Chapter 2: A critical review of futures methods

2.1 Introduction

This chapter begins with a broad overview of the seeming human need for anticipation, in the broadest sense of the term – from the pre-scientific use of prophecy, through numerical forecasting, to the qualitative methods of futures studies developed in the late 20th century. It uses the literature to argue that, although humans have long wanted to foresee the future, this has not been achieved satisfactorily, using any of the three types of approach used throughout history: prophecy, forecasting, or futures studies. The focus of the chapter is threefold: informative, integrative, and evaluative. In terms of the five categories of literature review discussed by Baumeister and Leary (1997), this falls mainly into the fourth: a literature review with problem identification as its goal. The particular problem to be identified in this case is to determine the likely direction of methods of anticipation, in terms of the underlying social needs that call forth those methods.

In summary, the argument is proposed that though scenario planning is the most widely used and in some ways the most versatile mode of anticipation, it has some weaknesses that could be addressed by a variant approach: the basis of the Process developed later in this thesis.

Many literature reviews set out to identify gaps in the relevant literature, so that these might be plugged by the ensuing research. But as November (2004, p42) points out, “Some academics talk about ‘gaps’ in the literature as though the literature is a well-built wall with just the occasional gap that needs filling.” This literature review, however, is trend-seeking rather than gap-finding: the gap is invisible, because it would be at the end of the wall.

2.2 Historical approaches to anticipation

Sections 2.3 to 2.6 review the progression of modes of anticipating the future. The underlying argument is that the historically predominant means of regarding the future has arisen from (and been constrained by) epistemologies characteristic of the era, stemming from humans’ knowledge of alternative possibilities and of their perceived current needs. For the purpose of this argument, three historical phases are distinguished:
• The intuitive, or pre-scientific phase, extant until the 19th century (section 2.3.1)
• Quantitative forecasting, beginning during the 19th century in developed countries (section 2.3.2)
• The “alternative futures” movement, beginning in the mid-20th century (section 2.3.3)

All of these are interpreted in terms of the social needs of the times, and the beginning of a possible new phase is anticipated.

2.2.1 The apparent human need for anticipation

Before examining the changing historical conceptions of the future, let us first review what appear to be four near-permanent characteristics of human society, and perhaps of the human brain: optimism, the desire to know the future, attribution of causation, and achievement motivation.

1. Self-positivity: the inherent optimism that spurs human beings on to goals which realistically they have little hope of achieving; everything from buying a lottery ticket to changing the world (Kahneman, Slovic, and Tversky, 1982; Peterson, 2000; Weinstein, 1980 and 1989; Fiske and Taylor, 1991; Menon et al 2002). Though the existence of this phenomenon is widely accepted, authorities disagree about its functions. Freud (1928) maintained that optimism (in its religious aspect, such as life after death) was a type of defence mechanism, the solution to a conflict between instincts and socialization. Tiger (1979) takes the opposite view: that a major function of religion is to support the biological need for optimism.

2. The desire to know the future. That the future is not fully knowable has been widely recognized throughout the course of history; yet fortune-tellers, shamans and seers seem always to have existed (Halpern, 2000). The biologist Jacob (1982) suggests that one of the chief distinctions between humans and other animals is our ability to envisage the future (more than a few minutes ahead); Damasio (1995) suggests that a sense of the future is inherent in the human brain.

3. The seeming need for attribution of causality. Historically, causality seems to have been used as a means of understanding and controlling the environment. However, in the context of individual lives, Bandura (1982) found that chance had played a larger role than respondents acknowledged in their hindsight. This is a process similar to what Weick (1995) labels in a workplace context as “sensemaking.” Krantz (1998) summarizes such
arguments, explaining the human tendency to attribution as a way of maintaining the illusion that our lives are planned and under control.

The need for attribution has not been confined to the uneducated: it has been a central focus of philosophers, from Aristotle (“the four causes”; 1993) to Pearl (2000) with his new logical notation. Still, as William James (1907) wrote in _Pragmatism_,

> “The word *cause* is in short, an altar to an unknown god: an empty pedestal still marking the place of a hoped-for statue.” (cited by Munton et al, 1999, p7)

The notion of causality is an essential component of the hypothetico-deductive approach to science. Hypotheses are often phrased in terms of “cause” and “effect.” Though this seems obvious in the immediate physical world, this approach has not been so successful in the social sciences: 100 years of scientific psychology and sociology have not brought prediction of human behaviour anywhere close to the level of prediction achieved in physics by Newton in the 18th century. Hence, as explained in chapter 5, the Process developed in this thesis incorporates a concept of probabilistic influences rather than of strict causation.

4. Achievement motivation: the drive – stronger in some settings than others – for a general improvement of the condition of an individual, of his or her family, of their community, and of their physical surroundings: an expanding circle that constitutes their social environment (McClelland, 1961; Douglas, 1986). This motive is less widespread than the others discussed above; McClelland found large differences between cultures. It is strongest in North America, as the Pew Research Center (2003) found in a recent international survey, but wide variations are evident there. For example, a Canadian study found that about 50% of owners of small businesses – the supposed hotbed of entrepreneurship – did not want their firms to grow (Blatt and Riding, 1992).

All four of the above motivations have been evident to varying degrees throughout human history (Braudel, 1980; Tainter, 1988; Burrow and Wei, 2000). Accordingly, they have been driving factors in each of the phases discussed below, and are relevant to the historical changes in preferred modes of anticipation, as listed above.
2.3 Anticipatory methods in relation to social circumstances

The following sections examine the outcomes of the above conceptions of the future, in terms of a demand-chain model: that is, the principle that a process will become frequent when social demand exists and suppliers are available.

2.3.1 The pre-scientific phase

From the beginning of recorded history until the rise of education in the wealthier countries (mainly western Europe and north America) in the mid-nineteenth century, four different modes of dealing with the future can be identified:

1. Cyclicity – the anticipation of biological cycles;
2. Destiny or fatalism – a preordained future;
3. Chance – a randomly determined future;
4. Utopian – a far-distant future, perceived as perfect.

1. Cyclicity. The cyclical mode was predominantly seasonal. Setting aside the briefer cycles such as day/night and the monthly fertility cycle, the main interest for a predominantly agrarian population lay in the effect of the seasons on cropping and hunting. As well as the annual cycle, there were also cycles of biological generation, all of which required some foresight (Mead and Calas, 1953; Clarke and Hindley, 1975, section 4).

2. Destiny. Another reaction to the future, in the face of untamable natural forces, was resigned acceptance: the belief that whatever happened was predetermined, and/or “God’s will.” There was nothing that could be done to prevent this, either by the individual or the community. This left only the option of how to deal with God’s will, as it manifested itself in various forms of destruction, such as crop failure (Vayda, 1969; Lévi-Strauss, 1966). A logical response to destiny was divination. In an attempt to understand God’s will, a range of methods was used, often with known limitations. Thus the Oracle at Delphi, though not strictly prophetic (Halpern, 2000) was renowned for giving ambiguous advice.

3. Chance. If one response to the apparent meaningless of events was destiny, an alternative response was the concept of chance, or Fortune. This, originating in medieval Europe, seems to have been a more recent development than destiny. Thus Boëthius (525/1943) wrote of the wheel of fortune (implying cyclicity as well as chance), and 1000 years later
Machiavelli (1525/1914, chapter 25) ascribed the course of history as half due to *fortuna*, and the other half to *virtù* (human intention).

### 4. Utopianism.

Even before Utopia had a name (More, 1518/1965) this stream of thought was evident in human affairs, both from philosophical works such as Plato’s *Republic* as well as in religious books such as the Bible and the Koran, with their descriptions of Heaven, Paradise, or Nirvana. Such perfection was imagined as either an earth-like place or a state of mind (Manuel and Manuel, 1979; Carey, 1999).

Godet (1983, p184) notes three types of reaction to the future: passivity, adaptation, and voluntarism. In terms of the above four categories, the cyclical approach requires adaptation, the fatalistic approach corresponds to passivity, while the voluntaristic approach – which embodies determining one’s future – could hardly have been common widespread in societies offering no personal freedom of choice. Utopianism is not relevant to Godet’s categories. But, as noted below, the macro-historical trend in attitudes to the future (at least in Western societies) has been a gradual movement across Godet’s spectrum, toward voluntarism.

None of the above pre-scientific approaches to anticipation has died out, even in modern societies. Cyclicality is still relevant, particularly when dealing with biological issues, from farming to child-rearing; the cycles can be used as an opportunity for learning – as with the development of the Process in this thesis, described in chapter 7. Dealing with cyclicality involves identifying cycles, detecting indicators, and taking steps to produce desired outcomes.

A fatalistic approach is still found in some US businesses, as noted by Whitney and Trosten-Bloom (2003) in the context of appreciative inquiry. The concept of chance is dealt with – mainly by individuals, rather than organizations – in terms of “luck,” and is the basis of the gambling industry. As for utopianism, a variant form of it is expressed in modern societies as nostalgia for a (perhaps imaginary) past, rather than a perfect future, hence the recent “sea change” movement in Australia, in which mid-career professionals dream of leaving their cities and going to live in rural areas in order to live a better life (Burnley and Murphy, 2003).

#### 2.3.2 The rise of forecasting

Though some use the word “forecasting” in a broader sense than the quantitative, in this thesis, to avoid confusion, the term “forecasting” is here restricted to quantitative forecasting. However, it is the output of forecasting that is quantified; the process of reaching that forecast
may include subjective judgement. The Delphi method (Linstone and Turoff, 1975) is for this purpose thus grouped with forecasting; other qualitative aspects of the broadly applied term “technological forecasting” (Martino, 1983) are not discussed in this section.

Though mathematical forecasting originated in renaissance Italy, it was not widely used until the 19th century (Bernstein, 1996; Gigerenzer et al, 1990). The rise in the use of forecasting depended on four preconditions in the demand chain:

1. mathematical skills among those making the forecasts;
2. the existence of a set of numeric data over an extended period in the past;
3. potential users of the forecasts being aware that the method exists;
4. the users accept the credibility of such methods.

Precondition (1) assumes only a moderate level of mathematical capability, among a few members of a population, because forecasting is not a large industry. Precondition (2) requires social stability, the preservation of data, and a methodical, almost obsessive frame of mind among those keeping the data. Among accountants, factors (1) and (2) exist together, hence the initial rise of forecasting among Jewish accountants in cities of northern Italy in the 17th century (Bernstein, 1996, p95).

The adoption of forecasting was restrained by preconditions (3) and (4): awareness and demand from potential users. The first published quantitative forecasts seem to have been made in France circa 1800, perhaps related to the spirit of quantification that arose after the French revolution, which brought the development of the metric system. Early statisticians such as Quetelet published demographic forecasts for a government audience: for example, Pradt’s population projections for Russia and the USA (de Jouvenel, 1967, p164).

In the late 20th century, further factors arose which sped the wide adoption of forecasting. These included:

5. The availability of mechanical calculators (and later, computers), which greatly facilitated the computation of forecasts.
6. The accumulation of statistical data by clerical systems – and later, by computers.
7. Pressure on businesses to become more profitable through higher efficiency. One outcome of this drive was statistical quality control; another was increased use of forecasting, partly due to the post-war emphasis on production efficiency: the need to use limited capital well and not tie it up in stock, and forecasting helped reduce stock levels.
Each of these three factors served to facilitate its corresponding precondition: (5) facilitated (1), (6) facilitated (2), and (8) facilitated (3) and (4) - though in practice, data collection (factor 6) occurred in most industries before forecasting gained credibility (factor 4). When Hollerith invented the punched-card machine, it was in response to the urgent needs of the decennial US Census, which because of rapid population growth in the USA had been taking longer and longer to compile (i.e. factor 7). During the first half of the 20th century, punched-card systems and mechanical calculators became more widely diffused in large organizations (Ifrah, 2000), realizing business efficiencies when used on a large scale (factor 7).

Over the last 100 years, numerous methods have emerged for relating the independent variables to the dependent variable/s, progressing from simple extrapolation to econometric modelling. However, as Armstrong (2001) has shown, even the most sophisticated forecasting techniques have proved relatively unsuccessful over more than a short-term period. Collopy and Armstrong (1992) sought options from 49 forecasting experts on guidelines for extrapolation methods. They agreed that discontinuities were one of the most important factors, even though this had been largely overlooked by the academic literature of forecasting. By “discontinuities” they were referring to abrupt changes in the level of a variable, rather than in its relevance or its effective meaning. Other writers on this topic such as van Notten, Sleegers, and van Asselt (2005) attribute a broader meaning to this term, as discussed below.

In the late 20th century, as forecasting became more widely used, it also became more complex, as demonstrated in textbooks, the most widely used of which was that of Makridakis et al (most recent edition, 1997). The introduction of forecasting software made the calculation of forecasts both more convenient and more accurate, while the increased availability of numerical data, specially when it was already in digital form, enabled much greater complexity of models, hence the advent of complex statistical procedures such as Box-Jenkins and ARIMA. A significant step, introduced with the available of mainframe computers and econometric software for multiple regression modelling, was the extension from the use of a single independent variable to a collection of such variables – and later to the use of an entire set of dependent variables, using methods such as rule-based forecasting (Adyaa et al, 2000).

The evaluation of forecasting has until recently used the sole criterion of “accuracy” – namely minimizing the difference between the predicted and the final value/s of the dependent variable/s. Wise (1976) reviewed the accuracy of 1,556 forecasts made in the USA between 1890 and 1940. His main findings were that experts producing forecasts for 10 years or more into the future were wrong more often than they were right, and that experts were not
significantly more accurate than non-experts. His study also found that the effects of technological development were more difficult to forecast accurately than were the developments themselves. In reviewing Wise’s paper, Godet (1983, p182) notes that the main factors behind the forecast errors described by Wise are “inaccurate data coupled with unstable models, lack of a global, qualitative approach, and explanation of the future in terms of the past.”

However, the accuracy of the forecasts, though often usefully precise over a short term (Armstrong, 1978, 1986, 2001), despite the introduction of more and more complex methods, is often not sustained in the longer term (Schnaars, 1989). De Jouvenel (1996, p10) notes that “although economists and demographers prefer to use increasingly sophisticated models of this sort [i.e. simulation], their initial hypotheses are frequently very crude, arbitrary and weakly argued.” Ascher (1981), reviewing the factors affecting accuracy of forecasts since the 1950s, found that the most accurate forecasts were those in which the same authority controlled supply and demand. He cited the example of electricity usage in the USA. Demand was forecast by the supply agencies, and naturally the demand could not exceed the supply. In a special issue of the *International Journal of Forecasting* (No. 8 of 1992), 16 papers compared the results of various different forecasting methods, but only one of these used a criterion other than accuracy. In a later study (Yokum and Armstrong, 1995), ease of use and interpretation was consistently the second most important factor for users of forecasts.

From the mid-1980s, writers began questioning whether accuracy should be the sole criterion of merit in a forecast. Part of this trend was due to the realization that forecasts could be self-fulfilling or self-defeating (discussed in most detail by Henshel, 1982, and Henshel and Johnston, 1987). This was a factor to which writers who focused on the technical methods (such as Makridakis et al, 1997) had devoted little attention. Ascher (1989) suggested using a scenario-like approach (as had Godet in 1983), while Robinson (1989, commenting on Ascher’s paper), as well as Makridakis (1986) and Morrison and Metcalfe (1996) all agreed that usefulness (however defined) is a more all-embracing criterion than is maximizing accuracy. Yokum and Armstrong (1995) added the criteria of ease of use and of interpretation.

To summarize the major problems with forecasting, from the point of view of this argument:

1. By its nature, forecasting can predict values and probabilities only for variables already identified – which may not continue to be relevant. In practice, the meaning of many concepts slowly changes with time. For example, the definition of unemployment was changed nine times in the UK between 1979 and 1994, resulting in successively lower recorded lev-
els of unemployment (Ecotec, 1998). Even when, as in this case, definitions were explicitly changed, continuity can be lost due to changes in the ways the data are collected.

2. Forecasts can be dangerous for decision-makers: “What makes forecasts so dangerous is that they are constructed on the assumption that tomorrow’s world will be much the same as today’s. Consequently, forecasts fail when they are needed most, namely as major changes suddenly occur” (Kenter, 1998, p29).

3. Forecasting encourages an illusion of control. Studies such as those described by Harries (2003, p808) and Langer (1994) have demonstrated that in the presence of forecasts, managers develop over-confidence in their own ability to foresee the future, resulting, in some cases, in the collapse of companies.

4. For anticipating human events that do not form part of a historical series, forecasting offers no objective basis on which to calculate probability (as noted by Keynes, 1921), or for the formation of subjective estimates, even in a rigorous process such as Delphi.

The tentative conclusion is that forecasting does not appear to be on the threshold of developing any breakthroughs in the near future, and its lack of accuracy for issues involving multiple dependent variables and over time periods of longer than a few years has no imminent prospect of solution by using more complex mathematics (Armstrong, 2001). This is not to deny that forecasting is highly useful for some purposes, but rather that it is of limited value when dealing with broad social questions, and with time ranges of more than several years. It was thus decided not to use aspects of forecasting in the Process being developed.

2.3.3 Alternative-futures thinking

This section describes the alternative futures concept that developed in the second half of the 20th century: the concept of anticipating many futures rather than a single one. This idea became the basis of scenario planning, and a group of related methods.

The altered geopolitical conditions of the world during and after World War II were the springboard for the development of alternative futures methods. The large-scale, prolonged war impelled governments to take a much larger role than previously, and this required an emphasis on planning – both for the conduct of the war itself, and for national development following the war. In contrast to the passive approach used by forecasting, which estimates
the likely effects of existing trends, planning takes an active approach to the future, determining goals and working towards them (identified by Godet, 1983, as a “voluntaristic” mode). This was particularly evident in France, in which a tradition of centralized government introduced after the Revolution was further developed after World War II for national reconstruction. However, perhaps due to corporate antipathy to government control, national planning was never as widespread in the USA as in Europe. With the ensuing Cold War came the looming threat of MAD (“mutually assured destruction”) and World War III.

Given the inability of forecasts to make successful predictions for more than a few years ahead, particularly when forecasting a probability rather than a quantity, interest turned to new methods of foresight. In response to these new needs, and the uncertainty that arose in a locally planned but globally uncontrolled environment, the earliest methods of futures studies were developed – mostly in the 1950s and 1960s. These included technological forecasting, prospective, and scenario planning. Another factor was the development of new military technologies, which brought methods such as the Delphi technique (Linstone and Turoff, 1975). The uncertainties in the Cold War gave rise, around 1960, to scenario planning, both in the USA (through Herman Kahn and the RAND Institute) and in Europe, most notably in the form of the Futuribles movement in France. Bertrand de Jouvenel developed the concept of futuribles, and published a book of that name in 1963, followed by *L’Art de la conjecture*, published in French in 1964, then in English as *The Art of Conjecture* in 1967). The term futuribles is based on a contraction of futures possibles, the plurality of which clearly displays the multiplistic basis of the movement. De Jouvenel refers to “conjectures” rather than to “scenarios,” and does not go so far in *L’Art de la conjecture* as to develop an explicit method for anticipating the future. However, conjectures and futuribles share with Kahn’s term scenarios the concept of a tentative, provisional story: a human construct rather than a historical record.

Herman Kahn is credited by Ringland (1998) and Rubin (2001) with being the inventor of scenario planning, the first of the multiplistic methods to be developed – though the principle is much older: the medieval theologian Molina introduced the idea of futuribles (for use in arguments on free will, according to Paalumäki, 2001), and the philosopher Vaihinger (1924) wrote of *Als Ob* (“as if”): a form of scenario. The earliest reference I could find to multiple scenarios was by Kahn (1961). The rationale of scenario planning was that if the future cannot be predicted by forecasting – particularly when it comes to forecasting the probability of occurrence of an unprecedented event, such as international nuclear war – an alternative approach was to list some key alternatives, and study the situations under which they could
develop. By the end of the 20th century, scenario work had become the most widely used method for multiplicative foresight – to judge from the number of references in the OECD Future Trends database (OECD, 2001). A recent review by Bradfield et al (2005) provides further information on the development of scenario techniques.

Continuing the demand-based approach used above to explain the rise of forecasting, the growth of planning (and the alternative-futures concept in general) had these prerequisites:

(1) As discussed in section 2.2 above, many people have a strong desire to know the future (even though they realize it is fundamentally unknowable), and a more generalized desire to improve their social environment.

(2) Those in positions of authority, both government or business, have not only the desire to know the future, and a drive toward improvement of their organizations, but also control enough funding and staff to carry this desire forward. The growth of control systems in business enabled much more detailed control over the activities of those at lower levels of hierarchies, and the later growth of ICT systems enhanced that control.

(3) Around the mid 20th century, as the world became seen as less predictable, there was increased demand for methods of planning the future. The widespread growth of management education encouraged this trend.

(4) Similarly, Daniel Bell (in Kahn and Wiener, 1967, p.xxviii) notes an emerging tendency to tip the balance between the fortuna and virtù of Machiavelli (1525/1914) – loosely equivalent to fate and planning, respectively – toward the latter pole, encouraged by the development of alternative-futures concepts. In Western societies at least, people have moved from an attitude of powerlessness in the face of natural forces towards an assumption that humans now have the upper hand: the “mastery of nature” described by Berry (1988). The shock now felt at extreme climatic and geological events, such as the Indian Ocean tsunami of December 2004, highlights this assumption.

The above four factors, taken together, contributed to the growth of planning, particularly strategic planning, as documented by Mintzberg (1994). The rise of scenario planning (and related methods) grew from the following three factors:
(5) Given widespread dissatisfaction with the outcomes of quantitative forecasting and strategic planning, some managers, particularly in large corporations and government agencies, decided to try scenario planning – just as they also decided to try a host of other new management tools (Argyris, 2000; Jackson, 2001).

(6) Knowledge of the existence of scenario planning, at first confined to technological and government circles, gradually spread among managers, boost by Wack’s two 1985 papers in the influential *Harvard Business Review*. Schwartz was another prominent writer: his *Art of the Long View* was specifically about scenario planning, and is still in print following its first publication in 1991.

(7) Following the widely reported success of Shell Oil with scenario planning (Wack, 1985a and 1985b, Kleiner, 1989, and Schwartz, 1991) many large organizations tried scenario planning. The management consultancy Bain & Co produces an annual index of the use of “management tools” in large corporations. Its 1999 survey reported that 21.5% of the companies surveyed had used scenario planning, placing it in the middle range of tools used (Rigby, 2001b). Scenario planning was also in the middle range in terms of user satisfaction, with a mean rating of 3.70 on a 5-point scale, compared with an average of 3.76 for all the 25 tools studied. In the 2005 survey (Rigby, 2005) the rating for “scenario and contingency planning” had risen to 3.90, marginally above average, with 54% of the 960 participating companies saying they had used it: a possibly massive increase over the 21.5% figure for 1999 – depending on how “contingency planning” was interpreted.

All of the above seven factors – the first four indirectly, and the second three directly – can be seen as instrumental in the rise of the “alternative futures” approach.

### 2.4 Review of anticipatory methods

This section reviews some of the methods used in futures studies with a view to their adaptation or inclusion in the Process being developed. This review is selective: it does not cover methods that did not appear to be able to be folded into the Process. Nor are those methods reviewed covered in full detail: the focus is on their strengths and weaknesses, and how they might be adapted and improved.

Several classifications of futures studies methods have been made. For example, Inayatullah (2002a) divides futures studies methods into four types: the predictive (e.g. forecasting), the
interpretive (much scenario planning), the critical (e.g. causal layered analysis), and the participatory. However, for the purposes of investigating the incorporation of elements of existing methods into a new method, they are here divided for discussion purposes here into four families:

- Methods of exhaustive comparison: mainly morphological analysis, and its derivatives (section 2.5).
- Methods for sequential projection, such as the futures wheel and backcasting (section 2.6).
- Methods of mental imagery, including scenarios and envisioning (section 2.7)
- Methods of increased understanding: critical approaches that contribute to broader-based insight into mechanisms, such as causal layered analysis (section 2.8).

Each of these families will now be discussed: not in detail, but purely from the perspective of their potential for incorporation into a new integrated Process. Though historical background is provided when relevant, the following section is not intended to be a comprehensive history of futures methods.

### 2.5 Methods of exhaustive comparison

These methods include mainly morphological analysis, its derivatives, the relevance tree, and cross-impact analysis. Only the former will be discussed at this point.

#### 2.5.1 Morphological analysis

In the 1930s (according to Ritchey, 2002) the astronomer Zwicky (1969) developed morphological analysis as a general aid to creativity. The method was not intended for use in futures studies – which as a discipline did not exist at the time – but was used in the 1950s for purposes such as designing new types of jet engines. Morphological analysis works best with a clearly limited number of variables (such as parts of a jet engine), each of which has a clearly limited number of properties. Zwicky’s key principle is that of the *morphological box*, an n-dimensional hypercube, each cell of which represents one combination of all the relevant variables. Because the number of possible combinations is a power function of the number of variables, there can be millions of possible combinations; thus it requires vastly more work than even cross-impact analysis. This number is collapsed by removing impossible combinations of properties. In practice, many of the combinations turn out to be impossible, and the final reduced number of possibilities is a tiny fraction of the total.
Morphological analysis can be dangerous, because it lulls its users into a false sense of security – that they have foreseen all possibilities. As it can rarely be proved that all potential variables have been included in the morphological box, there is a risk that an overlooked variable – or a completely new factor – may reveal that the original, supposedly complete, set of variables is only a subset of a much larger range of possibilities. Even when dealing with a manufactured item, each variable can be almost endlessly subdivided into other variables. Thus in practice, the variables form a faceted taxonomy (Canter, 1985) rather than a list, and the number of comparisons becomes near-infinite. This number can be reduced using human judgement, but its exercise embodies a risk of dismissing combinations that will later turn out to be important – so the apparent comprehensiveness of morphological analysis may be an illusion.

Morphological analysis has spawned several variants, including Field Anomaly Relaxation (Rhyne, 1981) and the Swedish Morphological Society approach (Ritchey, 1998, 2002). FAR, originated by Rhyne and elaborated by Coyle et al (1994), and Jenkins (1997), is a method of reducing the number of combinations, by “relaxing” (in the mathematical sense) conditions, one at a time. Powell (1997) described an extended version of FAR: EFAR, which derives scenarios from FAR, through a method of mathematically generating traceable scenario sets.

A recent variant is the XLRM Model of Lempert, Popper and Bankes (2002, 2003). This LTPA (long-term policy analysis) model is a method of defining a set of variables, and mathematically generating literally millions of scenarios based on the combinations of those variables. It involves four sets of variables, labelled X (exogenous uncertainties) L (policy levers), R (relationships), and M (measures for ranking desirability). Among those four, “a particular choice of Rs and Xs represents a future state of the world” (Lempert, Popper and Bankes, 2003, p.xvi). The millions of scenarios generated by this method are reduced by ruling out seemingly incompatible combinations, as in morphological analysis.

2.5.2 Limitations of the methods of exhaustive comparison

These approaches attempt to cover all possible situations, but because the detailed level at which they operate provides so many alternatives, it is impracticable to assess all morphological combinations, or all cross-impacts. Therefore it is necessary to make choices about the most plausible outcomes, with a consequent danger that an outcome seen as plausible at the time of preparation as implausible turns out to be irrelevant.

No matter how hard cross-impact analysis or morphological analysis tries to be comprehensive, it is often easy to imagine another possibility that was not included. For this reason –
combined with the sheer amount of work involved in making the necessary comparisons – these methods appear to have been less popular in recent times, to judge by the frequency of articles in the six leading futures journals. The same reservation may apply to the XLRM model of Lempert, Popper and Bankes (2003): though the software produced for this work can produce literally millions of scenarios, humans are still required to assess the relevance of each combination produced. A further limitation of the exhaustive approaches is that, though they can produce many combinations of possibilities, this is done by tokenizing the situations involved. For example, the XLRM model involved prior definition of four factors: the volume of possibilities militates against consideration of specific combinations of circumstances.

In summary, though the exhaustive approaches have the theoretical advantage of comprehensiveness, their weaknesses are (a) ensuring such comprehensiveness; (b) ensuring exhaustive execution; and (c) the assumption of entity.

2.6 Methods of sequential projection

“Sequential projection” refers to the way in which the futures are developed in these methods: generally, one step at a time. Thus the futures wheel and incasting step forward from the present, backcasting steps back from a future situation (usually normative), and technology roadmapping steps through a product life-cycle of design, manufacture, marketing, and recycling (Phaal, Farrukh, and Probert 2004).

2.6.1 Futures wheel

This method was developed and first described by Glenn (1972). The “wheel” principle is that the starting time is shown at the centre. From that, a number of “spokes” lead to a number of possible developments; the later the development, the further from the centre. A futures wheel is often created as a participatory exercise, and Snyder (1993) and Slaughter (1995b) report that the concept can easily be communicated to participants, that the latter generally enjoy the work, and that they therefore put a lot of effort into the development of possible outcomes. A related method is the mind map (Buzan, 1989), except that the radiating dimension of the latter is the scale of a concept rather than a change in time.

1. Though the “millions of scenarios” producible by XLRM seem mind-boggling at first, a mere 10 variables, each with 4 possible levels, have 1,048,576 possible combinations (4 x 4 x 4 x 4 x 4 x 4 x 4 x 4 x 4 x 4).
2. This was also my own experience in participatory workshops, before beginning work on this thesis.
2.6.2 Backcasting

Robinson was the first to write a full paper about backcasting in its current sense (Robinson, 1982) but the term was used some years earlier in quantitative forecasting (according to Dreborg, 1996). Backcasting is related to the chain scenario, and can be seen as an opposite of forecasting. With forecasting, one begins at the present and creates a time-line into the future. With backcasting, one begins with an end-state, and works back in time to determine how that end-state could be arrived at. Another claimed difference between forecasting and backcasting is that forecasting implies causality, while backcasting uses a teleological model (according to Dreborg, 1996); “causality” in this context presumably refers to the classical Humean concept.

Backcasting has been most used in environmental analyses, particularly in Canada. It has also been used to plan the marketing of innovations (e.g. Wang and Guild, 1995a and 1995b; Noori and Munro, 1999a and 1999b), and recently as part of scenario planning. Typically, a set of end-state scenarios is generated – or a single normative scenario – and backcasting is then applied to convert the end-states into chains (Ringland, 1998). The ensuing chains can then be used to produce a plan of action. De Jouvenel (1996) states that exploratory scenarios normally move forward, while strategic scenarios (for him, synonymous with normative) tend to use backcasting.

Looking ahead to the development of the Process, one element that my literature search failed to find was backcasting with branching; that is, two routes to one result. A more conditional view of backcasting might expect to find some backcasting chains that revealed multiple ways of reaching the same goal. However, all the chains reported (from a small number of cases) were effectively single lines of development. A key aspect of the Process developed in this thesis is the principle not simply of alternative futures, but of alternative means for attaining equivalent futures. For that, backcasting will be vital.

2.6.3 Technology roadmapping (TRM)

TRM grew from the critical path method (CPM and PERT), as often used in scheduling large construction industry and computer systems projects in which several different organizations are involved (Phaal, Farrukh and Probert, 2000). Technology roadmapping (or TRM) was first developed circa 1980 (Willyard and McClees, 1987, Bray and Garcia 1998) for coordinating many suppliers in the production of a new product. More recently, it has been extended beyond its original role into the marketing of discontinuous innovations, and thus has been obliged to take the marketing function into account, as well as the production function (Phaal, Farrukh, and Probert 2004).
Though TRM takes a variety of forms, these forms share a graphical display, generally with time progressing from left to right on a large graph, and often a number of layers denoting different aspects of a product – e.g. technology, suppliers, production, and markets. Phaal, Farrukh, and Probert (2004) distinguish eight different presentation formats, as well as eight different types of purpose. The more complex roadmaps display both a “technology push” and a “market pull,” and in many ways resemble backcasting (Barker and Smith, 1995), particularly when created for one organization rather than an entire industry.

2.6.4 Limitations of the methods of sequential projection

Sequential projection has three main limitations:

Limitation 1. A sequence of future events becomes increasingly uncertain as time progresses. If event A precedes B, this may have a very different outcome from B preceding A. For example, countries where fax availability preceded email availability (e.g. Japan) had a much slower uptake of internet usage than countries (e.g. South Korea) where the reverse sequence occurred (ITU, 2003; Petroski, 1996, chapter 6).

Limitation 2. Though trends are important in foresighting, methods of sequential projection generally cannot be applied to trends. This is because sequences, by definition, are sequences of events: in other words, for a sequence to exist, there must be a number of specific events or occasion. If two trends develop at approximately the same time (as they often do), there is no clear sequence, because the nature of a trend is that it has no specific starting date.

Limitation 3. Events may seem more identifiable than trends, but are not as clear-cut as they first seem. Thus a seemingly simple question, such as “did fax machines become available before or after email?” can have various answers depending on the precise definitions of the words in the question – as well as the words that do not appear in the question, such as “available where?” and “available to whom?” Thus any particular sequence could be deeply embedded in a specific context. This is not such a problem for past events, because the specifics can be researched, but is a conceptual problem for future events.

2.7 Methods of mental imagery

This class of methods includes scenario planning (including related methods such as Godet’s prospective) and envisioning images of the future. The latter, being a simpler method, will be discussed first.
2.7.1 Envisioning images of the future

This method consists of two main streams of research. The first was sparked off by Polak (1973), in his review of images of the future throughout history; he recorded a marked swing from optimism toward pessimism in the 20th century. This stream developed a range of descriptive studies of images of the future among the population – for example, the international surveys of Ornauer et al (1976), Lambourne, Feiz, and Rigot (1997) in a marketing context, and studies of the use of foresight in daily life (Hayward and Krishnan, 2002). The focus has been to discover and record the future images of various populations.

Where that first stream has been descriptive, the second has been normative: a process of envisioning preferred futures, as outlined by Ziegler (1991), Nanus (Visionary Leadership, 1992: a process beginning with a “vision audit” and ending with scenarios), Stewart (1993), Malaska and Holstius, 1999, and Malaska, 2001 (on visionary management) and Wacker and Taylor (2000). A major goal of these processes is to create in the minds of all involved a single coherent vision of a preferred future for the organization.

An obvious criticism of the writings in the latter stream is that their visions are not images, but abstract criteria that cannot be visualized. As a case in point, Nanus (1992, p218) gives an example of a vision for a government department: “Becoming the most efficient agency of its kind in the country, offering the greatest amount of public recreational services per budget dollar of all the states.” One might well ask: where is the vision there? What is the image? Surely that is a goal or objective, because it is not concrete enough to be correctly labelled a “vision” – and, lacking specificity, it is difficult to test against alternative courses of action. As Margaret Mead (1957) noted, utopias are unsatisfying places because they are not vivid enough to produce clear visions.

A parallel literature is that of spatial planning, which uses the concept of “community visioning,” as described by Ames (1997), the Center for Rural Pennsylvania (2001), Maine State Planning Office (2003), Nelessen (1994), Sancar (1993), and other contributors to journals on urban planning, architecture, and related disciplines. This type of visioning, because it deals with the designed environment, is intrinsically visual, and the preferred visions are of buildings, landscapes, and land use; they do not visibly embody social goals.

Though all three literatures deal with creating a vision of a preferred future, I found almost no cross-referencing between them – nor between any of them and the related literature of cognitive mapping (discussed below). Another aspect of the (en)visioning movement is its
insistence on a single corporate vision, to be embedded in the brain of each employee. This is a curious contrast with the “alternative futures” credo of scenario planning, particularly as visions are usually considered to be something highly personal: even in a widely shared scenario, people might have different visions of their preferred futures. A resolution of this paradox is offered in the Service Club study in chapter 8.

2.7.2 Multiple scenario methods

These methods, though they vary considerably in their procedures, are characterized by their output: an ensemble of scenarios for alternative futures, created for a specific entity at a future time which may or may not be specified. Though they often include elements of sequential projection, they are not solely methods of sequential projection in the sense discussed above.

The term “scenario” is used in a wide range of senses. Though all scenario planning produces an ensemble of scenarios, not all scenarios are derived from scenario planning. A large proportion of the scenarios reported in academic literature databases (OECD, Ebsco, Emerald, and Science Direct) are the outcomes of numerical forecasting. Trend projections in which assumptions are varied are frequently referred to as scenarios, even though these were derived purely from mathematical projections. Van Notten (2002, p3) distinguishes several meanings of the term “scenario” in strategic management, related to sensitivity analysis, contingency planning (e.g. military), and finally in the broader narrative sense of multiple futures. The final sense is that intended in the present context.

To judge from the literature of futures studies, including academic journal databases and the OECD Futures Group database (OECD, 2001), it seems that scenario planning is by far the most widely used mode of foresight. Perhaps because of its wide use, it has also become the most varied, with many different strands and methods described in the literature.

2.7.2.1 A typology of scenarios

Several writers on futures studies have described typologies of scenarios, including Masini and Vasquez (2000), Postma and Liebl (2005), Chermack et al (2001) and van Notten and his collaborators (2001, 2002, 2003, 2005). The most comprehensive typology published so far is that of van Notten et al (2003). They distinguish 14 scenario “types” (more precisely described as variables or factors, which could produce 24,576 different types of scenario) divided into three “overarching themes,” as follows:
<table>
<thead>
<tr>
<th>Overarching theme</th>
<th>Scenario type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Project goal: exploration vs. decision support</td>
<td>1. Inclusion of norms? Descriptive vs normative</td>
</tr>
<tr>
<td></td>
<td>5. Spatial scale: global/supranational vs national/local</td>
</tr>
<tr>
<td>B. Process design: intuitive vs formal</td>
<td>6. Data: qualitative vs quantitative</td>
</tr>
<tr>
<td></td>
<td>7. Method of data collection: participatory vs desk research</td>
</tr>
<tr>
<td></td>
<td>9. Institutional conditions: open vs restrained</td>
</tr>
<tr>
<td>C. Scenario content: complex to simple</td>
<td>10. Temporal nature: chain vs snapshot</td>
</tr>
<tr>
<td></td>
<td>11. Variables: heterogeneous vs homogeneous</td>
</tr>
<tr>
<td></td>
<td>13. Level of deviation: alternative vs conventional</td>
</tr>
</tbody>
</table>

Despite the apparent comprehensiveness of the above table (produced after a review of 70 scenarios, according to van Notten, 2002), there are several obvious omissions in overarching themes B and C. Also, those three themes describe only the generation of the scenarios, not the ways in which the scenarios are used. I have thus created a supplementary table:

<table>
<thead>
<tr>
<th>Overarching theme</th>
<th>Scenario type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Process design: intuitive vs formal</td>
<td>10A. Time taken for scenario development: short vs long</td>
</tr>
<tr>
<td></td>
<td>10B. Formality of process: rigid vs flexible</td>
</tr>
<tr>
<td></td>
<td>10C. Method of development</td>
</tr>
<tr>
<td>C. Scenario content: complex to simple</td>
<td>15. Number of scenarios: few vs many</td>
</tr>
<tr>
<td></td>
<td>16. Detail in each scenario: little vs much</td>
</tr>
<tr>
<td></td>
<td>17. Number of scenario iterations: 1 vs 2 [see below]</td>
</tr>
<tr>
<td></td>
<td>18. Shared content: standard vs unique</td>
</tr>
<tr>
<td>D. Scenario usage: internalized vs externalized</td>
<td>19. Promulgation: internal secret vs wide publication</td>
</tr>
<tr>
<td></td>
<td>20. Use: direct input into planning vs better understanding</td>
</tr>
<tr>
<td></td>
<td>21. Timescale: immediate use vs kept for reference</td>
</tr>
</tbody>
</table>

Explanatory notes on the additional scenario types:

10A. *Time taken.* Shell’s scenario development cycle lasts for around 18 months (Shell International, 2003) while at the other extreme Mercer (1997) describes achieving “robust strategies in a day.”

10B. *Formality.* Some processes such as *Prospective* (Godet, 1987) and the Future Mapping of NCRI/Nervewire (Mason, 1998) have become standardized with repetition, while other processes can vary considerably depending on the client’s needs (Ringland, 1998; Eden and Ackermann, 1998).

10C. *Method of development.* Unlike the other items in the above table, this is not a bipolar scale. The most widely used methods for developing scenarios are discussed below.
15. **Number of scenarios.** Some writers recommend few: thus Wack (1985b) suggests using three scenarios. The related literature of community visioning (such as Ames, 1997) often develops only a single scenario. Others use more – such as the seven Mont Fleur scenarios for South Africa (Kahane, 1992). Morphologically based methods (eg. Lempert, Popper, and Bankes, 2003) can generate millions, most of which are then culled.

16. **Detail.** Some scenarios are written up in detail (*Europe 2000*, with six volumes: Hall, 1997), while others (as used in businesses) can be limited to one page per scenario, on the ground that senior managers will not read anything longer.

17. **Iterations.** This refers to the practice common in the Shell tradition (Schoemaker and van der Heijden, 1992) of producing firstly a set of world-based exploratory scenarios, followed by a set of organization-specific decision scenarios.

18. **Shared content.** To some extent, each set of scenarios is unique, but to a surprisingly large extent, different sets of scenarios share many similarities. The new overarching theme (D) is concerned with the ways in which the scenarios are used. Though it could be argued that usage is not a characteristic of scenarios *per se* (perhaps why van Notten did not include this in his typology), the counter-argument is that a major component of this thesis is the evaluation of scenario methods, and such methods cannot be evaluated without regard to the uses to which they will be put. Thus I have added three variables (or “types”) under the overarching theme of scenario usage:

19. **Promulgation:** restricted distribution vs wide publication. At one extreme, the organizations that commission scenarios restrict knowledge of the output to a small group of managers, because the scenarios are seen as conferring commercial advantage. At the other extreme, scenarios are made available as widely as possible – for example, the Mont Fleur scenarios, published in newspapers in South Africa for public discussion (Kahane, 1992).

20. **Use of scenarios:** direct input into planning vs better understanding. This is the “scenario planning” vs “scenario learning” dichotomy expressed by van der Heijden (1996).

21. **Timescale:** immediate use vs kept for reference. At the “immediate use” extreme, scenarios may be developed in a workshop but not written up: their value is considered to reside in the minds of the participants. At the other extreme, scenarios are regarded as documents rather than as states of mind, and are filed away, to be consulted if an unexpected situation arises.

These 24 “types” or variables of scenarios (21, plus 3 more varieties of variable 10) were used in considering possibilities for the development of the Process.

The next section focuses on several of the above factors, since they were particularly relevant to the nascent Process: how scenarios are built (type 10C), who builds them (type 7), their temporal nature (type 10), their shared content (type 18), and how they are used (type 20).
2.7.2.2 The varied methods of scenario building

The major methods of developing scenarios, discussed in most detail by Huss and Honton (1987), Ringland (1998), and Chermack et al (2001) are intuitive logics, critical uncertainties, and Prospect. Each of these methods will be discussed briefly, examining only features likely to be relevant for the Process to be developed. The above list is not exhaustive. Other methods exist, falling into two main groups, neither of which will be discussed further: proprietary methods, often software-based, that often produce partly quantified scenarios, and impact-based methods such as cross-impact analysis (Gordon, 1999) and trend-impact analysis (Glenn, 1999, chapter 9).

Intuitive logics

The initial method of scenario planning was to study a situation in detail, then develop scenarios intuitively. By definition, there is no standard procedure when this method is used: an ensemble of scenarios is developed to fit a particular situation. Such scenarios are developed by experts: professional futurists, whose deep knowledge of trends informs their intuition. Though this method is limited by the vision of the experts who develop the scenarios, it has a good track record when outcomes are compared with scenarios – in companies such as Shell. Two widely cited examples (Wack, 1985a and 1985b; van der Heijden, 1996) are Shell’s successful anticipation of OPEC’s oil price rise in 1973, and the demise of the Soviet Union circa 1990. Van der Heijden (1996) suggests that part of the reason for Shell’s commercial success since the 1970s was its use of scenario planning in general, and the intuitive method in particular.

Critical uncertainties

This method, widely promulgated by Schwartz’s book (1991) and his Global Business Network, appears to be currently the most widely used of all, perhaps because it can be reduced to a concise set of instructions (e.g. Schoemaker, 1995; South Wind Design, 2001). Some writers (such as Huss and Honton, 1987) include this method in the “intuitive” group, perhaps because the label “critical uncertainties” has not been applied to it until recent years – as by van der Heijden et al (2002). However a clear historical thread exists: a search for the earliest reference to “critical uncertainties” uncovered a paper by Hitch (1960), in an operations research journal. The link is that Hitch was then at RAND, where Schwartz also worked. Thus this scenario development method (like some other futures methods) may be much older than publication dates would suggest.

The Critical Uncertainties method typically begins by listing a number of trends or variables relating to the future. These trends are then divided into three:
1. those whose continued influence on the entity under study is almost assured
2. those that are extremely unlikely to affect the entity
3. those that are uncertain.

The uncertain trends are then divided again, into one group that will have little effect on the entity, and another group that, if they occur, will have a major effect. The latter are the Critical Uncertainties. These are ranked in order of possible impact, and the most crucial few are used to create a notional hypercube of that number of dimensions. If there are two variables, four scenarios are generated. If the variables are labelled A and B, the scenarios will be (1) low level of A, low level of B, (2) low A, high B, (3) high A, low B, and (4) high A and high B. If some scenarios are judged to be implausible, they are discarded, so there may be less than four final scenarios (when using two variables) or less than eight scenarios (when using three variables).

This is a procedure-bound method of creating scenarios, and its ease of generation may explain its popularity. However, the danger with Critical Uncertainties is of missing the point, by choosing dimensions that turn out later to be not as critical as was perceived at the time of construction. Scenarios based on a slightly different set of critical uncertainties might have produced quite different futures, suggesting quite different anticipatory actions. As a situation can change quickly, a set of dimensions that is highly uncertain one year may be certain (in one way or another) the next. This was the case with a number of scenarios created in the late 1990s for the development of the Internet (e.g. Randall, 1997), as discussed in Appendix 1. A further problem with the Critical Uncertainties method is that the worlds described by the resulting combinations of variables can be difficult to imagine. Thus it can happen that all scenarios in an ensemble – or none – turn out to apply (Liebl, 2002, p175).

Prospective

The prospective method of Godet (1987, 1999) and his colleagues at LIPS is a systematic set of procedures, more mathematical than most others described in this section. It makes extensive use of subjective probabilities, and uses specially developed software to guide and ease the calculations. For Godet, a scenario includes both a vision and the path required to attain it. (Godet 2000:10) divides prospective into three phases: anticipation, decision, and action. The “anticipation” phase, which roughly corresponds with scenario production, ends with a set of environment scenarios (including megatrends, wild cards, threats and opportunities, and evaluation of risks) feeding into the stage “from identity to visions and projects” including strategic options and possible actions. Another way of expressing the process is through answering the five basic questions that are posed:
Q1: What can and might happen?
Q2: What can I do?
Q3: What am I going to do?
Q4: How am I going to do it
Q0: (Essential prerequisite): Who am I?

From this it can be seen that the scope of prospective is broader than that of the other scenario methods described in this section: for prospective, scenario-building is only part of the process. The full process includes MICMAC (similar to cross-impact analysis), a form of morphological analysis, and (uniquely among all the methods discussed in this chapter) the Mactor method, of analysing actors’ strategies. In Mactor, all the actors are identified, and their objectives, goals, motivations, and the like are studied in detail. The Mactor process is a complex one, requiring 2 to 5 months (Godet et al., 1999, p46).

2.7.2.3 Content types of scenarios

The content of scenarios can be highly varied, particularly when developed using the intuitive method or the Critical Uncertainties method, so this section considers types of content rather than actual content: predetermined scenarios and normative scenarios.

Predetermined scenarios

At least two processes use scenarios that are predetermined. These are “deductive forecasting” (Dator, 1998) and “Future Mapping” (Mason, 1994 and 1998). Deductive forecasting arises from Dator’s experience that scenarios often fall – or can be persuaded to fall – into four general categories: (a) continuation of the relevant status quo, (b) collapse, (c) disciplined society (organized around some set of overarching values or authority), and (d) transformational society (with emergence of new forms of beliefs, behaviour, etc.).

The deductive forecasting process for any entity is to inquire into how the entity would fare in each of those four scenarios. Cornish (2004) offers a set of five common scenarios, very similar to Dator’s four: Surprise-free, Optimistic, Pessimistic, Disaster, and Transformation. Even when scenarios are not predetermined, they often fall into a number of common categories; thus Schwartz (1992) lists eight common plots for scenarios.

Several methods of planning (other than scenario planning) construct the equivalent of two standard scenarios. Though similar to predetermined scenarios, these are not quite the same, because it is only the label that is predetermined. For example the search conference method of Emery and Trist (Emery and Purser, 1996) contrasts two futures for an organization or a
community: “business as usual” (what would happen if current trends continued) vs an “ideal state.” Ackoff (1978) presents an almost identical pair of standard scenarios, describing them as “reference” and “idealized.” The similarity is not coincidental: Emery and Ackoff worked closely together (Emery and Ackoff, 1972).

Linstone’s TOP typology associates predetermined scenario types with the three perspectives: probable futures with T (technical), preferable futures with O (organizational), and possible futures with the P (personal) perspective (Linstone 1999, p231).

Normative scenarios
Perhaps the most commonly occurring theme is the normative scenario, similar to Emery’s “ideal state” (1995) and Ackoff’s (1978) “idealized” scenario. In some ways, this is equivalent to the Utopias of the pre-scientific era, and corresponds to the inherent optimism of humans (discussed in section 2.2 above).

The concept of normative futures – that there is a “best” future, which should be pursued – has been widely discussed (Jantsch, 1967; Coates, 1994; Ogilvy, 1996; Bell, 2004), though variously interpreted. Jantsch (1967) and Coates (1994) discuss normative forecasting – which for Coates includes normative scenarios. Coates (1994) contrasts normative with exploratory futures: the latter describe possible outcomes, while the former describe desired outcomes. In Coates’ view, normative futures are not the same as goal-based futures, though this distinction is not always clear in his writing. He states that the difference between a goal statement and a normative forecast is that for the former “no detailed analysis backed up what was necessary to achieve those objectives.” This implies that the essential property of a normative scenario is the plan for attainment, as much as the desirability of its outcome.

Ogilvy and Bell offer slightly different views of the normative approach. Ogilvy (1996) argues that what distinguishes futures studies from other social sciences is the explicit consideration of ethical values, while Bell (2004) couches his argument in terms of human values, using findings from cross-cultural values research to demonstrate that concepts of virtue are widely shared across cultures. This is similar to Galtung’s (2000) TRANSCEND approach to conflict transformation, in which the establishment of shared values is used to agree on and work toward a jointly beneficial outcome.

A parallel approach that clearly falls within this group (though not explicitly a foresighting method) is Appreciative Inquiry, developed by Cooperrider (1986). This involves an organiza-
tion creating a forward path by retaining what stakeholders agree to be the best elements from its past. In effect, an Appreciative Inquiry process (Elliott, 1999; Coghlan et al 2003; Whitney and Cooperrider, 2000) involves the participative creation of a normative scenario: an agreed ideal future, similar to the concepts of Emery and Purser (1996) and Ackoff (1978) – but more grounded in the past.

An argument against normative scenarios, from the futures studies literature, is that for psychological reasons, the fleshing-out of a normative scenario tends to diminish the perceptions of other scenarios in that ensemble. Because of the prevalence of optimism in human thought (Weinstein, 1980; Tichy, 2002), the concept of the normative scenario – a perfect world – exerts a strong attraction in scenario work. For that very reason, some futurists (such as Simpson, 1992) advise against the use of normative scenarios, as their images are too powerful: in the presence of an attractive normative scenario, participants tend to neglect other possibilities. (I made the same finding, in several of the case studies described in Chapter 8). For related reasons, it is uncommon to find pessimistic scenarios arising through participative work (as discussed by van Notten, Sleegers, and van Asselt, 2005).

2.7.2.4 The temporal nature of scenarios
In the past, there have been two major approaches to the sequencing of scenarios, described as the end-state (or snapshot) and the chain. As those labels imply, a set of end-state scenarios is aligned to a date – usually between 5 and 30 years ahead. A chain scenario focuses not on the end-state but the way in which it was reached. Among the first scenarios to be published were of the chain type (Kahn, 1965, describing various ways in which World War III could come about), defined a scenario as a “hypothetical sequence of events, for the purpose of focusing attention on causal processes and decision points.” This is clearly a chain scenario, but few subsequent examples of that type have been published. Godet (1986, p139) combines both sequences in stating that “a scenario is the description of a possible future and the corresponding path to it.” This viewpoint has become the most common in recent literature, and most of the current methods of scenario development (as in the cases in Part 2 of Ringland, 1998) involve the use of both elements, though the main focus is usually on the endstate, with only secondary attention to its development.

2.7.2.5 The uses of scenarios: planning or learning
The intended use to which scenario work is put can often be detected from the label given to the project. Descriptors in common use include: scenario planning, scenario learning, scenario management, scenario analysis, and scenario thinking – all of which have slightly different implications. Scenario planning is the original and most commonly used term. More recently, the
concept of *scenario learning* has become popular. Van der Heijden, in his book on “strategic conversations” (1996) makes the case that the main value of scenario work may lie in the learning that occurs during scenario development. Reinforcing the view that “scenario planning” may be an undesirable expression is antipathy to planning among some managers, particularly in the USA – as described by Mintzberg (1994), and in a US government context by Fallows (2004). When “planning” is seen as unacceptably cumbersome, and “flexibility” as an operational virtue (Rumsfeld, 2002), scenario learning may be regarded as more palatable than scenario planning.

A bibliometric analysis of the content of futures-related journals on the Science Direct database (*Futures, Technological Forecasting and Social Change*, and *Long Range Planning*: three of the major English-language journals) found that between 1968 and March 2004, the term “scenario” (singular or plural) appeared as a keyword in 387 articles. Surprisingly, neither *scenario planning* (mentioned in 58 papers) nor *scenario learning* (only 3 so far) was predominant: *scenario analysis* was by far the leader, with 221 mentions – though mostly in the context of quantitative “scenarios” that were really extended forecasts, particularly in operations research and energy studies. Other terms, used infrequently, were *scenario management* (9 papers) and *scenario thinking* (6 papers). *Scenario modelling* appeared in 25 papers, generally in a quantitative context. The point of discussing those terms is that they are indicators of the uses of scenarios within organizations. Thus *scenario planning* (along with *scenario management*) is seen as a method of increasing market share and the like, by out-planning competitors. *Scenario learning* (along with *scenario thinking*) is viewed more as a way of making the organization readily adaptable to change: a more diffuse goal.

But perhaps the dichotomy between scenario planning and scenario learning is overstated; it could be that both planning and learning are important. An alternative way to view the distinction is that scenario planning is recorded on paper, while scenario learning is recorded in people’s heads. Regardless of where the record is stored, another view is that scenarios perform the function of informing robust decisions, as suggested by Mercer (2001). To avoid prejudgement, the rest of this section uses the neutral term “scenario work” rather than “planning” or “learning”.

### 2.7.2.6 Who develops the scenarios?

To judge from the review in Appendix 1, scenarios are generally developed by small teams of experts. However in recent years there has been some move to involving a range of stakeholders in the development of scenarios, leading to a growth in participatory methods of
development – though, as Arnstein (1969) demonstrates in her paper on the Ladder of Participation, “participation” can cover such a broad range that the term is almost meaningless. Thus participation can better be expressed in terms of degree than as a Boolean variable.

In Godet’s *prospective* method the participants are labelled actors, rather than stakeholders; but this is no mere change in label. By “actors” Godet means decision-makers: those with power to act. Those who are merely experts or consumers do not seem to qualify as actors.

As world development agencies have found repeatedly (e.g. Rietbergen-McCracken and Narayan, 1998), if development projects involving the broad population are to be successful, they must engender a sense of “ownership” – so participatory development techniques have become much more common in the development industry during the last 5 to 10 years, even extending to expert-laden agencies such as the World Bank. The same findings should apply to futures exercises: if they capture input from a wide range of stakeholders, the findings are more likely to be successfully applied than if a small group of experts produces the results. In the world development field, some of the best results are reported to occur when experts are used to train the other stakeholders, hence the use of methods such as ZOPP, or Ziel-Orientierte Projekt Planung, developed by the German aid agency GTZ (Ford, 1999; Hamdi and Goethert, 1997; Helming and Göbel, 1997; COMIT, 1998). I have used such methods in work with development agencies, and have found from the viewpoint of an “imported expert” that the co-operation of a wide range of stakeholders greatly enhances the quality of evaluation findings – as well as their later application. Thus an early objective of the Process was to include a high level of participation: around level 5 on Arnstein’s 7-point scale. (It could not be higher because I was developing the Process for this thesis: the methodological input had to be my own.)

One approach to scenario development is the partly-participative. This involves the trends, drivers, and/or scenarios being prepared in advance by professionals, as described in the Predetermined Scenarios section, above. Workshop participants are later asked how their organization might react in those situations. An example of this is the Nervewire Corporation’s “future mapping,” described at www.nervewire.com and by Mason (1998).

### 2.7.2.7 Problems of scenario work

The problems with scenarios will next be addressed, in two ways: firstly by reviewing the literature on the methods of scenario building (in this section), and in the next chapter by an empirical comparison of scenarios and their outcomes.
In the last few years, some writers, mainly from the Netherlands and Germany, have begun to question some of the well-established principles of scenario building. Postma and Liebl (2005) address some drawbacks of the commonest (critical uncertainties) scenario method, noting that it cannot deal with simultaneous trends and counter-trends. Postma and Liebl suggest incorporating the idea of the “paradoxical trend” in the scenario process.

The dependence of the conventional approach to scenario building on identifying trends means that this style of scenario work is similar to forecasting, except that the former is not (generally) quantitative, and takes a number of variables simultaneously into account. But whether a foresighting exercise takes the form of a forecast or a scenario ensemble, if the output is dependent on trends, future discontinuities are unlikely to be identified. Van Notten, Sleegers, and van Asselt (2005) found that half of the 22 scenario studies they examined in detail did not address discontinuity at all. Some of these explicitly stated that scenario work was not an appropriate vehicle for this. Brooks (1986) and Morgan (2002) suggest that scenario studies unconsciously incorporate an evolutionary model, making the implicit assumption that changes are slow and steady.

Integrating the above works, it appears that the main objection to scenario work as commonly practised is that it serves to contain uncertainty rather than to confront it. As Schoemaker (1993, p196) points out: “the scenario method caters to people’s preference for certainty, by primarily specifying uncertainty across rather than within scenarios. This treatment of uncertainty is quite different from more traditional methods which usually present one model, with uncertainty nested within it.” It may be that scenarios – like rosy strategic plans – can serve to seal off consideration of the future, rather than to open it up³. To the extent that users of scenarios see them in this reassuring way, the use of scenario work could have the opposite effect to that intended. This, of course, is an empirical question, which would be both feasible and interesting to test – but is beyond the scope of this thesis.

2.8 Methods of increased understanding

This section outlines three methods for increasing human understanding of the potential of the future: causal layered analysis, cognitive mapping, and surprise theory. Though at first they may appear to have little in common, they are all ways of dealing with complexity and unpredictability.

³. Thus in mid-2003 a Pentagon spokesperson complained at the tactics of suicide bombers in Iraq: that the US Army had war-gamed “hundreds of scenarios” but not suicide bombing – because it was not rational.
2.8.1 Causal layered analysis

This concept was first developed by Inayatullah (1998, but conceived in 1990, according to Ramos, 2003, p47). As much a way of viewing the present as the future, it amounts to a new means of categorizing causation. Other futurists, quickly grasping the usefulness of the method, have been applying it in a variety of ways, in slightly different forms. A special issue of Futures in 2002 (vol. 34, no. 6) was devoted to causal layered analysis, and a 30-chapter reader has recently been published (Inayatullah, 2004). The basis of CLA is to separate different types of concept into a set of successively “deeper” layers, so that each layer influences the layer above it. In Inayatullah’s original conception, the layers are:

1. The “litany”
2. Social causes
3. Structure and worldview
4. Metaphor and myth

Other methods described in that 2002 issue of Futures use between three and seven layers – though of course the number of layers defined is to some extent arguable, and can vary with the purpose of the analysis. A valuable aspect of CLA is that it provides a means for categorizing and clarifying the wide variety of factors that influence change in human affairs.

2.8.2 Cognitive mapping

Cognitive mapping was originated by the psychologist Tolman in 1948, and was most widely used in educational contexts. It was first used in a management context by Axelrod (1976), and has by now spawned many variants, the best known of which is perhaps “mind mapping” (Buzan, 1989). Another aspect is argument mapping (Kirschner et al, 2002) while further variants are covered in the edited volume Mapping Strategic Thought (Huff, 1990).

Axelrod’s process, often known as revealed causal mapping, is generally regarded as a management tool rather than as a futures studies method. However writers such as Eden and Ackerman (1998) have used it in strategic planning group processes, from which it is a short hop to futures studies processes. Warren (1995) was perhaps the first to explicitly link cognitive mapping with scenario planning. However this linkage has not been widely used, and seems to be largely confined to the UK. Sahin and Ülengin (2003) offer a Turkish example, but most of their examples are by English and Scottish writers.

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4. One chapter in that reader is an earlier version of part of chapter 5 in this thesis.
A key value in cognitive mapping, from a point of view of futures studies, may lie in eliciting images of the future, almost in the form of chain scenarios. This contrasts with the typical envisioning methods, as discussed above, where the focus is on the end-state. By combining cognitive mapping with envisioning, it may be possible to elicit and/or create more complete successions of images.

### 2.8.3 Surprise theory

Surprise theory originated in the mid-1980s, when environmental scientists became concerned with the sustainable development of the biosphere. Papers by Brooks, Holling, and Timmerman (all in Clark and Munn, 1986: the most widely cited work in this area) studied the concept of surprise. Since then, this area has developed sporadically, with most literature on surprise lacking references to the futures literature – except, notably, in the “seeds of change” concept of van Notten (2002), van Asselt (2000), and their colleagues.

Brooks (1986) presents a typology of surprise, distinguishing three types of surprise: unexpected discrete events, discontinuities in long-term trends, and the sudden emergence into political consciousness of new information. However, Brooks does not critically examine the concept of environmental surprise, and fails to note that the surprise lies in human reactions to an event, rather than in the event itself. Myers (1995) distinguishes two types of surprise: discontinuities and synergies. The latter occur when two types of event, separately unsurprising, occur together and have a potentiating effect. The concept of discontinuity is also widely used in the literature on technological innovation, and is discussed at length by Maio Mackay (2002). Ayres (2000), in a paper on forecasting discontinuities, distinguishes between trends, cycles, and catastrophes. He suggests that, though the predictability of natural events is increasing, such as improvements in weather forecasting, social evolution has moved from a Darwinian to a Lamarckian process, dominated by human interests, and is thus increasingly liable to instability through social feedback mechanisms.

Timmerman (1986) discusses a set of “myths” (which might also be labelled mental models) about change in the environment, and traces these to their origins in psychology or economics. He instances the myths of

- equilibrium or homeostasis: a self-righting world, or “Gaia” (Lovelock, 1979);
- multiple stability with phase changes or Keynesian “punctuated equilibrium”;
- resilience and vulnerability, in which an ecosystem may appear to be resilient, but is becoming vulnerable because its reserves and/or learning are becoming exhausted.
He distinguishes between an event and the surprise it brings about, offering a simple three-stage model, in which a discontinuous event is followed by perceptions (surprise), and then by interpretations.

As Postma and Liebl (2005) note, scenario work is adapted to dealing with uncertainty, but only to a degree. When a continuous or dichotomous variable is known, but its future value is not, scenario work can handle such uncertainty well. Uncertainty about the variable itself, however, is another matter. Completely unexpected events are referred to as wildcards (Rockfellow, 1994, Petersen, 1999), as surprises (Brooks, 1986), or as discontinuities (van Notten, Sleegers, and van Asselt, 2005). Note the subtle implications of the difference in terminology here: a wildcard is a noun referring to an object, something that comes “out of the blue” (Petersen’s 1999 title), but surprise, being a verb as well as a noun, implies a subject: who was surprised? A wildcard is presumed to surprise everybody, while a surprise can imply that some people are surprised, but not others (Thompson, Ellis, and Wildavsky, 1990).

Writers on risk management use different terms still: radical uncertainty (Funtowicz and Ravetz, 1990) and strategic risk (Vlek, 1996). As van Asselt (2000) points out, risk and uncertainty are effectively two sides of one coin: the object-subject distinction. However, both risk and uncertainty can be contrasted with surprises / wildcards / discontinuities, in that risk and uncertainty are forward-looking concepts, involving a pre-existing awareness that all may not occur as expected. On the other hand, wildcards, surprises, and discontinuities are by definition unexpected – at least by some. A further distinction can be drawn between discontinuities and the surprise that they cause among various stakeholder groups. An event may be relatively small, but its social effect may be large and/or delayed (such as the SARS outbreak in Asia in 2003). However, because sometimes an event does not exist unless it is perceived, it is not always possible to distinguish between the discontinuity and the surprise. An example is an unintended insult from one power-broker to another – in which case the surprise may precede the discontinuity5.

Van Notten, Sleegers, and van Asselt (2005) objectify surprise by speaking of discontinuities, classifying these as either gradual or sudden. Of course, the concept of a “gradual discontinuity” begs the question of how discontinuous a “discontinuity” can be. The rise of the Internet in the 1990s might thus be described as a “gradual discontinuity” from a 1990s point of view. From a 2005 viewpoint it can be seen as a trend; and very likely after 2020 it will be seen as

5. For example, when the Prime Minister of Papua New Guinea was asked to remove his shoes for security screening on arrival in Australia in March 2005, a co-operation treaty between the two countries was delayed.
one small element in the globalization of information and communications technology. Thus it may be that a discontinuity appears discontinuous only at first.

Returning to van Notten, Sleegers, and van Asselt (2005), their study of 22 published scenario projects found that most of these studies did not incorporate elements of surprise. They suggested that this might be because surprises were generally negative, and studies focusing on scenario learning saw negative surprises as organizationally disruptive. The implication is that establishing unanimity of corporate vision – implicit in many writings on visioning, such as Nanus (1992) and Collins and Porras (1994) – is seen as more important in an organizational environment than is envisaging a wide range of futures, which is the basic premise of futures thinking. Thus the question arises as to whether it is (a) desirable and (b) possible to simultaneously maintain a unified vision of a single preferred future, in combination with a recognition that exogenous forces may make it impossible to fulfil that specific vision. This is a central question for this thesis, which offers a theoretical resolution of the question in chapter 5 (section 5.3.4), with the concept of the Leaf of Goals.

Another aspect of surprise is unexpectedness. Morell (2003) outlines a tentative framework covering the implications for evaluation of unintended consequences. In this framework, based on the principles of evolutionary biology, Morell distinguishes between unforeseen and unforeseeable consequences, interpreting the root cause of the former as inadequate understanding of program behaviour, and the root cause of the latter as due to the dynamics of complex adaptive systems. Tactics for dealing with unforeseen consequences include logic modelling and the use of interdisciplinary teams. For dealing with unforeseeable consequences, Morell’s tentative suggestions are to set up monitoring in advance, and to monitor programs closely, using a method similar to emerging issues analysis.

Ringland et al (1999) analysed occasions when military planning had failed. They concluded that failures were not due to individuals in charge, but to entire military systems, and that the failures occurred for three main reasons:

- failure to learn – due to making unwarranted assumptions of knowledge in a situation;
- failure to anticipate – due to lack of foresight at command levels;
- failure to adapt (“fighting the last war again”).

Morell’s (2003) suggestions for monitoring would probably cover only the second of these.

As is evident from the above literature review, “surprise theory” is not really a theory at all – nor is it even a futures method. Rather it is a collection of observations about the
prevalence and taxonomies of unexpectedness and unintended consequences. While some of these writers have offered some suggestions for means of anticipating the more expectable surprises (mainly, searching for “weak signals” or “seeds of change”), no systematic model seems yet to have been developed for anticipating these surprises. The nearest approach has been that of Hagerstrand and Kates (1986), with six suggestions for constructing scenarios that include elements of surprise:

1. Contrariness: How can the surprise-free assumptions be changed?
2. Perceived expert surprise: What are the tails of the distributions of relevant tasks, events, and outcomes?
3. Imaging: Given an unlikely future, what sequence of events might be used to reach it?
4. System dynamics: How could known current trends produce counterintuitive results due to interaction?
5. Surprise theory: Are there underlying principles that would let us understand unexpected events and developments?
6. Historical retrodiction: Are the seeds of future surprise always present with hindsight, and how can they be recognized?

Another potential solution lies in Dewar’s (2002) Assumption-Based Planning, which is described as a “tool for reducing avoidable surprises.” It involves identifying “load-bearing assumptions” (similar to “critical uncertainties”) and from those identifying “signposts” and “shaping actions.” When key assumptions fail, the signposts can lead to “hedging action.”

Since a clear need exists for identifying discontinuity, one purpose of the Process in this thesis is to address this issue: specifically, to develop a method for anticipating and framing imaginable surprise. The morphologically-based method of midcasting (List, 2001b and 2004a) was developed for this purpose, and is tested in the fieldwork reported in chapter 8.

2.9 Trends in methods of anticipation

Having reviewed the historical progression of anticipation (in section 2.3) and the potential of specific methods for adaptation in a new Process (sections 2.4 to 2.7), emerging trends will now be considered, as pointing to possible needs for such a Process. When examining the progress of anticipation from the pre-scientific phase, through forecasting, to alternative futures, three inter-related trends were identified: (a) the transition in outlook from fatalism to voluntarism, as described by Godet (1983), (b) a movement in purpose from prediction to resilience, and (c) an increasing level of detail. Each of these trends will now be discussed.

2.9.1 From fatalism to voluntarism

In the earliest applications of anticipation, as described above, the entity whose future was being considered – whether a family, a village, or a kingdom – was regarded as powerless in
the face of natural forces, personified as “the gods” – cf. the Greek myths (Graves, 1955; Lefkowitz, 2003). The rise of quantitative forecasting implied more scope for the influence of decisions made by the entity to influence its own future. In the example cited earlier, a soft-drink factory could use seasonal forecasts to increase its profit. With the growth of the planning concept (which probably originated in military campaigns) came the implication that an entity could choose a future for itself and pursue a path towards that future.

In scenario work, such a future is often labelled as a normative scenario. However, some related approaches to organizational development are also grounded in normativity. These approaches include the search conference (Emery and Purser, 1996), future search (Weisbord, 1992), Open Space Technology (Owen, 1992), and Appreciative Inquiry (Cooperrider and Srivastva, 1987; Elliott, 1999), as well as some approaches with clinical rather than corporate origins (such as the *Koinonia* of de Maré et al, 1991). The underlying principle is that an outcome exists that is both desirable and attainable – so this approach assumes that the entity being studied possesses enough power over its environment to largely determine its own future. Particularly in North America, this attitude has become widespread, as demonstrated in an international survey by the Pew Research Center (2003).

However, a major argument of this thesis is that such power over the future is always partial, even for the world’s largest entities. Humans may have mastered nature (natural catastrophes excepted), but they have not mastered one another. An example is the present US experiment in converting Iraq to a stable democracy – currently, late 2005, still far from successful (see appendix 4, case 3). This suggests that a different approach to normative futures is required; accordingly, such an approach is developed later in this thesis.

### 2.9.2 From prediction to resilience

The movement from fatalism toward voluntarism has been accompanied by a realization (as noted above) that forecasting has not been highly successful at longer-term prediction, but that the utility of a forecast is also important. In the arena of alternative futures, a parallel movement is away from “scenario planning” to “scenario learning” (e.g. van der Heijden, 1996). Scenario planners have found that, though scenarios cannot produce accurate predictions, they function well at broadening the mental horizons of those who take part in scenario building. This creates an organizational robustness or resilience: the ability to adapt rapidly when a partly-foreseen development begins to occur.
2.9.3 Increasing level of detail

The third trend that has occurred through the development of the three broad approaches to anticipation is the use of an increasing level of detail about the entity whose future is being foreseen. With the pre-scientific approach, a prediction can be made with almost no knowledge of the circumstances of the entity (usually a person), thus with astrology, their future can be predicted knowing only their time and place of birth. Using the forecasting approach, a variable needs to be measured consistently across time. In a business, one person – perhaps an accountant or clerk – could record such data. Moving to the multiplistic approach, the task of information collection can be quite onerous, as in cross-impact analysis. For example, Shell Oil takes around 18 months to collate and develop new global scenarios (Shell International, 2003:30). Thus one danger is, if the world is changing ever more rapidly, that scenarios may be outdated before they are completed. When the US Census experienced such a problem in 1900, the result was Hollerith’s invention of punch cards (Ifrah, 2000) – so perhaps it is time for a similar development with multiplistic anticipation.

2.9.4 Emerging trends in demand for anticipation

In view of the above trends, a key question is whether a new phase of anticipation is developing. Given the large changes in the world’s social environment since most of the multiplistic methods were developed, it would not be surprising if a new phase were emerging. Perhaps it is too early for the power of our hindsight to enable us to detect that new phase, and perhaps it is too soon for a new direction to emerge, but if a new phase is to emerge in the next decade or two, its drivers should already be present. These appear to include:

1. Increasingly more complex and differentiated social systems.
2. Increasing globalization – in the specific sense that a change in one part of the world is becoming more likely to have an effect elsewhere.
3. An increasing volatility of reaction to events, particularly in automated systems such as computerized share trading, with changes factored into share prices before they occur.
4. A widespread sense of increasing uncertainty, producing a corresponding widespread desire for greater certainty and security, in both domestic and social life. This can be manifested, for example, in the form of hostility towards recent immigrants.
5. Managers’ growing skepticism about being handed a fait accompli, in the form of a statement with no apparent basis (Maccoby, 1982) or unexplained data from experts (White and Taket, 1993). For example, econometric forecasts may be accepted as long as they prove accurate. Forecasts that prove clearly wrong are unlikely to be used again. But if they continue to be almost accurate enough to be usable, the forecasters will be under pressure to explain and justify their assumptions. Evidence of this is cur-
rently found in acceptance of the forecasts being made by some technology forecasting companies. Clients readily accepted their forecasts as long as the ICT industry grew steadily. But after 1999, with following-year forecasts pitched far too high, clients began to demand more transparency (Tapscott and Ticoll, 2003).

Though these trends seem self-evident (at least in the developed OECD countries) it has proved frustrating to track down solid evidence for them. This may be because, when a trend first comes to public notice, it is often already too late to begin collecting data to demonstrate that the phenomenon did not previously exist – except when the trend is indicated by a variable which is being measured routinely, such as demographic statistics. None of the above five trends is of that type. However, if it can be accepted that that the above trends probably exist, the combination of (1) and (2) suggests that anticipation is becoming more difficult. Adding item (3) suggests that the pace of change is increasing, which is partly due to reduced delays between events, which in turn is partly due to faster and more precise communication. Thus a natural reaction to the increased difficulty of anticipation is (4) – a desire for more certainty. This concern was originally at a personal level (exemplified in the growth of gated communities in countries with highly unequal distributions of wealth) but, due to the presence of (1), (2), and (3), the concern is now transferred to a societal or national level (following events such as the September 2001 terrorist attacks in the USA).

What are the implications of these trends for methods of anticipation? My conclusion – and the reason for moving in this direction in this thesis – is that in management circles, there is an increasing focus on futures several years ahead, with particular attention now being paid to discontinuities and their attendant surprises.

2.10 Looking ahead to the next phase of anticipation

The above review leads to the suggestion that anticipation methods used in the next phase of history will have the following features:

1. Scalable. To both manage complexity and at the same time retain comprehensibility, the new methods will need to incorporate a “drill down” capability, readily scalable to whatever is the most appropriate level for a current purpose.

2. Verifiable. The methods will need some element of verifiability: not precise prediction, which as the above discussion of quantitative forecasting has shown is unlikely to be attained, but more in the sense of creating a metaphorical map of the path ahead, on which
the entity can locate itself some time after the anticipation was performed, if an unlikely development occurs (Slaughter, 1996a).

3. **Transparent.** The assumptions of the new methods will need to be challengeable, and thus clearly visible. This argues against black-box approaches such as econometric modelling or neural networks, which can be so complex that the compounding effects of assumptions cannot be traced (Berry and Linoff, 1999).

4. **Nimble.** The scalability will extend to the time it takes to produce the predictions. Shell Oil's 18-month planning cycle (van der Heijden, 1996; Davis, 2002) is too slow for many purposes, given the apparently increasing volatility of the macro-social environment. However, as identification of trends is time-consuming and uncertain, it may be more likely that systematic environmental scanning (Choo, 1998) will be used to build databases, from which anticipations will be made as required: ideally within weeks, when necessary.

5. **Eclectic:** using a diverse range of input data. Because, with the growth of specialization and globalization, futures of different entities are becoming more inter-related, the amount of information required to foresee the future of an entity is likely to be more than is needed with the multiplistic approach.

6. **Useful.** The ability to help those involved anticipate change. This characteristic includes what is referred to as “scenario learning” (van der Heijden, 1996; Bood and Postma, 1997).

Having outlined six relevant properties of a new class of anticipatory methods, a question arises: what method could usefully meet those criteria? On reviewing the recent futures studies literature, three emerging streams were noted:

1. The “critical futures” movement, as exemplified by the recent work of Inayatullah (1990, 1998, 2002a) and Slaughter (1989, 1996a, 2002b), and Causal Layered Analysis.

2. Technology roadmapping, and allied methods (Porter et al, 2004; Barker and Smith, 1995; Bray and Garcia, 1998). TRM is more an approach to planning and coordination of than a futures studies method, but it has potential for further development.

3. Increased interest in discontinuities, with which (as shown above) neither forecasting nor scenario planning was designed to deal. It may be possible to apply a morphological ap-
approach (such as that of Powell and Powell, 2004) to typologies such as those of Hagerstrand and Kates (1986) and Brooks (1986).

There has been much recent discussion in the interrelated areas of whole systems, chaos theory, emergence, complex adaptive systems and agent-based modelling (Briggs and Peat, 1990; Dent, 1999; Gleick, 1988; Schieritz and Milling, 2003; Wheatley, 1992). Since the whole Process is deeply grounded in systems thinking, I explored these areas, seeking a way of applying them to foresighting, but no clear options emerged.

How do the three classes of method discussed above meet the six likely features for a new approach to futures studies? The following table rates each class of methods on a five-point scale, where ***** represents a very high degree of matching, and * a very low degree.

<table>
<thead>
<tr>
<th>Feature of a new approach</th>
<th>Critical futures</th>
<th>Technology road-mapping</th>
<th>Anticipating discontinuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalable</td>
<td>*****</td>
<td>*****</td>
<td>**?</td>
</tr>
<tr>
<td>Verifiable</td>
<td>**</td>
<td>*****</td>
<td>*****</td>
</tr>
<tr>
<td>Transparent</td>
<td>****</td>
<td>**</td>
<td>****?</td>
</tr>
<tr>
<td>Nimble</td>
<td>*****</td>
<td>*</td>
<td>?</td>
</tr>
<tr>
<td>Eclectic</td>
<td>****</td>
<td>***</td>
<td>****?</td>
</tr>
<tr>
<td>Useful</td>
<td>*****</td>
<td>*****</td>
<td>****?</td>
</tr>
</tbody>
</table>

Critical futures methods aim at increased understanding, rather than verifiability, and to the extent that they are expert-driven, they lose some transparency. Technology roadmapping methods are slow, expensive, and time-consuming because they require much industry coordination – hence their low score on nimbleness. The presence of many different actors, with different goals, leads to political bargaining, which in turn reduces transparency. Methods for anticipating discontinuity are hardly developed yet, so much about them is uncertain. However they may not be readily scalable, because discontinuities can vary greatly in scale (e.g. from a disk drive failure to global catastrophe) and in consequences (“for want of a nail, the kingdom was lost”).

From the above table, an ideal new method would resemble...

- critical futures methods – but would be more verifiable;
- technology roadmapping – but more nimble and transparent, with broader input;
- surprise anticipation – but more scalable and with broader input.

Since to some extent each of the three methods compensates to some extent for the others, it may be possible to develop a superior Process, incorporating elements of all three of those. The arrival of new methods does not mean that earlier methods will be supplanted. Just as the introduction of scenario thinking did not mean the end of forecasting, there is no evident
reason why a fourth phase will indicate the end of scenario work. But in some situations where existing approaches are regarded as inadequate, a new approach could be useful.

### 2.11 Review of this chapter

This chapter has examined the historical progression of modes of anticipating the future, dividing these into three main phases: the pre-scientific (intuitive and fatalistic), the objective (quantitative forecasting) and the multiplistic (alternative-futures methods), and foreshadowed the appearance of a fourth approach: the critical. Looking ahead to create a new method of anticipation, that integrates the most useful multiplistic methods, a wide range of multiplistic methods was studied. Those with most potential for incorporation into a new approach to scenario work were the futures wheel, backcasting, surprise theory, and causal layered analysis.

A major limitation of this chapter is that details about the usage, application, and effectiveness of the methods are generally not available. This chapter has evaluated only the published literature, which focuses on methodology rather than application. At the outset of this thesis, I had no previous experience of working in the futures studies field, apart from several minor futures-wheel exercises that I facilitated, and organizing several search conferences (not strictly a futures method. Much of the work done in this field over the last several decades appears not to have been reported in detail. There are many foresighting studies carried out for individual organizations (judging by the number of professional futurists in the World Future Society directory), and most of these futurists are rarely published. Even rarer are reviews of how completed scenarios (and other futures studies outputs) were used. I am thus aware that the above account of the development of the area, and of possible weaknesses in methods used, being based only on the literature, may not provide complete information.

To supplement the methodological review in this chapter, Appendix 1 reviews 15 anticipations (mostly scenarios) of the year 2000, and compares them with the relevant outcomes for 2000. That review revealed eight classes of problem that arose when comparing the scenarios with the outcomes. One objective of the new Process will be to avoid those problems. Appendix 1 was originally intended to be a chapter in its own right, but because it is fairly long, and self-contained, and its implications for the new Process can be summarized very concisely, it has been removed from the main stream of argument. However, Appendix 1 could usefully be read (or skimmed) at this point, before continuing to chapter 3, in which criteria are set up to evaluate the effectiveness of foresighting methods.