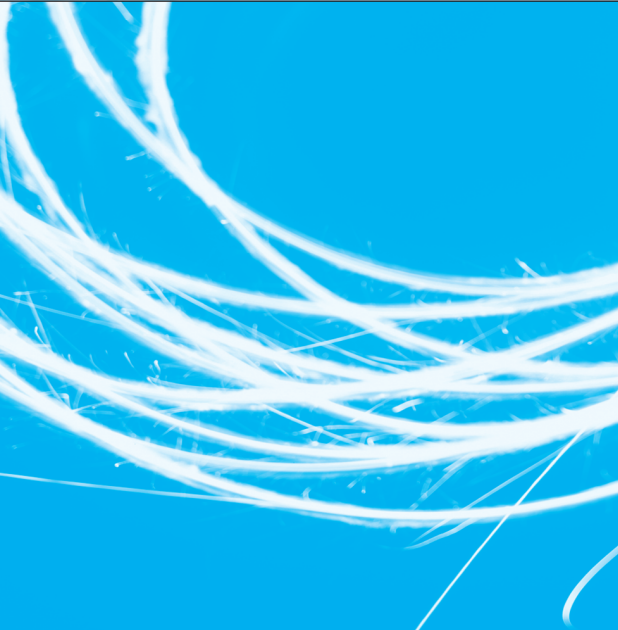# 7

Forecasting future demand and market requirements

What's small, dark and knocking at the door?
The future.

Greek proverb

Introduction

The economist Ralph Harris defined a forecast as 'a pretence of knowing what would have happened if what does happen hadn't'. People are rightly cynical about forecasting, but forecasting is at the heart of marketing strategy and competitive positioning. As part of the marketing information system in Chapter 4, forecasting feeds into many of the stages of marketing strategy formulation. There is little point in developing strategies to fit the past, so forecasting needs to extend the environment and industry analyses of Chapter 3 into the future. Portfolio analysis (Chapter 2) starts with historic information, but ends by projecting the portfolio forward to help decide what to do. From that stage onwards plans depend upon forecasts. Target markets are chosen because of what markets are forecast to be (Chapter 10) and new product development programmes (Chapter 13) build upon market and technology forecasts.

Companies that have not mastered forecasting are likely to build positions that defend against yesterday's competitors or appeal to yesterday's customers. Yet forecasting is often neglected or done naively. Why? The perceived complexity and sheer variety of forecasting methods are two reasons. These barriers have risen as people try to develop ever more sophisticated ways of doing the impossible: looking into the future.

Fortunately, forecasts do not have to complicated to be good, although the methods do have to be understood if they are to be useful. This chapter introduces the forecasting alternatives for sales, markets, technology and society. It gives examples of their use and suggests what to use and when.

7.1 Forecasting what?

Market demand measurement calls for a clear understanding of the market involved. A **market** is the set of all actual and potential buyers of a product or service. A market is the set of buyers, and an **industry** is the set of sellers. The size of a market hinges on the number of buyers who might exist for a particular market offer. Potential buyers for something have three characteristics: interest, income and access.

Companies commonly use a three-stage procedure to arrive at a sales forecast. First, they make an **environmental forecast**, followed by an industry **demand forecast**, followed by a company **sales forecast**. The environmental forecast calls for projecting inflation, unemployment, interest rates, consumer spending and saving, business investment, government expenditure, net exports and other environmental events important to the company. The result is a forecast of gross national product used, along with other indicators, to forecast industry sales. Then the company prepares its sales forecast assuming a certain share of industry sales.

Companies use many techniques to forecast their sales. All are built on one of four information bases: what there is, what has happened, what happens when, or what people think will happen. There are numerous forecasting methods for each use with each information base (Saunders *et al.*, 1987). Figure 7.1 shows the important ones.

7.2 Forecasts based on current demand

Companies have developed various practical methods for estimating total market demand (Barnett, 1988). We illustrate three.
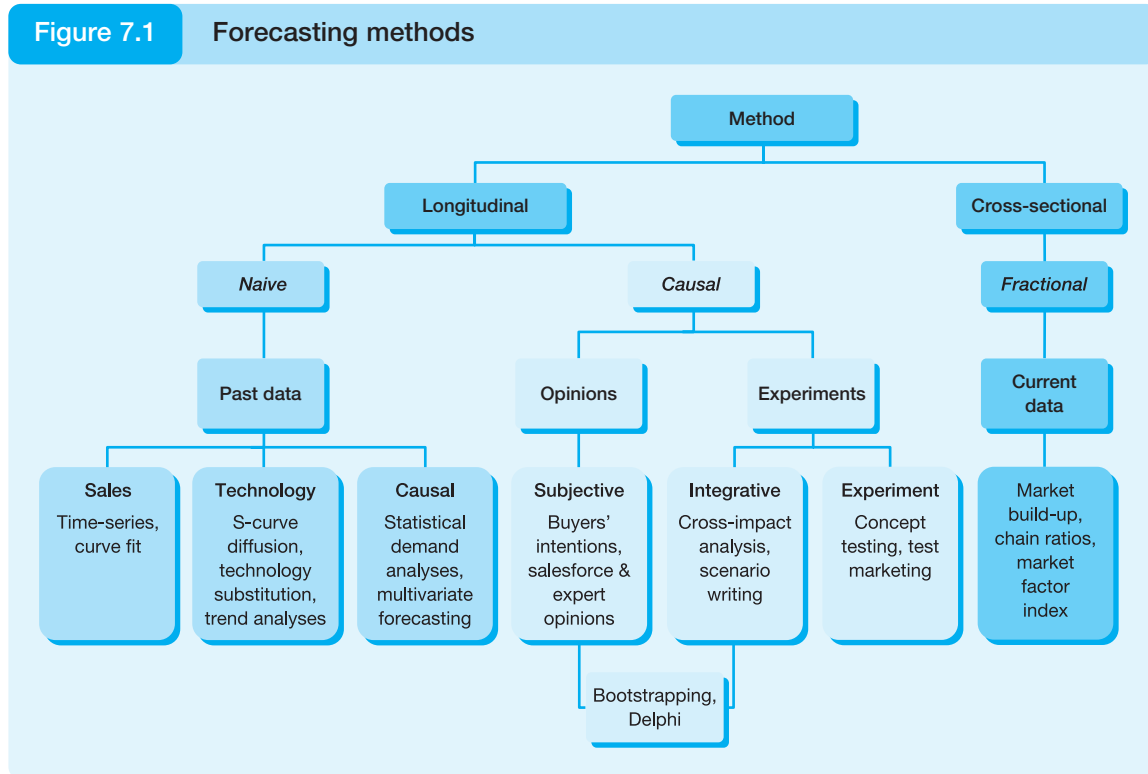
7.2.1 Market build-up method

The **market build-up** method identifies all the potential buyers in each market and estimates their potential purchases.

Suppose EMI wants to estimate the total annual sales of recorded compact discs. A common way to estimate total market demand is as follows:

$$Q = n \times q \times p$$

Figure 7.1   Forecasting methods

where:

Q = total market demand;
n = number of buyers in the market;
q = quantity purchased by an average buyer per year; and
p = price of an average unit.

If there are 10 million buyers of CDs each year and the average buyer buys six CDs a year and the average price is £15, then the total market demand for CDs is $10{,}000{,}000 \times 6 \times £15.00 = £900$ million.

The market build-up method faces the problem of all demand measurement methods: it is about the present, not the future. To find out what the market will be, forecasters have to estimate the future number of buyers, quantity purchased and prices. This disaggregation has its advantages. The three components are easier to forecast than sales alone. For example, existing population distributions make it easy to forecast an increased demand for medical support as the population ages.

7.2.2   Chain ratios

The **chain ratio** method multiplies a base number by a chain of adjusting percentages. For example, Britain has no national service, so the British Army needs to attract 20,000 recruits each year. There is a problem here, since the Army is already

under strength and the population of 16–19-year-olds is declining. The marketing question is whether this is a reasonable target in relation to the market potential. The Army estimates market potential using the following method:

Total number of males in age group:	1,200,000
Percentage who are militarily qualified (no physical, emotional or mental handicaps):	50%
Percentage of those qualified who are potentially interested in military service:	5%
Percentage of those qualified and interested in military service who consider the Army the preferred service:	60%

This chain of numbers shows a market potential of $1,200,000 \times 0.5 \times 0.05 \times 0.6 =$ 18,000 recruits, fewer than needed. Since this is less than the target number of recruits sought, the Army needs to do a better job of marketing itself. It responded by doing motivational research that showed existing advertising did not attract the target age group, although a military career did give them what they wanted. A new campaign therefore aimed to increase the attractiveness of a military career.

7.2.3 | Market-factor index method

The **market-factor index** method estimates the market potential for consumer goods. A manufacturer of shirts wishes to evaluate its sales performance with market potential in Scotland. It estimates total national potential for dress shirts at £400 million per year. The company's current nationwide sales are £4,800,000 – about a 1.2 per cent share of the total potential market. Its sales in Scotland are £1,200,000. It wants to know whether its share of the Scottish market is higher or lower than its national market share. To find this out, the company first needs to calculate market potential in Scotland.

One way of calculating this is to multiply together population and the area's income per capita by the average share of income spent on shirts. The product then compares with that for the whole country. Using this calculation the shirt manufacturer finds that Scotland has 8 per cent of the UK's total potential demand for dress shirts. Since the total national potential is £400 million each year, total potential in Scotland is $0.08 \times £400$ million = £32 million. Thus the company's sales in Scotland of £1,200,000 is £1,200,000/£32 million = 3.75 per cent share of area market potential. Comparing this with the 1.2 per cent national share, the company appears to be doing much better in Scotland than in other parts of the United Kingdom.

7.3 | Forecasts based on past demand

Time-series analyses use the pattern of past sales, or other items, to estimate the future. Although it is basically naive, it often outperforms more complicated methods. Its objectivity is one reason for its success. Time-series analyses are so mechanistic that there is little room for managerial intervention to bias results.

Figure 7.2   Time-series analysis
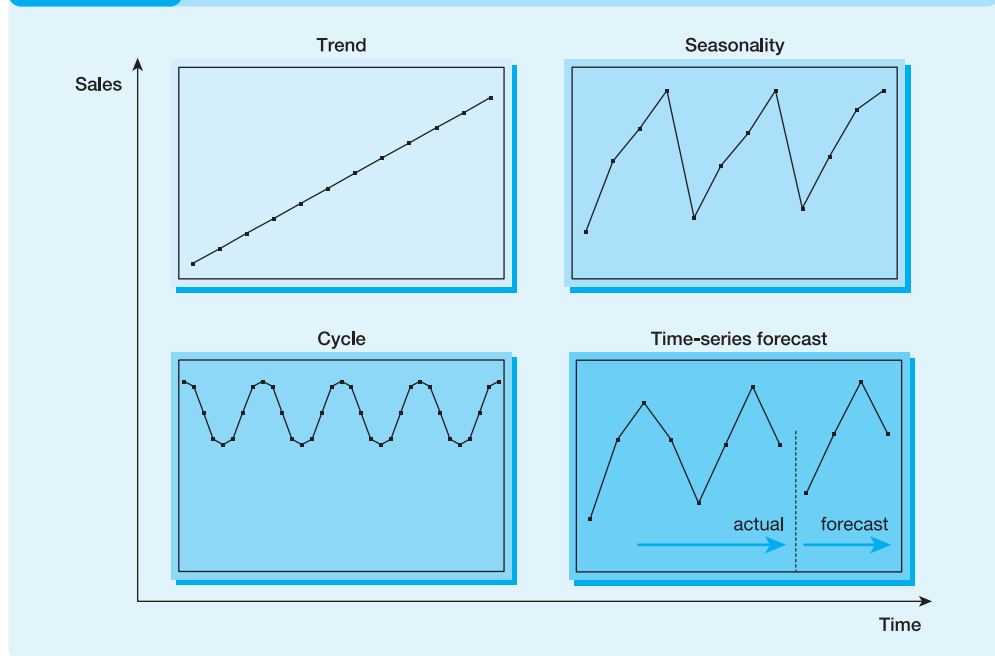
7.3.1   Time-series analysis

Many firms base their forecasts on past sales, a method our cynical Ralph Harris 'vividly compared to steering a ship by its wake'. They assume that statistical analysis can uncover the causes of past sales. Then analysts can use the causal relations to predict future sales.

Time-series analysis consists of breaking down sales into four components – trend, cycle, season and erratic components (see Figure 7.2) – then recombining these components to produce the sales forecast.

1 **Trend** is the long-term, underlying pattern of growth/decline in sales resulting from basic changes in population, capital formation and technology. It is found by fitting a straight or curved line through past sales.

2 **Cycle** captures the medium-term, wavelike movement of sales resulting from changes in general economic and competitive activity. The cyclical component can be useful for medium-range forecasting. Cyclical swings, however, are difficult to predict because they do not occur on a regular basis.

3 **Seasonality** refers to a consistent pattern of sales movements within the year. The term **season** describes any recurrent hourly, weekly, monthly or quarterly sales pattern. The seasonal component may relate to weather factors, holidays and trade customs. The seasonal pattern provides a norm for forecasting short-range sales.

4 **Erratic events** include fads, strikes, earthquakes, riots, fires and other disturbances. These components, by definition, are unpredictable and should be removed from

past data to see the more normal behaviour of sales. One UK retailer found that the best predictor of daily sales was the depth of snow falling. A true but not useful result!

In this method, sales volume, V_t, in period t is calculated from the product of past sales, V_{t-1}, trend, T_t, cyclical, C_t, and seasonal, S_t, components.

$$V_t = V_{t-1} \times T_t \times C_t \times S_t$$

Having sold 12,000 life insurance policies this year (V_{t-1} = 12,000), a life insurance company wants to predict next year's December sales. The long-term trend shows a 5 per cent sales growth rate per year (T_t = 1.05). This suggests sales next year of £12,000 × 1.05 = £12,600. However, a business recession is expected next year, which will probably result in total sales achieving only 90 per cent of the expected trend-adjusted sales (C_t = 0.90). Sales next year are therefore more likely to be £12,000 × 1.05 × 0.90 = £11,340. If sales were the same each month, monthly sales would be £11,340/12 = £945. However, December is an above-average month for insurance policy sales, with a seasonal index, S_{12}, standing at 1.30. Therefore, December sales may be as high as £945 × 1.30 = £1,228.

The central issue in time-series analysis is estimating the seasonal, cyclical and trend components. A simple approach is to average these over several years, although this does not give any extra weighting to recent events and there is always a problem about how many periods to average. Exponentially weighting moving averages overcomes this problem by including all past statistics but weighting recent ones more highly. This avoids the truncation problem, but the exponential decay rates that weight the past figures then become an issue. Many methods have been developed to adjust weights automatically but all have the same limitation of all time-series analysis: they assume past patterns will continue.
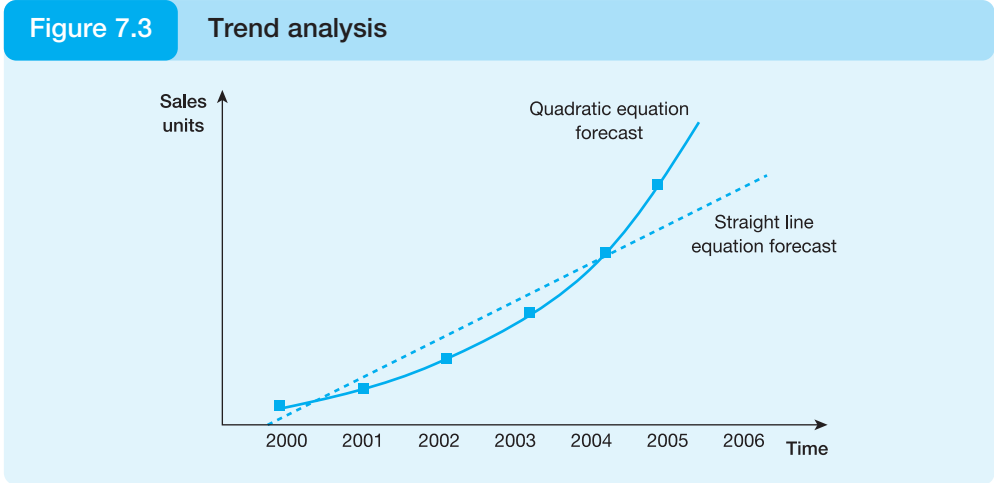
7.3.2 Trend analysis

Curve fitting

Trend analysis is the most widely used and abused method of strategic forecasting. It is popular because it is quick and easy to use. It is abused when it is used thought-lessly to give naive but statistically reliable results. The approach fits an equation to historical time-series data then projects that curve into the future to produce a fore-cast. Figure 7.3 is a typical case, where the objective is to use the sales history from 2000 to 2004, S_Y, to produce a forecast for 2005 and 2006.

The basic form of trend analysis fits a straight line to the time-series and then uses the result to extrapolate to future sales levels. This assumes that sales of DVD players will increase by the same amount each year, a trend explained by the linear equation:

$$F_Y = a + b \times T$$

where:

F_Y is the forecast DVD player sales in year Y, where $T = Y - 2000$, a and b are unknown coefficients to be estimated.

Figure 7.3	Trend analysis

The basic question of trend analysis, and many other statistical forecasting tools, is the estimation of the unknown coefficients. Regression analysis is the most common way of doing this. It calculates the values of the coefficient that minimise the sum of the squares of the differences between actual and forecast sales, minimising:

$$\sum_{Y=2000}^{2005} u_Y^2,$$

where u_Y is the error term, $F_Y - S_Y$.

The approach gives the equation:

$$F_Y = 0.14 + 1.65 \times T + u_Y$$

$$R^2 = 0.987$$

The R^2 value indicates a reasonably good fit since its value can range between 1, meaning a perfect fit to the data, and 0, meaning no fit at all.

This statistically excellent result reveals the dangers of trend analysis. The result is naive; only a fool would expect DVD sales to increase linearly with time for ever! Visual inspection also shows that the sales trend is not a straight line but one that curves upwards. Trend analysis can overcome this problem by fitting a more complex equation. A quadratic equation allows regression analysis to produce an equation with a better fit and shape:

$$F_Y = 0.44 + 1.05 \times T + 0.15 \times T^2 + u_Y$$

$$R^2 = 0.999$$

substituting $T = 5$, for 2005 and $T = 6$, for 2006. The results also give upper and lower limits (95 per cent) of the estimate – figures that are a useful by-product of regression analysis.

The linear and quadratic forms are two of many equations that can be used to fit trends. Other forecasts could be:

Log quadratic	$RF_Y = EXP(-0.67249 + 1.1727 \times T + 0.13112 \times T^2)$,	$R^2 = 0.999$
Exponential	$F_Y = 0.66348 \times EXP(0.64821 \times T)$,	$R^2 = 0.945$
Modified hyperbola	$F_Y = 1/(1.5006 - 0.4181 \times T)$,	$R^2 = 0.730$

The fits are good but what do they forecast? The quadratic and exponential forms both forecast sales growing increasingly rapidly, but the exponential form at such a rapid rate that it produces a forecast of over 30,000,000 units in 2006 – more than one per household in the United Kingdom. Unfortunately the two curves with the best fit give the most contrasting forecasts. While quadratic suggests a reasonable exponential increase, the log quadratic forecasts declining sales after 2004.

The results show the danger of collapsing the shape and curve fitting parts of trend analysis. Curve fitting using regression analysis should only be attempted after the desired shape and expression have been chosen. If in doubt, use a straight line to fit the series. It may be obviously wrong, but at least its limitations are known. Alternatively, the careful choice of series to be analysed and the use of constrained trend analysis can overcome some of the problems with wayward curves.

Despite its limitations there are several useful applications of trend analysis. Sales are the most common but the adoption rate of new products, the substitution of one technology for another and technology forecasting are other areas where trend analysis is effective. Trend analysis also inherits several advantages from regression analysis. It is relatively quick and easy to use and, because it is based on a well-understood technique, it provides statistical measures of the reliability and validity of the results.

The S-curve

S-shaped time series, or curves that saturate to an upper limit, are particularly suited to time-series analysis. In technology and sales forecasting there is often an upper limit beyond which performance or sales can never go. Take, for example, the motor car engine. There is a theoretical limit to the thermal efficiency that the internal combustion engine can ever achieve, so it is expected that gains from spending on R&D would decline as the theoretical limit is approached. Similarly, for DVD sales, there is obviously some upper limit to the sales that can be made. By taking into account these rational or practical constraints the quality and reliability of trend analysis can be significantly increased.

When forecasting the potential of a new product group, such as the DVD was, it is easier and more reliable to forecast penetration rather than sales. This is because penetration always follows a particular type of curve that has an upper limit. For domestic appliances the absolute upper limit must be 100 per cent of households, although there are some goods, such as dishwashers, that appear to have saturated at a much lower level.

Figure 7.4 contains penetration figures and a forecast for DVDs. The forecast is produced using a Gompertz curve that is S-shaped and saturates. The expression has the form:

$$F_T = a_0 \times a_1^{a^{T2}}$$

where a_0, a_1 and a_2 are parameters to be estimated and T is time. After solution a_0 is the saturation level, the level beyond which sales will never go, and $a_0 \times a_1$ is the

| Figure 7.4 | S-curve penetration forecast |
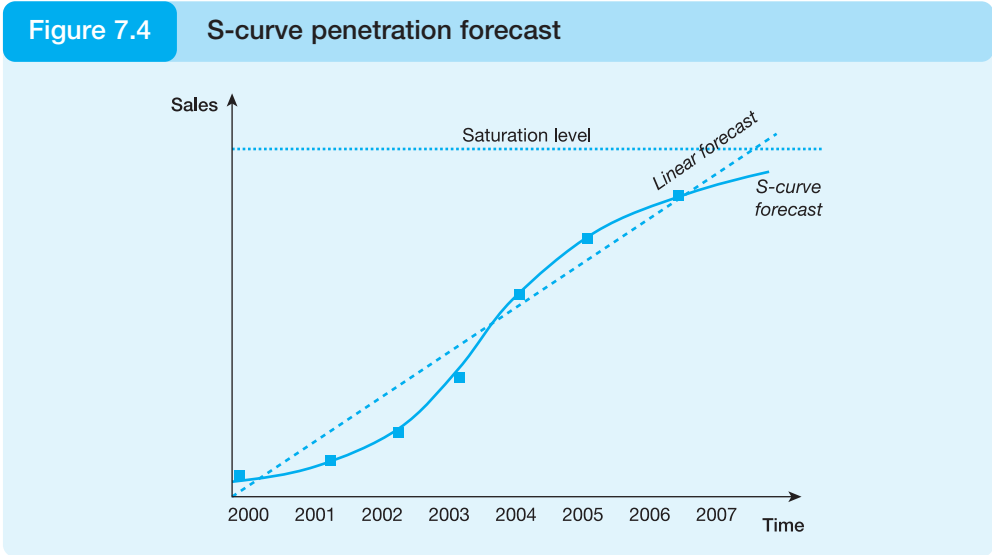
forecast when $T = 0$. Unfortunately, the Gompertz equation has to be solved using non-linear estimation techniques rather than regression. These are iterative procedures that use rules to guide the search for the coefficients that would otherwise be estimated using regression analysis. There is a wide range of procedures, but they are not all robust.

The Gompertz equation for the DVD penetration series is:

$$DVDF_Y = 59.2 \times 0.0420^{0.647^T}$$

where T = the year 2000.

This suggests a saturation level of penetration to be 59.2 per cent of households, with sales declining after 2004. As an alternative to using non-linear estimation to estimate an S-curve, the Gompertz equation, or a similar **logistic model**, can be solved using regression analysis if saturation level (a_0) is assumed.

These transformations allow reliable S-shaped expressions to be estimated, but if an inappropriate saturation level is chosen the results will provide a poor fit to the data. When this occurs alternative saturation levels should be tried until a more satisfactory result is obtained. If the search procedure is conducted systematically the process would become one of non-linear estimation. The following specialised cases of the diffusion of innovations and technology substitution provide other examples of where constrained trend analysis can be profitably used.

The similarity between the S-shaped curve explaining the adoption of a product and a plot of the early stages of the product life cycle is misleading. The S-curve tracks first uses of a product and leads to a saturation level when all users have adopted the product. In contrast, the product life cycle tracks sales that include repeat purchases as well as first-time uses. These curves are often out of phase. For example, in Europe almost everyone has travelled by bus so the S-curve of the adoption has levelled off and will not go up and cannot go down. Conversely, the product life cycle for buses

is declining as more people take to their cars. An opposite case occurs for US wine consumption. Again the S-curve for adoption has levelled out as most people who are willing and able to try wine have done so. However, the product life cycle curve for wine in the United Kingdom continues to increase as people consume more table wine.

The 'market build-up' model discussed above (Section 7.2.1) links the adoption and product life cycle curves. In this the S-curve plot closely follows 'the number of buyers in the market' while the product life cycle represents 'total market demand'.

Diffusion of innovations

Some insights into the mechanism of the diffusion of innovations have led to trend analysis models with some behavioural detail. Bass (1969) has produced a new product growth model for consumer durables that is based on the innovative and imitative behaviour of consumers. For DVDs this suggests that I_T, the increase in penetration in time T, will be:

$$I_T = r(M - P_T) + p(M - P_T)P_T/M$$

where:

$r(M - P_T)$ is the *innovation effect*, proportional to the untapped potential;

$p(M - P_T)P_T/M$ is the *imitation effect*, proportional to the potential already tapped;

M is the final potential achieved as a fraction of the maximum potential;

P_T is the penetration achieved at time T.

This makes the realistic assumption that some individuals make their adoption decision independently (innovators), while others (imitators) are influenced by the number of people who have already adopted. The shape of the cumulative penetration curve depends on the relative magnitudes of the **innovation rate** (r) and the **imitation rate** (p). If the *innovation rate* is larger than the *imitation rate*, sales will start quickly then slowly approach saturation. However, if *imitation rate* dominates, an S-shaped curve will occur. Once sufficient data have been collected r and p can be calculated using regression analysis.

The diffusion equations are a useful variation on conventional trend analysis. Unlike other time-series methods, they are based on ideas about consumer behaviour. Actual diffusion processes are obviously far more complex than the simple dichotomy into innovators and imitators suggests, but the resulting equations are robust and can produce reliable forecasts.

There have been attempts to produce more sophisticated diffusion models by adding extra dimensions. These have had limited success. Most add the effect of one or two marketing variables (usually advertising and promotion), but there is no unified theory of how to incorporate marketing or exogenous variables. The few comparisons that have been made tend to show that the extra sophistication offers little improvement over the simple models. A major limitation of the more sophisticated models is their need to be estimated early in a product's life when few data are available.

Technology substitution

Technology substitution is a special case of the diffusion of innovation that occurs when a new technology replaces an old one; for example, the substitution of air for sea/rail travel, or the replacement of vinyl albums by prerecorded tapes or compact discs. Substitution can be forecast in the same way as conventional diffusion processes by the very neat method devised by Fisher and Pry (1978).

The Fisher–Pry method represents a series showing a new idea replacing an older one, in this case the per capita consumption of margarine and butter where:

$$f_T/(f_T - 1) = e^{d+bT}$$

where:

f_T is the fraction of people having adopted the new technology (margarine) at time T,
d and b need estimating.

Regression analysis gives the result:

$$f_T/(f_T - 1) = e^{-0.261+0.284T}, \quad R^2 = 0.928$$

Although an equation can be solved using regression, the beauty of the substitution process is its regularity, which allows a clever transformation to show the process as a straight line that can be projected without resorting to statistics. This result shows the proportion of margarine consumed continuing to increase from 81 per cent in 1995 to 91 per cent by 2005.

The Fisher–Pry method is a simple way of looking at a very complex process. Over the decades covered by the substitution the economic, trade and health reasons for the change must have undergone many changes. An attempt to model the change causally would have to find some way of representing all the mechanisms involved. Like the other trend analysis methods, the Fisher–Pry approach observes the aggregate effect of all the influences and assumes that together they will produce the same pattern of substitution in the future as they did in the past. However, sometimes one of the major influences does undergo a major change and affect the rate of substitution.

Technology trend analysis

Technology trend analysis seeks to forecast changes in technological performance rather than sales. It has grown out of the realisation that, for most of the time, technological progress proceeds at a steady pace. Figure 7.5 shows how this is true for computational speeds that have changed dramatically over the last 40 years.

The trend analysis of technological progress appears to be at odds with the popular view of unexpected scientific progress, but unexpected breakthroughs are much rarer than commonly supposed. The much-quoted example of penicillin is the exception rather than the rule. Most of the innovation in the early decades of the new millennium will be based on scientific and technological knowledge existing now. The pattern of technological progress tends to be uniform because it is usually achieved as the result of designers selecting and integrating a large number of innovations from diverse technological areas to produce the higher performance achieved.

Often the impact of a radically new innovation is swamped by the steady progress of evolutionary developments in related areas. This is shown by the change

Figure 7.5	Technology trend analysis
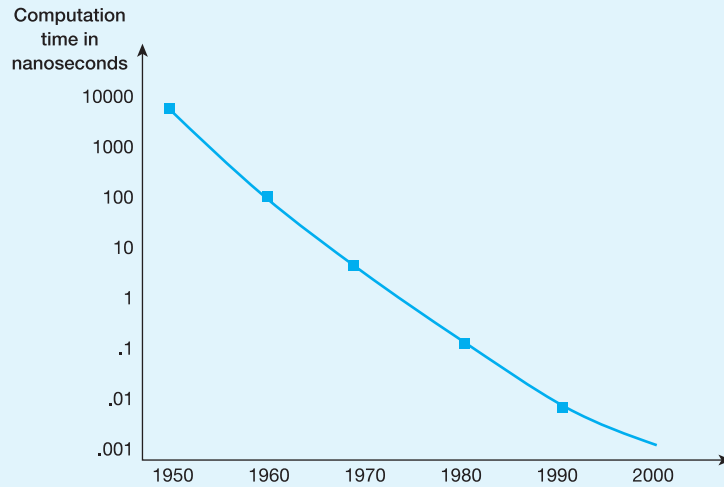
of computational speeds. The period covers major discontinuous innovations (from vacuum tubes in 1950 to transistors in 1960, silicon chips in 1970 and gallium arsenide in 1980), but the progress is regular. The transistor itself provides a good example of the relative impact of breakthroughs. It is often credited with being responsible for the size reduction in electronic equipment, yet without the parallel development of ancillary technologies it is estimated that transistor-based electronic equipment would be only marginally smaller (about 10 per cent) than a vacuum tube version.

So, technological trend analysis is based on the same assumption as the Fisher–Pry approach to technological substitution. Both are the result of very complex processes, but their cumulative effect tends to be regular, and the past trends can be a good indication of the immediate future.

The recognition of the S-shaped path of technological progress is a major feature of technology trend analysis. Initially technological progress is slow, maybe because few people are involved, basic scientific knowledge must be gained and engineering obstacles cleared. Conventional wisdom and the establishment can hold back development for a long time. Combat aircraft technology progressed rapidly in the First World War, but then became almost frozen for 20 years as military budgets were cut and the senior services resisted flying machines. Advances start to accelerate exponentially once the importance of a technology is realised and technological effort and funds are expanded. The threat of the Second World War stimulated the rapid increase in combat aircraft performance and this continued after the war and the introduction of radically new jet engine technology.

Finally, technological advances cease to accelerate and may stop growing altogether. There are two reasons why rapid technological progress ends. First, there may be an absolute limit to the technology. For example, the maximum speed of operational helicopters has saturated at just above 350 kph. Above that speed either the forward moving rotor becomes supersonic (so loses lift), or the rearward moving rotor stalls (also losing lift). By using radically new technology the barrier can be overcome,

187

but not satisfactorily or economically for most helicopter roles, even with military R&D budgets.

Sometimes the barrier is purely economic. For example, the 'sound barrier' did not slow combat aircraft development, so why should civil aircraft not be supersonic? Concorde and the Tu-144 (maybe) have shown there is no technological barrier, but all economically successful aircraft are subsonic. Practical technologies stop advancing when rapidly diminishing returns set in. At the moment the limited economic value to the customer of supersonic air travel, in conjunction with its high economic and social costs, make the speed of sound an economic barrier. Even combat aircraft appear to have reached a non-technological barrier to their development. Faster combat aircraft could be built but at too great a cost to other performance criteria, and speed, just like size, isn't everything! These days it is much better to be invisible than fast, as with the B-2 and F-117 stealth aircraft.

The S-shaped curve of technological trends is more prone to uncertainty than that of sales trends. The initial slow growth may not exist if the potential of a new idea is grasped quickly. Both helicopter and laser technology developed rapidly from the start because their significance was obvious and they were no challenge to established power bases. Levelling of development is usually due to a combination of technological and economic factors. Often the trend line continues across several major technological innovations but new technologies can sometimes cause rapid changes, as is now occurring in telecommunications where satellites and deregulation have destroyed the relationship between the distance of phone calls and cost, if not price.

The normally regular pace of technological development makes technology trend analysis a useful planning tool. It can help set realistic performance targets for new developments and prevent heavy expenditure on technologies when the likely returns are diminishing. However, it is a tool that can be dangerous if used thoughtlessly.

Often it is not obvious which performance trends are central. US aero engine manufacturers, and the UK government, initially rejected jet engines for transport aircraft because some experts were preoccupied with specific fuel consumption as the criterion for comparing aero engines. Relative to piston engines, jet engines still have poor specific fuel consumption, but they are supreme in terms of passenger miles per unit cost. To overcome this myopia, identifying at least half a dozen attributes or, more likely, twice that, is necessary. The criteria should then be used, compared and reviewed periodically.

Technology trend lines are often fitted manually rather than using regression analysis. Regression analysis is limited because transformations are often unable to follow the rapid saturation that sometimes occurs. It provides a good statistical fit to the data but produces a shape that overshoots natural or economic barriers. A second disadvantage of regression is the need to envelop data points rather than fit a line of best fit through them. It is usually the extremes of performance, rather than the average, that are tracked. However, developments in envelope methods are overcoming this problem (Bultez and Parsons, 1998).

The direction and limits of trends should be explored carefully. It is easy to neglect the limits to performance improvement when competition has focused attention on a particular criterion for a long time. Potential technical, economic, social, political and ecological reasons for barriers should be considered. Often, as was the case with Concorde, the actual limit is not due to one factor but to a combination of factors.

7.3.3 Leading indicators

Many companies try to forecast their sales by finding one or more **leading indicators**: that is, other time-series that change in the same direction but ahead of company sales. For example, a plumbing supply company might find that its sales lag behind the housing starts index by about four months. An index of housing starts would then be a useful leading indicator. Other leading indicators, such as birth rates and life expectancy, show huge shifts in markets in the next millennium. Many developed countries, including France, Germany and Japan, will have huge problems funding the greying population's pensions. Other countries with funded pension schemes, including the Netherlands, the United States and the United Kingdom, will have an increasingly wealthy ageing population. Despite the wide difference in countries' preparedness for this easy to forecast demographic shift, all will enjoy one rapidly growing market over the next few decades: the funeral market.

It can be dangerous to assume that the indicators that served in the past will continue to do so in the future, or will transfer from one market to another. For example, Disney places great stress on a model of concentric circles around its theme park sites, in which travel time and population numbers indicate demand. Part of the initial failure of EuroDisney (now Disneyland Paris) was because the company clung to this model, ignoring the fact that Europeans have different vacation spending and travel behaviour from Americans.

Getty Images/AFP

7.3.4 Multivariate statistical analysis

Time-series analysis treats past and future sales as a function of time rather than as a function of any real demand factors. But many real factors affect the sales of any product.

Statistical demand analysis

Statistical demand analysis uses statistical procedures to discover the most important real factors affecting sales and their relative influence. The factors most commonly analysed are prices, income, population and promotion. It consists of expressing sales (Q_T) as a dependent variable and trying to explain sales as a function of a number of independent demand variables $X_1, X_2, \ldots, X_n$. That is:

$$Q_T = f(X_1, X_2, \ldots, X_n)$$

Using multiple-regression analysis various equations can be fitted to the data to find the best predicting factors and equation.

For example, the South of Scotland Electricity Board developed an equation that predicted the annual sales of washing machines (Q_T) to be (Moutinho, 1991):

$$Q_T = 210,739 - 703P_T + 69H_T + 20Y_T$$

where:

P_T is average installed price;

H_T is new single-family homes connected to utilities;

Y_T is per capita income.

Thus in a year when an average installed price is £387, there are 5,000 new connected homes, and the average per capita income is £4,800, from the equation we would predict the actual sales of washing machines to be 379,678 units:

$$Q_T = 210,739 - 703(387) + 69(5,000) + 20(4,800)$$

The equation was found to be 95 per cent accurate. If the equation predicted as well as this for other regions it would serve as a useful forecasting tool. Marketing management would predict next year's per capita income, new homes and prices and use them to make forecasts. Statistical demand analysis can be very complex and the marketer must take care in designing, conducting and interpreting such analysis. Yet constantly improving computer technology has made statistical demand analysis an increasingly popular approach to forecasting.

Multivariate sales forecasting

Information gathered by the company's marketing information systems often requires more analysis, and sometimes managers may need more help in applying it to marketing problems and decisions. This help may include advanced statistical analysis to learn more about both the relationships within a set of data and their statistical reliability. Such analysis allows managers to go beyond mean and standard deviations in the data. In an examination of consumer non-durable goods in the Netherlands, regression analysis gave a model that forecast a brand's market share (B_t) based on predicted marketing activity (Alsem *et al.*, 1989):

$$B_t = -7.86 - 1.45P_T + 0.084_{T-1} + 1.23D_T$$

where:

P_T is relative price of brand;

A_{T-1} is advertising share in the previous period;

D_T is effective store distribution.

This, and models like it, can help answer marketing questions such as the following:

- What are the chief variables affecting my sales and how important is each one?
- If I raised my price 10 per cent and increased my advertising expenditure 20 per cent, what would happen to sales?
- How much should I spend on advertising?
- What are the best predictors of which consumers are likely to buy my brand versus my competitor's brand?
- What are the best variables for segmenting my market and how many segments exist?

Information analysis might also involve a collection of mathematical models that will help marketers make better decisions. Each model represents some real system, process or outcome. These models can help answer the questions *What if?* and *Which is best?* During the past 20 years marketing scientists have developed numerous models to help marketing managers make better marketing mix decisions, design sales territories and sales-call plans, select sites for retail outlets, develop optimal advertising mixes and forecast new-product sales.

7.4 Forecasting through experimentation

Where buyers do not plan their purchases or where experts are not available or reliable, the company may want to conduct a direct test market. This is especially useful in forecasting new-product sales or established-product sales in a new distribution channel or territory. New-product forecasting methods range from quick and inexpensive concept testing, which tests products before they even exist, to highly expensive test markets that test the whole marketing mix in a geographical region.

7.4.1 Concept testing

Concept testing calls for testing new-product concepts with a group of target consumers. The concepts may be presented to consumers symbolically or physically. Here, in words, is *Concept 1*:

> An efficient, fun-to-drive, electric-powered subcompact car that seats four. Great for shopping trips and visits to friends. Costs half as much to operate as similar petrol-driven cars. Goes up to 90 km per hour and does not need to be recharged for 170 km. Priced at £6,000.

In this case a word or picture description might be sufficient. However, a more concrete and physical presentation of the concept will increase the reliability of the concept test. Today marketers are finding innovative ways to make product concepts more real to concept-test subjects.

After being exposed to the concept consumers may be asked their likelihood of buying the product. The answers will help the company decide which concept has the strongest appeal. For example, the last question asks about the consumer's intention to buy. Suppose 10 per cent of the consumers said they 'definitely' would

buy and another 5 per cent said 'probably'. The company could project these figures to the population size of this target group to estimate sales volume. Concept testing offers a rough estimate of potential sales, but managers must view this with caution. They must recognise that the estimate is only a broad pointer and is uncertain largely because consumers do not always carry out stated intentions. Drivers, for example, might like the idea of the electric car that is kind to the environment, but might not want to pay for one. It is, none the less, important to carry out such tests with product concepts so as to gauge customers' responses as well as identify aspects of the concept that are particularly liked or disliked by potential buyers. Feedback might suggest ways to refine the concept, thereby increasing its appeal to customers.

7.4.2   Pre-test markets

Companies can also test new products in a simulated shopping environment. The company or research firm shows, to a sample of consumers, ads and promotions for a variety of products, including the new product being tested. It gives consumers a small amount of money and invites them to a real or laboratory store where they may keep the money or use it to buy items. The researchers note how many consumers buy the new product and competing brands. This simulation provides a measure of trial of the commercial's effectiveness against competing commercials. The researchers then ask consumers the reasons for their purchase or non-purchase. Some weeks later they interview the consumer by phone to determine product attitudes, usage, satisfaction and repurchase intentions. Using sophisticated computer models the researchers then project national sales from results of the simulated test market.

Simulated test markets overcome some of the disadvantages of standard and controlled test markets. They usually cost much less (£25,000–£50,000), can be run in eight weeks, and keep the new product out of competitors' view. Yet, because of their small samples and simulated shopping environments, many marketers do not think that simulated test markets are as accurate or reliable as larger, real-world tests. Still, simulated test markets are used widely, often as 'pre-test' markets. Because they are fast and inexpensive one or more simulated tests can be run to assess a new product or its marketing programme quickly. If the pre-test results are strongly positive the product might be introduced without further testing. If the results are very poor the product might be dropped or substantially redesigned and retested. If the results are promising but indefinite the product and marketing programme can be tested further in controlled or standard test markets.

7.4.3   Mini-test markets

Several research firms keep controlled panels of stores that have agreed to carry new products for a fee. The company with the new product specifies the number of stores and geographical locations it wants. The research firm delivers the product to the participating stores and controls shelf location, amount of shelf space, displays and point-of-purchase promotions, and pricing according to specified plans. Sales results are tracked to determine the impact of these factors on demand.

Controlled test-marketing systems are particularly well developed in the United States. Systems such as Nielsen's Scantrack and Information Resources Inc.'s (IRI)

BehaviorScan track individual behaviour from the television set to the checkout counter. IRI, for example, keeps panels of shoppers in carefully selected cities. It uses microcomputers to measure TV viewing in each panel household and can send special commercials to panel member television sets. Panel consumers buy from cooperating stores and show identification cards when making purchases. Detailed, electronic scanner information on each consumer's purchases is fed into a central computer, where it is combined with the consumer's demographic and TV viewing information and reported daily. Thus BehaviorScan can provide store-by-store, week-by-week reports on the sales of new products being tested. And because the scanners record the specific purchases of individual consumers the system can also provide information on repeat purchases and the ways that different types of consumers are reacting to the new product, its advertising and various other elements of the marketing programme.

Controlled test markets take less time than standard test markets (six months to a year) and usually cost less. However, some companies are concerned that the limited number of small cities and panel consumers used by the research services may not be representative of their products' markets or target consumers. And, as in standard test markets, controlled test markets allow competitors to get a look at the company's new product.

7.4.4 Full test market

Full test markets test the new consumer product in situations similar to those it would face in a full-scale launch. The company finds a small number of representative test cities where the company's salesforce tries to persuade retailers to carry the product and give it good shelf space and promotion support. The company puts on a full advertising and promotion campaign in these markets and uses store audits, consumer and distributor surveys, and other measures to gauge product performance. It then uses the results to forecast national sales and profits, to discover potential product problems and to fine-tune the marketing programme.

Standard market tests have some drawbacks. First, they take a long time to complete – sometimes one to three years. If the testing proves to be unnecessary the company will have lost many months of sales and profits. Second, extensive standard test markets may be very costly. Finally, full test markets give competitors a look at the company's new product well before it is introduced nationally. Many competitors will analyse the product and monitor the company's test market results. If the testing goes on too long competitors will have time to develop defensive strategies and may even beat the company's product to the market. For example, prior to its launch in the United Kingdom, Carnation's Coffee-Mate, a coffee whitener, was test marketed over a period of six years. This gave rival firm Cadbury ample warning and the opportunity to develop and introduce its own product – Cadbury's Coffee Complement – to compete head on with Coffee-Mate.

There are other dangers. In 1997 Sainsbury's was conducting price tests by charging different prices at different stores to gauge customer response. When discovered, this made headline news, with the company criticised for the unfairness of differential pricing even in market tests. Market testing that endangers brand equity is unlikely to be pursued by many companies.

Furthermore, competitors often try to distort test market results by cutting their prices in test cities, increasing their promotion or even buying up the product being tested. Despite these disadvantages standard test markets are still the most widely used approach for significant market testing, although many companies are shifting towards quicker and cheaper, controlled and simulated test marketing methods.

Full test marketing tests its entire marketing programme for the product – its positioning strategy, advertising distribution, pricing, branding and packaging, and budget levels. The company uses it to learn how consumers and dealers will react to handling, using and repurchasing the product. The results can be used to make better sales and profit forecasts. Thus a good test market can provide a wealth of information about the potential success of the product and marketing programme.

The cost of a full test market can be enormous and test marketing takes time that may allow competitors to gain advantages. When the costs of developing and introducing the product are low, or when management is already confident that the new product will succeed, the company may do little or no test marketing. Minor modifications of current products or copies of successful competitors' products might not need standard testing. But when the new-product introduction requires a large investment, or when management is not sure of the product or marketing programme, the company should do a lot of test marketing. In fact some products and marketing programmes are tested, withdrawn, changed and retested many times during a period of several years before they are finally introduced. The costs of such test markets are high, but often small compared with the costs of making a serious mistake.

Whether or not a company test markets, and the amount of testing it does, depends on the cost and risk of introducing the product on the one hand, and on the testing costs and time pressures on the other. Test marketing methods vary with the type of product and market situation, and each method has advantages and disadvantages.

7.4.5 Test marketing business-to-business goods

Business marketers use different methods for test marketing their new products, including product-use tests; trade shows; distributor/dealer display rooms; and standard or controlled test markets. These various methods are explained below:

- **Product-use tests:** Here the business marketer selects a small group of potential customers who agree to use the new product for a limited time. The manufacturer's technical people watch how these customers use the product. From this test the manufacturer learns about customer training and servicing requirements. After the test the marketer asks the customer about purchase intent and other reactions.

- **Trade shows:** These shows draw a large number of buyers to view new products in a few, concentrated days. The manufacturer sees how buyers react to various product features and terms, and can assess buyer interest and purchase intentions.

- **Distributor and dealer display rooms:** Here the new industrial product may stand next to other company products and possibly competitors' products. This method yields preference and pricing information in the normal selling atmosphere of the product.

- **Standard or controlled test markets:** These are used to measure the potential of new industrial products. The business marketer produces a limited supply of the product and gives it to the salesforce to sell in a limited number of geographical areas. The company gives the product full advertising, sales promotion and other marketing support. Such test markets let the company test the product and its marketing programme in real market situations.

7.5 Forecasting through intentions and expert opinion

7.5.1 Buyers' intentions

One way to forecast what buyers will do is to ask them directly. This suggests that the forecaster should survey buyers. Surveys are especially valuable if the buyers have clearly formed intentions, will carry them out and can describe them to interviewers.

Several research organisations conduct periodic surveys of consumer buying intentions. These also ask about consumers' present and future personal finances and their expectations about the economy. Consumer-durable goods companies subscribe to these indexes to help them anticipate significant shifts in consumer buying intentions, so that they can adjust their production and marketing plans accordingly. For **business buying**, various agencies carry out intention surveys about plant, equipment and materials purchases. These measures need adjusting when conducted across nations and cultures. Overestimation of intention to buy is higher in Southern Europe than it is in Northern Europe and the United States. In Asia, the Japanese tend to make fewer overstatements than the Chinese (Lin, 1990).

7.5.2 Salesforce opinions

When buyer interviewing is impractical the company may base its sales forecasts on information provided by the salesforce. The company typically asks its salespeople to estimate sales by product for their individual territories. It then adds up the individual estimates to arrive at an overall sales forecast.

Few companies use their salesforce's estimates without some adjustments. Salespeople are basically observers. They may be naturally pessimistic or optimistic, or they may go to one extreme or another because of recent sales setbacks or successes. Furthermore, they are often unaware of larger economic developments and do not always know how their company's marketing plans will affect future sales in their territories. They may understate demand so that the company will set a low sales quota. They may not have the time to prepare careful estimates or may not consider it worthwhile.

Accepting these biases, a number of benefits can be gained by involving the salesforce in forecasting. Salespeople may have better insights into developing trends than any other group. After participating in the forecasting process the salespeople may have greater confidence in their quotas and more incentive to achieve them.

Also, such 'grassroots' forecasting provides estimates broken down by product, territory, customer and salesperson.

7.5.3 Dealer opinions

Motor vehicle companies survey their dealers periodically for their forecasts of short-term demand. Although dealer estimates have the same strengths and weaknesses as salesforce estimates, forecasting accuracy can be improved by using role-playing exercises, involving both salespeople and dealers (Armstrong and Hutcherson, 1989).

7.5.4 Expert opinion

Companies can also obtain forecasts by turning to experts: distributors, suppliers, marketing consultants and trade associations. Experts can provide good insights, but they can be wildly wrong. In 1943 IBM's Chairman, Thomas J. Watson, predicted 'a world market for five computers'. Soon after that another expert, Twentieth Century Fox's head Darryl F. Zanuck, predicted that 'TV won't be able to hold on to any market it captures after the first six months. People will soon get tired of staring at a plywood box every night.' Where possible, the company should verify experts' opinions with other estimates.

7.5.5 Delphi method

Occasionally companies will invite a special group of experts to prepare a forecast. They exchange views and come up with a group estimate (group discussion method). Or they may supply their estimates individually, with the company analyst combining them into a single estimate (pooling of individual estimates). Or they may supply individual estimates and assumptions reviewed by a company analyst, revised and followed by further rounds of estimation using the Delphi method (Cassino, 1984).

This systematic gathering of subjective opinions considerably increases the reliability of subjective forecasting (Armstrong, 1985). This process is not as expensive, in terms of the cost of experts, as it at first seems. Delphi is designed to gather estimates from people who are geographically dispersed so the experts do not need to be called to even one meeting. In addition, few experts are needed, typically 5–20, and people with modest expertise work as well as true experts (Hogarth, 1978). Ironically, true expertise appears to be a real problem with Delphi since it is generally wise to involve some people who are not involved with the products being forecast in order to avoid bias (Tyebjee, 1987).

7.5.6 Bootstrapping

Bootstrapping strives to convert judgements into objective measures. One way to do this is to obtain protocols of experts: descriptions of the process the expert uses in making forecasts. This process is then converted to a set of rules that is used to make forecasts. Another approach is to create a series of situations and to ask an expert

to make forecasts for each. These judgemental forecasts are then regressed against data that the experts used to make their forecasts. This method provides estimates of how the experts relate each variable to sales volume. Bootstrapping models offer a low-cost procedure for making additional forecasts. They usually provide a small but useful improvement in accuracy over judgemental forecasts.

7.5.7 Scenario writing

According to Cornelius Kuikon, the head of strategic analysis and planning at Shell, the reason why many firms are disenchanted with planning is that they committed themselves too much to specific future predictions. To overcome the problem Shell, and many other companies including GE, now use scenario planning to generate a series of possible futures against which strategic plans can be tested.

The subset of individual forecasts to be combined into a scenario can be chosen in many ways. Cross-impact analysis can be used to generate a single 'most probable' scenario, although this approach is limited by its dependence on the forecasts making up the matrix. Once a most probable scenario has been chosen other boundary scenarios can be generated by examining deviations from the core. Alternatively, several 'individual theme scenarios' can be chosen automatically or by groups. The military were one of the earliest users of scenario planning and they have used a process where events and trends are combined randomly to produce alternative views. A more popular managerial approach brings a group of imaginative experts together to discuss a pre-prepared series of trends, topics and hypotheses. Each scenario is then developed around a theme and given a title that focuses attention on their major features. For example, 'the violent society' where crime and civil disobedience grow exponentially, or 'the limits to growth' where the world economy and population collapse when material limits are reached.

How many scenarios should be produced? The answer is: a few. A single most probable scenario is likely to retain too many of the problems of myopic planning. It is also obvious that the strategic planning process would be ridiculous if there were dozens of scenarios against which each strategy had to be tested. So the number chosen must be a compromise between a desire for safety and a need for simplicity.

7.5.8 Cross-impact analysis

Cross-impact analysis is used to examine the potential interaction between forecasts. Some events may interact to reduce the impact of either, while others may interact to facilitate accelerated development or a disaster. For example, Malthus's (1777–1834) prediction that the world would starve because of exponential population growth with fixed land resources was wrong because population growth has been more than balanced by agricultural productivity. Two developments that have had a mutually amplifying effect were liquid crystal and silicon chip technology. Without the other, neither would have revolutionised the watch or computer in the way they did.

In its simple form cross-impact analysis involves cross-tabulating possible events on a matrix that allows the interaction between every pair of events to be reviewed

Figure 7.6	Cross-impact analysis

If these events occur . . .

What is the impact on these events?

Event	1	2	3	4	5
1	–	?	?	?	?
2	?	–	?	?	?
3	?	?	–	?	?
4	?	?	?	–	?
5	?	?	?	?	–

(Figure 7.6). The matrix is then examined asking, if event 1 is true, what would be the impact on events 2, 3, 4, etc.? Typically, three forms of impact are considered.

1 **Impact:** will event 1 amplify or diminish the impact of events 2, 3 . . . ?
2 **Timing:** will it accelerate or retard the occurrence of the other events?
3 **Probability:** will it ensure, require or prevent the other events occurring?

It is sometimes imputed that the evaluation should be conducted by an analyst, but the process is one that is likely to be enhanced by teamwork. In a first passthrough experts may be asked the likely level of cross-impact for each cell, and then required to give more information where interactions are high. Cross-impact analysis could stop at this stage, having forced participants to consider the complex dynamics of events. Even at this level the technique has a potential for improving the internal consistency of forecasts and clarifying assumptions.

Cross-impact lends itself to the development of more sophisticated analyses. Interactions are likely to be more than one to one, making the whole matrix interactive with, for example, event 1 affecting events 2, 5 and 6; event 2 affecting 5, 7 and 9; and event 5 affecting 1, 2, etc. To evaluate such patterns iterative computer simulations have been used to produce likely probability distributions of the times of events.

Summary

Although our review of forecasting methods is no way near comprehensive, there is clearly no shortage of forecasting methods. The managerial questions are: Which ones work? Which ones to use? When? One important principle is to understand the

Table 7.1 Forecasting methods, roles and ranges

Forecasting	Time period		
	Short up to 1 year	Medium 1 to 3 years	Long beyond 3 years
Company sales	Salesforce opinion Time-series analysis	Buyers' intentions Chain ratios Concept testing Market factor Multivariate sales forecasting Test marketing	
Demand	Time-series analysis	Curve fitting Expert opinion Market build-up Statistical demand analysis	Diffusion Leading indicators
Technology		Diffusion Expert opinion S-curve	Bootstrapping Delphi Substitution Trend analysis
Futures			Cross-impact analysis Scenario writing

limitations of the methods used and to use them only in the way they are intended. Table 7.1 suggests what to use and when. In this the categories are not rigid and it is likely that any method could fit in one of its adjacent boxes. For example, expert opinion could be used of **medium-term demand forecasting** as well as for **technology forecasting**. Moving beyond adjacent boxes is dangerous. Time-series analysis could sometimes accurately forecast sales three years ahead but it wrongly assumes the past will be repeated forever.

Studies comparing the accuracy of methods help in two ways: they show which methods work best and that complicated mathematical methods do not always outperform simple ones. For short-term forecasting the **time-series analysis** has been made technically more sophisticated by statisticians. Fortunately for managers, but not for statisticians, comparative studies show that **simple exponential smoothing** usually outperforms other methods (Gardner, 1985); in addition, that hugely complex methods, such as the **Box–Jenkins** method, offer no improvement in forecasting accuracy (Makridakis *et al.*, 1993). For obvious reasons these exquisitely complicated alternatives were not discussed here.

For medium-term forecasting **subjective methods**, which depend solely on people's judgement, and simple extrapolations, such as **curve fitting**, do equally well (Lawrence *et al.*, 1985). However, this result is contingent on circumstances. Subjective methods can be improved by using the **Delphi method** with **bootstrapping** (Armstrong and Hutcherson, 1989). **Judgemental methods** also outperform **trend analysis** when there are large recent changes in sales levels and there is some knowledge about what influences the sales to be forecast. This weakness of trend analysis occurs because of its naivety – **trend analyses** have no way of

absorbing external information or quickly responding to step changes. In contrast, **trend analyses** outperform **judgemental methods** when there is plenty of historic sales data or when regular increases in sales are large (Sanders and Ritzman, 1992).

Econometric methods, including **multivariate demand analysis** and **multivariate sales forecasting**, are useful in exploring the impact of influences that are known and modelled. In these cases the influences have to be large and direct otherwise the margins of error swamp variations. **Econometric methods** do outperform **trend analyses** and **expert judgement** when changes are large. Once again, trend analyses suffer from their inability to learn quickly and 'experts' find it hard to imagine dramatic changes.

Comparative results for **new-product forecasting** are particularly convenient. Forecasting new-product sales is hard – an early estimate suggesting the average error is 65 per cent (Tull, 1967). Luckily the error does not increase with the earliness of forecasts. Relatively unrealistic but inexpensive **pre-test marketing** forecasts as well as full **test markets**. **Concept testing** also gives results as good as test marketing if the product being tested is an incremental change. This changes the role of new-product forecasting. Rather than checking what sales will be with the product in hand, managers can test what sales would be if it existed! If a concept does not work it is easy and quick to try an alternative. Developments in **conjoint analysis** have made it relatively easily to test and refine several product concepts simultaneously. From these conjoint experiments it is even possible to forecast the likely sales of some concepts not even tested (Cattin and Wittink, 1992).

Part of the answer to the difficult question of which forecasting method to use is not to choose just one. Combining forecasts irons out some of the problems with individual methods. In particular, combine forecasts derived using different approaches, such as econometric and subjective methods (Blattberg and Hoch, 1992). Do not worry about the weighting used in combining them, equal weighting is as accurate as any other schemes (Clemen, 1989).

A few simple guidelines can be suggested in choosing forecasting methods:

- Use the simple methods you understand rather than complex methods that few people do.
- Simple methods are often as good as complicated ones.
- Do not choose a forecasting method based on its past forecasting accuracy but on its fitness for the job in hand.
- Use different methods and combine them.
- Expensive does not necessarily mean good.
- Before making decisions based on forecasts, be aware of the way they were produced, and the limitations and risks involved.

When making forecasts it is useful to remember that for existing markets, where there is not major change, it is hard to beat a naive model that assumes that tomorrow will be like today (Brodie and de Kluyver, 1987). We should also remember that the past is unlikely to contain the information that forecasts major changes, so we need to scan the environment for these. Finally, if the environment is uncertain, flexibility not forecasting is the key to business success!

Boeing*

Case study

Alamy/The Flight Collection

Boeing, the world's leading aircraft maker, is forecasting annual growth of 4.7 per cent a year in air travel during the next 20 years and a market worth $4,700bn for new aircraft and aviation services.

Airline investment in new aircraft alone is forecast at $1,700bn over 20 years.

As a result of the continuing high growth, the world jet airliner fleet will more than double by 2020 from 14,500 to 33,000 aircraft, placing huge demands on strained airport capacities.

The Boeing 2001 Current Market Outlook released in Paris yesterday forecasts 18,400 new aircraft will be needed to meet the growth in air travel with a further 5,100 to replace existing aircraft. Around 9,500 aircraft flying today will still be in the air in 20 years.

Growth rates in Asia–Pacific of around 6.4 per cent a year will mean that the region will rival North America in traffic volumes by 2020 with traffic in the more mature markets of the US and Canada forecast to grow at only 3.1 per cent. Latin America is the fastest growing market, averaging 7.7 per cent a year.

The global market forecast underpins Boeing's belief that there will be a growing fragmentation of air travel, with passengers preferring more frequent, non-stop flights and short trip times, rather than flying on main trunk routes between congested hub airports.

Note: * US airlines experienced their worst revenue decline on record in May, analysts said yesterday, and June could be the second worst month on record, writes Andrew Edgecliffe-Johnson in New York. Samuel Buttrick of UBS Warburg said revenues fell 10 per cent in May – the steepest decline since records began in 1976.

Source: Andrew Edgecliffe-Johnson, 'Boeing predicts fleets to double', *Financial Times*, 21 June 2001, p. 32.

Discussion questions

1 What is the likely basis for Boeing's long-term forecast of the world's airline market?

2 What accounts for the conflicting news from the Paris Air Show, where Boeing predicted fleets would double, and the report by UBS Warburg in New York that US airlines had their second worst month on record?

3 Within 18 months of making its bullish forecast Boeing closed plants in its home town of Seattle and discontinued its Sonic Cruiser project, a 250-seat long-range challenger to Airbus's 555-seat A380 super jumbo. Does this turn of events indicate major problems with market forecasting in support of strategic decision making?