

Chapter 5

MANAGEMENT ACCOUNTING AND THE PLANNING PROCESS – 2

Key Learning Objectives

By the time you have finished studying this chapter, you should be able to:

- use and understand specific non-quantitative techniques to estimate costs;
- use and understand relevant quantitative techniques to estimate costs;
- interpret the results of your analysis and advise management accordingly;
- discuss advances in budgetary techniques and their influences in new organisational environments;
- outline a selection of contemporary management accounting approaches and techniques;
- appreciate the role and philosophy of just-in-time production as a means of stock control.

Cost Estimation

It might be assumed that it is reasonable to suggest that the identification of cost behaviour is relatively straightforward in the business world. This is, however, far from the case, but determining how cost will change with output, or other measures of activity associated with, for example, service delivery, is essential. To give a few examples of the problems encountered:

- Direct labour is often treated as a variable cost. For companies, however, which retain a static workforce because of the skills possessed and who thus cannot be simply hired and fired, direct labour is treated as a fixed cost.
- Depreciation of assets is suggestive of being a fixed cost yet certain assets are more likely to be exhausted by production level changes than by time.

- Time has an impact on cost classification, as the longer the time period the more likely the cost is to become variable.
- Tight budget control systems with positive management intervention are more likely to keep costs under control than weaker systems.

The first section of this chapter is thus concerned with developing an understanding of these issues given their actual and potential impact on managerial decision making. We begin with relatively straightforward techniques before moving on to discuss techniques using more quantitative analysis.

Engineering Methods

Under this system of estimating cost behaviour a study is undertaken of the technological relationships between outputs and the inputs required to achieve those outputs. Various techniques are used associated with work study and time and motion methods. By their nature they are more practical where there is a significant repetition of a manufacturing productive process, although they can be applied equally well to administrative and selling functions. The disadvantages of using engineering methods, however, are associated with attempting to measure overhead costs. In addition, in recent years as UK manufacturing has gone into decline, such techniques may not be as relevant. Those large-scale manufacturing businesses which remain in the UK are no longer huge employers of labour but are likely to have highly automated production techniques with a major emphasis on the identification and controlling of overheads for which the engineering method is not ideally suited.

Inspection of Accounts

Under this system the accountant and manager classify each item as wholly fixed, wholly variable, semi-variable or semi-fixed. This process is clearly subjective and different individuals might get different results even if the technical reasons for the alternative choices can be fully justified. This analysis might well be based on historical data; however, in decision making managers are dealing with the future, with all its complexities and uncertainties. In summary, inspection of accounts methods leads to arbitrary decisions and a consequent potential for lack of precision. As such its approach cannot be recommended for use in managerial decision making.

High-Low Method

This method consists of looking at the period of highest and lowest volumes of productive activity and comparing the cost changes that result from the two levels. This is illustrated by the following example:

	Lowest	Highest
Volume of production	10,000	20,000
Cost (£)	25,000	37,500

For these data

$$\begin{aligned} \text{Variable cost} &= \frac{\text{Change in cost related to change in output}}{\text{Change in activity level}} \\ &= \frac{\pounds 12,500}{10,000} \\ &= \pounds 1.25 \text{ per unit} \end{aligned}$$

and

$$\begin{aligned} \text{Fixed cost} &= \text{Total cost} - (\text{Number of units} \times \text{Variable cost per unit}) \\ &= \pounds 25,000 - (10,000 \times \pounds 1.25) \\ &= \pounds 12,500 \end{aligned}$$

This method assumes a straight line relationship between costs and output levels lying between the two observations. This may of course be incorrect as by taking extremes (the highest and lowest) these production levels and their associated cost behaviours may be atypical and thus unrepresentative. While the method may have the advantage of simplicity, it cannot be recommended.

Mathematical Methods

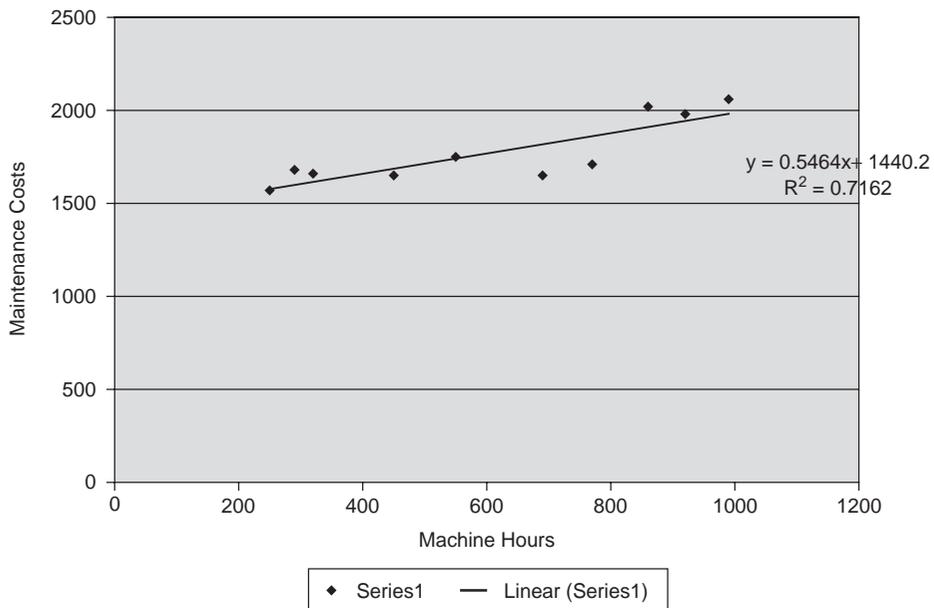
These methods centre on the technique of regression analysis. In their simplest form, the relevant costs and the related cost driver data can be plotted on a graph and a 'line of best fit' drawn in by eye. While this method is simple to use and provides a visual indicator of how costs depend on their driver, the process is subjective and can thus give different results.

The most appropriate method therefore is one involving mathematical equations, although today the development of packages such as Microsoft Excel makes it easier to manipulate the numbers. The process involves deriving a regression equation which is used to identify the relationship between cost (the dependent variable) and cost driver (the independent variable). This driver is an activity measure (number of direct labour hours, number of machine hours, etc.). The model can be adopted for use with a single independent variable (simple regression) or where there are two or more independent variables (multiple regression).

Table 5.1 shows maintenance costs and direct machine hours for the last 10 accounting periods for a company. It is assumed for the purpose of this exercise that maintenance costs are correlated with machine hours. Maintenance costs are the dependent variable (*Y*)

Table 5.1 Total maintenance costs and direct machine hours for the past 10 accounting periods

Accounting period	Direct machine hours X	Maintenance costs Y
1	990	2060
2	920	1980
3	690	1650
4	770	1710
5	860	2020
6	550	1750
7	450	1650
8	320	1660
9	250	1570
10	290	1680

**Figure 5.1** Graph of maintenance costs against direct machine hours

and machine hours the independent variable (X). While the graph based on the information in this table in Figure 5.1 has been produced using Excel, what follows is the detail of the calculation to show how the technique may be applied. Table 5.2 shows the regression calculations that would be performed by Excel to ultimately produce the graph discussed later in this section.

Table 5.2 Regression analysis calculations

Direct machine hours X	Maintenance costs Y	X ²	XY
990	2,060	980,100	2,039,400
920	1,980	846,400	1,821,600
690	1,650	476,100	1,138,500
770	1,710	592,900	1,316,700
860	2,020	739,600	1,737,200
550	1,750	302,500	962,500
450	1,650	202,500	742,500
320	1,660	102,400	531,200
250	1,570	62,500	392,500
290	1,680	84,100	487,200
6,090	17,730	4,389,100	11,169,300

The regression line is the ‘line of best fit’ and is that line which when compared with other possible lines is that one which minimises the square of the vertical deviations from the observed points. The equations used are:

$$\Sigma y = na + b\Sigma x,$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2.$$

In the above formula n is the number of observations, in this example 10. Substituting the data in Table 5.2,

$$\begin{aligned} 17,730 &= 10a + 6,090b, \\ 11,169,300 &= 6,090a + 4,389,100b. \end{aligned}$$

Solving these equations results in an answer of $b = 0.55$ and $a = \text{£}1,440$, which naturally agrees with the result obtained using Excel.

This gives us an indication that at 770 hours of activity, maintenance costs are estimated at $\text{£}1,863$ ($\text{£}1,440 + 0.55 \times 770$). In fact they were $\text{£}1,710$ and, since the equation is based on an average, they do not match exactly and it is essential that managers in making a decision based on these data realise how reliable they are.

An indication of reliability is given by (amongst other possible measures) the coefficient of determination (r^2). This has been calculated by Excel at 0.7162. This means that we can explain 71.62% of the relationship between the two variables. The measure of the association between the two variables is referred to as correlation. The square root of the coefficient of determination is the correlation coefficient (r). The lower the value of the coefficient of determination the less the linear relationship. The closer to 1 the stronger the linear relationship. In this case 28% of the relationship is unexplained by the independent variable used. Managers would need to consider this when reaching decisions on how to use this relationship between the variables discovered by the analysis.

Other possible methods include the standard error of the estimate and the standard error of the coefficient (for a fuller explanation see Drury, 2004).

In the example above there was one dependent variable and *one* independent variable. In reality, a number of variables are likely to influence costs. In the case of machine maintenance it might include the frequency of the servicing intervals and not just hours of operation. Thus what is required is the identification and analysis of all variables which can affect cost. This leads to a multiple regression equation of the form

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 \dots$$

Again, various computer programs exist to solve such equations and report the degree of reliability managers can place on the results in terms of decisions based on the answer obtained. One further complication is that multiple regression assumes no correlation between the independent variables. This condition is called multicollinearity and prevents the availability of sufficient information to enable the regression coefficients to be determined, although writers such as Kaplan (1982) suggest this problem can be ignored in certain circumstances. To explain further, an example might include a company which manufactures a range of closely-related products where each product's output is treated as a separate variable, yet in reality, the demand for these products is highly correlated. In this situation, the regression coefficients would be meaningless and any predictions, based on the results obtained from a multiple regression analysis where such relationships exist, would be misleading and potentially dangerous as the wrong decisions could be made.

Finally in this section, we turn to the conditions for applying the techniques above, although they are common to any similar activity:

- Cost and activity data are matched so that they relate to the same period, otherwise we are not comparing like with like.
- Sufficient observations of cost behaviour are made to support the statistical analysis.
- When using data under conditions of inflation the observed costs should be adjusted to place them on the same price basis.
- Any technology changes should also be taken into account. This is known as the learning curve phenomenon.
- Known changes that will take place in the period for which the forecast is being made should be taken into account.
- Recognition should be given to those accounting policies which have the potential to distort the results. This particularly applies where fixed costs are allocated to production departments and as such may appear variable when it is known they are fixed.

Advances in Budgetary Techniques

In the previous chapter we looked at the general principles of the budget preparation process and the impact of the organisational context on budgeting requirements. In this section of this chapter we turn to look at advances in budgetary techniques.

Zero-Based Budgets

Traditional methods of budgeting have taken the current level of operating activity (the base) as the starting point and then adjusted this starting point for expected changes. As these changes are normally made at the margin of the existing budget and do not involve a fundamental review of the base budget, the term *incremental budgeting* is used to describe this process. In this context it can be seen that any inefficiencies in the base can be overlooked. Again we would, however, point out that many industries are under severe cost pressure so this may present a somewhat simplistic view of the world, and probably considerably more work goes on reviewing the base budget from the previous period than many textbooks appear to suggest.

The alternative solution presented to the problem of inefficiency in the base is termed zero-based budgeting (ZBB) or sometimes *priority-based budgeting*. As can be imagined, under this system each manager in charge of an authorised programme has to justify each item of expense as if the programme was totally new to the organisation. This solution would thus reject the concept of an existing base and raise issues over whether the function should be performed at all, how it should be performed, how much should it cost to perform and so on. Managers are thus constantly questioning the way in which an activity is delivered and if it is to the benefit of their organisation. Advantages of ZBB are as follows:

- ZBB allocates resources according to priorities which managers decide are essential or less essential.
- As budget allocations are related to business objectives, this results in resource allocation being improved.
- Managers, in having to defend their budgets, are forced to plan ahead and justify activities.
- Managers feel a greater sense of ownership as a result of the process.
- ZBB creates a questioning and critical attitude to processes and procedures amongst managers.
- Resources are allocated on the basis of need and benefits received in line with the objectives of the organisation.

The disadvantages of ZBB are:

- Other than in the smallest organisations, it is not possible from a time basis to constantly be reappraising activities.
- The organisation could lose sight of its strategic goals if its gets obsessed with ‘navel gazing’.
- The bureaucracy of meetings and reports can overwhelm managers.
- In government organisations managers are locked into delivery of certain programmes by law, although this should not stop them questioning the methods of delivery to seek efficiencies.
- In some organisations activities are highly interlinked and difficult to separate. In a university, for example, staff could teach on a variety of courses, so closing one course may not achieve a great deal or may be completely impractical.

As a way of mitigating some of the disadvantages the organisation could target certain activities for a full review, such that over time it covers the organisation as a whole. This may work in certain cases. However, in complex organisations such as a university a decision to zero-base the budget of one school or department while ignoring others in forecasting a particular budget year sounds straightforward, but there can be many complex relationships with other schools or departments which again overwhelm managers in terms of the detail to be considered.

It should also be remembered that there are benefits to the incremental budgeting approach which can be ignored if a manager focuses on a single technique such as ZBB. One major advantage of incrementalism is that it can minimise conflict as it facilitates the consensus-produced bargain. It may trade some inefficiencies in that type of budget process for the greater benefit of goal congruence amongst managers. As can be imagined, a core feature of ZBB is the conflict between managers in the fight to gain scarce resources built in as a fundamental principle especially when people's behavioural characteristics are brought into consideration. Thus the qualitative gains of incrementalism in the areas of company harmony could outweigh any minor inefficiencies sacrificed through not using ZBB.

Option Budgets

A variation on ZBB that may add to the efficiency with which it can be made to operate is the use of option budgets. Under this system managers are required to consider how their department/service would respond to a 5% or 10% cut in expenditure (increases are equally possible). These options are designed to force managers to think through their policies and operating procedures by again forcing them to question what they do and how they do it.

Planned Programme Budget Systems

This is a public sector technique which gained some credence in the 1970s as a way forward. It is intended to be a fully rational and corporate system. In essence, it attempts to identify the goals and objectives of the organisation in each area of activity and analyse the results of activities against objectives within programmes. Activities are multidimensional and cross traditional departmental boundaries. They also extend beyond the time period of a year. Thus the concentration is on programmes which encompass all organisational endeavours to achieve the specific outcomes that the programme is set up to deliver. Programmes are broken down into objectives, subobjectives and activities to make a coherent whole. A programme with an objective of delivering care and support for the elderly, for example, could have health care activities, accommodation activities, educational activities and so on with a range of complex objectives which together should add up to the overall programme objective.

As can be imagined this results in very demanding programme structures which cross traditional departmental boundaries. It is difficult to allocate activities to programmes, as

some activities will contribute to objectives across a number of potential programmes. Coombs and Jenkins (2002: 93) point out that financial information is equally complex and leads to the allocation of joint costs over a number of programmes with a wide variety of allocation bases available. As a result of these issues, interest in the technique has faded.

Formula Budgets

Under the 1988 Education Reform Act in the UK the process of delegating budgets to schools was begun. After taking account of mandatory and discretionary retentions, the local authority is required to distribute what remains to schools through the use of a formula to give the individual school budget. The elements which the local authority can retain have been reduced over time, thereby transferring more of the education budget to schools.

The elements contained in the formula distribute money on the basis (as appropriate to the level of education provided by the school) of pupil numbers, sixth-form provision, school meals activities and the provision of nursery education. It is the job of the school and its governors to balance their expenditure against the funding distributed by the formula. It is this requirement to balance which places significant budget pressure on schools. It also impacts on quality in that if a school can, for example, drive up its examination results it can attract pupils in, and with extra pupils come more resources. This effectively introduces to some effect an element of the market system in the budget process for schools. There may, however, be a time lag between attracting any extra pupils and gaining extra resources, as the school still operates within the local authority budgeting time framework. Control at the local level is increased as the school has its own bank account and therefore increased ownership and control of its delegated budget.

Activity-Based Cost Management

In contrast to the traditional ways of reporting budgets, activity-based cost management attempts to critically assess costs by activity and to provide managers with information on why costs are incurred in any process (see also the discussion of activity-based costing in Chapter 3). It also aims to look at the output from that activity. The process concentrates on cost drivers and divides activities into value-added activities and non-value-added activities. By concentrating on non-value-added activities it is possible in the budget process to reduce these without impacting on the customer's use of the product or service. Managers are thus able to prioritise where they should be reducing waste and inefficiency.

Under the traditional approach to budgeting, costs are allocated against subjective (i.e. judgemental) headings – payroll, premises costs, transport and so on. As has been stated above, there is no information linking costs with outcomes from the expenditure. Under activity-based budgets major activities are linked to the resource inputs. In summary, the process is as follows:

- Identify and define activities and activity pools.
- Directly trace costs to activities and cost objects where possible.
- Assign costs to activity cost pools.
- Calculate activity rates.
- Assign costs to cost objects using the activity rates and activity measures.
- Prepare necessary reports.

The organisation is now in a position to focus on managing activities as a way of eliminating waste and reducing delays and defects. This information can be used to directly improve the budgeting and budgetary control processes.

Benchmarking provides a structured approach to identifying the activities with the greatest room for improvement. In the public sector, for example, many organisations have formed ‘benchmark clubs’ as a source of information to identify waste and inefficiency. In the private sector trade associations exist to help ensure that efficiency gains can be achieved but within a confidential information-gathering process. This is not to ignore the information that a company can itself generate over time and can access at a particular point in the budget decision cycle. By examining the number of times a particular activity is set up or the number of engineering changes, attention is focused on areas where a detailed study may reduce the volume of such activities and consequently costs.

Within this process, value chain analysis, which links sets of activities from the beginning of the production process through to the end use of the product or service, is becoming the increasing focus of attention. If each activity in that process is viewed as a customer–supplier relationship all opinions can be used to improve that process so that budgets reflect optimum opinions. It should be recognised that we are stressing cost management as being the key, rather than cost imposition on products and services.

Balanced Scorecard

The objective of the balanced scorecard is to express an organisation’s strategy and mission in a comprehensive set of range of performance measures which provides a framework for implementing strategy. It inevitably provides a framework against which performance against those measures can be tested over time. It is important to recognise that such a framework is based on measures other than financial. The balanced scorecard is made up by setting four key perspectives – finance, customers, internal business processes, and learning and growth, although variations are possible. Figure 5.2 shows the balanced scorecard performance matrix for an administrative unit and defines the key areas as: people, to develop and enable people to progress; processes, to aim for continuous improvement; resources, to use them wisely; and, service, to respond to the needs of customers. The concept is relatively straightforward to implement:

- Staff from each frontline unit identify the goals that are most critical to their unit’s success.
- They then devise a measure (‘metric’) to track the unit’s performance at achieving each of these goals.

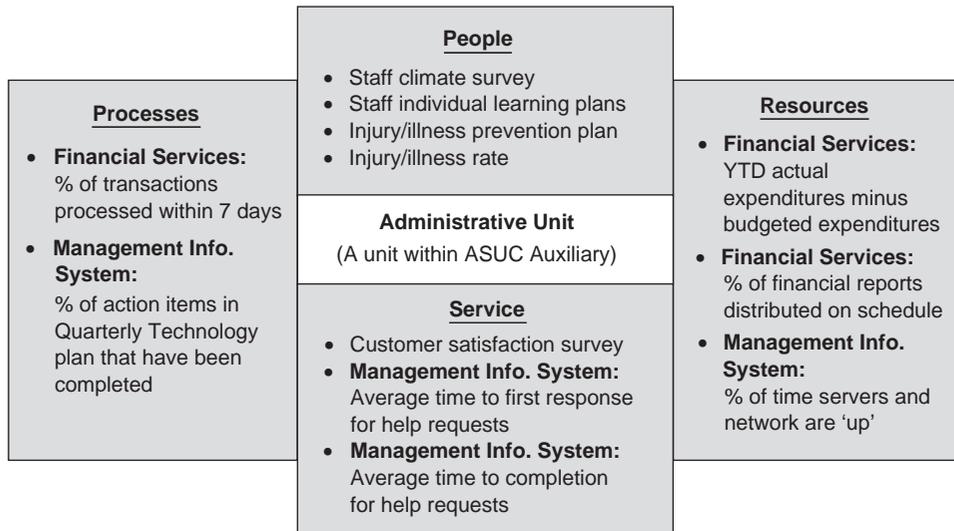


Figure 5.2 Balanced scorecard (University of California – Business and Administrative Services)

- The result is staff have created a set of metrics under each of the core values which is referred to as the unit's balanced scorecard.
- Finally staff assess progress over time and revise as necessary.

In this example it is these core values which drive the organisation and, taken together, they point out virtually all things the organisation must do to be successful. Each of the work units is seen as achieving success by putting the organisation's core values into practice and tracking achievement through the metrics.

The term 'balance' arises from the desire to balance quantitative and qualitative performance measures in both the short term and long term. The scorecard is an attempt to reduce managers' concentration on short-term changes by emphasising the longer-term consequences. An emphasis on expenditure in a particular function in the short term is planned to lead to improvements in non-financial measures such as customer satisfaction which will lead to growth in long-term sales and income.

Let us examine the four elements in more detail. The *financial* perspective could examine the profitability of following a particular strategy. Many businesses aim to reduce costs in comparison with their competitors, or to utilise spare capacity. Target performance would be set in financial terms for each of these strategies to measure their effect on the bottom line, with initiatives to achieve the strategies. This would be expressed in financial terms so that actual performance can be compared with plan.

The *customer* perspective identifies the target market segments and measures the company's success in each area. An objective might be to increase market share. For a multi-product company this could be expressed in terms of increasing a particular segment. For

a company such as Sony this might be to increase the share of the plasma TV market. Target performance could then be expressed as a percentage increase in market share as measured against actual performance in due course.

The *business processes* (internal) would be identified, such as improving the yield from the raw materials input into a particular manufacturing process. Specific initiatives would be identified to do this and a percentage increase in yield set as a target. Again actual results could be compared with the target. Targets could be set by benchmarking against competitors. Improvements in the operational process could benefit customers through better quality or improved delivery times, while the bottom line would also improve.

The *learning and growth* perspective would include developing skills through measures such as improved training, with target numbers set to benefit from the training. This could be extended to include improved manufacturing processes and enhanced IT.

While presented above as separate paragraphs, each of the processes is linked as improved training could improve operational business practices which leads to better customer relationships and finally to a better financial position. It should also be remembered that each company, even if operating in the same industry, would have a different scorecard depending on its own strategy and assessment. Finally, by invoking a balanced scorecard process we should be involving more people in the company, potentially improving motivation and a feeling of 'belonging' to the process.

The balance scorecard is equally appropriate for use in the public and not-for-profit sectors and is discussed further in Chapter 10.

Business Process Re-engineering

This area concentrates on making substantial changes (or re-engineering) to the business processes which operate within an organisation. Within the business process will be a series of activities which make up that process. The objective is to concentrate on improvement such that the business sees cost reduction, quality improvement and increased customer satisfaction. This can be seen as one element of a balanced scorecard or an activity in its own right.

Economic Value-Added Analysis

Economic value-added analysis aims to measure the value created for shareholders by a business unit or company. The objective is that these have an ability to earn more than the cost of capital, and the framework provided allows firms to assess various options to increase value to shareholders. Trade-offs between reinvesting in existing businesses, investing in new businesses and returning cash to the shareholders can be compared. In this process the cost of capital is highly visible to managers and attention can be focused on making investment decisions which are in the best interests of stockholders. This means that attention is also focused on the disposal of or, improvement in the use of, underutilised assets.

The elements of the technique are the following:

- Determination of income generated by a new business and the extra value created by the potential investment opportunity.
- Estimation of the return required by shareholders. This requires a calculation of the cost of capital.
- Determination of the economic value added of each business. This is achieved by deducting the expected return to the shareholders from the value created by the firm or business unit by the new project. This return has to be above that required by shareholders for the investment to take place. This analysis is claimed by its proponents to be suitable for one-off major investment decisions or everyday decision making in an enterprise.

Beyond Budgeting

A view is emerging that annual budgeting tends to fix a company's thinking and response to events when the world is changing. This limits flexibility in responding to these events. There is an argument that the budget in effect reflects the previous year's reality, and this is what locks companies and managers into the past rather than thinking about what is happening to the business in the present. Rolling or perhaps monthly forecasting and budgets focus thinking on current and future realities and contexts. This is not seen as managing change as this is outside the control of the organisation, but rather as an attempt to be ahead of change or more in control of the response to the challenges facing the organisation. This importance may be emphasised in the knowledge-based economies that the western world has increasingly developed. Knowledge-based companies face competition which detracts from any innovation made particularly in respect of the time horizon for the life of products, which is becoming shorter and shorter. Prices are also falling and quality rising. Firms need to be operating at the excellent end of the quality spectrum if they are to continue to flourish and be close to their customers. Managers are also talented people in short supply. This type of individual seeks freedom, challenge and responsibility. Traditional time-consuming and 'legalistic' budget processes can be off-putting for such persons. The rapid production of new solutions to constantly changing issues in the competitive environment and strategies also depends on attracting and retaining such individuals.

In this view of the world the traditional budget is seen as the fixed point around which all management processes are based and aligned. This determines how managers behave and the activities and objectives on which they focus. Annual budgeting is seen as absorbing considerable management time, and the monthly budget actual comparisons as primarily about control. Managers will not exceed their budgets by perhaps spending necessary resources outside the planned budget cycle to react to events because their bonus or even their jobs will depend on it. This, in a globally competitive world where, when the budget was set, circumstances were entirely different from those pertaining when any comparisons are being made and decisions required. Inflexibility is thus seen as the key failing of traditional budgeting and companies are being urged to move towards continuous

rolling forecasting to enable speedy and co-ordinated adaptations to actual and anticipated changes in the business environment.

Under rolling monthly forecasts of financial performance and for other non-financial value drivers, managers are forced to confront current and future opportunities and risks. In essence, the beyond budgeting model calls for devolving managerial responsibility where power and responsibility go hand in hand. The system:

- creates and fosters a performance climate based on competitive success. Goals are agreed external benchmarks and not internal negotiated fixed targets. The focus is on beating the competition not other managers for a slice of resources.
- motivates people by giving them challenges, responsibilities and clear values as guidelines. Rewards are team-based, recognising that no single person can act alone to achieve goals.
- devolves performance responsibilities to operational management closer to the 'coal face'. This uses know-how from the individuals and teams at the customer front to adapt quickly to changing market needs.
- empowers operational managers to act by giving them the capability to do so by removing resource constraints. Key ratios are set rather than detailed line by line budgets. Local access to resources is thus based on agreed parameters rather than on line by line budget authorisations. This is aimed at speeding up the response to changing threats and exploiting new opportunities as quickly as possible.
- establishes customer-orientated teams that are accountable for profitable customer outcomes. Frontline units agree resource and service requirements with service units and standards of service from these departments (service level agreements).
- creates transparent and open information systems throughout the organisation. The information system should provide fast, open and distributed information for multi-level control. The IT system is crucial in flexing the key performance indicators as part of the rolling forecasting process.

It can be seen that the above represents a private sector view of the world; the legal framework of public sector organisations would probably prevent such a system being extended to them. As with all alternatives, the success of a particular process depends on the needs of the individual organisation. The alternative of 'beyond budgeting' places considerable emphasis on organisational and managerial cultural changes, and without these it is doomed to failure.

Just-in-Time Stock Control and Production Systems

It will have been gathered from what has just been said that there have been tremendous changes in the business environment. These changes show no sign of slowing down – if anything, the pace of change is quickening. Companies have had to react or cease trading. One of the reactions to change has been to use just-in-time (JIT) stock (inventory) control systems. An example of a company which use such methods is Toyota, although it is common among other car-producing companies. In this type of organisation the management

view is that holding stock is a waste of a resource and should be minimised through careful planning throughout the supply chain. One obvious saving is the gains in interest earned (or saved on the bank overdraft) through not having money tied up in stock. Other benefits include reduction in handling costs, reduced risks of obsolescence of stock, increased production space available and reduced stockholding-related security costs. There may be a reduction in suppliers, saving in paperwork and time, although often there will be a substantial time commitment invested in the supply chain to ensure everyone is fully aware of the objectives of each party.

JIT production systems are systems where each component is produced immediately it is needed in the next stage of production of a product. Production is thus triggered by demand. At the end of the line is the customer asking for finished product, and it is the request for supply which triggers everything back to an order for raw materials. Traditional systems tended to be push-through systems in that the budget would predict that a certain level of sales and production occurred, thus building up stocks of raw materials, work in progress and finished goods.

Features of JIT include:

- production organised in work units or cells;
- multi-skilled workers who can perform a variety of tasks and operations;
- emphasis on total quality management (TQM) to eliminate defects as such defects disrupt the planned time cycles and even shut down production altogether;
- reduced lead and set-up times;
- careful selection of suppliers who deliver on time and to the required quality;
- a claimed reduction in paperwork.

TQM, referred to above, is a system designed to continuously improve quality through focusing on customer needs and systematic problem solving through teams involving frontline workers. If a worker in a production unit or cell discovers a quality problem the production line is halted until the problem is solved. JIT creates an urgency to solve the problem as delays are now costly as there are no (or minimal) buffer stocks to call on. Energies are thus concentrated on:

- identifying in a systematic manner what has gone wrong and planning to avoid it happening again (planning stage);
- implementing corrective action (perhaps on a small scale first) to prevent it happening again (doing stage);
- evaluating the results of the change in practice (checking stage);
- assessing that the problem has now been solved and, if relevant, extend the agreed solution to the whole system (action stage).

It should be remembered that JIT is not confined to manufacturing industry but is relevant to hospitals and even accounting practices (service sector) through the focus on the customer. In terms of a service industry such as accounting, an important element of TQM is the customer satisfaction survey.

Conclusions

This chapter has:

- used and developed specific non-quantitative techniques to estimate costs;
- examined the quantitative techniques used as a way of estimating costs;
- discussed the interpretation of the results of analysis in the context of advice to management;
- outlined advances in budgetary techniques and their influences in new organisational environments;
- reviewed a selection of contemporary management accounting approaches and techniques;
- developed an appreciation of the role and philosophy of just-in-time systems in the modern business environment.

Summary

The first part of this chapter pointed out that while the identification of cost and cost behaviour appears to be relatively straightforward in theory, it is far more complex in reality. Various methods were explored to help managers identify how costs behave, although each has its limitations. The second part of the chapter explored various advances in budgeting techniques to indicate how the forces of change unleashed by an increasingly competitive world were compelling a variety of responses in both private and public sector organisations. A range of these techniques were explored to allow the reader to gain a broad understanding of the key issues associated with the techniques.

Recommended Further Reading

Burns, J. (2000) 'The dynamics of accounting change – interplay between new practices, routines, institutions, power and politics', *Accounting, Auditing and Accountability*, 13(5): 566–596.

In this paper the author looks at a small chemicals manufacturer (Becks) located in the North of England. The company had suffered severe cash-flow problems and consequently needed to move towards a results-orientated approach to decision making and control. This approach was supported by new accounting practices imposed by the managing director and locally developed accounting solutions by financially aware departmental managers. There were still issues about the adoption of the approach particularly in the product development department (PDD); which was widely seen as doing science simply for its own sake and not for the benefit of the organisation. There were weak, or non-existent, controls in this department over product development and innovation. The primary focus of the paper is how the dynamics of accounting change in a unique organisational

setting interacted with organisational culture. Thus the paper is concerned with how and why accounting change evolves in the way it does, through time and within the organisational context.

The company was established in the 1970s; by 1995 there were 150 employees and turnover was £20 million. The economic recession of the late 1980s saw demand fall significantly, and productive capacity became considerably underutilised. Bankruptcy loomed. This cash-flow crisis, which was caused by primarily external factors, created recognition for and stimulated the need to change. Much of the company's traditional business was in so-called 'captives' companies locked in by period contracts. As the external market for chemicals changed these organisations failed to renew contracts, creating considerably underutilised capacity. The bank was unwilling to extend the overdraft, forcing the company to seek alternative sources of finance. The marketing department stated the experience was 'like a Siberian wind blowing straight through you' making the company realise that 'it was a small and very vulnerable business' (p. 575).

In addition to revising other strategies, greater emphasis was placed on developing new products internally. This affected the PDD in that it had to develop more products which could be sold successfully within more acceptable timescales. The board felt, given legal issues, that product costs could not readily be reduced and an alternative sales and market focus was needed. Production costs had already been cut as much as possible.

Becks wished to see the PDD recognising its profit role. New accounting techniques were introduced to increase awareness of profitability and to prioritise new products which could be brought to market faster. Scientific expertise was thus supplemented by attempting to develop accounting ways of thinking about profit and cost. This required new reports and reporting processes. Analysis was thus required to establish the basis from which the results-orientated approach could be developed. The initial investigation revealed that about 50–60% of time was spent on research (primary tasks) and 40–50% on administration (secondary tasks). Only one product which had been developed in the period of study was seen as making an acceptable return. The change in approach saw chemicals, yields and products being expressed in terms of 'pound notes' (p. 578). This included emphasis on start and finish dates, hours devoted to the project, costs, technical difficulty of the process, and so on. A target of 75% of scientific time on primary tasks was set. In this process the managing director drove change through the exercise of power within the company. This was backed by his accounting expertise. The essence of such challenges to the PDD was to translate technical scientific feedback at board level into recognition of what the PDD was contributing to profit and results. The paper claims that through the skilful manipulation of accounting terms the board was convinced of the need for and desirability of new accounting.

In the context of this chapter the paper illustrates that the mobilisation of power is needed to effect change, even where such change is essential for the survival of the organisation. Such power was mobilised following a crisis caused by external factors. Interestingly, despite this process the PDD still maintained its traditional ways of thinking, although presumably in a more questioning, results-orientated environment. In this context, as the paper concludes, accounting change is not 'the end' but part of the process.

Case Study: Tuba Accessories

Tuba Accessories produces a standard navigation system for motor vehicles. Its assembly department is largely mechanised and most of the costs of the department are produced by the two overhead support centres – assembly support and machine service.

You are the assistant to the manager of the assembly department, Charlie Cregan.

Each department is evaluated by comparing its actual costs with its flexed budget. This comparison is effected on a monthly basis through the year. The differences between the actual expenditure and the flexed budget are referred to as 'operational cost variances' by the company. Each department is responsible for investigating its own operational cost variances and, each month, the manager of each department has to make a presentation of findings and remedial action in a senior management meeting that is chaired by Alastair Graham, the company's managing director.

During the past 12 months the assembly department's cost variances have been negative in most months and its manager has regularly attributed this to the inaccurate budgeting of overhead costs. However, Alastair Graham has not been convinced by this argument because Charlene O'Donaghue, the management accountant, has stressed that the method of predicting overheads is based on the current methodology used in manufacturing companies.

The assembly manager is very keen to establish whether there is a better basis for projecting the overhead budgets for the next 12 months and, knowing that you have studied accountancy at university, has asked you to undertake an investigation of the current system and to examine alternative approaches.

Month	Units produced	Assembly support costs (£000)	Machine service costs (£000)
1	8000	37.9	70
2	7400	33.8	66.9
3	7000	30.5	65.1
4	6500	33.9	63.2
5	6200	32.4	61.2
6	8000	39.3	70.1
7	5000	28.2	56.2
8	4300	26.6	53.5
9	6200	33.8	61.2
10	8200	39.4	71.1
11	8000	38.1	70.3
12	9200	41.5	76.5

Your first step was to collect data for the last 12 months for the assembly department and the machine service department. These data have been summarised on page 142.

Your next step was to speak to Charlene O'Donaghue about the method used by her department for predicting overheads. A summary of her response is as follows:

The predicting of overheads in manufacturing companies such as Tuba is difficult and also very important because overheads constitute a high proportion of total costs. We have considered an activity-based cost (ABC) approach and employed a consultant to conduct a feasibility study for us. However, his recommendation was that there would be little positive financial return compared with the costs of installing, implementing and updating an ABC system. The single-product nature of Tuba's output strongly influenced his recommendation, with which I concur.

I have also considered an engineering approach to determine the overhead component of product costs. Discussion with our engineers has shown this to be a practical and highly accurate method of budgeting the direct cost elements of our navigation system. However, they can see no way of transferring this approach to overheads within the company.

The approach that we have adopted for the past three years is as follows. We treat each overhead department separately. For each department we identify the highest and lowest monthly output and cost for the previous year and we use this information to estimate the fixed cost and variable cost per measure of output for each department. We do this by simply comparing the change in cost with the change in output which allows us to calculate the variable cost per unit of output. It's a short step to calculate the fixed cost. If necessary, we then apply inflation in order to uplift the costs. This has the advantage of simplicity and can be readily understood by all managers. We regard this as very important, not least because the managers are being evaluated by comparing the budgets (based on cost estimation) with the actual expenditure incurred by their departments.

I am pleased that you are interested in this problem and I would be happy to discuss any further issues with you.

From your university studies you recall that regression can be used in cost estimation. You are also aware that it need to be used with care. Consequently, you decide to investigate whether regression analysis can make a contribution to cost estimation within Tuba Accessories.

- (a) Carry out a regression analysis, for each department and summarise your results.
- (b) Explain the main features of the regression analysis output and, making use of the output, explain the relevance to cost estimation of each of the following: correlation coefficients; R^2 ; standard error; 95% confidence limits; residuals.
- (c) Using graph paper for each pair of dependent/independent variables, draw scatter graphs and also draw in both regression lines using the regression results from your output in (a) above.
- (d) For the next month (month 5) the predicted output is 6800 units. Provide a forecast of the predicted costs of both assembly support and machine service at a 95% confidence level.
- (e) Carry out a high–low analysis for both departments. Predict costs using this approach and compare your results with the results of the regression programme in (d) above.

- (f) Explain the major limitations with regard to the use of regression analysis in cost estimation in Tuba Accessories.
- (g) You are to make two presentations of your results: first, to the company's management accountant; and second, to a group of senior managers which is chaired by the managing director. What alternative approaches might you adopt in presenting your results to these two parties?

Questions

1. Trent PLC produces a single product. Currently, the company is attempting to improve the way it estimates its manufacturing overheads. The following information has been collected for the last 12 months, and one independent variable has been identified as a key cost driver – direct labour hours (DLH):

Month	Overhead (£000s)	DLH (000s)
1	10	4
2	12	6
3	14	7
4	11	6
5	9	4
6	8	3
7	8	3.5
8	9	4
9	10	5
10	11	5
11	12	6
12	15	7

The following calculations are provided:

$$\Sigma Y = 129, \quad \Sigma X = 60.5, \quad \Sigma XY = 682, \quad \Sigma X^2 = 325.25, \quad \Sigma Y^2 = 1441.$$

Using regression analysis, estimate, for manufacturing overheads, the fixed cost and variable cost per direct labour hour. Use your model to estimate the cost at 4000 direct labour hours.

2. Extra Accessories produces a navigation system for motor vehicles. Its assembly department is largely mechanised and most of the costs of the department are produced by the two overhead support centres – assembly support and machine service. Each department is evaluated by comparing its actual costs with its flexed

budget. During the past 12 months, the assembly department's cost variances have been negative in most months and its manager attributes this to the inaccurate budgeting of overhead support costs. The assembly manager is very keen to establish a better basis for projecting the budgets for the next 12 months and has asked you to undertake a cost investigation as a basis for improved budgetary preparation.

Your first step was to collect data for the last 12 months for the overhead support departments:

Month	Units produced	Assembly support costs £000	Machine service costs £000
1	8000	37.9	70
2	7400	33.8	66.9
3	7000	30.5	65.1
4	6500	33.9	63.2
5	6200	32.4	61.2
6	8000	39.3	70.1
7	5000	28.2	56.2
8	4300	26.6	53.5
9	6200	33.8	61.2
10	8200	39.4	71.1
11	8000	38.1	70.3
12	9200	41.5	76.5

You have carried out regression analysis on each pair of dependent/independent variables and the results are as follows:

Dependent variable	Independent variable: Units produced	
	Assembly support costs	Machine service costs
R	0.939	0.998
R^2	0.882	0.996
a	£12,830	£32,608
b	£3.11	£4.69

- For next month the expected output is 6800 units. Provide cost forecasts for both departments at that level of output.
- Using the high–low method, determine the fixed costs and unit variable costs for both overhead support departments and project total costs for both departments when 6800 units are produced.

- (c) Explain why the estimates obtained in (a) and (b) above are different.
 - (d) Discuss three limitations with regard to the use of regression in cost estimation.
3. Carveri Brown is a leading manufacturer of navigational fins. It currently adopts a subjective approach to classifying overheads into their fixed and variable elements for purposes of cost estimation. It is not entirely satisfied with its current approach and is looking for a more scientific way of estimating costs.

For each of the last 12 months it has collected the following data: monthly production overhead costs; monthly machine hours; and monthly output. The data have been input into a computer package which has produced the following regression statistics:

- Using *monthly machine hours* as the independent variable and production overhead costs as the dependent variable:

$$y = -500 + 1.2x, \quad r^2 = 0.96, \quad n = 12.$$

- Using *monthly output* as the independent variable and production overhead costs as the dependent variable:

$$y = 500 + 4.9x \quad r^2 = 0.94, \quad n = 12.$$

- (a) Calculate each independent variable's estimate of production overheads in a month when 5000 machine hours will be used to produce 1000 fins.
 - (b) Comment on the relative value of each of these independent variables to cost estimation in this case.
 - (c) Identify five limitations of regression in cost estimation and explain carefully why each is a limitation.
4. Explain why a standard costing system may be less useful in the following manufacturing environments:
- (a) just-in-time manufacturing.
 - (b) total quality management.
5. The use of incremental budgeting processes may lead to the carry-forward of inefficiencies in organisations. Examine the contribution of each of the following in improving efficiency in such organisations:
- (a) zero-based budgets.
 - (b) planned programme budget systems.