CHAPTER 3

Value and logistics costs

Objectives

The planned objectives of this chapter are to:

- **explain the concept of value and its implications for managing the supply chain;**
- **explain how total costs can be divided up in different ways, and how they can be applied to managing the supply chain;**
- **identify how better cost information can be used to create more value.**

By the end of this chapter you should be able to understand:

- **what is meant by the term 'value creation';**
- **how logistics costs can be managed for better value creation;**
- **how activity-based management can be used to identify the cost drivers in your business.**

Introduction

In section 1.3 of Chapter 1 we reviewed the way in which different products may have different logistics strategies. While the range of classic shirts compete on price and brand, and demand is relatively stable over the year, fashion blouses compete on style and brand. For a fashion product, the logistics challenge is to be able to support highly uncertain demand in the marketplace. The logistics task for the two supply chains is essentially different, and some companies refer to a 'supply chain for every product' to emphasise this difference. In Chapter 2, we stated the need for compromise here – between 'one size fits all' on the one hand, and endless customisation on the other.

Here, we develop the information flow aspects of our model in Figure 1.4. We also show how there is another flow in supply chains – *funds flow*. Funds flow in the opposite direction to materials. Funds – in the form of cash – originate from the end-customer, and are used to pay the bills progressively from one supply chain partner to the next upstream.

While funds flow has not yet been formally included in the logistics domain, the integration of finance and logistics is an increasingly important aspect of logistics in the twenty-first century. The acquisition of Vastera (a third party logistics company) by JP Morgan Chase Bank (a financial institution) to form JP Morgan Chase Vastera is aimed at 'driving cost savings and global supply chain

efficiencies while providing best-in-class compliance with government regulations'.

This chapter probes the financial implications of different logistics strategies. While it may be clear that cost must form a central plank of supply chain strategy for classic shirts, that is not to say that the product team for fashion blouses can ignore the cost implications of their actions (see Table 1.1). The common theme is the concept of *value*, and the extent to which both management teams are creating value for the end-customer. Here, we advance the concept of 'value' beyond the mainly end-customer view that we took in Chapter 2, and extend it to other stakeholders in the supply chain.

While value is based on *cost* from the point of view of the company accountant, the concept of value may have different interpretations outside the company. In section 2.4.3, we stated that value from the end-customer's point of view is the *perceived benefit* gained from a product/service compared with the cost of purchase. From the shareholder's point of view, value is determined by the *best alternative use* of a given investment. In other words, value is greatest where the return on investment is highest.

Key issues

This chapter addresses five key issues:

1. **Where does value come from?**: different views of value, and how it can be measured using return on investment.
2. **How can logistics costs be represented?**: three different ways to divide up total costs.
3. **Activity-based costing (ABC)**: a process-based alternative to allocating overheads.
4. **A balanced measurement portfolio**: balancing the needs of all stakeholders.
5. **Supply chain operations reference model (SCOR)**: a further process-based approach to measuring supply chain costs and performance.

The chapter assumes a basic knowledge of a profit/loss account and balance sheet. If finance is not your long suit, then a helpful accompanying financial text is *Management Accounting for Non-Specialists* (Atrill and McLaney, 2007). We acknowledge the assistance from our colleague at Cranfield, Sri Srikanathan, for his help with sections 3.1 and 3.2. Figures 3.1 to 3.7 and Table 3.2 are from his lectures.

3.1 Where does value come from?

***Key issue:* How can shareholder value be defined? What is economic value added, and how does it help in this definition?**

Creating shareholder value is widely used today to describe the main objective of a business. In its simplest form, shareholder value is created when the shareholder gets a better return by investing in your business than from a comparable investment. A *comparable investment* is one that has a similar level of risk. You

might make the same return on €100,000 from playing roulette as you do from buying a house, but the risk profiles are very different! In order for a business to create superior shareholder value, it must have a competitive advantage. Return on investment is an important measure that is widely used to assess shareholder value.

3.1.1 Return on investment (ROI)

One way of looking at the creation of shareholder value is to end the year with a lot more money than at the start. If this extra money results from profitable trading, then management has been successful in *improving the productivity of capital*. Return on investment (ROI) is measured as profit (in €) before interest and tax as a percentage of capital employed (also in €):

% ROI = 100 × € Profit / € Capital employed

The term 'investment' is used because capital employed is equivalent to the money invested in the business. ROI can also be seen as the outcome of profitability and asset utilisation:

$$\%\ \text{ROI} = 100\ \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital employed}}$$

Let us look at the detail behind each of these ratios, and the way they fit in with each other. Figure 3.1 gives a family tree of the way return on investment is made up. Let us look at the potential for improving each from a point of view of managing the supply chain better.

Sales

Superior customer service improves sales, and makes our company more valued by the customer in the long term.

- Improving customer responsiveness is a key goal for managing the supply chain.

Costs

The supply chain is a potential gold mine for making bottom line improvements to business performance. But directors of many businesses are impatient for cost improvement, and consider that cutting stocks and headcount is all that is needed. This may achieve short-term margin improvement, but strategic supply chain management is about improving the way things are done and hence improving long-term performance.

- Supply chain modelling shows that manufacturing and distribution costs together with inventories can be optimised while customer service is maximised.
- Studies in efficient consumer response (ECR) have shown that cutting out non-value-added products and inefficient promotional activity can reduce overall costs by 6 per cent. (ECR is discussed in Chapter 8.)

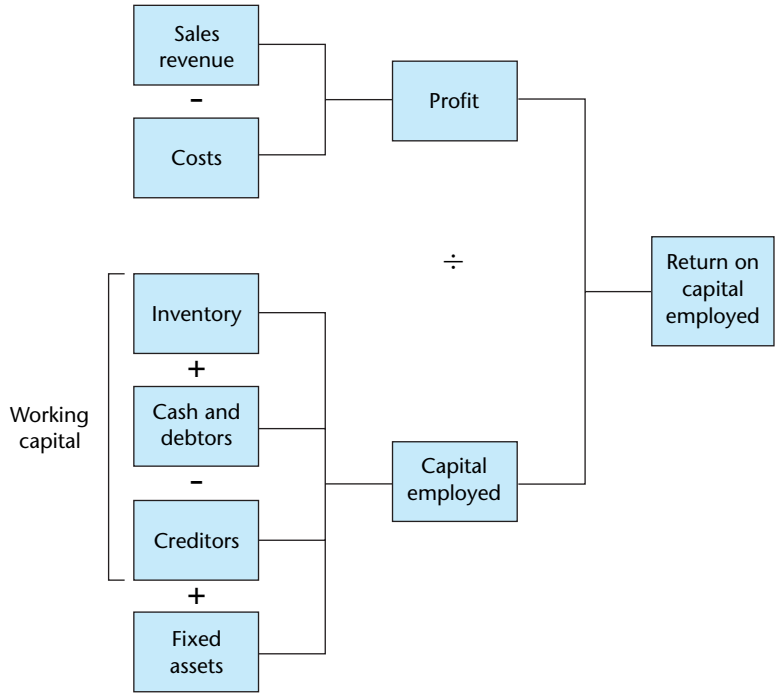

Figure 3.1 **The make-up of return on capital employed (investment)**
(Source: Courtesy of Sri Srikanthan)

Working capital

Note that the combination of inventory, cash and debtors *less* creditors is called working capital. Each of the elements of working capital is considered in turn.

Inventory

This is a major asset in many businesses. It is there to buffer uncertainty of supply and demand, and to permit immediate availability when replenishment times are too lengthy. However, inventory is often regarded as a hindrance rather than a help: it ties up cash, it needs resources to be stored and it becomes obsolete.

- A primary goal for supply chain management is to replace inventory with information. Try to minimise the use of forecasts and to increase the use of real demand.
- Question any means for automatically replenishing inventory.

Cash and debtors

The key task here is to make the time between receipt of customer order and receipt of the cash as short as possible. Progress against this ideal not only makes the company more competitive by reducing lead times, but also improves its cash position. This means that business processes from sales order processing to distribution should be integrated and free from waste.

- Debtors (customers who owe us money) can be minimised by basic controls such as regular review and problem resolution. Sending out incomplete invoices is an invitation for non-payment!

Creditors

Creditors are people we owe money to. In supply chain terms, this term applies mainly to our suppliers. Many organisations think that lengthy payment terms to suppliers maximise credit and therefore improve the balance sheet. The downside of this thinking is that suppliers factor in the credit terms to their prices, and their own balance sheets become saddled with debt.

- Plan material requirements and distribution requirements to maximise flow of parts through the supply chain as needed.
- Discipline goods inwards to check delivery date, quality and correct prices. There is no point in starting the credit cycle early.
- If the supplier is a smaller company, it may be that the cost of capital is higher than it is for your company. It may be worthwhile to consider negotiating with the supplier to pay early, and therefore getting a share of the money that the supplier is paying in interest to the bank.

Fixed assets

The value-generating assets of a business that form the focus of supply chain management are a heavy drain on capital. They include manufacturing facilities, transport and distribution. They contribute to high *fixed costs* for an operation: that is, costs that do not change much with throughput. Such costs are therefore highly volume sensitive, as we shall see.

- Many organisations respond by a 'maximum variable, minimum fixed' policy. This is helped by *outsourcing* all but the core capabilities, which are retained in-house. Thus transport and warehousing are today often outsourced to specialist 'third-party logistics providers' such as DHL Exel and UPS.

Activity 3.1

1 Review the categories in Figure 3.1 and compile your own list of the way in which these categories can be influenced (made better or worse) in an organisation.
2 What are the implications for logistics strategy?

3.1.2 Financial ratios and ROI drivers

ROI is an important measure for assessing shareholder value and is underpinned by two main drivers:

- increased profitability;
- increased asset utilisation.

As discussed section 3.1.1, these two supporting drivers are the key determinants for increasing ROI and hence shareholder value. An understanding of the financial ratios that affect these two drivers is essential when formulating an organisation's supply chain strategy. While financial ratios are based on historical information, and therefore have limitations, they have a number of advantages for an organisation. They can be:

- a benchmark for comparing one organisation with another;
- used as a comparator for a particular industrial sector;
- used to track past performance;
- a motivator for setting performance targets;
- an early warning indicator if the organisation's performance starts to decline.

Table 3.1 provides a guide to linking ROI and its drivers with the financial ratios for a manufacturing company (CIMA, 1989).

Table 3.1 ROI and its key drivers

Level 1	Level 2	Level 3	Level 4
Return on investment	$\frac{\text{Net profit}}{\text{Sales}}$	Production costs as % of sales	Labour costs as % of sales Materials as % of sales
		Selling costs as % of sales	Labour costs as % of sales
		Administration costs as % of sales	Labour costs as % of sales
	$\frac{\text{Sales}}{\text{Total assets}}$	Fixed assets as % of sales	Property as % of sales Plant as % of sales Vehicles as % of sales
		Current assets as % of sales	Inventory as % of sales Debtors as % of sales Cash as % of sales

Section 3.2 of this chapter tackles the issues concerning the visibility of costing information. This form of analysis can be applied to benchmark an existing operation with a competitor, or it can be used to assess the implications on ROI against potential *trade-offs* (see section 1.4.3), such as comparing an in-house operation with a third party outsourcing alternative.

The use of financial ratios in relation to time are key to monitoring working capital and the 'cash to cash' cycle. Key time-related ratios include:

- *average inventory turnover*: the number of times inventory is turned over in relation to the cost of good sold;
- *average settlement period for debtors*: the time taken for customers to pay their invoices;

- *average settlement period for creditors*: the time taken for an organisation to pay its creditors.

Reductions in working capital will have a beneficial effect on an organisation's ROI. For example, inventory reductions increase both profitability (reduced costs) and capital (increased asset utilisation). Supply chain decisions have an impact on costs *and* assets, so they affect both the drivers of ROI. Understanding the trade-offs involved is key to increasing value.

3.2 How can logistics costs be represented?

Key issues: **What are the various ways of cutting up the total cost 'cake', and what are the relative merits of each?**

We all have a pretty good idea of what the total costs of a business are in practice. The costs of such items as materials used, power and wages all lead to bills that have to be paid. What is not so clear is how these costs should be allocated to supply chain processes – or even to products for that matter. Christopher (2005) states that problems with traditional cost accounting as related to logistics include:

- the true costs of servicing different customer types, channels and market segments are poorly understood;
- costs are captured at too high a level of aggregation;
- costing is functionally oriented at the expense of output;
- the emphasis on full cost allocation to products ignores customer costs.

This section reviews commonly used ways of representing costs (fixed and variable, direct and indirect), and one less commonly used way (engineered and discretionary). If you are already familiar with the concepts of variable and fixed costs and break-even charts, then start at section 3.3. Bear in mind that the total cost picture is always the same; the different ways of representing them are simply different ways of 'cutting the cake'. Let us look at the total cost as a cube instead of a cake. Then the three different ways of representing costs can be shown as different ways of cutting up the cube (Figure 3.2).

The important point here is that the total cost is constant: it is the ways we *analyse* that cost that are different. Why analyse it in different ways? To gain better information about our cost basis so that we can manage the business better. Let us look in turn at each of these ways to cut the total cost cube.

3.2.1 Fixed/variable

One popular way of analysing costs is to consider the effect of *volume of activity* on them. Costs tend to respond differently as the volume changes:

- *fixed costs* tend to stay the same as volume of activity changes, or at least within a given volume range;
- *variable costs* change as the volume of activity changes.

Fixed costs include things such as warehouse rental, which is charged on a time basis (€/month). As volume of activity increases, additional warehouses may be added around Europe, and we get the familiar *stepped fixed costs*, as shown in Figure 3.3 opposite. The same relationship would apply if volumes were reduced and a warehouse closed.

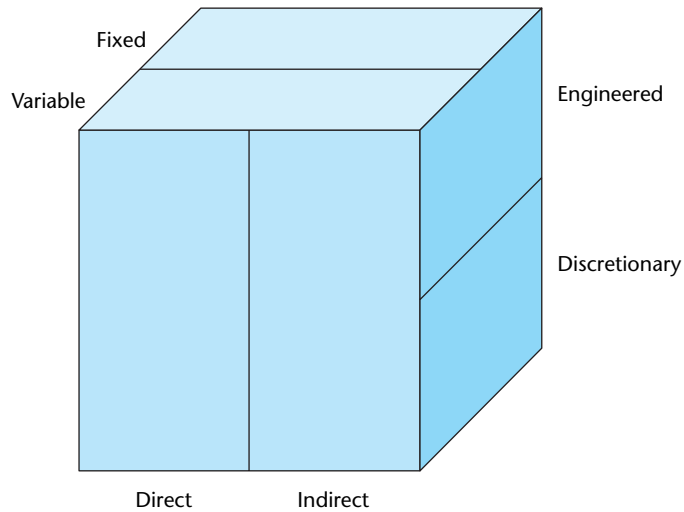

Figure 3.2 Three ways to cut the 'total cost cube'
(Source: Courtesy of Sri Srikanthan)

Variable costs include things such as direct materials, which are ordered in line with demand. If demand increases, we buy more. Starting with zero cost at zero activity, variable costs increase roughly in line with volume, as shown in Figure 3.4 opposite.

If we add the variable costs to the fixed costs against a given range of volume (so that the fixed costs remain completely fixed), and add in the sales revenue (which also increases in line with volume), we arrive at the break-even chart shown in Figure 3.5 overleaf. The sloping line that starts at O is the sales revenue. The total cost line starts at F, and represents the sum of fixed and variable costs. The point at which the sales revenue line crosses the total cost line is the break-even point. Below this point, a loss will be incurred; above it a profit will be made.

A helpful concept in evaluating break-even charts is that of contribution:

Contribution = Sales less variable costs

Therefore contribution is the fixed costs plus the profit. Contribution is useful in decision making. High contribution per unit indicates a more volatile business: that is, one that is more risky. Therefore we should expect a business with high contribution/unit to provide a higher return on investment in the longer term. Look at the two break-even charts in Figures 3.6 and 3.7 overleaf. What are the

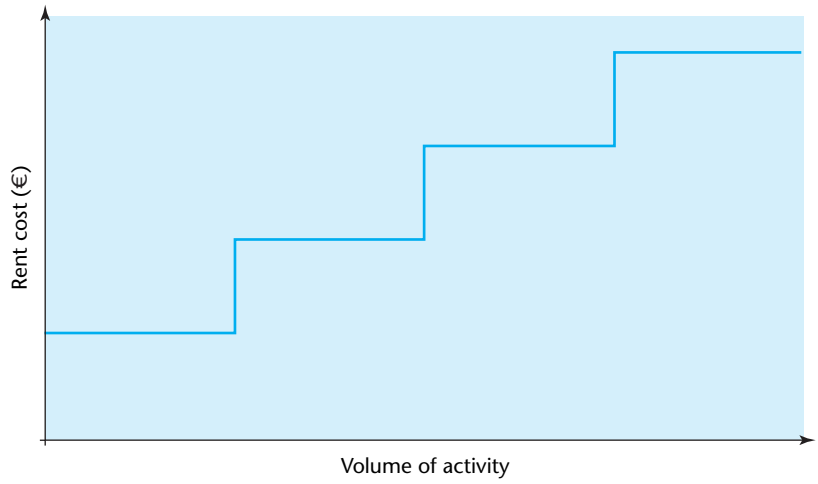

Figure 3.3 **Rent cost against volume of activity**

(Source: Courtesy of Sri Srikanthan)

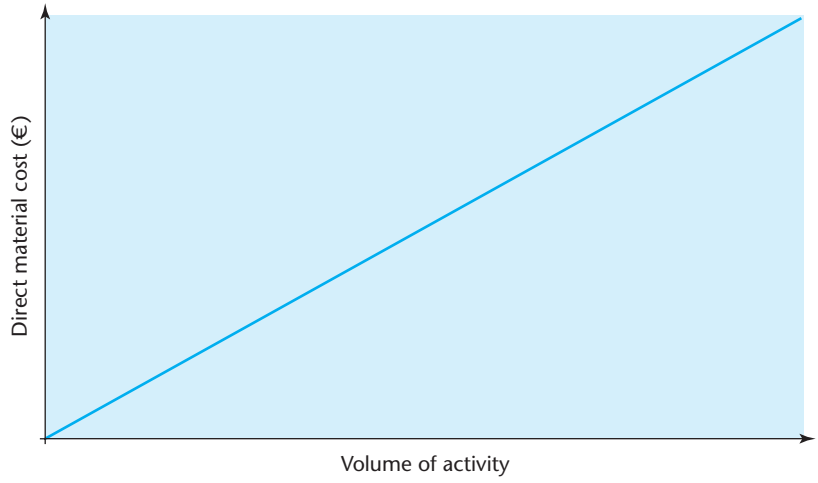

Figure 3.4 **Direct material costs against volume of activity**

(Source: Courtesy of Sri Srikanthan)

differences between the two situations? What has happened to the break-even point, and why?

Chart A shows a situation with high variable costs and low fixed costs. In chart B, the situation is reversed. The break-even point has moved well to the right: that is, chart B requires a higher volume to break even than A. This is because a much higher volume of sales is needed to cover the high level of fixed costs.

Furthermore, additional volume has a small impact on chart A, whereas it has a much higher impact on chart B. So high fixed costs and low variable costs lead to greater volume sensitivity. Accordingly, profitability (the area above the break-even point) is affected much more by volume changes in chart B. In terms of contribution, chart A represents a situation with low contribution/unit, and therefore low risk in comparison with chart B.

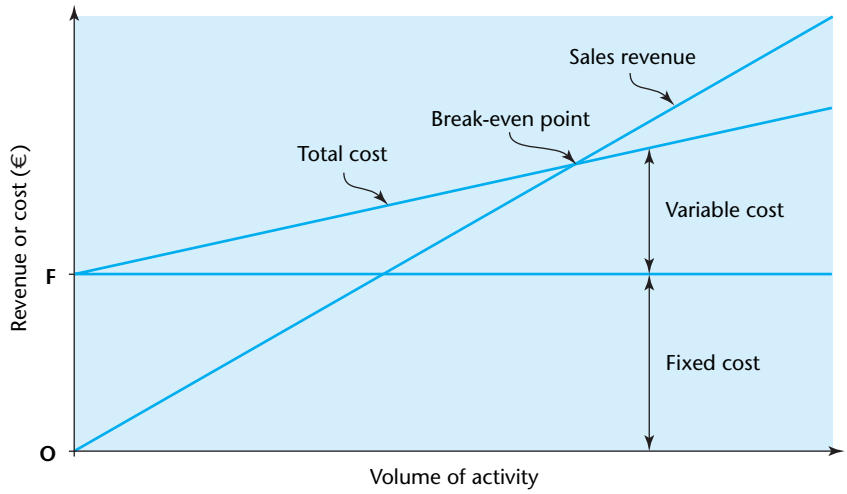

Figure 3.5 Break-even chart

(Source: Courtesy of Sri Srikanthan)

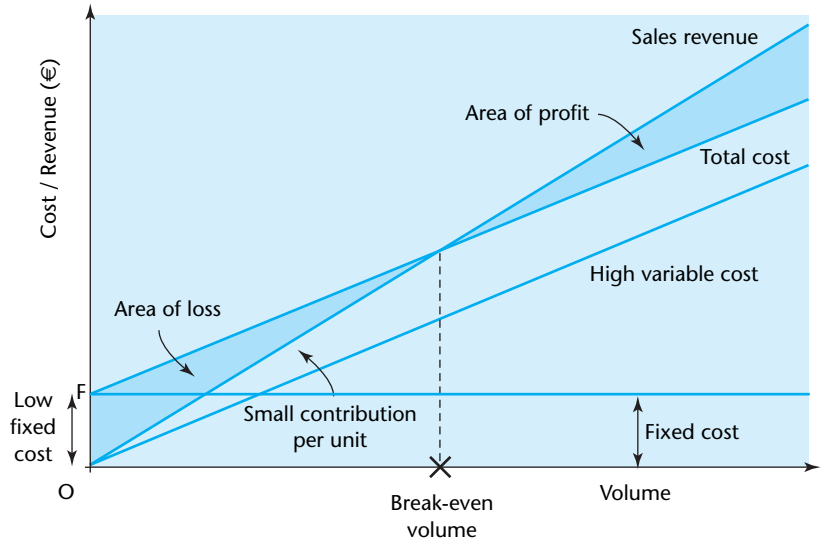

Figure 3.6 Break-even chart A

(Source: Courtesy of Sri Srikanthan)

The supply chain implications of such considerations are that we are most often faced with chart B situations. For example, core resources such as warehousing and distribution systems create little opportunity to reduce investments in line with reducing sales volumes other than the step changes shown in Figure 3.3. We are back to the advice for increasing ROI given in section 3.1.1 above: to increase sales and reduce costs. The reassuring point is that every 1 per cent increase in sales or 1 per cent reduction in costs has a leveraged effect on profits.

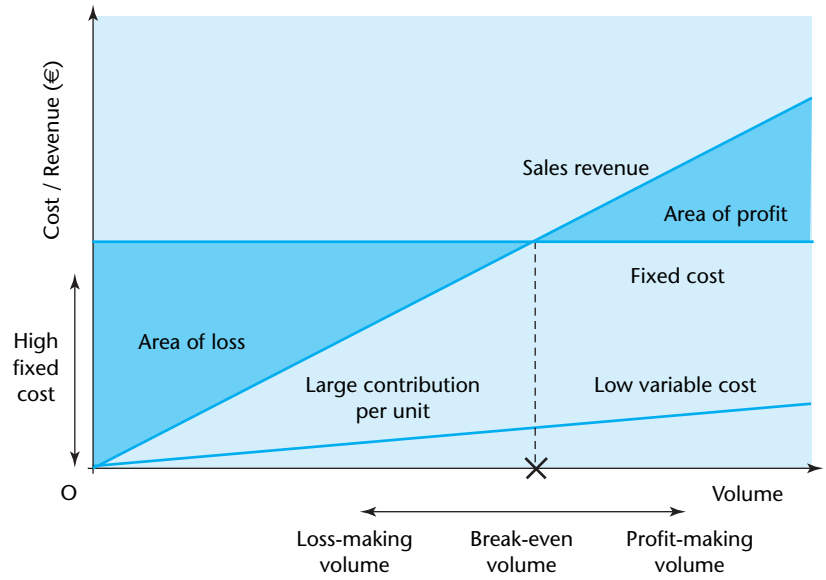

Figure 3.7 **Break-even chart B**

(Source: Courtesy of Sri Srikanthan)

CASE STUDY 3.1

Bond SA – a marginal costing example

Bond SA is planning to manufacture a new product with an initial sales forecast of 3,600 units in the first year at a selling price of €800 each. The finance department has calculated that the variable cost for each truck will be €300. The fixed costs for the manufacturing facility for the year are €1,500,000. Using the information provided by the sales forecast and the finance department it is now possible to calculate the planned profit, the contribution and the break-even point for this venture by leveraging the nature of fixed and variable costs.

Planned profit	€	**Planned break-even point**	€
Sales revenue	2,880,000	Fixed costs	1,500,000
Less variable costs	1,080,000	Contribution per unit	
Contribution	1,800,000	Sales value – variable cost	500
Less fixed costs	1,500,000	Break-even point (units)	
Profit	300,000	Fixed costs/contribution per unit	3,000

If Bond plc achieves its sales forecast of 3,600 units then the company will make a planned profit before tax of €300,000. Crucially the company's break-even point is 3,000 units, at which point Bond plc makes no profit but also no loss, because sales revenue (€2,400,000) equals all the variable costs (€900,000) and all the total fixed costs associated with production process (€1,500,000). Any additional unit sold after this point will provide Bond with profitable sales revenue. The difference between the planned profit and the break-even point is called the margin of safety. In the case of Bond SA, this equates to 600 units.

(Source: Simon Templar, Cranfield)

Questions

What happens to the break-even point if:

1 Fixed costs increase by 10 per cent?

2 The sales price reduces by 5 per cent?

3.2.2 Direct/indirect

Another way to cut up the total cost 'cube' is to analyse costs in terms of whether or not they can be directly allocated to a given product. Two further categories emerge:

- *Direct costs* can be tied to specific products. The most obvious examples are direct labour and direct materials. Thus we can allocate exactly the cost of bought-in parts to the products into which they are built.
- *Indirect costs* are whatever is left over after direct costs have been allocated. Indirect costs are also called 'overheads', and include everything from the managing director's salary to the rent rates paid for the distribution centre – anything that cannot be allocated directly to a given product.

Directness of costs is concerned with the extent to which costs can be allocated directly to given products. This is a completely different concept from that of fixed/variable costs. While there is a tendency to associate fixed costs with indirect and variable with direct, there is no necessary relationship at all. Thus direct labour costs tend to be fixed, at least in the short term.

As stated above, the reason for analysing costs differently is *to gain better information about our cost basis so that we can manage the business better*. Direct and indirect costs help us to decide the full cost of a product or service when more than one is offered. If there were just a single product, life would be easy, because all of the costs could be allocated to that one product. Most businesses are much more complex than that, and are faced with the issue of how indirect costs should be apportioned to products. The most popular way to spread indirect costs is on the basis of direct labour. This is not the 'correct way', nor is it the only way.

One way in which to get a closer view of how fixed costs behave by product is to use a method called *direct product profitability* (DPP). This method has been widely used in the retail industry to understand the way in which logistics costs behave for each product. The understanding is achieved by allocating fixed costs by making assumptions about how these are incurred by a product as it moves through the logistics system.

A good DPP system should take account of all the significant differences in the ways products are developed, sourced, produced, sold and distributed. In order to make this analysis practical, products will normally need to be grouped together. Product groups need to recognise shared technologies, processes, fixed assets, raw material inputs and packaging methods. The key objective of product groupings

is to remove the need for apportioning costs, and thereby not to apportion profit across the products.

An example DPP is shown for a manufacturing company in Table 3.2. Note that not all of the fixed costs have been assigned. DPP assumes that only those costs that can rationally be allocated may be deducted. Thus DPP may be viewed as a development of direct/indirect costing in that it attempts to convert into direct costs logistics costs that would otherwise have been regarded as fixed. In this way, DPP seeks to provide more accurate information about which products are contributing most to profitability – and which are contributing least.

The principle at stake here is that good accounting and financial analysis force us to ask more questions about what is going on in our business. DPP can have a role to play here: it attempts to allocate logistics costs more specifically to products (and, in this case, orders as well) than is possible by spreading 'fixed' costs on the basis of an assumption such as direct labour. The assumption would otherwise be that direct labour actually 'drives' the overheads, which is highly doubtful.

Table 3.2 Direct product profitability (DPP)

	€	€
Gross sales for product group		X
● Less product-specific discounts and rebates		X
Net sales by product		X
● Less direct costs of product		X
Gross product contribution		X
● Less product-based marketing expenses	X	
Product-specific direct sales support costs	X	
● Less product-specific direct transportation costs:		
Sourcing costs	X	
Operations support	X	
Fixed-assets financing	X	
Warehousing and distribution	X	
Inventory financing	X	
Order, invoice and collection processing	X	X
● Less product-attributable overheads		X
Direct product profitability		X

(Source: Courtesy of Sri Srikanthan)

CASE STUDY 3.2

Direct product profitability

Filmco makes two thin film (gauge = 12μm) products for packaging applications in the food industry. Product A is coated so that it can subsequently be printed on; product B is uncoated. There is no changeover time on the production line, because all that needs to happen is that the coating drum is switched on or off. Once produced on the film-making lines, the film is slit to width and to length to customer order. Roughly 40 per cent of Filmco's output is A, and 60 per cent B, and film-making takes

place 360 days/year on a continuous basis because of the high capital cost of the process.

A DPP study was carried out at Filmco to determine the relative profitability of the two products A and B by major customer. The method was adapted from that shown in Table 3.1 because Filmco is a manufacturing environment. Here is how it was done:

a Invoice price: this was the total sales value invoiced to the customer.
b Cost of placing orders: the total cost of the sales office (salaries, etc.) was divided by the number of orders dispatched that month. This cost per order (€150) was allocated to each order placed by each customer.
c Manufacturing cost: a variable cost for each product was found by collecting raw material, labour, power, packaging and waste costs. Manufacturing overheads (fixed costs) were allocated on the basis of direct labour. Because of the small difference in manufacturing methods, the manufacturing costs for the two products were similar. They were €2,107 for A and €2,032 for B.
d Storage costs: the total cost of the warehousing operation is €800k/year. There are 8,300 pallet locations, and the cost/day for a pallet was calculated as €0.30 assuming 360 working days. The storage cost for a given order was calculated as the number of pallets × the number of days × €0.30.
e Opportunity costs: orders must wait in the warehouse until the last reel has been produced. An order with a value of €3,000 that stays for seven days in the warehouse with an interest rate of 14 per cent is said to have an opportunity cost of €8.20.
f Transport cost: this was based on a price per tonne delivered to a given customer.
g Total cost: this was the sum of b to f for a given order.
h DPP: this was sales price less total cost g.

Table 3.3 gives a sample of the DPPs for four orders for customer P. The average DPP for customer P over all orders shipped over a given month was 19.6 per cent, while that for customer Q was 23.1 per cent and customer R was 33.0 per cent.

Table 3.3 DPP for customer P for a sample of four orders in a given month

Order no.	Film	Weight (t)	a	b	c	d	e	f	g	h(%)
186232	A	482	1,210	150	876	1.08	1.88	79	1,108	8.4
185525	A	2,418	5,997	150	4,344	7.83	9.33	190	4,702	21.6
185187	B	4,538	13,000	150	8,402	20.80	30.33	343	8,946	31.2
185351	B	2,615	7,576	150	4,897	14.58	17.68	198	5,277	30.3

Question

1 What can we tell from the above analysis in Table 3.3 and the average DPPs per customer? (Consider in particular the differences in DPP between the four orders shown, and between the three customers P, Q and R.)

3.2.3 Engineered/discretionary

A third way of analysing costs is to consider *the ease of allocating* them. Some things are easy to cost; others may require considerable thought and analysis

because they are difficult to cost under current methods. This line of thinking creates a third way of cutting the total cost cube:

- *Engineered costs* have a clear input–output relationship. In other words, the benefit of a given cost is measurable. For example, if it takes 10 hours to produce 10 boxes of product A in the factory, then we have a clear output benefit (1 box) for the cost of each hour of input.
- *Discretionary costs* do not have a clear input–output relationship. Here, the input cost is clear but the output benefit is unclear. For example, the cost of the contract cleaners who clean the factory is clear, but the benefit they produce is not easily quantifiable.

The challenge is to convert discretionary costs into engineered costs, so that we can quantify better the competitive impact of a given course of action. A classic example of converting discretionary costs into engineered costs has been the conversion of 'quality' as a discretionary concept into engineered 'quality costs' (Dale and Plunkett, 1995). This was achieved by breaking down the concept of quality into three cost drivers:

- *Prevention*. This comprises the costs of measures to prevent defects from taking place, such as training and process capability studies.
- *Appraisal*. This comprises the costs incurred in detecting defects, which would include testing and inspection.
- *Internal and external failure*. Internal costs are scrap, rework and the associated costs of not getting it right the first time. External failure costs are rectification after products have reached the final customer, such as warranty claims, returns and repairs.

In this case, it was argued, greater investment in prevention would result in the overall cost of quality being reduced over time.

The principle is to convert discretionary costs into engineered costs where possible. As indicated in the above examples, it is usually possible to make an estimate of what the engineered costs are, perhaps accompanied by a sensitivity or risk analysis. Without such guidelines, decisions would have to be taken on 'gut feel' – or, as usually happens, not taken at all! In other words, the logistics team may have an excellent project for increased flexibility in the distribution centre, but because they have not quantified the savings (outputs) the application for funding is rejected.

CASE STUDY 3.3

Glup SA

Glup SA supplies a range of household soaps to supermarkets in northern Europe. There are 12 stock-keeping units (skus) in the range. The logistics manager has determined that an investment of €0.5 million on improved material-handling equipment would convert the main distribution centre into a more flexible facility. A number of benefits in improved product availability have been identified – but current information is largely in the form of discretionary costs. Glup's assessment of the ▶

benefits and its plans to convert the justification into engineered costs are outlined below.

Improved in-store availability

This is the percentage of time for which a product is available on the shelf. If the product is not available on the shelf, then it will lose sales to competitive products that are available, such as supermarket own brands. (Availability is a classic 'order losing sensitive' qualifying criterion as described in section 1.3, Chapter 1.) Current available data at Glup are scant, but suggest that average in-store availability is as low as 85 per cent for a given stock-keeping unit (sku). In order to convert this discretionary benefit into an engineered cost, Glup intends to measure the time for which each of the 12 product lines is unavailable each week. One way to do this is to use a market research agency to conduct sample studies of product availability in selected stores at random times across the working week. This will yield an availability guide, such as the 85 per cent figure referred to. The new system will, it is believed, reduce this unavailable time. Glup then plans to model the new material-handling equipment methods using simulation, and to calculate the new in-store availability. The reduced non-availability time could then be converted into additional contribution for each sku to give an engineered cost saving.

Reduced transportation costs

The new equipment would also allow lower transportation costs, because trays of different skus could be mixed together on the same pallet. Glup again intends to use simulation modelling to identify the opportunities for savings using this method. It is considered that this will offer the opportunity to reduce overall transport costs by more flexible loading of the trailers used to distribute the products to Glup's customers.

Promotions and new product launches

It is considered that the new equipment will enable promotions and new product launches to be delivered to selected stores more accurately and more quickly. Demand uncertainty in such situations is very high: for example, a recent 'three for the price of two' promotion created a fivefold increase in sales. In order to launch a new product it is first necessary to drain the pipeline of the old product, or to 'write it off' as obsolete stock. If the more flexible warehouse system can reduce the length of the pipeline from factory to supermarket, it is argued, then a real saving in time or obsolete stock is possible. Glup again intends to measure this by simulation. It will then be necessary to determine by how much sales will increase as a result of the new product advantages. This will be estimated by Glup marketing people, who will use experience of previous promotions and new product launches. The engineered cost will be the additional time for which the new product is available multiplied by the additional estimated sales volume multiplied by the contribution per unit. Alternatively, it will be the reduction in obsolete stocks multiplied by the total cost per product plus any costs of double handling and scrapping.

Question

1 Comment on Glup's plans to create engineered costs from the perceived benefits of the new material-handling equipment.

3.3 Activity-based costing (ABC)

Key issues: **What are the shortcomings of traditional cost accounting from a logistics point of view? How can costs be allocated to processes so that better decisions can be made?**

The driving force behind activity-based costing (ABC) is that the traditional way of allocating indirect costs by spreading them to products on the basis of direct labour is becoming difficult to manage. While direct labour used to constitute a substantial portion of product costs, today that rarely applies. Therefore overhead rates of 500 per cent on direct labour are not uncommon. Just a small change in direct labour content would lead to a massive change in product cost.

Cooper and Kaplan (1988) explain the problem by referring to two factories, which we here refer to as Simple and Complex. Both factories produce 1 million ballpoint pens each year; they are the same size and have the same capital equipment. But while Simple produces only blue pens, Complex produces hundreds of colour and style variations in volumes that range from 500 (lavender) to 100,000 (blue) units per year. A visitor would notice many differences between the factories. Complex has far more production support staff to handle the numerous production loading and scheduling challenges, changeovers between colours and styles, and so on. Complex would also have more design change issues, supplier scheduling problems, and outbound warehousing, picking and distribution challenges. There would be much higher levels of idle time, overtime, inventory, rework and scrap because of the difficulty of balancing production and demand across a much wider product range. Because overheads are allocated on the basis of direct labour, blue pens are clobbered with 10 per cent of the much higher Complex overheads. The market price of blue pens is determined by focused factories such as Simple, so the blue pens from Complex appear to be unprofitable. As a result, the management of Complex considers that specialist products such as lavender – which sell at a premium – are the future of the business, and that blue pens are low priority. This strategy further increases overheads and costs, and perpetuates the myth that the unit cost of each pen is the same. Traditional cost systems often understate profits on high-volume products and overstate profits on low-volume, high-variety products. ABC principles would help the management of Complex to make more informed product decisions. The management of Simple has no need for another costing system; the current one works well for them.

ABC recognises that overhead costs do not just happen, but are caused by activities, such as holding products in store. ABC therefore seeks to break the business down into major processes – such as manufacture, storage and distribution – and then break each process into activities. For example, the distribution process would include such activities as picking, loading, transport and delivery. For each of these activities, there must be one cost driver: what is it that drives cost for that activity? For example, the cost driver for the storage activity may be the volume of a case, whereas the transport activity may be driven by weight. Once we know the cost driver, we need to know how many units of that cost driver are incurred for that activity, and the cost per unit for the cost driver.

For example, the cost driver for the transportation activity may be the number of kilometres driven, and the cost per kilometre would be the cost per unit of the cost driver. This yields the cost of the activity and, when summed across all of the activities in a process, the total cost of that process.

ABC is difficult to implement because we need first to understand what the discrete processes are in a business where the existing links between functions are not well understood. There is then the issue of identifying the cost driver, which requires a fresh way of looking at each activity. For example, the cost driver for a warehouse fork-lift operator would be the number of pallets moved. The cost driver for stocking shelves would be the number of pieces that must be stacked in a given time period. A further problem occurs if there is more than one cost driver for a given activity. You are then faced with the same problem as with overhead allocation: on what basis should the cost drivers be weighted? Usually, this problem shows that activities have not been broken down into sufficient detail, and that more analysis is needed. ABC can therefore become complex to implement.

In spite of the implementation challenges, logistics and ABC go hand in hand (van Damme and van der Zon, 1999). It is a very rational way to analyse costs, and logistics practitioners recognise that providing a service is about managing a sequence of activities. Logistics or supply chain managers are particularly well placed to understand, analyse and apply ABC. They understand business processes and the activities that go with them. Theirs is a cross-functional task. The value chain stares them in the face.

The procedure of determining cost drivers is often considered to be more valuable than the ABC system itself. Activity-based management enables the cost structure of a business to be examined in a new light, allowing anomalies to be resolved and sources of waste highlighted. It may also help in better targeting investment decisions.

3.3.1 ABC example

Komplex GmBH has four production lines, which each operates for 8,000 hours a year. Each line makes a number of products, which are based on size and colour. Many changeovers are therefore required, each incurring set-up and maintenance costs. Traditionally the maintenance costs have been allocated on the basis of machine hours, so each production line is charged equally. This year, the maintenance budget of €1 million has been divided into four, so each line is charged with €250,000.

Sales and marketing are concerned that certain products are losing market share, and this is due to prices relative to the competition. All departments have been instructed to investigate costs and to suggest improvements. How can activity-based costing improve this situation? By identifying the cost driver for maintenance, in this case the number of changeovers, costs can be allocated to each production line on this basis. Costs are then matched to the activity that generates them, so avoiding cross-subsidies.

The results are illustrated in Table 3.4. Maintenance costs have now been transferred to the production lines that incur the activity. For example, costs on line

A have doubled to €500,000, while costs on line D have reduced to €50,000. ABC in this example has not taken cost out of the process, but has reallocated the costs to give a better understanding of the cost base. Complex is now in a better position to make decisions that affect the cost competitiveness of the product range.

Table 3.4 Different ways of allocating maintenance costs

Production lines	A	B	C	D	Total
Machine hours	8,000	8,000	8,000	8,000	32,000
No. of changeovers	50	30	15	5	100
Equal allocation	250,000	250,000	250,000	250,000	1,000,000
Allocation by activity	500,000	300,000	150,000	50,000	1,000,000
Difference	250,000	50,000	−100,000	–200,000	0

3.3.2 Cost–time profile (CTP)

A key benefit of being able to cost logistics processes is that cost information can be used in conjunction with time information. The synergies of the two can then provide opportunities for identifying activities which create either value or waste.

The cost–time profile (CTP) (Bicheno, 2004) is a graph, which plots cumulative time against cumulative cost for a set of discrete activities that together form a process or a supply chain. The CTP utilises outputs from two sources:

- *activity times*: from the time-based process mapping (TBPM) process time recording system (see Chapter 5);
- *activity costs*: from a process costing system that is underpinned by activity-based costing.

As discussed earlier, ABC strives to achieve an equitable distribution of overhead costs to activities. Table 3.5 illustrates cumulative time and cost for a process comprising six activities.

Table 3.5 Cumulative time and cost data by activity

Activity	A	B	C	D	E	F
Cumulative time (%)	14	64	65	67	97	100
Cumulative cost (%)	25	45	83	85	95	100

Such data can be used to construct a *cost–time profile*. Bernon *et al*. (2003) record the process in terms of time and cost for a poultry product from receipt of live bird to delivery of finished product to the retailer. Overall, the process takes an average of 175 hours to complete. The profile shows areas that consume time and cost within the supply chain, highlighting those for future investigation that could yield savings. For example, distribution accounts for 35 per cent of process time, but only 3 per cent of total cost. Slicing and packaging are more in line, since they account for 25 per cent of total cost and are responsible for 28 per cent of the total process time. Figure 3.8 shows the time–cost profile for this process.

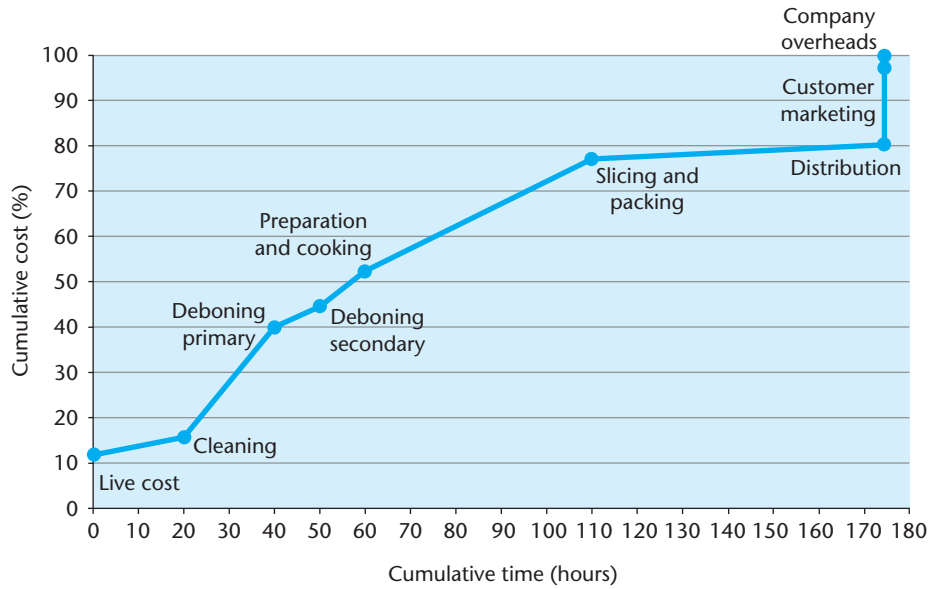

Figure 3.8 Cost–time profile for poultry product

(Source: After Bernon *et al.*, 2003, reprinted by permission of EIASM)

The profile shows that time and cost are *not related linearly*. Bicheno (2004) stresses the importance of interpreting both the horizontal and vertical lines of the CTP:

- *Long, horizontal lines* tend to occur when there is a relatively small increase in total cost as a result of an activity that runs over a relatively long period of time. An example is storage of finished product after slicing and packing.
- *Steep, vertical lines* tend to occur when costs are consumed over a relatively short period of processing time. An example is deboning, where the cumulative cost rises sharply.

A focus on the long, horizontal sections of the CTP graph may help reduce cumulative time (see Chapter 5). A focus on steep, vertical lines may help reduce cumulative cost. The CTP can be used to prioritise improvement processes, as shown in Figure 3.9:

Processes in the top right-hand box are prime candidates for savings in both time *and* cost. Processes in the bottom left-hand box are low on the list of priorities.

A further conclusion of the Cranfield study shown in Figure 3.8 was that decisions to optimise cost in one area could have a detrimental effect downstream (Whicker *et al.*, 2006). Large batch sizes reduced the need for machine changeovers in manufacturing. But this meant that the NDC was often running over capacity, and that overspill inventories had to be extracted and sent to third-party warehouses. Savings in manufacturing efficiency were causing extra costs and lead times in distribution.

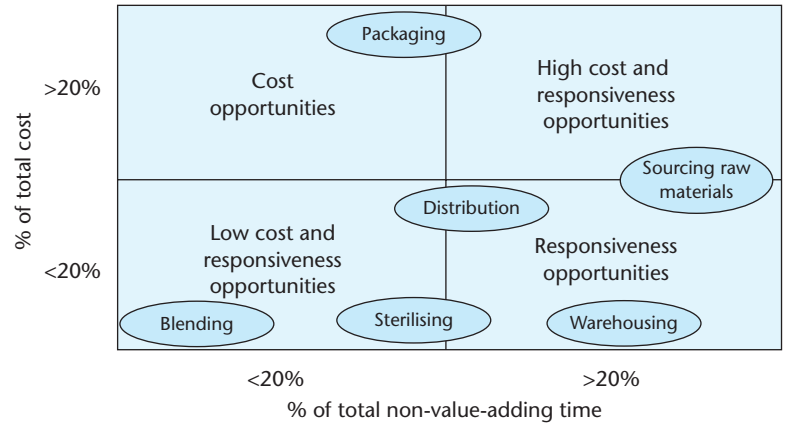

Figure 3.9 **Cost–time grid**

Source: (Whicker *et al.*, 2006)

3.4 A balanced measurement portfolio

Key issues: **Who are the key stakeholders in a business, and what needs to be achieved in order to satisfy them? How can a balanced set of measures of performance be developed in order to address stakeholder satisfaction and stakeholder contribution?**

Many organisations have suffered from undue emphasis on particular measures of performance within the firm. For example, a preoccupation with labour productivity may lead to excessive stocks of inbound parts ('Do not run out of raw materials otherwise bonuses will suffer'). Such a preoccupation may also lead to excessive stocks of outbound products, because the most important priority is to keep workers busy, whether the product can be sold or not. While this priority may be good for productivity, it may well disrupt flow in the supply network: inbound parts are ordered too early, and outbound products are made too early. What is good for one measure (productivity in this case) is bad for others (inventories and material flow).

In reality, management today is faced with the challenge of performing across a whole range of objectives. Different groups of stakeholders in a firm include shareholders, employees, customers, suppliers, the local community and government. This is not a comprehensive list, and industries such as pharmaceuticals have other important stakeholders, including regulators such as the Drug Enforcement Agency. The challenge for the directors of a firm is to *balance* the diverse interests of these groups of stakeholders. We review the interests of each group in turn:

- *Shareholders* typically have a passing interest in a firm in which they invest. They will keep their shareholding as long as it provides a return that is competitive with other investments. Shareholders are impressed by high dividends and share appreciation resulting from profitability and growth of the business. Failure to deliver adequate returns often turns shareholders against the management of the day.

- *Employees* often have a long-term commitment to a firm, and are concerned with employment stability, competitive wages and job satisfaction. Failure to deliver on such goals may create negative reactions such as loss of motivation and loyalty, difficulty in recruitment, and various forms of industrial action.
- *Customers* are in theory the most important stakeholders in a free market economy. It is their demand that draws material through the supply network. Customers can choose from whom they buy, and failure to keep them satisfied creates the risk of loss of business.
- S*uppliers* are interested in such benefits as long-term business, involvement in new product development, and of course payment on time. Failure to meet such benefits leads to sanctions such as disruption of supply and higher prices.
- *Local community*. Here, the interests are in the firm as a local employer, with a reputation for civic responsibility and long-term commitment to the region as an employer and as a ratepayer. Failure to deliver against such interests may lead to environmental disputes and difficulty in obtaining planning permission.
- *Government* is interested in the firm as a contributor to employment and value creation in the economy, and as a source of revenues. Failure to meet government laws, on the other hand, may lead to prosecution or even closure of the business.

Thus the directors of a business are faced with the need to manage the potentially conflicting interests of the stakeholders, keeping each within what Doyle (1994) refers to as a *tolerance zone*. Each stakeholder has a limit beyond which the risk of disruption to the business increases rapidly. An upper limit exists as well. For example, a preoccupation with profits may please shareholders for the time being, but may result in negatives from labour exploitation and low levels of investment. While bumper profits appear in year 1, these are rapidly eroded as the negatives cut in during later years. In the end, the whole business suffers. And customers can disrupt the business too: a preoccupation with customers at the expense of everything else can lead to shrinking margins and loss of focus. The challenge for the directors is to keep all stakeholders just satisfied, keeping each within the tolerance zone.

3.4.1 Balanced measures

While balance between stakeholders is one issue, another is the balance between financial and operational measures of performance, and between history and the future. Kaplan and Norton (1996) point to the shortcomings of traditional cost accounting systems. Traditional systems are geared to the needs of the stock market, and are essentially historical and financial in emphasis. Modern systems, they argue, need to be balanced between financial and operations, and between history and the future. A way of showing the relative emphasis between traditional measures and balanced measures is to show relative priorities by means of circles, where larger circles imply a greater priority and number of measures in use, as shown in Figure 3. 10.

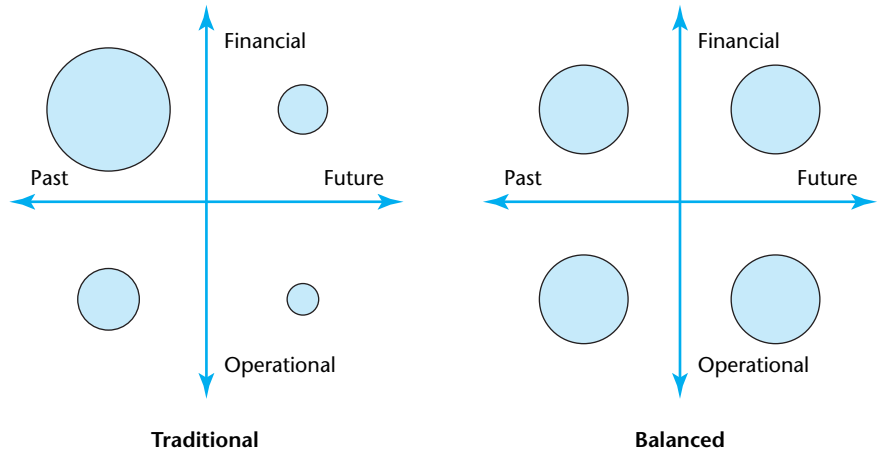

Figure 3.10 **Traditional and balanced priorities**

In developing a modern performance measurement system it is necessary to take all of these factors into account, and to create a balanced performance measurement system. That is the objective of the 'balanced scorecard'.

In practice, Kaplan and Norton propose that the balanced scorecard should balance the financial perspective (goals for future performance and measures of past performance) with similar goals and measures for the underlying drivers of long-term profitability. These drivers are identified as the business process perspective, the innovation and learning perspective and the customer perspective.

3.4.2 Supply chain management and the balanced scorecard

Extending the balanced scorecard into the context of the supply chain, Brewer and Speh (2000) consider that performance measurement systems must be aligned to supply chain practices:

> **If firms talk about the importance of supply chain concepts, but continue to evaluate employees using performance measures that are . . . unaffected by supply chain improvements, then they will fail in their supply chain endeavours.**

Traditional performance measurements within a focal firm have a number of significant deficiencies. They often track individual activities within functions: this can promote the optimisation of the function rather than of the supply network as a whole.

As a general rule, effective cross-supply chain measures should have the following characteristics (Derocher and Kilpatrick, 2000):

- simple to understand;
- no more than 10 in total number;
- representative of a significant causal relationship;
- have an associated target;
- capable of being shared across the supply chain.

Here are eight such measures, which can be adapted to focus on specific sectors:

- *on time in full, outbound*: a measure of customer orders fulfilled, complete and on time, conforming to specification;
- *on time in full, inbound*: a measure of supplier deliveries received, complete and on time, conforming to specification;
- *internal defect rates*: a measure of process conformance and control (rather than inspection);
- *new product introduction rate*: a measure of supply chain responsiveness to new product introduction;
- *cost reduction*: a measure of sustainable product and process improvement;
- *stock turns*: a measure of supply chain goods flow. This measure is useful when applied to supply chains focused on segments: as a 'blanket' measure, it can be misleading;
- *order to delivery lead time*: a measure of supply chain process responsiveness;
- *financial flexibility*: a measure of how easy it is to structure the supply chain for financial advantage (with international supply chains, channelling operations through low-tax locations for purposes of gaining supply chain cost benefits should be considered).

The main benefits of these measures are that they can be applied to all partners in a supply chain, and can thereby help to improve visibility and control.

Brewer and Speh (2000) have developed a supply chain framework that links the four perspectives of the balanced scorecard to corresponding supply chain management goals, as illustrated in Figure 3.11.

Consistent with our view that different supply strategies are needed to support different product needs in the marketplace, the aim should be to identify consistent groups of measures that support particular supply strategies.

3.4.3 Supply chain financial model

Similar arguments can be made about linking supply chain practices to financial performance. We have been working on a model which links decisions about the supply chain (such as inventory holding, outsourcing and supplier reduction) with a focal firm's financial performance (Johnson and Templar, 2007). The model is shown in Figure 3.12, and starts off with two ratios for a given financial period. These are adaptations of the ROI model we considered in 3.1.1 above (see for example Ellram and Liu, 2002):

- *cash generation* is the net cash inflow (operating profit before deducting depreciation) adjusted for changes in working capital divided by sales;
- *asset efficiency* is the sales divided by the value of the firm's total assets less current liabilities.

The product of these two ratios is the *supply chain ratio*.

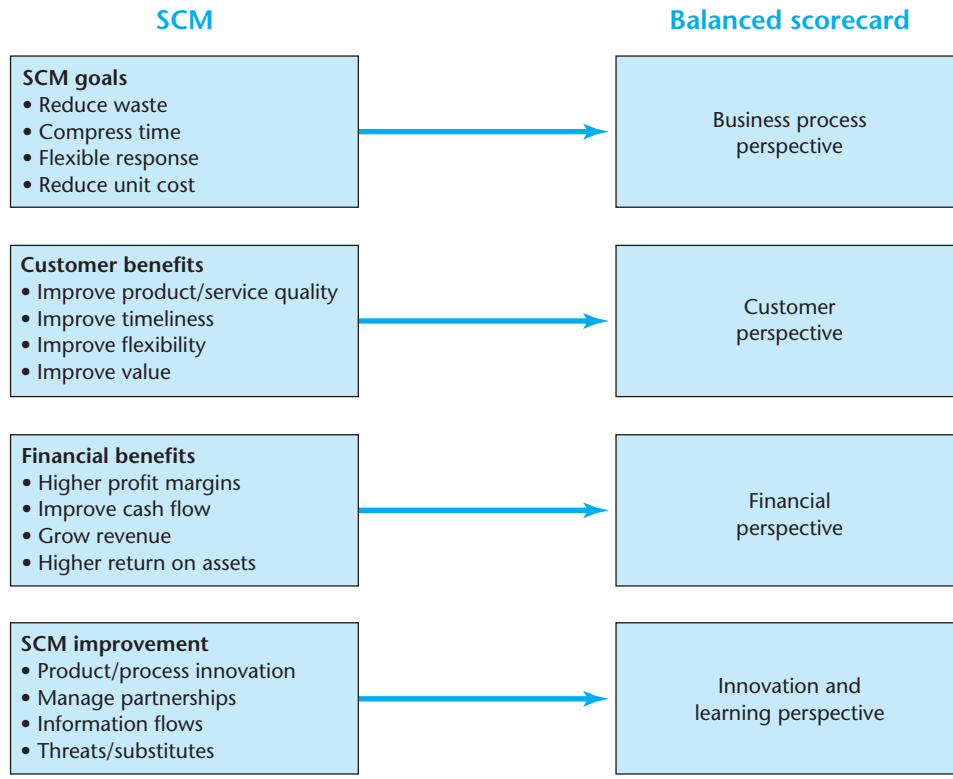

Figure 3.11 **Linking supply chain management to the balanced scoreboard**
(Source: After Brewer and Speh, 2000)

Any tactical decision in the supply chain (five are shown) influences these ratios either positively or negatively. As a result, we can predict the impact of tactical supply chain decisions on financial performance. Equally, we can use the model to predict the impact of top down decisions (for example 'cut working capital', or 'increase sales through promotions') on supply chain positives and negatives.

3.5 Supply chain operations reference model (SCOR)

***Key issues:* How can *process* thinking be applied to measures across the supply chain? What is the supply chain operations reference model, and how is it constructed?**

The previous two sections looked at process-based performance measures within an organisation. This section reviews a model that places a focal firm in the context of the supply chain. In order to help companies to understand their supply chain performance and opportunities for improvement, a cross-industry framework has been developed by the Supply Chain Council. You can visit the council website at www.supply-chain.org.

This section gives an introduction to SCOR based on publicly available material; in order to obtain detailed benchmarking data from the model, your

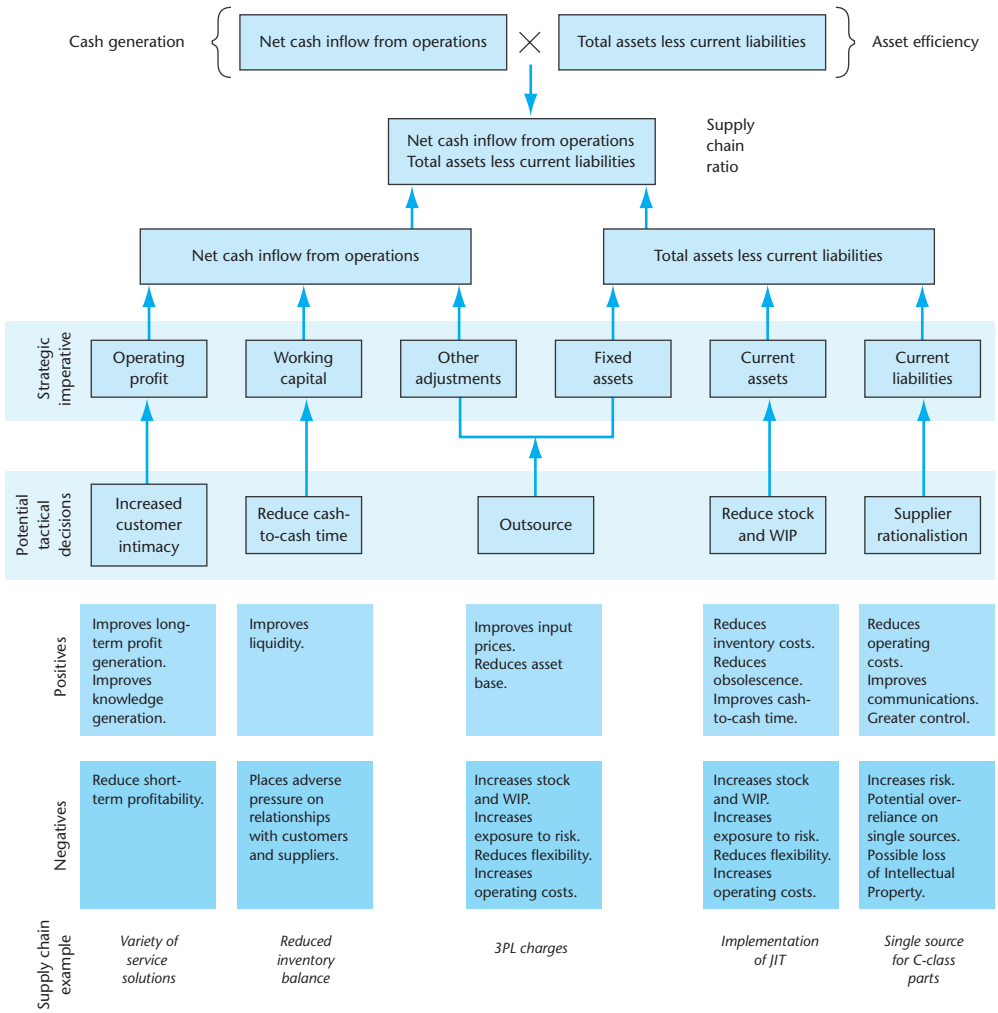

Figure 3.12 Supply chain financial model

(Source: © Cranfield and PA Consulting Group)

organisation would need to become a member. In common with ABC, the SCOR model uses a process-based approach to the supply chain.

The supply chain operations reference model (SCOR) is founded on five distinct management processes. The supply chain is viewed in terms of overlapping management processes – source, make, deliver and return – within an integrated planning framework that encompasses all of the organisations in the chain, as shown in Figure 3.13. It is a process-based version of Figure 1.1 in Chapter 1. The management processes of the 'focal firm' are seen as linked with corresponding processes within supplier and customer organisations. The five distinct management processes can be described as follows:

- *Plan*: the tasks of planning demand and supply set within an overall planning system that covers activities such as long-term capacity and resource planning.

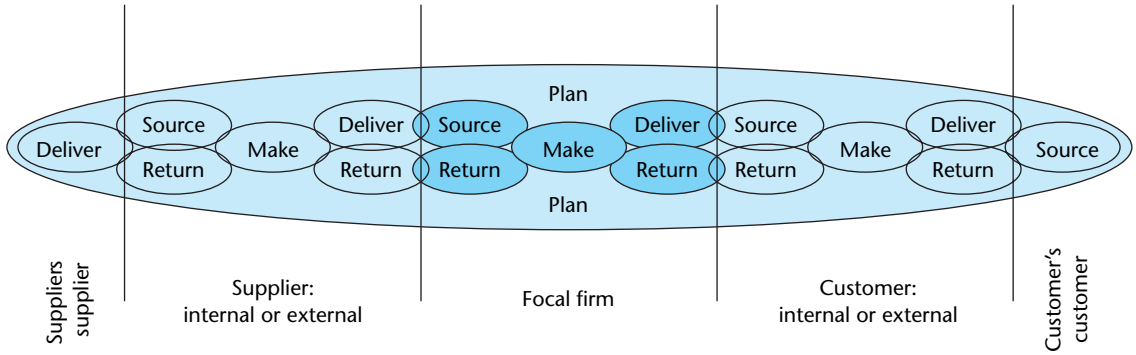

Figure 3.13 **Five distinct management processes**
(Source: After Supply Chain Council, www.supply-chain.org)

- *Source*: the task of material acquisition, set within an overall sourcing system that includes activities such as vendor certification and vendor contracting.
- *Make*: the task of production execution, set within an overall production system that includes activities such as shop scheduling. Any added value activity (e.g., material repackaging at a distribution centre; quality control at a production line) falls under this process type as well.
- *Deliver*: the day-to-day tasks of managing demand, orders, warehouse and transportation, and installation and commissioning. These tasks are set within an overall delivery management system that includes order rules and management of delivery quantities.
- *Return*: the return of non-conforming goods for replacement or rectification, and the recycling of materials no longer needed by the customer.

There are three levels to the SCOR model:

- *Level 1*: a broad definition of the plan, source, make, deliver, and return management processes, which is used to set competitive objectives.
- *Level 2*: defines core process categories that are possible scenarios of a supply chain (e.g., make to stock; make to order; engineer to order).
- *Level 3*: provides the process breakdown needed to describe each element that comprises the level 2 categories. Detailed performance metrics are set at this level.

Table 3.6 shows 13 metrics at level 1 in the SCOR model, and is taken from the SCOR website (www.supply-chain.org). As with processes, the model's hierarchical structure is repeated also for the metrics. That means that the SCOR model provides a breakdown of level 2 and level 3 subcomponents of the level 1 performance metrics. The intention is that an individual company should not attempt to be 'best in class' in all areas. Rather, a given company should target its strength in four to six selected areas to create differentiation in the marketplace. The company will also need to ensure that it stays competitive in the other areas.

Note that the customer-facing measures are what we referred to in section 3.2 as 'discretionary costs', while the internal-facing measures are 'engineered costs'. By drilling down into levels 2 and 3 of the SCOR model, the aim is to identify the cost drivers and so convert discretionary costs into engineered costs: that is, to convert supply chain performance directly into revenue, cost and margin. Also note that the internal-facing metrics encourage improvement of ROI (section 3.1) by reducing costs and maximising asset turns. Participating companies in the Supply Chain Council may obtain benchmarking information on how their organisation's performance compares with others: see the website given above.

Table 3.6 Supply chain performance is tied to measurements that can be benchmarked

	Customer-facing		Internal-facing	
SCOR Level 1 *Supply chain management*	***Supply chain reliability***	***Flexibility and responsiveness***	***Cost***	***Assets***
Delivery performance	◀			
Order fulfilment performance	◀			
Fill rate				
Order fulfilment lead time				
Perfect order fulfilment	◀			
Supply-chain response time		◀		
Production flexibility		◀		
Total logistics management cost			◀	
Value-added productivity			◀	
Warranty cost or returns processing cost			◀	
Cash-to-cash cycle time				◀
Inventory days of supply				◀
Asset turns				◀

(Source: www.supply-chain.org)

In order to illustrate how such concepts could be applied in practice, Table 3.7 shows actual performance against the SCOR level 1 metrics for a given company. It also shows how those metrics compared with the SCOR database in terms of what was needed to achieve parity with the 'competitive population', what was needed to gain advantage, and what was needed to show superior performance. Where is this supply chain positioned in terms of its competitive performance? Not very well, it seems! *All* of the level 1 metrics are below parity with the exception of order fulfilment lead times. External metrics such as delivery performance and perfect order fulfilment are seriously adrift. Production flexibility is way behind the competitive population, suggesting that the master schedule is 'fixed' for too long a period – and there will no doubt be underlying causes of that. Internal measures are not in good shape either, with a poor cost performance and a seriously uncompetitive asset utilisation record.

Table 3.7 Supply chain performance evaluated within the context of the competitive environment

	Supply chain scorecard v. 3.0			Performance versus competitive population		
	Overview metrics	**SCOR level 1 metrics**	**Actual**	**Parity**	**Advantage**	**Superior**
		Delivery performance to commit date	50%	**85%**	**90%**	**95%**
EXTERNAL	**Supply chain reliability**	Fill rates	63%	**94%**	**96%**	**98%**
		Perfect order fulfilment (on time in full)	0%	**80%**	**85%**	**90%**
		Order fulfilment lead times (customer to customer)	7 days	**7 days**	**5 days**	**3 days**
	Flexibility and responsiveness	Production flexibility (days master schedule fixed)	45 days	**30 days**	**25 days**	**20 days**
INTERNAL	**Cost**	Total logistics management costs as % of revenues	19%	**13%**	**8%**	**3%**
		Warranty cost, returns and allowances	NA	**NA**	**NA**	**NA**
		Value-added per-employee productivity	$122K	**$156K**	**$306K**	**$460K**
	Assets	Inventory days of supply	119 days	**55 days**	**38 days**	**22 days**
		Cash-to-cash cycle time	196 days	**80 days**	**46 days**	**28 days**
		Net asset turns (working capital)	2.2 turns	**8 turns**	**12 turns**	**19 turns**

Summary

What is 'value' in the context of the supply chain?

- Return on investment (ROI) is a widely used method for measuring shareholder value. ROI encourages logistics management to control costs, working capital and fixed assets.
- Logistics is increasingly concerned with funds flow as well as material flow and information flow (Chapter 1). It is a cross-functional discipline that addresses management processes of plan, source, make, deliver and return. These processes are repeated across the supply chain.

- Traditional cost accounting is unhelpful in making logistics-related decisions because it is insensitive to processes and to cost drivers. Traditional cost accounting tends to understate profits on high-volume products and to overstate profits on low-volume/high-variety products.

How can logistics costs be better represented?

- Logistics costs can be better described by using a variety of methods of allocating costs to products. The purpose of such a variety of allocations is to gain better information about the cost base of logistics operations, and hence to take better decisions. For example, direct product profitability (DPP) attempts to allocate logistics costs more specifically to products by considering how they use fixed resources. Another principle is to convert discretionary costs such as product availability into engineering costs such as profit contribution from increased sales.
- Activity-based costing (ABC) seeks to understand what factors drive costs, and how costs are incurred by logistics processes that span the organisation – and the supply chain in general. It is essentially a process-based view of costing, and again seeks to enhance the quality of logistics decision making.
- Financial measures that are rooted in the past are insufficient for taking logistics decisions in today's fast-moving environment. A balanced measurement portfolio is called for, one that takes into account the needs of different stakeholders in a business. A balanced measurement portfolio is extended into the supply chain by means of the supply chain operations reference model (SCOR).

Discussion questions

1 Explain what is meant by the term *value* in a supply chain. How can value best be measured in a supply chain context?

2 Why are processes important in terms of managing logistics? Suggest how the processes of plan, source, make, deliver and return might differ in the case of the two factories Simple and Complex described in section 3.3.

3 What are the advantages of cutting the 'total cost cube' in different ways? Summarise the different perspectives on logistics costs provided by fixed/variable, direct/indirect and engineered/discretionary costs, and by activity-based costing.

4 Suggest balanced measurement portfolios for the two factories Simple and Complex described in section 3.3. In particular, suggest key performance measures in the areas of strategy, process and capability.

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Part Two

LEVERAGING LOGISTICS OPERATIONS

Part Two uses the basic understanding of logistics management and strategy developed in Part One to focus in on critical roles for logistics operations. This covers the centre panel of logistics model: the flow of materials, lead times and the network in a global context.

Despite its role in corporate success, the logistics task ultimately boils down to orchestrating the flow of materials and information in the supply chain. The aim is to support products and services in the marketplace better than competitors. You could say that the logistics task is about making strategic objectives a reality by executing against demand and making value propositions to customers a reality.

Chapters 4 and 5 look at the basic dimensions of logistics operations: their international reach and their contribution to a timely response to demand. Chapters 6 and 7 then take that thinking a level higher by introducing key managerial concepts that support logistics operations. Chapter 6 addresses the immense amount of detail that is needed to plan and control material flow – both in the focal firm and more broadly in the supply chain. We continue by considering the role of just-in-time and lean thinking, which have become important ways of coordinating material movements in an efficient manner. The agile supply chain (Chapter 7) is a more recent concept that focuses on leveraging responsiveness to customer demand. Here, logistics plays a crucial role in aligning material flow across the supply network with customer demand, and in ensuring execution in a flexible and customised manner.