Chapter 3
Finance and accounting

However good the quality of its products or services, no organization can be successful for any length of time unless its finances are soundly managed. As well as requiring specialist staff possessed of the necessary skills, sound financial management also demands that the whole management of the organization appreciates its importance and understands the ideas on which it is based. The purpose of this chapter is to present those ideas and explain their importance. Inevitably, in the interests of clarity, the material is much simplified and many important provisos and special cases have been ignored or only briefly alluded to; it should not therefore be taken as a complete statement of either law or current practice. In particular, we have largely omitted questions of taxation which, in practice, have a substantial effect on most aspects of a company's financial affairs.

The chapter emphasizes those aspects of finance and accounting with which the newly graduated software engineer is most likely to come into contact. We have thus given prominence to issues such as budgeting, costing and pricing, somewhat at the expense of such topics as annual statements. However, because so many young software engineers are attracted by the idea of starting their own company, we have given some attention to the financial issues involved in doing this.

3.1 The need for capital

It is not uncommon for a group of new or recent graduates in computing to decide to set up their own company to provide software services. Initially at least, their intention is typically to offer contract hire services, that is, to offer their services as programmers charging a daily fee. Not infrequently, however, they also intend to develop packages to meet perceived gaps in the market.

Even if the intention is only to carry out contract hire work, there will be a need to have some money with which to start the venture. Invoices are normally issued at the end of a month to cover the work that has been done during the month. A client is unlikely to pay an invoice within less than one month of receiving it. Two months is more likely with commercial clients and three months is not uncommon; some large companies are notorious for not paying invoices for as much as six or even twelve months. The result is that the group needs enough cash in hand to be able to live for at least three months. Additional money will be needed for the expenses of starting the company.

If the group intends to develop packages, a much larger sum of money is likely to be needed. While the packages are being developed, there will be no revenue coming into the company. For this period cash will be needed for:

- salaries, however small, for the group and for any other staff they may need to employ;
- rent, rates, heating and lighting of the premises used;
- equipment and consumables;
- costs of advertising and marketing the products;
- miscellaneous expenses, ranging from company stationery to travelling expenses for any trips that may be necessary;
- interest on any money borrowed.

However successful the development of the packages, it will take some months before sales reach a level sufficient to cover the company's on-going costs, so, even after development is complete, more cash will be needed.

How does one set about raising this money? The first step is to produce a *business plan*. The purpose of this document is to explain the plans to potential funders and to convince them that the plans are well thought out and that the venture is likely to be successful. It typically contains:

- a description of what the company will be doing, together with information to show that it is technically feasible and that founders of the company have the necessary expertise;
- an assessment of the size of the market and the competition;
- a prediction of the financial performance of the company.

Armed with the business plan, one is in a position to approach potential funders.

3.2 Sources of funds

Government policy in the UK has, over recent years, strongly encouraged the growth of small companies and, as a result, there are many possible sources of funding. However, they can all be grouped under three headings: grants, loans, and sale of equity.

3.2.1 Grants

A *grant* is a sum of money given to the company; while the company is obliged to demonstrate that it has been used for the purposes for which it was intended, it is not intended that the grant should ever be paid back to the organization which gave it. Not surprisingly, grants are only available from government (local or national) and European Commission sources or, very occasionally, from charities. Very often, grants are limited to a certain proportion of the money spent on a particular development and are conditional upon the remainder being raised from other sources.

The availability of grants and other help for new companies depends very much on where the company is located, how many people it expects to employ, and on government policy at the time. Typically, a new company, setting up in an area where maximum assistance is available, might expect to be provided with premises rent free or at half rent for the first 12 months; it might also expect a grant of £15,000 to £20,000, once it is employing five or six people, and a second similar grant when the number of employees reaches ten or a dozen [1] . These grants are intended to assist with capital investment, typically investment in premises and equipment, and are subject to a number of

conditions, in particular the raising of capital from other sources, and often the grant is limited to a certain proportion of the capital investment that the company can prove it has made. This means that they are often of limited usefulness to small software companies, whose investment more usually takes the form of employees' time.

A variety of programmes, both national and European, offer grants to assist in the development of high technology products. Examples are the European Community Framework V programme and the SMART programme of the Department of Industry in Britain. Depending on the programme, it may a requirement that the proposed development is collaborative, i.e. involves more than one company, and, in the case of European programmes, that the collaboration involves companies from at least two member states of the European Community. The assistance is almost invariably limited to 50 per cent of the cost of the development and often to less.

3.2.2 Loans

While grants are undoubtedly very helpful, their effect on company finance, for all but the smallest companies, is usually marginal. The major sources of finance are loans and the sale of equity.

1. Very much larger grants are, of course, available to large companies building new plants that will create many new jobs.

A loan is a sum of money lent to the company; interest is payable on it, at a rate that may be fixed or variable, and the loan is usually for a fixed period. The company is liable to pay back the loan and, if the company goes into liquidation, the lender is entitled to recover the loan from the sale of the assets of the company. In most cases, security is required for the loan; that is, the loan is associated with assets owned by the company in much the same way that a mortgage is associated with a house. If the borrower defaults, i.e. fails to meet the repayment conditions agreed, the lender can request the courts to make an order that the assets be sold off and the proceeds used to repay the loan. If the company does not have assets sufficient to cover the loan, then the lender may ask for personal guarantees from the directors of the company; this may mean that the directors use their own homes or other property as security for the loan.

It is usual to divide loans into three categories: overdrafts, short-term loans and long-term loans. An overdraft is the most flexible form of loan. Overdrafts are offered by banks; they allow a company (or an individual) to spend more money than is in its account, up to a specified maximum. Interest is only payable on the amount actually owned and the rate is normally comparatively low; it is usually fixed at a certain number of points above the bank base lending rate, the precise figure depending on the bank's view of the credit-worthiness of the borrower. While overdrafts are the most flexible and usually the cheapest way to borrow, there is a price to be paid. A bank can withdraw overdraft facilities without warning, possibly for reasons of general policy that have nothing to do with the borrower. Many small companies have been forced into liquidation unnecessarily as a result of such action by banks.

In contrast, long-term loans are usually made for a fixed period at a fixed rate of

interest. The borrower receives the capital (the amount of the loan) at the start of the period of the loan and is committed to paying interest on that amount throughout the period of the loan. Provided the borrower pays the interest on time, the lender cannot call in the loan. The borrower must repay the capital at the end of the period.

As a result of various government initiatives, a 'soft loan' may be available; this is a loan on terms which are less onerous than those that prevail for commercial loans. Soft loans are usually only available to start-up companies; the interest rates may be lower than commercial interest rates and security is not demanded.

3.2.3 Equity capital and gearing

Equity capital is money paid to the company in exchange for a share in the ownership of the company, as described in the previous chapter.

The relationship between loan capital and equity capital in a company is important. It is known as *gearing* [2] . Shareholders are at a much greater risk of getting a poor return on their capital or even losing it completely than are lenders but, in compensation for this, they stand to make a greater profit than lenders if all goes well. To illustrate this, let us take the extreme (and unrealistic) example of a company which has a share capital of £100 and loan capital of £10,000, at 10 per cent. If the company makes an operating profit of £1,000, the interest charges will consume all the profit and the shareholders will receive nothing. If the company's operating profit doubles, to £2,000, the lender will still receive £1,000 but, neglecting taxation and assuming that all the profit is distributed to the shareholders, the shareholders will receive £1,000, a rate of return of 1000 per cent. Furthermore, as the profits increase, the value of the company, and hence the value of the shares, increases. If the company is sold, the shareholders will get much more than their original £100 investment, but the lenders will still only be entitled to their original £10,000, plus interest. If, on the other hand, the company is unsuccessful and goes into liquidation, the lenders will be at the front of the queue of people to whom money is owed, whereas the shareholders will get nothing until everyone else has been paid in full.

Such high levels of gearing are undesirable both from the point of view of the shareholders, because so much of the company's income is committed to interest payments, and from the point of view of the lenders, because shareholders may encourage the company to trade recklessly in the knowledge that they have little to lose and a lot to gain.

3.3 Budgeting and monitoring

A budget is a prediction of the future financial position of an organization covering, usually, the current or the next financial year. In effect, therefore, it is like the financial parts of a business plan and should, indeed, be backed up by the same sort of analysis of the marketing position and the technical feasibility of the company's plans. A complete budget will include predictions for all of the annual financial statements described in Section 3.9. The ordinary manager in a company is, however, much more concerned with budgeting for income and expenditure than with other aspects of budgeting and it is with

this type of budget that we shall be concerned in this section.

2. The term leverage is used in the USA. This is only one example of some very confusing differences in financial terminology between Britain and North America. In recent years, the globalization of the finance industry has exacerbated this confusion. In Britain the term *stock* is used to mean a loan that can be bought and sold on the stock market, what is otherwise known as a *debenture;* in particular the phrase *Government stocks* refers to fixed interest government loans that can be traded on the stock market. In North America, the word *bond* is used for this and the term *stocks* means what in Britain are usually referred to as shares.

In any large organization, budgets are prepared at several levels. For a medium-sized computer services company, growing rapidly, the top-level expenditure budget, covering the whole organization, might take something like the form shown in Table 3.1.

These budget headings reflect, at least in part, an organization structured along functional lines; for an organization structured geographically some of the budget headings would refer to the costs of the geographical units. The totals under each heading will have been derived from more detailed budgets. Thus the budget for sales and marketing would be broken up into payroll costs for a sales manager and a specified number of salesmen; costs of their cars; travel, subsistence and entertainment costs; costs of mounting stands at exhibitions; and so on.

As well as budgeting for expenditure, it is necessary to predict the value of sales during the year. This again will be broken down into figures for the various areas of activity in which the company expects to engage. For a services company, it is also useful to break down the figures to show the amount which is expected from existing contracts, the amount expected from new contracts with existing clients and the amount expected from new clients. The last of these is inevitably the most uncertain.

Budgeting is an iterative process. The first version of the budget is likely to show expenditure exceeding income, since the operating managers will want to expand their operations while the sales and marketing department will not wish to give hostages to fortune by being over-optimistic about the volume of sales it can generate. Adjustments will have to be made repeatedly until a situation is reached in which budgeted sales exceed budgeted

Table 3.1 Expenditure budget for 1999 with 1998 budget for comparison (£)

	1999	*1998*
Directors salaries and expenses	504,000	480,000
Sales and marketing	600,000	400,000
Management salaries and expenses	1,125,000	945,000
Accounting and administration	200,000	180,000
Cost of labour	5,550,000	4,890,000
Education and training	165,000	150,000

Support services	41,000	37,000
Premises	600,000	500,000
Postage and telecommunications	90,000	85,000
Equipment maintenance	36,000	33,000
Consumables	22,000	20,000
Secretarial	240,000	190,000
Insurance	38,000	35,000
Professional services	20,000	25,000
Totals	9,231,000	7,170,000

expenditure with a reasonable profit margin; the operational managers are happy that they can service the predicted volume of sales with the budgeted staff levels; and the salesmen are confident that they can produce the predicted sales.

A budget reflects the organization's plans for the coming financial period. Like all plans, it is of limited usefulness in itself but becomes valuable when used as a basis for monitoring the organization's performance. The figures in the budget must be split into monthly (or sometimes weekly) figures; when the actual figures for a month become available they, together with the cumulative figures for the period so far, are compared with the corresponding figures in the budget. If expenditure under a particular heading significantly exceeds the budgeted figure, the reason must be determined quickly and remedial action taken. While in many cases the remedial action will be to reduce expenditure, in other cases—for example, when production costs are over budget because sales are higher than budgeted—the appropriate action may be to update the budget.

3.4 Sales and order intake

As we have seen, a company's costs and therefore, in part, its pricing and the level of overheads which it can afford, depend critically, in the first instance, on the level of sales. Monitoring the level of sales is therefore an important managerial activity and needs to be supported by adequate information. Some products, such as chocolate bars or floppy discs, are comparatively cheap and sell in large quantities. Typically, companies which produce them do so at a steady rate and store them until they are needed to fulfil an order. They expect to be able to despatch an order for a consignment of the product off the shelf, more or less as soon as the order is received. Thus the gap between receiving an order and payment becoming due is very short.

While some companies in the computer industry are of this type—for example, successful producers of desk top computers or very widely used software packages—most companies in the industry produce to order. The most extreme examples are the bespoke software houses, which produce software to meet the specific needs of individual customers or provide the services of staff to support customers who are

producing their own software. Although there may be some reuse of software from preceding projects, each order is usually substantially different from any other. In such companies, it becomes important to distinguish between *sales* and *order intake*. The amount of sales in a month is the total value of the invoices issued during the month; the order intake is the total value of the orders received.

A common situation is that a software house will win an order to provide support for a large project which is expected to last for three years; the order might provide for 500 man months of effort at a total cost of *£2* million. Assuming that the basis of the order is contract hire [3] , it will generate sales revenue in each of the following 36 months. It is unlikely that the manning pattern will be flat (i.e. the same number of people each month) and, indeed, the pattern agreed initially is likely to be subject to re-negotiation as the project proceeds; furthermore, a contract of this length is likely to include a clause allowing charges to be increased in line with inflation.

In order to monitor the company's sales, it is necessary therefore to calculate, from each order received, the pattern of future sales revenue which it is expected to generate. Furthermore, this calculation will need to be revised from time to time to take into account negotiated changes in the pattern of manning and increases in charges arising from the inflation clause.

3.5 Costing

The price at which an organization decides to sell a product or a service depends on the cost of producing or providing it and on the market conditions—the price and availability of competing products and the elasticity of demand (i.e. how the size of the market for the product will change if the price changes). The notion of cost is a remarkably complicated one and we shall deal with this first.

The cost of producing an item or providing a service is not a well-defined quantity and we need to use different definitions of cost for different purposes. Failure to realize this leads to many lengthy and heated but ultimately pointless arguments. Costs can be grouped into four categories, as follows:

- raw materials and bought-in items;
- costs of equipment;
- direct labour costs;
- overheads.

The relative importance of the four categories will vary considerably from organization to organization and some organizations may place certain costs in different categories; in some, the cost of premises will be treated as a fifth category.

3.5.1 Raw materials and bought-in items

Products are not produced out of thin air. Motor manufacturers buy steel from which they make car bodies; chemical companies buy sulphur from which they manufacture sulphuric acid. Materials such as these, which are

3. See Chapter 5 for a description of the various types of contractual arrangement.

bought by a company and processed as part of the company's manufacturing process, are known as *raw materials*.

Companies also buy items that are incorporated, unchanged, into their products—computer manufacturers buy chips from specialist suppliers; motor manufacturers buy door locks. Such items are known as *bought-in items*.

There is usually no difficulty in determining how many of which bought-in items, or how much of each type of raw material, goes into the final product. There is, however, one subtle point concerning the cost of such inputs. A company which uses chips or sulphur will usually carry a stock; it is quite likely that not all the stock was purchased at the same time or at the same price. Since we may not know from which batch the chips or the sulphur used in producing a given unit of output came, how do we decide which price to use in assessing its cost? The usual practice is to adopt a 'first in, first out' policy for costing, regardless of the order in which the items or materials are used. In other words, we use the cost of the oldest batch until we have used a quantity equal to the size of that batch, and then we pass on to the next batch.

In the case of raw materials or bought-in components such as memory chips, whose price may fall dramatically as a result of over-supply, a first in, first out policy for costing may render a company's prices uncompetitive and the current cost then has to be used instead.

3.5.2 Costs of equipment

Let us start with a domestic example: what is the cost of owning and using a car? Suppose that we buy a new car for £10,000, keep it for three years and then sell it for cash; suppose also that we drive 10,000 miles each year. For the moment, we neglect the effects of inflation.

When we come to sell the car for cash at the end of the three years, we may expect to get somewhere in the region of £4,200—the exact figure will depend on the make and model of car, how well we have looked after it, the time of year and the geographical location, and so on; remember also that, in neglecting the effects of inflation, we are assuming that the price of a new car has remained the same. The difference between what we paid for the car and what we sell it for is the depreciation of the car; it is a real and very important element in the cost of owning the car.

In order to buy the car in the first place, we need to have £10,000 available. We may have to borrow all or part of this sum, in which case we shall have to pay interest on it. This again is part of the cost of owning the car: if we don't buy the car we don't have to pay the interest. Less obviously, even if we do have the £10,000 available from our own resources, there is a cost attached to using the money to buy the car because we must forgo the income that the £10,000 could have brought us. In the simplest case we might have invested the money in a Building Society at, say, 6 per cent per annum. However, this is not consistent with our assumption of no inflation. Interest rates reflect inflation because lenders expect the interest rate to compensate them for the fall in the value of money as well as providing real earnings; in a time of no inflation, one would not expect

the interest rate to be more than 3 per cent. Taking this figure, at the end of the three year period, we would have had £10,927 in our account.

The income of £927 which we have elected to forgo is an example of an *opportunity cost,* that is a cost generated as a result of being unable to take up another opportunity of using the capital. Again we must emphasize that this is a real cost: if we do not choose to buy the car [4] , then we can invest the money in a Building Society and at the end of three years, subject only to possible variations in the interest rate, we will have an extra £927. Of course, there are other opportunities for investing the money—an outsider at 100 to 1 in the 3.30 at Ascot, for example—and therefore other ways in which we might choose to calculate the opportunity cost but such investments are likely to be less certain to produce a predictable return.

The costs that we have dealt with so far *are fixed costs;* that is, they do not vary with the amount that we use the car. Other examples of fixed costs include the Road Fund Licence (£155 per year) and insurance (say £500 per year).

There are other costs which are *variable costs;* these are costs which vary in proportion to the amount the car is used. The most obvious is fuel. If we assume that petrol costs £3.30 per gallon and that, on average, the consumption is 30 miles per gallon, the cost per mile is 11p. Other variable costs vary in a less smooth manner. A set of modern tyres will last for some 40,000 miles if they are properly looked after; a replacement set might cost £200. This gives a cost of 0.5p per mile for wear and tear on tyres. However, since we have only covered 30,000 miles by the time we sell the car, we shall have spent nothing on replacement tyres. Servicing costs are rather similar in nature. We assume that the car needs servicing every 10,000 miles and that a service costs £150; we shall therefore have serviced the car at 10,000 miles and 20,000 miles but not immediately before we sell it.

The costs of owning the car are summarized in Table 3.2.

If we distribute the cost over the 30,000 miles that we have driven, we arrive at a cost of 40.97p per mile. This figure is in line with the costs quoted by, for example, the Automobile Association.

This cost per mile is very dependent on how many miles we drive in the three year period, that is, on the utilization of the car. If we doubled the mileage to 60,000, allowing for additional fuel and servicing plus £200 for a

4. Strictly speaking, this is not quite true; the secondhand value of the car may be affected if we do a very high or a very low mileage. However, it is more or less constant over a fairly wide range of use.

Table 3.2 Costs of running a car

Loss of interest on capital	927
Depreciation	5,800
Road fund licence	465
Insurance	1,500

Total fixed costs	8,692
Fuel costs at 11p per mile	3,300
Servicing costs	300
Total variable cost over 30,000 miles	3,600
Total costs	12,292

new set of tyres and £500 for repairs (on the grounds that some repairs other than routine maintenance are likely to be necessary in the second 30,000 miles), the total cost would rise to £16,742 but the cost per mile would fall to 27.90p. This is a dramatic example of the general point that the cost of a unit of output from an asset depends critically on its utilization.

When we come to decide whether to make a journey using the car or whether to make it by some other means, even if our decision is made on purely financial grounds, these are not the cost figures we should use. The fixed costs will not be affected by the extra miles travelled on the journey. The only additional costs will therefore be the variable costs. On the figures given, these amount to 11p per mile for fuel, 0.5p per mile for tyres and 1.5p per mile for servicing, i.e. a total of 13p per mile. This, the cost of obtaining one extra unit of production from a machine, is called the marginal cost.

Opportunity costs have to be treated with care; what we have done above is not in accordance with normal commercial practice. It is appropriate to take into account opportunity costs when we are comparing competing proposals for investment or deciding whether or not to make a given investment (see Section 3.7); once we have decided to make the investment, we have, presumably, decided that it is the best of the available ways in which the company could use the capital and it is no longer appropriate to associate the opportunity cost with the asset. We therefore ignore it in calculating the cost of a unit of production from the asset. The cost of the capital is still real, of course, but it will be treated as an overhead—see below.

Table 3.2 is what economists would call an *ex post* calculation; it is based on a knowledge of what actually happened to our hypothetical car; we can only carry out such a costing after we have finally sold the car. For costing the use of a piece of machinery in industry, we need an *ex ante* estimate of what will happen, that is an estimate that can be made at the start of the life of the machine. This means making assumptions about what happens to the average machine of that type in the same environment. The same type of calculations will be carried out (excluding the cost of capital) but we need to look more carefully at the question of depreciation.

Depreciation can be looked at in (at least) two ways. On the one hand, it reflects the diminishing value of the item, both its market value and its value to the company, as its life passes; on the other hand, it is a way of distributing the cost of owning the item over the work which it produces. There are several ways of calculating depreciation. The two most commonly used are *straight line* depreciation and *reducing balance* depreciation. Suppose the initial cost of the item is C. Using straight line depreciation, we decide the likely life of the item, n years say, and its resale or scrap value at the end of its life, S. We

then calculate the annual depreciation as *(C−S)/n*. The notional value of the item at the end of year *m (m ⩽n)* is thus

$$C - \frac{m(C-S)}{n} = C\left(1 - \frac{m}{n}\right) + S\frac{m}{n}$$

Straight line depreciation is simple and adequate for many purposes. In particular, it is a reasonable way of distributing the cost of owning the item over its useful lifetime. If, however, we want the depreciated value of the asset to reflect its diminished market value—and, possibly, its diminished value to the company—straight line depreciation is unrealistic; the resale value of an asset normally falls much more in absolute terms during the earlier years of its life than during the later years. The reducing balance method of calculating depreciation reflects this. We choose a factor *r* (0<*r*<1) as the fraction by which the value falls in each year. Thus the notional value of the asset at the end of year *m* is $C(1-r)^m$ and the depreciation in year *m* is

$$C(1-r)^{m-1} - C(1-r)^m = Cr(1-r)^{m-1}$$

We would usually choose *r* to satisfy the equation

$$C(1-r)^n = S$$

i.e.

$$r = 1 - (S/C)^{1/n}$$

so that the nominal value at the end of the item's life will still be *S,* as with straight line depreciation.

Clearly with the reducing balance method, the value of the asset can never fall to zero; if we want to obtain the effect of no resale value we take *S* to be 1.

Table 3.3 shows for comparison purposes the depreciation and depreciated values, using the two methods, of an item whose initial cost is £10,000. We have taken a life of five years for the asset and a resale value of £2,000 at the end of the period. This implies a rate of 0.3312 for the reducing balance method. It should be clear that, certainly if the item is a car, the reducing

Table 3.3 Different methods of calculating depreciation (£) on an asset which cost £10,000.

	Straight line		*Reducing balance*	
Year	*Depreciation*	*Value at end*	*Depreciation*	*Value at end*

1	2,000	8,000	3,312	6,688
2	2,000	6,000	2,215	4,473
3	2,000	4,000	1,482	2,991
4	2,000	2,000	990	2,000

balance method gives a much more realistic picture of the change in its resale value.

For the purposes of internal costing, a company is free to use whatever methods it wishes for calculating depreciation. However, in its published accounts (see Section 3.9) the same method must be used for all assets of the same type and it is therefore common to use the same methods for internal costing as are used in the published accounts.

3.5.3 Cost of labour

Suppose that an employee is paid a salary of £15,000 per year. If that employee works for one hour in order to produce an item, what cost should we attribute to the employee's time?

First, we need to calculate the total cost of employing the employee for one year. In addition to his salary, we are obliged to pay what is known as the Employer's National Insurance Contribution. This depends on the salary in a rather complicated way; for a salary of £15,000, it comes to about £1,500. If the company runs a pension scheme, then it is normal for the employer as well as the employee to make a contribution to this; we assume the employer's contribution is 6 per cent, i.e. £900. In some cases, there may be other allowances payable, such as car allowances or clothing allowances but we shall ignore these. The total cost of employing the employee for the year is thus £17,400.

Next we need to work out how many hours the employee will work in a year. Assuming a five day week, there are 260 possible working days in a year. If there are 20 working days of holiday plus eight days of public holidays, this reduces the total number of working days possible to 232. However, we must make some allowance for days off for sickness. The best we can do is to take the average for the company as a whole, since we cannot predict what will happen to an individual employee; this might be eight days. This brings the total days worked down to 224. (It might be appropriate to reduce this number even further, to allow for time spent in training or time when there is no work to do, for example, but we shall ignore these possibilities here.) If we assume a seven hour day, the total number of hours worked is 1568. The cost per hour is therefore £11.10. A cost calculated in this way is not appropriate for all purposes, as we shall see in the following sections.

3.5.4 Overheads

Some costs (e.g. raw materials, use of specific machinery, some labour costs) can be directly associated with specific products or services. They are therefore taken into account directly in determining prices. Other costs, such as sales and marketing, managers' costs and costs related to the preparation of bids, cannot be directly associated

with specific products or services but nevertheless must still be covered by the total revenue. These are called *overheads*. Although they cannot be associated with specific items of production or service, they are nonetheless real costs and, if the company is to be profitable, they must be recovered from revenue.

Some of the overheads can be associated with specific parts of the organization and should therefore be covered by the revenue earned by those parts; these may be called *departmental overheads*. Other overheads can only be associated with the whole organization; these are known as *corporate overheads*.

It is important to realize that what is regarded as an overhead may vary from one organization to another. A software house based at a single site may find it impracticable or not worthwhile to associate the cost of rent, rates, heating and lighting with individual projects or departments; it will therefore treat these as corporate overheads. A computer manufacturer producing peripherals on one site, processors on another and system software on a third, will treat the cost of these premises as a departmental overhead (although the cost of premises for the head office will still be a corporate overhead). A company that runs a number of aluminium smelters at different sites will associate the costs of each site with the aluminium produced there. There is no "right" way of allocating overheads to individual parts of the organization or to individual products. How it is done depends partly on the policy of the organization and partly on the nature of the overhead. There are two basic approaches. Overheads can be added to costs of the inputs (labour, machine time, etc.) or they can be added to the costs of the outputs (products and services). In a bespoke software house, for example, overheads are usually recovered by adding them to the direct labour costs, calculated as in the previous section; this means that if the software house buys in computer equipment which will be delivered to the client along with software which is being developed, no substantial overhead is added to the cost of the equipment (although there may be a small addition to cover the costs of handling and financing it). A manufacturing company is more likely to recover overheads by adding a mark-up to the direct cost of each product. It is usual to make the amount added for overheads a fixed percentage of the cost to which it is being added, whether this is an input or an output, but some organizations use, say, a fixed overhead per man hour, regardless of the direct cost of the man hour.

All these different strategies can sometimes lead to markedly different price structures and it is important to ensure that the resulting price structure does not make the company uncompetitive. In the case of bespoke software houses, mentioned above, an attempt to add overheads to the cost of bought-in computers might make them uncompetitive in comparison with computer manufacturers who offer a software development service and who would, presumably, not expect to add an additional overhead to a product that they have manufactured themselves.

The treatment of overheads can markedly influence the way in which managers behave; in particular, it can alleviate or exacerbate the problems of sub-optimization referred to in the last chapter. We shall quote three examples from our own experience to illustrate the problem.

- An organization treats all the costs of running its fleet of cars, except for petrol, as overheads. As a result, it apparently costs only £25 for an employee to drive from Bristol to London and back, as against £80 return on peak hour trains. Local

management therefore encourages employees to drive rather than taking the train.

- A training company had a policy of applying overheads to all its charges. When it expanded its activities into residential courses, it applied this policy to the accommodation costs, with the result that its courses were seen as more highly priced than their (perfectly adequate) quality justified. Eventually it abandoned residential courses because it could not sell places on them at the prices it was charging.
- Department A in a large company is very highly automated and the marginal cost of its production is very low; because of the high capital investment, the departmental overheads are very high and thus are recovered by a very large percentage mark-up on everything the department produces. In the course of developing the automation, department A produces a novel software package. Department B hears about this package and realizes that it would help solve some of its own problems. It approaches department A asking to be allowed to use the software and expecting to pay a part of the development cost. However, department A's rules require that the very high mark-up is applied to everything it sells and even the 20 per cent discount which it is allowed to offer to internal customers still leaves the package costing more than equivalent packages available commercially. As a result, department B purchases a commercial package, at lower cost to itself but greater cost to the company as a whole.

Within the overall constraint that all overheads must ultimately be recovered from revenue, the following principles should apply to the way that overheads are distributed:

- consistency: similar costs should be treated in similar ways;
- the treatment of overheads should encourage managers to behave in ways which optimize the performance of the company as a whole rather than just the performance of their own department;
- the treatment of overheads should not distort the price structure of the company's products so as to make them uncompetitive.

It should be remarked that it is easier to enunciate these principles in general than it is to implement them in practice.

3.6 Pricing

The prices that a company charges for its products and services are ultimately constrained by the long-term requirement that the revenue from its trading operations must exceed the costs of those operations. Breaking this constraint in one year will mean an overall loss for that year, which may be acceptable if the company's assets and prospects justify it. However, it is clear that the company cannot continue to make losses indefinitely. In the very simple case that a company produces only a single product, this constraint implies a minimum selling price for a given volume of sales.

For a company which provides a range of products or services, the unit price of each item can be adjusted to maximize the company's profits and need not necessarily be related to the cost of providing the item. This is most easily seen by formulating the problem mathematically. Suppose that the company produces n products, numbered 1 to n. The cost of producing unit quantity of product i is c_i. The quantity of product i which

can be sold at a unit price of p_i is $q_i(p_i)$, that is q_i depends on p_i. The trading profit is thus

$$\sum_{i=1}^{n} q_i(p_i)(p_i - c_i)$$

We therefore want to choose the pi in such a way as to maximize this quantity. This choice of the p_i will be constrained by limitations on the q_i resulting from the fact that the company only has limited resources and cannot produce indefinitely large quantities of any of the products.

In certain industries, such as the chemical industry, a more sophisticated version of this model can indeed be used for planning pricing and production strategies. Both the market for the products and the number of producers may well be so large that the amount produced by an individual producer will have little if any effect on the price, which is itself determined by the market. In this case, the p_i are taken as constants and the model can be used to determine the q_i which maximize the trading profit, that is, what mix of products will produce the maximum profit.

For most companies the way in which q_i depends on p_i is much too uncertain for this approach to be useful. Pricing in such circumstances is usually based on the cost of producing the product or providing the service, plus a percentage for profit (and a percentage for overheads if these are not included in the costs used); the result of this calculation may then be modified in the light of perceived market conditions. In some industries, it is normal to discount prices for quantity or for favoured customers so that published prices must be sufficiently high to allow a sale to be profitable even after discounting.

3.6. 1 Pricing in software companies

Software companies are typically faced with pricing in three contexts:

1. pricing a bid to provide services, such as consultancy, design or programming, with payment based on the effort supplied;
2. pricing a bid for a contract to supply bespoke software at a fixed price;
3. pricing a software product which they have developed or for which they are agents.

In case (1), the price will depend on the cost of labour, calculated as described in the previous section, plus overheads. However, this price may need to be modified to take into account a number of factors:

- how badly the company needs the business. If there are staff not assigned to useful work who could be employed on the contract being bid for, the company may reduce its price to make its bid more attractive. In extreme cases, a company may bid for the business at little more than marginal cost (i.e. direct labour cost plus expenses) in order to avoid having to lay staff off. Alternatively, if there are no staff likely to be available to do the job or the work could only be done by transferring staff from other projects, to their detriment, the company may decline to bid or bid an unrealistically

high price;

- the desirability of the client. Clients may be desirable because the prestige of their name on the company's client list will help the company win other business. Or they may be desirable because they are known to place a lot of business in the general area of the company's activities but it has previously always been placed with competitors. In either case, the company may be prepared to cut its prices in order to win business with the client;
- the general level of the market. If a company's competitors are offering similar services at a lower price, the company may have to lower its price; conversely, if the competitors' prices are known to be higher, the company may raise its prices so that they are closer to those of the competition.

In case (2), the first step is to estimate the resources needed to carry out the project; this is a notoriously difficult task and its results are unreliable. However, software engineering courses usually address this topic at some length and so we shall assume here that the estimating has been carried out. The costs of the labour required and any travel and subsistence expenses can be calculated as before but there will be other costs to be included. If the system as delivered is to include bought-in hardware or software, the costs of these must be included; this may include maintenance costs, operating costs and costs for floor space, insurance and delivery of hardware. On a fixed price contract, it is usually the case that stage payments (i.e. payments made by the client in advance of delivery of the system) lag behind the supplier's costs, so the cost of financing the work must be taken into account (see Section 3.7). Systems of this sort are usually supplied with some sort of guarantee so the cost of servicing this needs to be included. Finally, fixed price projects invariably carry a significant risk; it is normal to increase the total price by a factor of up to 50 per cent, depending on the perceived level of the risk in order, on the one hand, to provide a contingency allowance in case of problems and, on the other hand, to compensate the company for the risk being taken.

Once a price has been determined for a fixed price contract, the same factors as above may cause the company to adjust its price. However, because of the risks involved, the company should be very much more cautious about price cutting; many prestigious software companies have suffered severe financial damage as a result of undertaking fixed price contracts at too low a price and, in some cases, this has resulted in the total collapse of the company.

Pricing software products is very different. The resources used in developing the product should be known and from these the costs of the development can be calculated. The costs of maintaining and supporting the product must also be estimated; these will usually consist of a fairly substantial fixed cost plus a small variable element depending on the number of copies sold (or, perhaps, the number of different clients to whom it is sold). The cost of selling the product must also be taken into account. The pattern of selling and support costs will be very different for a product which is expected to sell a very large number of copies fairly cheaply than for a product which is expected to sell only a few copies but at a high price. A company which already has a number of successful products will already have the necessary sales and support infrastructure and the costs of adding the new product may be quite low; for a company starting from scratch in the products market, the costs can be extremely high.

Since there are substantial fixed costs involved, including the need to recoup the costs of the individual development, the pricing is critically dependent on an estimate of likely sales. Unfortunately, this is always uncertain, particularly since the price may affect sales volumes. Thus, while it is clearly better to sell 1,000 copies at £100 than to sell 100 copies at £500, to pitch the price at £100 and then only sell 100 copies may well be disastrous.

Surprisingly, with most products and services, there is a danger of failing to win orders because the price is too *low*. Nowhere is this more true than in the software industry. This apparent paradox arises because customers usually have an idea of the price they expect to pay and will be suspicious of the quality of the product or the supplier's understanding of their requirements if the price is significantly less than expected.

3.7 Working capital and cash flow

It is perfectly possible for a company to be consistently profitable and yet be unable to pay its bills. This can arise because accounting normally operates on an *accrual* basis. In other words, the proceeds of a sale are treated as revenue from the moment that an invoice is issued, rather than when payment is received; similarly expenditure is treated as incurred at the moment that payment of an invoice is authorized rather than when payment leaves the company's bank account. Profit and loss, assets and liabilities are assessed on this basis.

We have already mentioned the large gap that can occur between issuing an invoice and receiving payment. Some of the delay is a consequence of the procedures which have to be carried out before the invoice is paid—checking that the goods or services have been received and meet their specifications and that their purchase was correctly authorized; some arises because payments to creditors are batched and only take place once or twice a month; and some arises because certain companies have a policy of delaying payment to creditors as long as possible.

A second reason why a profitable company may be unable to pay its bills is the value of its *work in progress*. The development of a large piece of bespoke software may take many months or even years; if the customer is not prepared to pay for it until it is delivered, the company producing it will have to pay the costs of the development before it receives payment and these may include costs of bought-in items. In such circumstances, it is usual to negotiate stage payments rather than leaving all payment until the work is completed. Nevertheless, stage payments rarely cover the full value of the work done up to the point that they are made. Typical arrangements for stage payments are described in Chapter 5. In a manufacturing company, stocks of finished goods and raw materials have to be financed in an analogous way.

Cash has therefore to be found to cover the gap between what a company has to pay out in cash and what it receives in cash. This is known as *working capital*. It is important to understand the difference between working capital, which is money needed to finance the company's day to day operations, and investment capital, which is capital used to enhance the company's productive capacity (e.g. by purchasing new machinery) or to develop new products.

In order to avoid the danger of the company being unable to pay its bills, it is necessary to ensure that sufficient cash will be available. This, in turn, requires the production of a *cash flow prediction*. Typically, such a document shows the amount of cash expected to be received and disbursed in each of the next twelve months, together with the cumulative position. A simple example is given in Table 3.4; note the common accounting convention that figures in parentheses are negative. The variation in cash received will be due to changes in the amount that the company is able to invoice in preceding months—cash received in month 4 depends on the amounts invoiced in months 1 and 2, according to the known payment records of its customers; the irregularity in cash disbursed will reflect such items as rent payable quarterly. From such a table the company's maximum requirement for working capital over the period covered by the prediction can be estimated; in this case it is £34,000. In contracting companies, where the forward cash position can be drastically affected by a single contract, the cash flow prediction will usually be revised monthly.

The commonest source of working capital is a bank overdraft. In contrast to other sorts of loans, the bank specifies the maximum that can be borrowed on an overdraft but interest is only payable on the amount actually owed. Furthermore, the bank can demand repayment of the overdraft at short notice. If a need for more working capital is foreseen, an

Table 3.4 Simple cash flow prediction (£).

Month	*Cash in*	*Cash out*	*Net monthly cash flow*	*Cumulative cash flow*
1	4,000	15,000	(11,000)	(11,000)
2	5,000	15,000	(10,000)	(21,000)
3	8,000	18,000	(10,000)	(31,000)
4	12,000	15,000	(3,000)	(34,000)
5	16,000	15,000	1,000	(33,000)
6	18,000	19,000	(1,000)	(34,000)
7	20,000	17,000	3,000	(31,000)
8	28,000	17,000	11,000	(20,000)
9	24,000	20,000	4,000	(16,000)
10	16,000	17,000	(1,000)	(17,000)
11	30,000	18,000	12,000	(5,000)
12	23,000	20,000	3,000	(2,000)

increase in the overdraft limit will need to be negotiated. Predicting this need well in advance will serve to convince the bank that the company is well managed and therefore make it more likely that the bank will agree to the request.

3.8 Assessing investment proposals

At any time, there are likely to be several proposals competing for investment resources in a company. They may range from a proposal to invest £100 million in the production of a new supercomputer to a proposal to invest £10,000 in equipping typists with word processors to increase their productivity. The amount of capital which a company can raise for investment purposes is always limited—lenders and investors will only provide capital commensurate with size of the company—and it is usually necessary, therefore, to select from the proposals on the table.

There is no single way of assessing and comparing the different proposals; factors that must be taken into consideration include, for example, the extent to which the proposals are consistent with the company's long-term plans; the risk attached to the proposals; and the availability of the necessary resources even if the money is available. One important criterion, however, is the financial one: which of the proposals will give the best return on the investment? The usual way of determining this is to use the method known as *discounted cash flow*.

Discounted cash flow (DCF) starts from the observation that a sum of money held now is worth more, even in the absence of inflation, than the right to the same sum of money at some time in the future: assuming a 3 per cent interest rate, in the absence of inflation, £100 held now is worth £103 in one year's time, or £100 in a year's time is worth £97.09 now. In general, if the cost of capital is r (expressed as a fraction such as 0.13, not a percentage), then the present value of a cash flow X due in t years' time is

$$\frac{X}{(1+r)^t}$$

The quantity $1/(1+r)^t$ is known as the *discount factor*.

The essence of investment is that money is spent now so as to produce benefits in the future; assuming those benefits can be quantified in monetary terms, we need to ask what is their *present* value. To do this, we calculate the net cash flows that the project will generate over each year of its life and convert these to a present day value. The sum of these gives the *net present value* (NPV) of the project; if the life of the project is n years and the cash flow in year i is X_i the NPV is

$$\sum_{i=0}^{i=n} X_i/(1+r)^i$$

The annual cash flows exclude interest charges on outstanding negative balances or interest receivable from positive balances because these are, in effect, taken into account by the process of calculating the NPV.

Provided that the effects of inflation are taken into account when predicting future cash flows, there is no need to make special provision for handling inflation in a DCF analysis.

By using the monetary cost of capital (i.e. the interest rate actually paid), its effects are automatically taken into account. Alternatively, the analysis can be carried out assuming no change in general price levels but in this case the cost of capital should be taken as $(m-i)/(m+i)$ where m is the monetary cost of capital and i is the inflation rate.

As an example of simple DCF analysis, consider a company that is considering the development of a software product. It is estimated that three people will be required for development in the first year and a further person and a half in the second year; suitable staff cost £20,000 per year, including the employer's pension and National Insurance costs. The product will be released in the second year and it is expected that its life will be about four years. Maintenance is expected to require one person, full-time, for three years, dropping to a quarter of a person in the final year. Sales and marketing costs are estimated to be £10,000 in the first year, rising to £20,000 for the next three years and falling to £5,000 in the final year. The product itself is a fairly high value but specialized product. It is expected that about 85 copies will be sold in all, at somewhere between £3,000 and £5,000 a copy. Table 3.5 shows the DCF analysis for the proposal, using 10 per cent as the (monetary) cost of capital, and a selling price of £4,000.

The NPV of the project over its five year life is the cumulative present value shown in the bottom right hand entry, £67,620 but there are other measures of a project's attractiveness which can be deduced from this table.

Table 3.5 DCF analysis for a proposed product development (£).

	Year 0	*Year 1*	*Year 2*	*Year 3*	*Year 4*
Development cost	60,000	30,000	0	0	0
Maintenance	0	20,000	20,000	20,000	5,000
Sales and marketing	10,000	20,000	20,000	20,000	5,000
Number of sales	0	15	30	30	10
Revenue	0	60,000	120,000	120,000	40,000
Net cash flow	(70,000)	(10,000)	80,000	80,000	30,000
Discount factor	1	0.909	0.826	0.751	0.683
Present value	(70,000)	(9,091)	66,116	60,105	20,490
Cumulative present value	(70,000)	(79,091)	(12,975)	47,130	67,620

One is the *pay-back period;* this is the time required for the project to achieve a positive net cash flow. For the project in the table, this is four years, since the first positive cumulative cash flow is £47,130, at the end of year 3 (remembering that we start from year 0). We can also calculate the *internal rate of return* (IRR) on the project. This is the cost of capital which would lead to the NPV being precisely zero; it is calculated by solving the equation [5]

$$\sum_{i=0}^{i=n} X_i/(1+r)^i = 0$$

for *r*. The IRR is the maximum cost of capital at which the project would be viable. For the figures in the table it is 40.5 per cent.

A proposal will normally be rejected out of hand if its NPV is not positive, if its pay-back period is greater than some pre-set threshold or if its IRR is less than the current cost of capital. If there still remain projects between which a choice must be made, the organization should probably choose those which have the highest positive NPV. This, however, usually reflects a long term view and other pressures may cause companies to accept the projects with the highest IRRs or the shortest pay-back periods. (Note that a shorter pay-back period generally means less risk, because our assumptions about market conditions are likely to be more reliable over the shorter period.)

Because of its apparently precise nature, there is a tendency to put too much trust in DCF analysis. However precise the calculations, the cash flow predictions are inherently uncertain. An example of the case where uncertainty is comparatively low is the replacement of plant or equipment in the manufacturing or process industries. If the new plant is installed and functioning correctly by the scheduled date and if market conditions do not change dramatically, the cash flow predictions should be reasonably accurate and the major source of uncertainty is the cost of capital; there are, of course, plenty of occasions when the assumptions about installation of the plant and market conditions will prove false but this is likely to be the exception rather than the rule.

If we use DCF analysis to assess a proposal for developing a software product, as we have done above, then the sources of uncertainty are very much greater. Although a net present value of £67,620 and an IRR of 40.5 per cent look attractive, we must take into account that:

- the development may take more resources than estimated;
- the product may not be in a marketable state until later than predicted;

5. The solution of this equation involves some non-trivial numerical analysis. Fortunately, most widely used spreadsheets include a facility for carrying out the calculation of the IRR.

- sales may not follow the predicted pattern;
- a competing product may be launched before the product being assessed is available.

It is important, therefore, to carry out a series of DCF analyses with different estimates of the cash flows and the discount rate in order to assess the sensitivity of the results to such changes. If the project remains attractive under the different sets of assumptions, it is comparatively low risk; if it becomes unattractive under small changes, then it is high risk and should probably be rethought. In the given example, if the sales in years 2, 3 and 4 drop to 20, 20 and 5 respectively, the cash flow never becomes positive. Predicting sales this far ahead is very uncertain, so the project should be regarded as high risk. On the other hand, if the sales in years 2 and 3 reach 40, the NPV rises to £130,731. This

sensitivity to changes in sales volumes is characteristic of software product developments.

3.9 Annual statements

The Companies Act 1985 requires all limited companies to produce annual accounts and to give a copy of them to the Registrar of Companies for filing; the public has access to these files. The Companies Act further requires that the company accounts should include a balance sheet, a profit and loss account and an auditor's report. It also requires the disclosure of a substantial amount of supplementary information. Companies which fall below certain size thresholds are exempt from some of these provisions. As mentioned in Section 2.2.3, companies whose shares are traded on a stock exchange are also subject to disclosure rules imposed by the stock exchange; these requirements are more stringent than those imposed by the Companies Act.

While the Companies Act places general requirements regarding the disclosure of financial information relating to companies, the details of how this information should be prepared and presented are governed by accounting standards. Until July 1990, these were promulgated by the Accounting Standards Committee (ASC), a joint committee of the six major professional accountancy bodies in the British Isles: the Institutes of Chartered Accountants in England and Wales, of Scotland and in Ireland; the Association of Certified Accountants; the Institute of Cost and Management Accountants; and the Chartered Institute of Public Finance and Accountancy. Its membership also included "user" representatives, drawn from such bodies as the banks, the Stock Exchange and the Confederation of British Industries.

The ASC prepared draft Statements of Standard Accounting Practice (SSAP); these were then adopted by the professional bodies and it became incumbent on their members to adhere to them or to justify any deviation from them. The ASC has now been replaced by a more independent body, the Accounting Standards Board. The SSAPSs are being replaced by Financial Reporting Standards (FRS). These standards often allow a wide variation in practice and leave much scope for individual judgement.

3.9.1 The balance sheet

A balance sheet is a snapshot of the financial state of an organization at single instant—normally the end of an organization's financial year. It shows the value of what the organization owns (the assets) and what it owes (the liabilities). To illustrate this in simple terms, Table 3.6 shows the personal balance sheet for an imaginary student. As is usual, the balance sheet also shows the position twelve months previously, for comparison purposes.

At first sight, the assets part of this balance sheet contains one or two surprising items. The accommodation item refers to the fact that the student has paid a term's fees to the hall of residence in advance; since the balance sheet refers to the position on 31 October, some 60 per cent (six weeks out of ten) of this accommodation has not been used. Depending on the regulations of the hall, if the accommodation is no longer required, the

student may be able to get a refund on the unused period or sell it to another student; in other words, the student has paid for the right to live in hall for a further six weeks and this right can be converted into cash and is therefore an asset. In a similar

Table 3.6 Balance sheet for a student (£).

Kenneth Widmerpool *Balance Sheet* *As at 31 October 1999*	*1999*	*1998*
ASSETS		
Cash in hand	32.50	41.30
Cash at bank	271.15	175.42
CD player and discs	120.00	
Books	40.00	50.00
Bicycle	60.00	65.00
Pre-paid accommodation	300.00	280.00
Debts owed by friends	12.00	
Total assets	835.65	611.72
LIABILITIES		
Credit card bill	124.31	51.22
Student loans	4,200.00	1,300.00
Total liabilities	4,324.31	1,351.22
NET WORTH	(3,488.66)	(739.50)

way, the debt of £12 owed by friends can be turned into cash and is also therefore an asset.

The valuation of assets can be a contentious issue. For the moment we shall simply accept the figures given in the balance sheet but we shall have much more to say on this topic when we come to look at a commercial balance sheet.

As its name suggests, a balance sheet must balance: the total assets and total liabilities should be equal. To achieve this we need to include a *balancing item* on one side or the other; it is often labelled "excess of assets over liabilities" but in this case we have chosen to call it "net worth" because it represents the amount of cash which the student would have if all assets were sold and all debts paid off—in other words, how much the student is "worth". The net worth plus the liabilities together equal the student's total assets.

Commercial balance sheets

Commercial balance sheets are prepared on precisely the same basis as we have just

described but the assets and liabilities are grouped into various categories and a single figure is given for each category. There will be several "notes" to the balance sheet describing the basis of the accounts and giving more detail about certain items; such items will cross reference the notes. Table 3.7 is an example of such a balance sheet for an imaginary software services company but no notes have been included.

Assets are classified as current assets and fixed assets. The essential difference between the two is that fixed assets contribute to the company's productive capacity while current assets are items which are bought and sold in the course of its day-to-day trading activities. The fixed assets are further subdivided into investments (e.g. shares in other companies), tangible assets (assets which have some physical existence) and intangible assets (assets such as copyrights in literary works, which have no physical existence).

In most cases the difference between fixed assets and current assets is easily perceived. A new computer bought to provide program development facilities in a software house or a machine tool used to produce printer barrels are clearly examples of fixed assets; a stock of paper for the laser printer is equally clearly a current asset. It should be borne in mind, however, that the treatment of the same item may vary from organization to organization or even within the same organization. Thus, if a company buys a car to enable one of its salesmen to operate more effectively, this is a fixed asset but, if a car dealer buys a car in order to resell it as part of his business, this is a current asset. If the software house buys a computer on which it will implement special software before delivering the whole system to a client, the computer is a current asset, not a fixed one.

Table 3.7 Balance sheet for a services company (£'000)

XYZ Software Ltd *Balance Sheet* *As at 31 October 1999*	1999	1998
FIXED ASSETS		
Intangible assets	475	–
Tangible assets	960	770
Investments	50	82
Total fixed assets	1,485	852
CURRENT ASSETS		
Work in progress	550	621
Debtors	3,400	2,580
Cash in hand and at bank	2,491	1,770
Total current assets	6,441	4,971
CREDITORS: AMOUNTS FALLING DUE WITHIN ONE YEAR	(3,210)	(2,601)

Net current assets	3,231	2,370
Total assets less current liabilities	4,716	3,222
CREDITORS: AMOUNTS FALLING DUE AFTER ONE YEAR		
Borrowings	(154)	(61)
Provisions for liabilities and charges	(7)	(16)
Net assets	4,555	3,145
CAPITAL AND RESERVES		
Called up share capital	318	308
Share premium reserve	350	145
Profit and loss account	3,887	2,692
Shareholders' funds-equity	4,555	3,145

Fixed assets

Fixed assets will be shown as such on the balance sheet and will be depreciated over the years according to the company's normal practice. They will be recorded in the company's fixed asset register and, from time to time, their presence will be physically checked. If a fixed asset is sold for a sum higher than its depreciated value then the company must show the difference as profit. Because of these complicated procedures, it is usual to treat all purchases of less than, say, £1,000 as expenses in the year in which they are incurred.

There are some items which are difficult to classify. Bought-in software is one such example. If a company commissions the development of bespoke software, at a cost which can easily run into hundreds of thousands, if not millions, of pounds, it usually expects that this will increase its productive capacity, in one way or another. In other words, it should be treated as a fixed asset and its cost written off over its expected useful life. However, it is not uncommon to see such purchases written off in the year of purchase, unless the software has been bought as part of a complete system including hardware. The rationale for this would seem to be that the staff costs of a company's DP department are usually treated as part of the costs of its day-to-day operations, since much of its activity is indeed part and parcel of these operations; the result is that software developed in the DP department is not treated as a fixed asset. Software commissioned from an external contractor is usually procured in this way as an alternative to developing it "in-house" and it is therefore treated in the same way. However, the Finance (No. 2) Act 1992 explicitly provides for bought-in software to be treated on a par with plant and machinery for the purpose of claiming capital allowances [6] and, since the end of 1998, both bought-in software and software developed inhouse are included in the national accounts; with such official encouragement, it is likely that the capitalization of expenditure on software will become more common.

A particular problem is presented by the capitalization (i.e. treatment as a fixed asset)

of research and development (R & D). On the one hand, expenditure on R & D is usually intended to improve the company's productive capacity; its results should therefore be treated as a fixed asset. On the other hand, the level of uncertainty in R & D is so high that any valuation is potentially misleading. The formal position is that R & D expenditure should be written off in the year in which the costs are incurred with the exception of development expenditure associated with specific marketing plans for a commercially viable product, which may be capitalized. In the USA, there are strict rules regarding the capitalization of software that is developed for sale; these rules are based on a rather unrealistic model of the product life cycle. In the UK, a variety of different treatments are acceptable, including the US one.

Intangible fixed assets are the source of much discussion in the accounting profession. Software is generally regarded as an intangible asset but it is more tangible than many items, brand names, for example, which are often shown as intangible assets. An item that frequently appears under intangible assets on the balance sheets of software product companies is goodwill. This might arise, for example, if XYZ Ltd purchased another company, PQR Ltd, that owned the rights in a profitable package. If, as is likely, the package was not

6. Special tax allowances for capital expenditure, intended to encourage investment.

shown as an asset on PQR's balance sheet, XYZ would probably have paid much more to buy PQR than the value of its net assets. The difference between the price paid for PQR and the value of its net assets represents XYZ's estimate of the value of the rights in that package (and, possibly, other things such as the value of PQR's name). This needs to be shown on XYZ's balance sheet. While it would be preferable for the value of the package to be shown explicitly, this is not normal practice and the whole of the difference between the purchase price and the value of PQR's net assets is normally shown under the heading of goodwill. It will then, of course, need to be amortized over a fixed period. The notes to a company's accounts will normally itemize any acquisitions and give details of the goodwill arising from each one. When Internet companies change hands a similar situation occurs but, in this case, the intangible assets may be much more difficult to identify; they are certainly less tangible than the rights to a package.

In contrast to current assets, fixed assets are part of the company's productive capacity; they are not therefore expected to be sold in normal trading operations and resale value is irrelevant; what is needed is a measure of their value to the company. In practice, this is done by reducing their value each year in accordance with the company's depreciation policy. The value of certain types of fixed assets, in particular property, may increase rather than decrease. Public companies therefore usually arrange to have their property revalued at regular intervals (typically every five years or so) and include this valuation in the balance sheet.

Current assets

The rules for valuing current assets are very different from those for valuing fixed assets. Current assets must be valued at the lower of cost and net realizable value (the money

that would be obtained by selling them, less any expenses of the sale). This is appropriate because current assets are part of the company's day-to-day trading operations and are expected to be sold. In the case of bespoke software acquired by a company and treated as a current asset, its resale value is probably nil—bespoke software is usually of use only to the company that commissioned it and the scrap value of used software is zero; it will not therefore appear in the balance sheet.

Manufacturing companies will usually have items in their list of current assets covering stocks of finished products, i.e. stocks of whatever it is they produce that have not yet been sold to customers, and stocks of raw materials. Contracting companies will usually have an item for "amounts recoverable on contracts" or "work in progress", that is work being carried out under contract to clients that has not yet been billed. The valuation of any of these items is subject to a degree of uncertainty. The finished goods have not yet been sold; it might prove impossible to sell them. The work in progress value on a software contract may be based on the assumption that the software is 90 per cent complete but software projects have been known to remain 90 per cent complete for a very long time.

Over-optimistic valuation of stock or of work in progress was followed by two spectacular company collapses in the 1970s. In the case of Pergamon Press, large stocks of expensive scientific books, translated from the Russian, were valued at their selling price, despite the fact that there was little likelihood of selling them. In the case of Rolls Royce, a new generation of aeroengines was being produced under a fixed price contract; the work in progress was valued on the basis of the resources so far expended, rather than on the basis of the resources required to complete the work; the difference between the two valuations was substantial. In both cases, the companies ran out of cash and their bankers refused to provide further loans once the true situation became apparent. In the case of Pergamon, the incorrect valuation appeared to have been deliberate, and hence fraudulent [7] ; in the case of Rolls Royce it was simple incompetence.

Liabilities

The liabilities section of a commercial balance sheet effectively distinguishes between current liabilities, which are those which fall due within twelve months of the date of the balance sheet and long-term liabilities. (Note that the difference is also apparent in the student's balance sheet, where there is a clear difference between the debt to the credit card company, which has to be repaid quickly, and the student loan, which does not.) The current liabilities will usually be those that have been incurred in the company's normal trading operations while the long-term liabilities will arise from funds borrowed for investment in fixed assets. However, even a long-term loan eventually comes to its final year and will then appear under current liabilities. It is usual to arrange current liabilities next to current assets in the balance sheet so that they can be deducted to give a figure for "net current assets".

The phrase "provisions for liabilities and charges" refers to items which the company knows it will have to pay but whose precise amount may be uncertain; this may include tax on previous years' earnings which has still to be assessed or work which may have to be carried out by the company under warranty.

After deducting the short- and long-term liabilities, we are left with a figure that shows the company's net assets, what we called the net worth in the case

7. It was the collapse of the Pergamon group that led Department if Industry inspectors to describe the late Captain Robert Maxwell as "unfit to be a director of a public company", despite which condemnation he was subsequently permitted to become chairman of Mirror Group, with the now well known consequences.

of our student. In the case of a company, it is customary to show how these net assets have come about. In the example shown, there are three items. Called-up share capital is simply the face value of the shares that have been issued; the figure from the profit and loss account is simply the total value of the profits and losses made by the company since it was established; and the share premium reserve is the extra money raised when shares have been sold at above their face value.

3.9.2 Profit and loss account

A *profit and loss account* (usually called an *income and expenditure* account in the case of non-profit making organizations) shows what has happened to an organization's financial position over a period of time—usually, again, the organization's financial year; it records the money received and the money spent. Table 3.8 shows such an account for our imaginary student. It is important to observe that the excess of expenditure over income, that is, the amount that the student has overspent, is the same as the difference in his net worth between 1998 and 1999. This will usually be the case in simple situations where there has been no capital investment. In more complicated cases, particularly with commercial organizations, other items enter into the relationship.

Table 3.8 Income and expenditure account for a student (£).

Kenneth Widmerpool *Income and Expenditure Account* *Year ended 31 October 1999*	*1999*	*1998*
INCOME		
Contribution from parents	1,000.00	1,000.00
Income from summer job (net)	1,851.35	1,467.43
Total income	2,851.35	2,467.43
EXPENDITURE		
Course fees	1,025.00	1,000.00
Hall fees	1,980.00	1,850.00
Transport	125.78	101.32
Food	1,203.40	990.38

Entertainment	1,261.33	840.25
Depreciation	30.00	30.00
Total expenditure	5,600.51	4,811.95
EXCESS OF INCOME OVER EXPENDITURE	(2,749.16)	(2,344.52)

Just as in the balance sheet, there is a certain arbitrariness about the way in which items have been aggregated. We could, for example, have lumped together "Food" and "Entertainment" under the heading "Living Expenses" or have split "Transport" into "Road" and "Rail". We have chosen to show the income from the summer job net (i.e. the take home pay) rather than show it gross with tax and national insurance on the expenditure side.

Some explanation of the depreciation item is required. The net figure at the bottom of the profit and loss account should reflect the extent to which the organization—or, in this case, the individual—is better or worse off at the end of the year than at the beginning. Clearly, a fall in the value of the assets tends to make it worse off. Depreciation, although it is not an expenditure in the sense that cash is paid out, reflects this decline and is therefore shown as an expenditure.

Commercial profit and loss accounts

Although the same basic idea underlies a commercial profit and loss account, its appearance is very different from the one above. Table 3.9 shows an example for our fictitious computer services company. Just as with the balance sheet, we see that items have been aggregated into very broad categories; the notes to the accounts will usually provide more detail. A package

Table 3.9. Profit and loss account for a services company (£'000).

XYZ Software Ltd *Profit and Loss Account* *Year ending 31 October 1999*	*1999*	*1998*
TURNOVER		
Continuing operations	14,311	11,001
Acquisitions	407	
Total turnover	14,718	11,001
Cost of sales	(11,604)	(8,699)
Gross profit	3,114	2,302
Other operating expenses	(1,177)	(805)

OPERATING PROFIT	1,937	1,497
Interest payable	(23)	(27)
Profit on ordinary activities before taxation	1,914	1,470
Tax on profit on ordinary activities	719	480
Retained profit for the year	1,195	990

company, for example, might show in the notes how much of its income came from sales of packages, how much from training and consultancy, and how much from maintenance contracts.

A number of points about this statement need to be explained. First, the turnover for a company acquired during the year is shown separately from the turnover from continuing operations, that is, operations that were carried on in 1998 and 1999. This is to facilitate the comparison between the two years. In the same way, if part of XYZ Ltd had been disposed of in 1998, its turnover would have been shown under the heading 'discontinued operations'.

A second point is the distinction between 'cost of sales' and 'other operating expenses'. This distinction is an uncertain one and some companies do not show the items separately. However, for a package software company, there is a real difference between, on the one hand, expenditure on selling, printing documentation, installing software, and so on, all of which are the costs of sales, and expenditure on the development of new versions of existing packages or on new products, which would come under the heading of other operational expenses.

The bottom line of the profit and loss account shows the retained profit for the year, that is the profit not paid out in tax or dividends to shareholders; this is added to the cumulative retained profit in the previous year's balance sheet to give the value of the retained profit shown in the new balance sheet.

The profit and loss account gives very little information about where the company's revenue during the year has come from or how it has spent its money. Such information is normally given in the notes to the accounts. The 1997 Annual Report and Accounts of Logica plc, for example, gives a breakdown of turnover and profit by geographic area—UK, continental Europe, North America, and Asia Pacific/Middle East. It shows numbers of staff and expenditure on wages and salaries, on social security costs, and pension costs and other costs are also broken down into a number of categories. Package companies will often also show a breakdown of revenue into licence fees, maintenance charges, and consultancy fees—see, for example, the 1998 Accounts of London Bridge Software Holdings plc. On the whole, software companies are fairly open in revealing information in the notes to their accounts but the level of detail provided in other sectors varies enormously from company to company.

3.9.3 Other statements

The perceived need for greater openness and more extensive disclosure of companies

activities has led to the inclusion of further statements and more extensive notes in companies' annual reports. Some are required by stock markets and some have simply become regarded as good practice. On the whole, but by no means universally, software companies set good examples in this regard.

The most important of the new statements is the cash flow statement. As we have already pointed out, the income and expenditure account does not show expenditure on capital items, only their depreciation; capital expenditure affects the balance sheet but the balance sheet does not give sufficient information to deduce how much this expenditure amounts to and how it was funded. The link which ties the balance sheet and the profit and loss account to the capital expenditure is the cash flow statement. A moment's examination of our student's financial statements will reveal that, because there is no cash flow statement, there is no explanation of where the money to purchase his CD player came from.

The cash flow statement (Table 3.10) explains the change in "cash" between the dates of two successive balance sheets. Cash is defined [8] as "cash at bank and in hand and cash equivalents less bank overdrafts and other borrowings repayable within one year of the accounting date".

The first source of cash is the operating profit before tax generated during the year. This needs to be adjusted for certain items which may appear in

Table 3.10 Cash flow statement for a services company (£'000).

XYZ Software Ltd *Cash Flow Statement* *Year ending 31 October 1999*	*1999*	*1998*
NET CASH INFLOW FROM OPERATING	2,105	1,620
ACTIVITIES		
Returns on investments and servicing of finance	(23)	(27)
Capital expenditure and financial investment	(320)	(265)
Taxation	(719)	(480)
Acquisitions and disposals	(380)	
Equity dividends paid		
Cash outflow before financing	(1,342)	(772)
NET CASH INFLOW BEFORE FINANCING	763	848
FINANCING		
Issue of share capital	215	100
Repayment of long term loan	(50)	
Net cash inflow from financing	165	100

INCREASE IN CASH IN THE YEAR	928	948

8. In SSAP 10.

the profit and loss account but do not involve the movement of money in or out of the company. The most obvious of these is depreciation. This was entered in the profit and loss account to reflect the extent to which the life of the fixed assets was consumed during the year; in no way did it reflect the movement of money out of the company and so it must be added to the profit.

Following the adjusted figure for the operating profit, there are a number of items that may lead to cash flowing out of the company for reasons that are nothing directly to do with its operations. Taxation, interest payable and dividends paid are obvious examples. Capital investment in equipment or premises is another reason for which cash may flow out of the company, as is the purchase of another company. In some circumstances, e.g., the disposal of a subsidiary company, these items can give rise to an inflow of cash. When all these items are added together and subtracted from the operating profit, we arrive at a total figure for the inflow or outflow of cash into or out of the company before taking into account any changes in the financing of the company. The final section of the cash flow statement shows the effect on the cash position of changes in the financing of the company. The company has issued new shares and raised £215,000 through this; it has also paid off £50,000 of long term debt. Both of these, of course, affect its cash position and the bottom line of the cash flow statement reflects this; it gives the overall change in the company's cash position over the year.

The alert reader will recall that XYZ's balance sheet shows that, despite the fact that a loan of £50,000 has been paid off, the long-term debt has increased from £61,000 to £154,000 and that there is nothing in the cash flow statement to account for this. It almost certainly arises from the acquisition of another company. The statement shows that £380,000 was spent on acquisitions; the likelihood is that the company bought substantial debts, which were taken over by XYZ as part of the deal.

At this point we should make clear that the financial statements for XYZ Software Ltd show a vigorous company growing very rapidly in an expanding market; they are typical of many IT services companies in the 1990s but not typical of many other industries.

3.9.4 Historical cost and current cost

So far, in our description of annual statements we have ignored the fact that prices change over time. In saying that current assets are valued at cost or net realizable value, whichever is the lower, we implicitly assumed that the word "cost" meant the amount of money paid for the asset, what is known as the *historical cost*. This assumption was built into accounting practice from the start but, in periods of high inflation, it can lead to annual statements giving a very distorted view of a company's financial affairs. Concern over this led to extensive discussions and consultations and eventually to the issue of SSAP 16 [9] laying down guidelines for *current cost* accounting and requiring that certain categories of "large" companies include accounts prepared on this basis in their annual

statements.

To illustrate the problems caused by historical cost accounting, consider the simple case of a retailer who buys refrigerators from a wholesaler and sells them to the public. Suppose that, on 1 January 1998, he has £4,000 and no refrigerators in stock. On 2 January, he buys 20 refrigerators for £200 each, which he sells during the year for £300 each; on 31 December, he has £6,000 and no refrigerators. Since he is in the same position on 1 January 1999 as he was on 1 January 1998, except that he now has £6,000 instead of £4,000, it is reasonable to conclude that he has made a profit of £2,000 over the period 1 January to 31 December 1998. Delighted with his business acumen, he goes out on 2 January 1999 to buy another 20 refrigerators.

Suppose now the price of refrigerators to the retailer has increased to £300 during 1998. The 20 refrigerators he buys on 2 January 1999 will cost him all of his £6,000. If we take the results of his trading from 3 January 1998 to 2 January 1999, we see that his position is unchanged; in both cases he has 20 refrigerators and no money. In other words, it would appear that he has made no profit over the period.

The solution to this apparent paradox is, of course, that the £6,000 that he has on 31 December 1998 is only "worth" the same as the £4,000 that he had on 1 January 1998—at least, in terms of its power to buy refrigerators. However, it illustrates graphically the distortion that can be introduced by the historical cost basis.

The problems of taking inflation into account in financial statements are many and subtle; they are beyond the scope of this chapter but the interested reader is referred to the Further Reading section for books which cover the topic in more detail.

3.10 Capital and its maintenance

The concept of *capital maintenance* is subtle but it has important practical consequences. The capital subscribed by members of the company is to be seen as a (rather ineffective) guarantee that the company will be able to meet its obligations. Certainly, a lender is likely to take the size of the issued share capital of the company into account when deciding whether or not to make a loan. For this reason, a company is not allowed to issue shares at a discount, i.e. for less than their nominal value, because this would lead to the actual capital received by the company being less than the issued share

9. Now withdrawn!

capital [10] . Similarly, a company cannot pay back to the shareholders any of their original contribution. The practical consequence of this is that a dividend must not be paid to shareholders unless the company has "profits available for the purpose", that is, the algebraic sum of the realized and retained profits and losses over the lifetime of the company is positive. "Retained" means not previously paid out in the form of dividends or tax. The term "realized" is relevant because, in the case of profits and losses made on the disposal of fixed assets, a realized profit or loss occurs only when the asset is actually disposed of, not when its value in the company's books changes. The effect of these rules is that the company's capital can only be eroded by the losses it makes, not by any

payment to shareholders.

If the accounting is done on the basis of historical cost, capital is maintained only in terms of money values. A profit is recorded when the money value of the net assets at the end of the year exceeds the money value of the net assets at the start of the year. Alternative approaches might be to say that the productive capacity of the company must be maintained or that the purchasing power of the net assets must be maintained; either of these approaches seems more realistic than simply maintaining the money value of the capital. Nevertheless, the practical difficulties of such approaches are considerable.

3.11 Auditing [11]

The Companies Act 1989 requires that company accounts should be accompanied by an auditors' report. The purpose of the report is to provide members of the company and the public at large with an assurance that, in the opinion of the auditors, the accounts give a "true and fair view" of the state of the affairs of the company. With one or two minor exceptions, only members of the three Institutes of Chartered Accountants (in England and Wales, of Scotland and in Ireland) and of the Association of Certified Accountants are eligible for appointment as auditors and they must satisfy certain criteria of independence of the company.

It is not practicable for auditors to check every financial transaction that has taken place during the year. Instead they work by examining the ade

10. As was mentioned in Chapter 2, a company can issue shares partly paid but in this case the shareholder is obliged to pay the unpaid amount when called on to do so, which will certainly happen if the company goes into liquidation.

11. In recent years the meaning of the term "audit" has been extended and it is widely used to cover the external checking of any type of company procedure; thus a "quality audit" of a project may be carried out to ensure that the project is operating in accordance with the company's quality control procedures.

quacy of the company's financial procedures and controls and by making detailed checks on a small sample of transactions, to see that they have been carried out in accordance with the procedures, and on a sample of the assets, to ensure that they exist. The latter may involve, for example, contacting some of the company's debtors to confirm that they agree that they owe money to the company or checking that what is claimed to be a ton of tungsten is indeed tungsten and not some much cheaper metal. In addition, analytical review procedures are used to confirm the reasonableness of the total figures shown in the annual statement.

It is important to understand the limits of auditors' responsibilities, a topic addressed at some length in the Cadbury Report (see Section 2.2.4). First of all, accounting standards permit the figures in the annual statements to be presented in a variety of different ways. The auditors' responsibility is limited to certifying that the accounts have been prepared in accordance with these standards; auditors have no authority to question whether the particular choices are the most appropriate for the company, provided that they are used

consistently. While it may be hoped that the Accounting Standards Board will impose tighter standards, it can only do this if it can obtain a reasonable consensus in favour of changes; the many special interests involved make this difficult.

Secondly, there is the issue of whether the company is a "going concern". In other words, is the company likely to survive its next financial year? It is perfectly possible to imagine the circumstances in which the balance sheet and the profit and loss account present a picture of a healthy bespoke software house, which the auditors can certify is true and fair, and yet the company has little chance of surviving the next twelve months—consider, for example, a company which has been totally dependent on a single, large and lucrative contract that is just ending, with no further business on the horizon. If auditors have reason to suspect that the company is not a going concern, they are expected to carry out procedures to test the position, typically by examining cash flow predictions and seeking assurances that suitable credit facilities will be available over the next twelve months. But if they have no such suspicions, they are not required to take such action. Both the Cadbury Report and Auditing Practices Board have made recommendations that would mean more positive statements, properly justified, would have to be produced.

The primary responsibility for preventing and detecting fraud lies with the directors of the company, not with the auditors. Auditors, however, do have a responsibility to do their work in such a way as to have a reasonable expectation of finding anything seriously misleading in the financial statements and, of course, if they find evidence of fraud, they have a duty to report it to the directors. Larger organizations employ internal auditors who have the responsibility of ensuring that company financial procedures are properly followed and of preventing fraud.

In addition to the question of the duties and responsibilities of auditors, a second area of concern addressed by the Cadbury Report is the independence of auditors. Although the auditors are formally appointed by the shareholders and report to them, the nature of their work inevitably means that they will develop a continuing relationship with the management of the company rather than with the shareholders. It may well be that the firm carrying out the audit will also be undertaking other types of work for the company. Suggestions have been made that an auditing firm should be prohibited from undertaking non-audit work for its audit clients and that companies should be required to change their auditors every few years. The Cadbury Report rejected these suggestions but recommended that fees paid to auditors for both audit and non-audit work should be shown separately in the accounts and that *audit partners* (i.e. the partner in the auditing firm who takes responsibility for the audit) should rotate.

3.12 Further reading

A much more extensive treatment of the material in this chapter will be found in

Blackstaff, M. 1999. *Finance for IT decision makers: a practical handbook for buyers, sellers, and managers*. London: Springer Verlag.

It is, however, aimed more at IT managers in large user organizations than at entrepreneurs in small high technology companies.

The annual reports and accounts of software companies are well worth reading in order to get an overall view of the industry and its finances. They are readily available either in hard copy, through services offered by, amongst others, the *Financial Times* and various stockbrokers with a presence on the Internet, or they can be accessed directly at the companies' web sites. (Hard copy is often more reliable; the notes to the accounts are often omitted on the web site.) As a starting point we suggest looking at Logica, Cedardata, Admiral, Kalamazoo, London Bridge, and Sage.

The accounting practices in the US software industry are dealt with very fully in:

Morris, J.M. 1992. *Software industry accounting*. Wiley. Somerset, NJ: Wiley.

It addresses the important question of software revenue recognition, i.e. the point at which software revenue can safely be recognized in a company's accounts but it does not, unfortunately, address the question of software developed in house, for internal use.

There are innumerable books on accounting that will take the reader beyond what is covered in this chapter. The material in Sections 3.1, 3.2, 3.9, 3.10, and 3.11 is usually described as financial accounting; a good treatment for non-specialists will be found in:

Atrill, P. & E.McLancy 1999. *Financial accounting for non-specialists* . 2nd Edn. Prentice Hall.

Two good books on management accounting, which is the subject of Sections 3.3 to 3.8, are:

Upchurch, A. 1998. *Management accounting: principles and practice* . London: Financial Times/Pitman

Williamson, D. 1996. *Cost and management accounting* . Prentice Hall.