	Percentage of warehouse space	Average number of days items were purchased in advance of sale
New textbooks	€5,730,972	€840,475	25%	63
Used textbooks	1,258,007	180,600	12	37
Trade books	563,686	370,500	10	86
Supplies	662,560	251,700	8	71
General merchandise	883,251	640,600	25	94
Computers	<u>2,246,600</u>	<u>402,000</u>	<u>20</u>	<u>28</u>
Total store	<u>€11,345,076</u>	<u>€2,685,875</u>	<u>100%</u>	<u>66.3</u>

#### Required

- Compute inventory turnover ratios (i.e., cost of sales ÷ average inventory) for each department and the bookstore as a whole. What would these ratios tell Nováková about the management of inventories at Campus Bookstore? Is it reasonable to compare these ratios across departments? Why or why not?
- A privately owned store in the university commercial area sells licensed (general) products with the university's logo and reported to Nováková that its inventory turnover ratio for the past year was 5.30. Is that a legitimate benchmark for Campus Bookstore? Why or why not?
- What are the benefits and costs to the bookstore of its methods for purchasing and inventory?
- What information would Nováková need to place a dollar figure on all of those costs?
- Nováková has learned that the manager of the General Merchandise Department is a close personal friend of the bookstore manager and receives incentive prizes from suppliers for ordering large quantities of products. What are her ethical responsibilities?

### Case 2.47 [LO 4-6] 'I Enjoy Challenges'; Effect of Changes in Production and Costing Method on Operating Profit

(This classic case is based on an actual company's experience.) Brassinni Company uses an accrual cost system to apply all production costs to units produced. The plant has a maximum production capacity of 40 million units but produced and sold only 10 million units during year 1. There were no beginning or ending inventories. Brassinni Company's statement of income for year 1 follows:

BRASSINNI COMPANY	
Statement of income	
For the year ending 31 December, Year 1	
Sales (10,000,000 units at €6)	€60,000,000
Cost of sales:	
Direct costs, material and labour (10,000,000 at €2).	€20,000,000

Manufacturing overhead	<u>48,000,000</u>
Cost of sales	<u>68,000,000</u>
Gross margin	(8,000,000)
Selling and administrative costs	<u>10,000,000</u>
Operating profit (loss)	<u>€(18,000,000)</u>

The board of directors is concerned about the €18 million loss. A consultant approached the board with the following offer: 'I agree to become president for no fixed salary. But I insist on a year-end bonus of 10 per cent of operating profit (before considering the bonus).' The board of directors agreed to these terms and hired the consultant as Brassinni's new president.

The new president promptly stepped up production to an annual rate of 30 million units. Sales for year 2 remained at 10 million units. The resulting Brassinni Company accrual-costing statement of income for year 2 follows:

<b>BRASSINNI COMPANY</b>	
<b>Statement of Income</b>	
<b>For the year ending 31 December, Year 2</b>	
Sales (10,000,000 units at €6)	€60,000,000
Cost of sales:	
Cost of goods manufactured:	
Direct costs, material and labour (30,000,000 at €2)	60,000,000
Manufacturing overhead	<u>48,000,000</u>
Total cost of goods manufactured	<u>108,000,000</u>
Less: Ending inventory:	
Variable (20,000,000 at \$2)	40,000,000
Indirect ( $20/30 \times \$48,000,000$ )	<u>32,000,000</u>
Total ending inventory	72,000,000
Cost of sales	<u>36,000,000</u>
Gross margin	24,000,000
Selling and administrative costs	<u>10,000,000</u>
Operating profit before bonus	14,000,000
Bonus	<u>1,400,000</u>
Operating profit after bonus	<u>€12,600,000</u>

The day after the statement was verified, the president took his cheque for €1,400,000 and resigned to take a job with another corporation. He remarked, 'I enjoy challenges. Now that Brassinni Company is in the black, I'd prefer tackling another challenging situation.' (His contract with his new employer is similar to the one he had with Brassinni Company.)

### Required

- Step back, and look at this overall situation. In general, what do you think is going on here? More specifically, how would you evaluate the company's year-2 performance?
- If you valued inventory at only variable cost, what would operating profit be for year 1? For year 2? (Assume that all fixed production costs and non-product costs are unchanged.) Compare those results with the accrual statements.
- Comment on any ethical issues you see in this scenario.

### Case 2.48 [LO 5, 6] Analysis of Costing; Import Decisions

Cotierre imports designer clothing manufactured by subcontractors in Mexico. Clothing is a seasonal product. The goods must be ready for sale prior to the start of the season. Any goods left over at the end

of the season usually must be sold at steep discounts. The company prepares a dress design and selects fabrics approximately six months before a given season. It receives these goods and distributes them at the start of the season. Based on past experience, the company estimates that 60 per cent of a particular lot of dresses will be unsold at the end of the season and will be marked down to one-half of the initial retail price. Even with the markdown, a substantial number of dresses will remain unsold and will be returned to Cotierre and destroyed. Although a large number of dresses must be discounted or destroyed, the company needs to place a minimum order of 1,000 dresses to have a sufficient selection of styles and sizes to market the design.

Recently, the company placed an order for 1,000 dresses of a particular design for \$25,000 plus import duties of \$5,000 and a \$7 commission for each dress sold at retail, regardless of the price. Return mailing and disposing of each unsold dress cost \$3 after the end of the markdown period.

### Required

- Compute the accrual cost of each dress in this lot of dresses.
- Suppose that the company sells 30 per cent of the dresses in this lot for \$75 each during the first accounting period. What is the accrual value of the ending inventory? What is the operating profit or loss for the period, assuming no other transactions and that the season has not ended, so that the number of dresses subject to markdown or to be returned is unknown?
- During the second period, 10 per cent of the 1,000 dresses were sold at full price, and 30 per cent were sold at the half-price markdown. The remaining dresses were returned and disposed of. What is the operating profit or loss for the period, assuming no other transactions?
- Suggest a method to account for these dresses that would more closely relate revenues and costs.



## Solutions to You're the Decision Maker

### 2.1 Opportunity Cost, p. 50

The opportunity cost of seeing Radiohead is the value of what you must sacrifice to attend their concert - the value to you of attending the Lady Gaga concert, €50, less the €40 you would have to pay for a ticket. If you did not get the correct answer of €10, you have company. Only 21.6 per cent of the professional economists surveyed chose that answer. The accounting cost is €0, because that is the observed transaction price.

Source: Ferraro and Taylor (2005).

### 2.2 Cost Reductions, p. 60

- Sacs Chameaux statement of income


Sacs Chameaux, without cost reductions	20xx (adjusted)	Percentage change
Sales turnover	€2,370,480	-17%
Cost of sales	1,142,400	0%
Gross margin	1,228,080	-28%
Period expenses	1,245,000	0%
Operating income	(16,920)	-104%

- The required cost reduction could ripple through the entire industry 'supply chain' to the most basic supplier. Sacs Chameaux may try to reduce its costs, and try to persuade its suppliers (e.g., the fabric wholesaler, Arnault Expert Comptable, and so on) to reduce sales prices. These suppliers may in turn pressure their suppliers to reduce their prices. Eventually, all participants in the chain may seek the lowest cost supplies and suppliers, who might be located externally to their firms and in low-cost regions of the world. One could get anxious and expect that one day there will be (low) world prices for everything. We can probably relax a bit because the world is not static, and innovations will always keep the supply chains in flux.

### 2.3 Sacs Chameaux's Opportunities for Cost Savings, p. 66

- All of the costs to be added (direct material, direct labour and manufacturing overhead) may be changeable next year. None of the 20xx ending inventory balances can be changed; they are sunk costs.



-  **b.** A backpack would have to lose an average of 17% or €9.65 (= 194,208/20,130) based on 20xx production costs.
- c.** Some organizations levy uniform cost reductions across all departments, but that usually is unwise. Some costs might be easier than others to cut, and cutting some costs might adversely affect the quality of the product to a greater or lesser degree. The company should look to cut activities and costs that do not affect the quality of the product or the timeliness of filling orders. Many of these may be found in manufacturing overhead and period expenses. Perhaps more 'back office' services can be outsourced more cheaply, but assuming this will be true is not safe. It may be neither wise nor possible to cut direct labour or direct materials without harming quality, but these should be investigated for obvious waste and streamlining.
- d.** If production costs are reduced, one certainly could, for internal and customer bargaining purposes, revalue the beginning inventories for purposes of computing and demonstrating potentially sufficient cost savings. One could investigate whether writing down the inventories and taking a period loss is wise and allowed for external reporting.

## Endnotes

- 1 You may jump to the end of this chapter to view Exhibit 2.12 to see an abstraction of the many possibilities, but don't be dismayed – we will work through the complications. The key is to understand why one is measuring cost in the first place, then settle on a definition of cost.
- 2 Sacs Chameaux SA is a fictional company that is based loosely on the experiences of Millet, which was acquired by the Lafuma Group in 1995.
- 3 Other external entities that are part of the extended value chain include materials suppliers, energy utilities, legal services and labour unions. The figure does not include these entities for economy of presentation.
- 4 Adapted from a 2005 study by Ferraro and Taylor.
- 5 If €8 is a competitive market price, this also is a market-based measure of opportunity cost. However, not all markets are competitive, and some participants may recognize opportunities to use inputs to generate even higher values.
- 6 But wait, we are not done with the complexity surrounding the cost of the nylon fabric. The previous measure of cost relied on observed transactions that exchanged resources (e.g., fabric for cash). Not all transactions are mediated by observed exchanges. For example, the cost of the nylon fabric reflects its production costs, which includes the costs of hydrocarbon materials usually obtained from oil, but this portion of cost is incomplete. The market price for oil fluctuates, but so far it does not include the unobserved environmental cost associated with the production and use of oil. Likewise, the cost of the fuel used by Sac Chameaux's trucks does not include the environmental and social costs of resulting emissions. These interesting pressures on the meaning and measurement of the 'true' cost of human activities are controversial and constantly evolving. For example, the cost of extracting oil, from which nylon is made, from deep-water wells might resemble the 'true' cost if insurance rates adjust to account for damages like those experienced by British Petroleum's 2010 blowout in the Gulf of Mexico. Similarly, participants in the Kyoto Protocol trade carbon credits to mitigate environmental costs of harmful emissions from fossil fuel, and in the process measure the costs of these emissions. The full treatment of these costs is beyond the scope of this text.
- 7 We defer to Chapter 8 the related discussion of tax effects from gains or losses on sales of resources or depreciation of historical purchase prices of long-lived capacity resources.
- 8 The timing of expenses can also be important to managers when a firm's or their performance is measured by periodic income. This important topic, which reflects complications of managers' incentives, is discussed in Chapter 14.
- 9 The statements in Exhibit 2.7 also resemble those of service firms, except that gross margin is computed as sales turnover minus cost of *services provided*.

## References

- Brierly, J.A., C.J. Cowton and C. Drury (2006) 'The application of costs in make-or-buy decisions: an analysis', *International Journal of Management*, vol. 23, no 4, pp. 794–800.
- Ferraro P.J. and L.O. Taylor (2005) 'Do economists recognize an opportunity cost when they see one? A dismal performance from the dismal science', *Contributions to Economic Analysis and Policy*, vol. 4, no. 1, [www.bepress.com/bejeep/contributions/vol4/iss1/art7](http://www.bepress.com/bejeep/contributions/vol4/iss1/art7)
- Skinner, R.C. (1990) 'The role of profitability in divisional decision making and performance evaluation', *Accounting and Business Research*, vol. 20, no. 78, pp. 135–141.