

Literary Review

Scenario Thinking

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“Anticipation is not widely practiced by decision makers because when things are going well, they can manage without it, and when things are going badly, it is too late to see beyond the ends of their noses”¹

Introduction

No matter what the context, the ability to understand the future has played a vital role in the formulation of strategy. However, doing so accurately has proved extremely difficult, and many methods - from astrology to econometric forecasting - have been developed in order to do this, with varying degrees of success.

Mathematical forecasting has been the preferred method of management strategists attempting to predict the future, in part due to its scientific credibility. However, although often effective in the short term, “you can forecast the future only when all of its elements are predetermined”² and so the accuracy of mathematical forecasts decreases exponentially as the forecast time - and therefore the number of uncertain variables - increases, and their capacity for illuminating future changes is correspondingly reduced for long term planning. In order to fill this gap, the method of scenario planning was developed by Herman Kahn for use by the US military in the 1960s. Pierre Wack was the first person to apply this technique to management strategy, using the scenario thinking process to great effect at Royal Dutch/Shell in the 1970s, helping Shell to move from being the smallest of the world’s major oil firms before the 1973 OPEC oil embargo to being the largest in its aftermath.

The use of the technique has spread rapidly since its inception, and an extensive academic literature has been written on the subject, discussing its techniques and processes, areas of effectiveness and weaknesses, and this document provides a review of the literature that has been written on the subject.

In analysing the literature, we identified two key areas of discussion, and throughout this review we will debate what the positions of different key theorist are on these areas, the

¹ Godet, Michael. (2000). *The Art Of Scenarios and Strategic Planning: Tools and Pitfalls*. [Technological Forecasting and Social Change](#). 65. pp. 3-22

² Wack, Pierre. "Scenarios, uncharted waters ahead." *Harvard Business Review*, September/October 1985.

important differences between their positions and, where appropriate, how the theory has developed since. First, we will examine the different definitions of what exactly a 'scenario' is, then the first major area of discussion; different approaches to the scenario thinking process and how the scenarios can best be used once they have been generated. Finally, we will investigate the areas where theorists believe that scenarios are particularly effective, as well as where they cannot be so effectively employed and what limitations the scenario-thinking process holds.

Definition of scenarios

Before discussing the views of the different theorists on the process and applications of scenario thinking, it is important to understand how scenarios are defined, and whether there are any important differences in the literature on how the term 'scenario' is defined.

The first academic articles on scenario were published in the mid 1980s, and therefore one of the first definitions of scenarios was by Michael Porter in 1985, who defined a scenario as, "an internally consistent view of what the future might turn out to be."³ He elaborates on this definition later in the article, explaining that "each scenario is, in effect, a full analysis of industry structure, competitor behaviour and the sources of competitive advantage under a particular set of assumptions about the future"⁴. This definition suggests that scenarios are concerned with the particular end results of the main driving forces, rather than analysing the driver itself. Another pioneer of the scenario thinking process, Pierre Wack, sums this up with the analogy that, "scenarios are like cherry trees: their fruit grows neither on the trunk nor on the boughs, but rather on the small branches,"⁵ meaning that the added value resulting from the scenario thinking process is in analysing the end results, rather than the main drivers that determine them.

Later definitions focused more on the practical uses of scenarios, with Schoemaker defining scenarios as "a thinking tool and a communication device that aids the managerial mind

³ Porter, Michael. (1985). Competitive Advantage. New York: The Free Press

⁴ Ibid

⁵ Wack, Pierre. "Scenarios, shooting the rapids." Harvard Business Review, November/December 1985.

rather than replacing it”⁶. Godet’s definition of scenarios also focused on their practical uses, stating that, “a scenario is not a future reality, but a way of foreseeing the future, thereby throwing light on the present in terms of all possible and desirable futures”⁷. With scenarios finding increasing use in aiding management decision making, it became important not merely to define a scenario in terms of what it is, as in the 1980s, but to also explain what they are in terms of how they can be used. Another difference was the inclusion of the drivers that determined the resulting scenarios and their role in illuminating how these scenarios may become reality, evidenced in Godet’s specification that, “a scenario is the set formed by the description of a future situation and the course of events that enable one to progress from the original situation to the future situation”⁸.

The most recent definitions of scenarios focus on distinguishing them from forecasts and strategies, emphasising their hypothetical nature and use in aiding understanding of the future, rather than predicting it; “the word scenario, as used here, denotes stories about the business environment of an organisation. They are not projections or forecasts, nor are they strategies or (contingency) plans”⁹. The difference between scenarios and plans is an important one, as the misuse of scenario thinking frequently arises from a lack of understanding about what they actually are: whereas planning can be defined as, “to conceive of a desired future as well as the practical means of achieving it”¹⁰, scenarios reflect plausible - rather than desired - futures, and are not concerned with the means to achieving those futures. Rather than imagining scenarios as a means to creating plans, MacKay and McKiernan encourage us to, “imagine them as postcards that describe business conditions surrounding the organisation in the future and sent back to you by a future analyst so that you can read them now”¹¹.

⁶ Schoemaker, Paul. (1991). *When And How To Use Scenario Planning*. Journal of Forecasting. Vol. 10

⁷ Godet, Michael. (2000). *The Art Of Scenarios and Strategic Planning: Tools and Pitfalls*. Technological Forecasting and Social Change. 65. pp. 3-22

⁸ Ibid

⁹ Van Der Heijden, Kees and Schutte, Peter. (2000, February/March). *Look Before You Leap: Key Questions For Designing Scenario Applications*. Scenario and Strategy Planning. Vol. 1, Issue 6.

¹⁰ Godet, Michael. (2000). *The Art Of Scenarios and Strategic Planning: Tools and Pitfalls*. Technological Forecasting and Social Change. 65. pp. 3-22, citing Ackoff

¹¹ MacKay, Brad and McKiernan, Peter. (2004). *The Role of Hindsight In Foresight: Refining Strategic Reasoning*. Futures. 36: pp. 161-179

Although there are differences in the focus of how the definition of a scenario is explained, the literature on scenarios is consistent in the views of scenarios as hypothetical sets of business conditions in the future that do not serve any purpose on their own besides aiding the development of an understanding of how the future may develop.

Approaches to the scenario planning process:

Having reviewed how the term 'scenario' is defined in the literature, it is important to next examine the actual process of building scenarios – the technique described by the key theorists, the names given to the particular approaches that have been identified, and the recommendations they give regarding the process of gathering data and using it to identify the core drivers and hence the scenarios themselves.

Michael Porter and Pierre Wack were the first theorists to write academically about the use of scenario thinking in the formulation of management strategy in the mid 1980s, and so they were the first to define the process itself. Michael Porter used the flow diagram (fig. 1.1) to explain the process of building useful scenarios. First of all, it is vital to identify the important structural variables, and then to distinguish which are predetermined and which are uncertain, as “constant and predetermined structural variables are part of each scenario, while uncertain structural variables actually determine different scenarios”¹². This step is key to ensuring that the subjective projection of how the uncertain variables will evolve over time are tempered by a solid background of the certain variables which can be predicted with more certainty.

The next stage is to identify the casual factors driving them and to make several plausible assumptions about how each of these will develop in the future. This step can be a source of bias and error, as this projection is almost wholly subjective, and any inherent biases on the part of the scenario planners would be reflected in their projections of how the uncertain variables will evolve over time. Once this is done, the uncertain variables can be combined into internally consistent groups which represent a particular story about how the future may

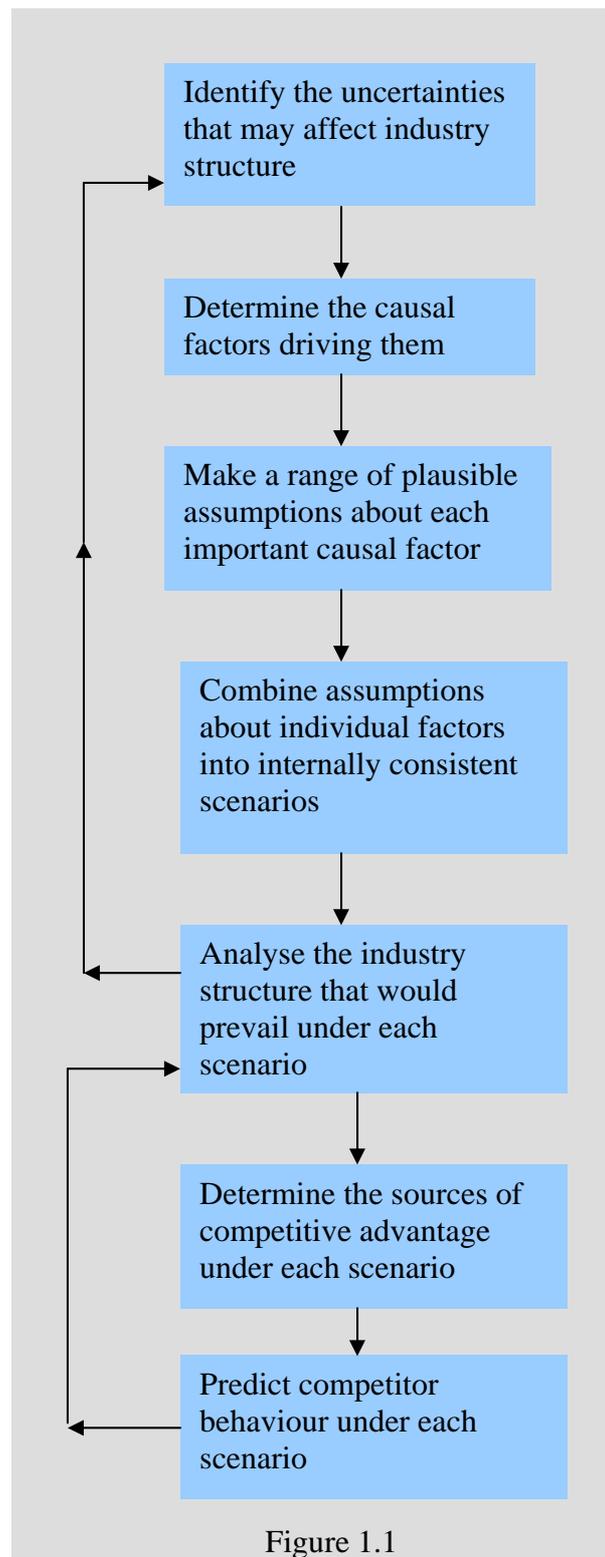
¹² Porter, Michael. (1985). Competitive Advantage. New York: The Free Press

develop, i.e. a scenario. Once again, this step can be a source of bias and error due to the subjective construction of these internally consistent groups.

After this is done, the industry structure that would prevail under each scenario can be determined, and this may in turn have an effect on the causal factors driving the uncertainties, and we would have to return to the first step of the process. Interrelations between the variables can thus be identified very effectively, enhancing the ability of the process to enhance manager's understanding of how the future will develop. With this done, the sources of competitive advantage under each scenario can be identified. This allows us to predict competitor behaviour in each scenario, and again, this may require another analysis of the industrial structure that would prevail under that scenario.

During the data gathering stage, Porter recommends the use of opinions from outside the industry or from newcomers to the industry as "soliciting opinions from outsiders new to the industry, who can view

it objectively, provides another mechanism for overcoming conventional wisdom"¹³. It is important that mechanisms are put in place to promote the development of different points of



¹³ Porter, Michael. (1985). Competitive Advantage. New York: The Free Press

view, and this method can be effective in introducing viewpoints that industry insiders may not have considered, although these viewpoints may be less informed. Porter also recommends that the search for sources of uncertainty begins within the industry, but is continued outside the industry, as the impact of new entrants is often less predictable than start-ups from competitors.

Furthermore, Porter justifiably believed it to be important to ensure that the managers find the process credible, and in order to achieve this, he recommends that, “it is important to build at least one scenario around assumptions that reflect [senior management’s] commonly held beliefs”¹⁴. However, although implementing this may make the scenario process more accessible to managers, there is also the danger that managers will believe the scenario that contains their basic assumptions to be the most likely to occur, and will try to plan for that eventuality.

Once the scenarios were generated, Porter recommended five simple approaches to planning the subsequent strategy – planning under the assumption that the most probably scenario would result, planning as if the most preferable scenario would come to pass (a highly risky strategy, especially if no consideration is given to the consequences of another scenario occurring), hedging so that the company would minimise its losses, even if the least favourable scenario would result (also known as the maximin approach, which can minimise losses, although it may do this at the cost of eliminating any possibility of gaining significant profitability), trying to preserve the flexibility to adapt to the likely future conditions according to the signs that were identified during the scenario building process, or trying to influence the drivers in order to ensure that a particularly favourable set of circumstances would result in the future.

In order to take advantage of these possible strategic responses, Porter recommended that, “scenario variables and their causal factors should be the focal point for gathering market intelligence. Changes affecting scenario variables are warning signs of industry structural

¹⁴ Ibid

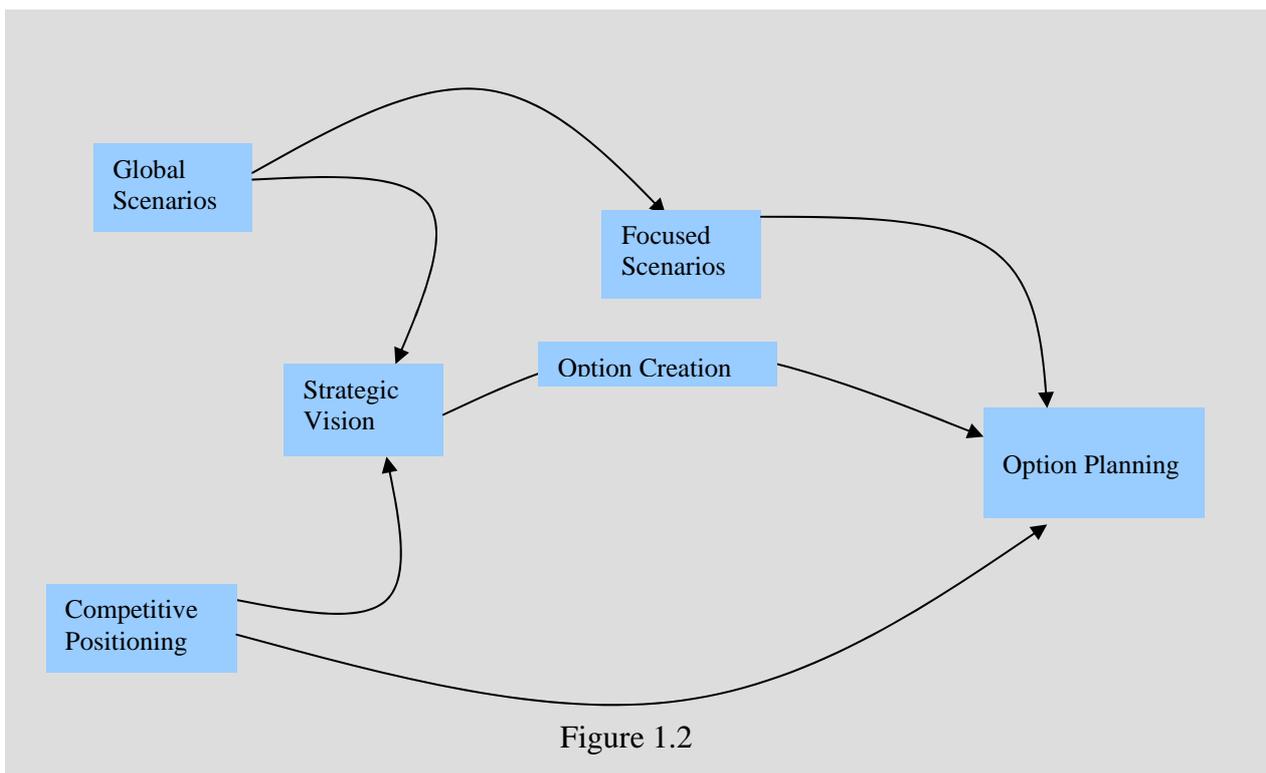
change”¹⁵. This is an important idea, as one of the key strengths of the scenario planning process is in enabling managers to understand how the various drivers inter-relate to affect the future, and by identifying which signs need to be observed, managers can use this understanding fully in order to improve the quality of their strategic thinking and decision-making.

Finally, in order to further help managers make full use of the scenarios developed, Porter outlined several internal factors that should determine the companies’ strategic response to the scenarios developed: whether the company has the first-mover advantage in an industry, what the firm’s current competitive position is, the costs and resources required in order to plan for each scenario, when they would need to be committed, the consequences of planning for a scenario that does not actually come to pass, the probability of each scenario becoming a reality, the cost of changing plans and how the company expects that the competition will react to the future developments.

The process detailed by Pierre Wack, which he pioneered to great effect at Shell in the early 1970s, focused particularly on the behaviour key players in Shell’s business environment (such as OPEC), rather than looking beyond it for sources of uncertainty. His process then became similar to Porter’s; examining how each of these players would act given the development of certain drivers, and what effect that behaviour would have, in order to develop the actual scenarios. Wack also suggested that as a next step, further scenarios should be developed in order to clarify the details of the more likely scenarios, for example at Shell it appeared likely that there would be large fluctuations in the price of oil, and so more scenarios were generated to illuminate what the likely timing, and effect of the timing, would be. Although this step would prove very useful in deepening managers’ understanding of the future, it would also be extremely costly and time consuming, and it is unlikely that an organisation which was new to the scenario thinking process would want to spare the resources to accommodate this extra step.

¹⁵ Porter, Michael. (1985). Competitive Advantage. New York: The Free Press

In order for the scenarios to be effective at promoting strategic action, Wack believed that the scenario planners should keep the organisation's goals in mind at every stage of developing the scenarios, and to link them to option planning and strategic vision, since "the greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic"¹⁶. This step is a particularly important one, and would prove effective both at making the scenario planning approach more useful to managers, as well as making it easier for the managers to move from hypothetical scenarios to real action. In order to achieve this, Wack detailed a flow diagram (figure 1.2) to explain how the global scenarios and the current competitive positioning both contribute to the strategic vision, which allows the creation of options which can be considered in view of the current competitive position and the global and focused scenarios that have been developed.



During the 1990s, Paul Schoemaker was one of the most productive academics on scenario thinking, focusing on the particular applications of scenario thinking as well as introducing the concept. He defined ten key steps involved in scenario building:

¹⁶ Wack, Pierre. (1985, September-October). *Scenarios: Uncharted Waters Ahead*. *Harvard Business Review*. Number 5, citing Drucker

- (1) Defining the scope and time frame of the project, and how much data to include
- (2) Identifying the major stakeholders involved in the project
- (3) Identifying the basic, predetermined trends which, like Porter, Schoemaker used to construct the basic form of the scenarios
- (4) Identifying the key uncertainties that would determine the differences between the scenarios
- (5) Using the uncertain variables to construct the initial, broad scenarios
- (6) Appraising the scenarios for internal consistency, plausibility, compatibility with the scope of the project and whether they would result in changes in stakeholder behaviour that would themselves have an impact on the future
- (7) Focusing in on the broad scenarios by developing learning scenarios around the emerging trends
- (8) Identifying any gaps that would require further research
- (9) Using quantitative models to re-examine the scenarios for consistency
- (10) Finally, generating the decision scenarios and dealing with the real strategic issues they raise.

Although this process is very similar to that defined by Porter in 1985, taking advantage of many of the advantages of Porter's process, but not making an attempt to improve upon any of the weaknesses of Porter's approach, Schoemaker also agreed with Wack that scenarios-within-scenarios could be used to focus on the details of the larger macro-scenarios - "usually, there is no unique solution to this challenge, which itself may prompt a respecification of the original issues, trends and uncertainties. As such, they function as learning scenarios in which various interactions and issues are further explored and researched"¹⁷. Looking at the global- or macro-scenarios would help with identifying the factors necessary for a PEST analysis of the industry, and subsequent creation of industry scenarios. In turn, the definition of industry drivers and scenarios can aid a five forces analysis of the industry, resulting in scenarios for the firm itself, which can be used to guide strategic thinking. This effective framework acts as an improvement upon Wack's idea of

¹⁷ Schoemaker, Paul. (1991). *When And How To Use Scenario Planning*. *Journal of Forecasting*. Vol. 10

focusing in the scenario by providing a more systematic means to do so. However, it still suffers from the disadvantage of requiring significantly more time and resources to pursue than Porter's approach. The relationships between the three different levels of are shown in the flow diagram in figure 1.3.

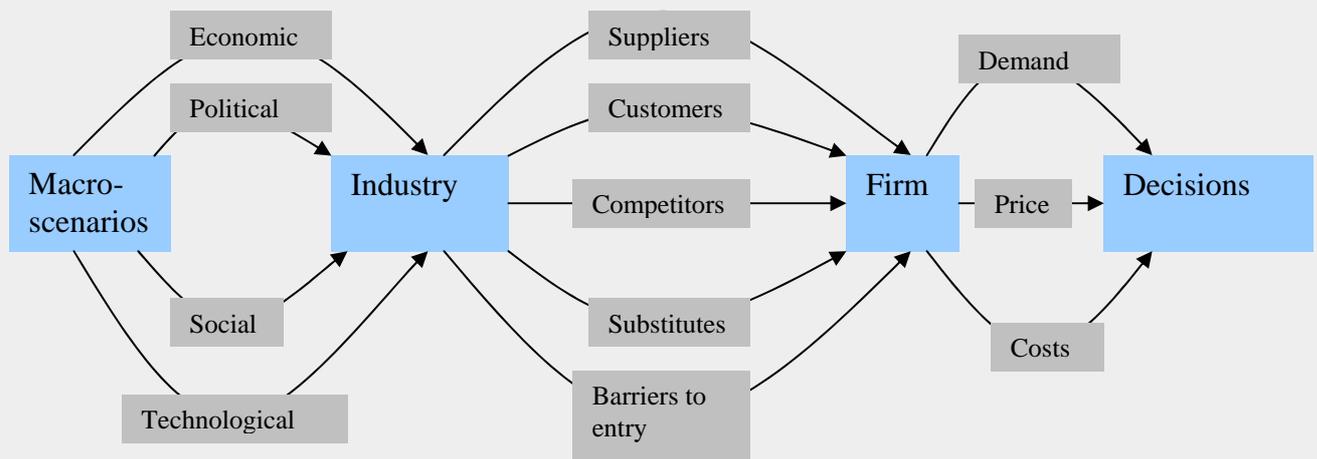


Figure 1.3

Further to this, Schoemaker defined three different ways that the variables and drivers could be grouped into scenarios: intuitively, by looking at the data holistically once it has all been gathered, and identifying any trends that stand out, allowing a full use of the data, but risking the introduction of subjective biases in what data to use; heuristically, by identifying the two most important drivers and using a matrix of them and their most likely future outcomes as a starting point for the scenarios before bringing in the other uncertainties, which risks ignoring the influence of the other, less important, drivers, which may nonetheless have an important influence on how the future may develop; statistically, by combining the outcomes of the uncertainties into internally consistent strings in order to provide feasible boundaries, which requires more expertise than the other methods (although this expertise is likely to be accessible to most companies employing this approach), but avoids the possibility of subjective bias without restricting the number of drivers used to base the scenarios on. Once these scenarios had been developed, Schoemaker believed that it could be useful to assign probabilities and utilities to the scenarios, in order to use a pay-off matrix and calculate the

worth of different strategies under different scenarios according to decision theory, but also acknowledged that because the scenarios are unlikely to be exhaustive, the scenarios would probably be too far removed from the resulting real futures for the assigned utilities to be sufficiently accurate.

In order to use the scenarios for strategic planning, Schoemaker recommended that the companies examine which competencies would be required given the evolution of a particular scenario, and to compare this to the competencies that the company currently possesses in order to determine which key competencies they should seek to develop. This method of using the scenarios carries the additional benefits of encouraging managers to appraise their own business, and to make the scenarios more personal, by forcing managers to think about how their companies' strengths will help, or even hinder them in the futures that may develop.

Another major theorist of the 1990s was Gareth Price, who first defined the 'St Andrew's Approach', which differed from the approaches of Porter and Schoemaker with the principle that only the information contained in scenarios should be presented to the client, not the implications for them or any strategic actions that the scenario planners may think the client ought to take. Despite the serious danger of failing to sufficiently link the development of scenarios to actual strategic action, Price believed that the scenarios would be accepted more readily by the client if they did not presume to suggest how the client ought to act as a result of the generation of the scenarios. However, the three key stages of scenario building that Price identified; diagnosis of the issues seen by the contributors as important, exploration of future developments of the most critical drivers and bringing these developments together to form scenarios; were still very similar to the traditional method outlined by Porter in 1985. Price is also the first author in the literature to define the 'normative approach' as an alternative to the conventional approach, whereby the scenario planner builds their scenarios by starting with a set of assumptions about how the future will evolve, and understands the future by tracing back the necessary causal events that would bring about these futures.

Like Schoemaker, Price believed that scenario planners should assign quantitative values to scenarios, since,

“in preparing the outputs, it is essential to concentrate on the logic of what is being offered. In addition, while scenarios are largely conceptual stories, it is also essential that an analytical quantification of their outcomes be provided. Managers will still need the numbers if they are to be convinced”¹⁸.

However, with this approach, Price ignores the danger that the managers will not fully appreciate the numbers, and will latch onto the scenario with the highest probability of occurring as the only scenario that they should prepare for.

Antonio Martelli’s main contribution to the literature was the definition of eight different approaches that one can take to the development of scenarios, designed to cover the full range of different uses of scenarios and the different approaches that can be taken to generate them. He defined explorative scenarios as those scenarios which are constructed in order to explore the future consequences of current trends. Anticipatory scenarios are similar to Price’s (1994) definition of the normative approach, in that they start with particular assumptions about how the future may evolve and trace back the requisite causal factors. The descriptive approach to building scenarios was defined by using particular trends to imagine how the future may evolve, for example, how Britain would develop if its GDP growth was 5% for the next 20 years. The normative approach, by contrast, involves frequent use of simulation techniques. The intuitive method involves a more general use of all of the scenario-building resources; “intuitive logics allow the use of virtually all the research and/or forecasting techniques available, giving the scenario-builder a very large freedom in choosing and adapting them to the case in hand”¹⁹. The morphological analysis of drivers, however, cuts down the numbers by using particular ‘factors of exclusion’ in order to build the scenarios around only the most critical drivers, risking the exclusion of drivers which do not currently appear influential, but may evolve to have a significant effect on the future. The trend impact analysis method is a very quantitative approach, defined as having 5 key steps: first of all, the critical system drivers are identified. Next, the variables to be used are chosen according to their impact on the system as defined by a regression analysis. The future developments of

¹⁸ Price, Gareth (1994). *Scenario Planning As Discipline*. [University of St Andrews Draft Working Paper](#).

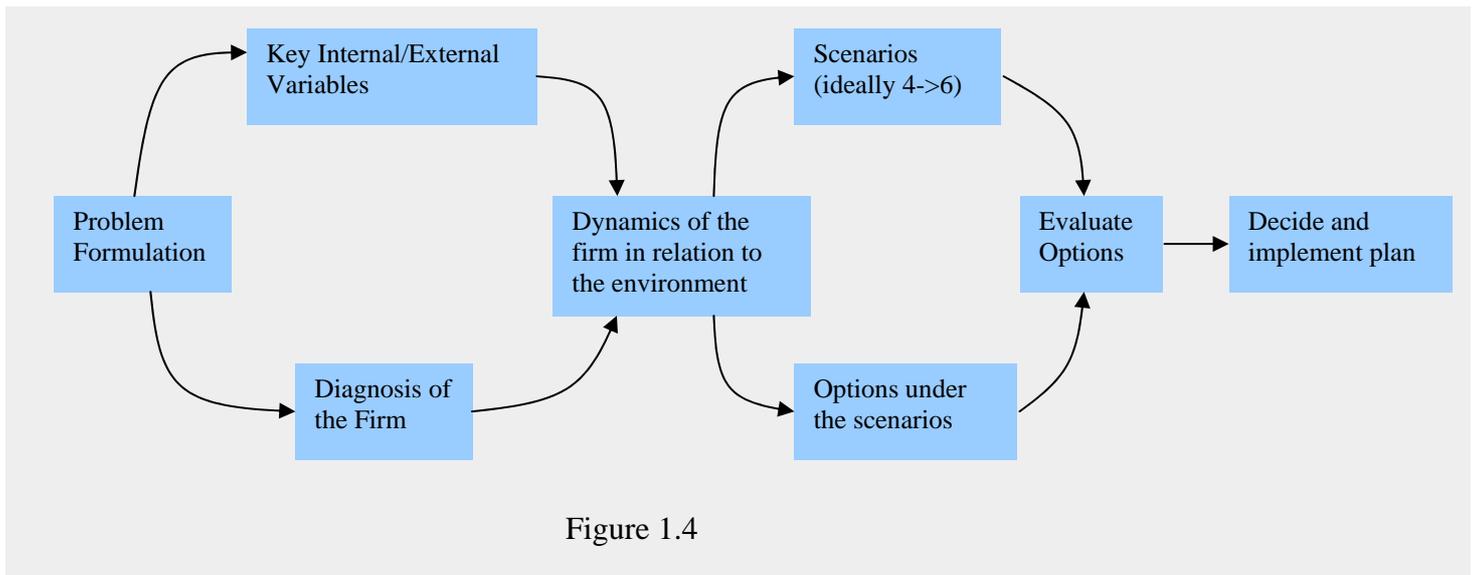
¹⁹ Martelli, Antonio. (1996). *Scenarios And Business Strategy*. [CEMS Business Review](#). The Netherlands: Kluwer Academic Publishers

these variables are then forecast using trend projection techniques before analysing the effects of these projections on the other variables. Finally, the scenarios are created from the resulting data. Another quantitative approach is the cross impact analysis, whereby the interactions of the variables are examined by constructing a matrix and cluster analysis used to identify the groups that can then form the basis of the scenarios. These two approaches require more expertise than some of the other approaches, although this will also lend them more credibility with managers who are more used to forecasting techniques, however, they also lack some of the flexibility of a more subjective approach, and the divergent view points that they can bring

Like the other major theorists of the 1990s - Price and Schoemaker – Martelli believed that it was dangerous not to assign quantitative values to the outcomes of the scenarios, as this could bring about an overly subjective mindset and result in the scenarios being too deeply based on assumptions.

Like authors such as Porter, Michael Godet warns scenarios planners against being too cautious in their approach to strategic planning based on developed scenarios; “the danger here, however, is refusing to take a risk by adopting a strategy that rejects risky options that could, however, turn out to be very profitable, and falling back on choices with gains as low as the risks”²⁰, although this approach also risks committing too many resources to planning for a future that may not occur. Godet sets out a flow chart (figure 1.4) that explains how scenarios can be combined with problem formulation in order to generate strategic options:

²⁰ Godet, Michael. (2000). *The Art Of Scenarios and Strategic Planning: Tools and Pitfalls*. Technological Forecasting and Social Change, 65, pp. 3-22



The description of the scenario building process offered by Grinyer in 2000 focused more on involving the client in the process, as this had by then been identified as a vital element determining the success of the scenario thinking process. In order to achieve this, Grinyer recommends that the scenario planner first begins with an analysis of the documents relevant to the client, in order to give them a strong background on the case. Although largely ignored by other theorists, this step can be important to lending the scenario process more credibility, especially if it is to be performed by an external group, as it demonstrates a commitment to the client and can increase the scenario planner's understanding of the market in which they operate. Also, because "early commitment by a powerful coalition is essential if fundamental change is to occur"²¹, "to ensure commitment, and to give him/her shared ownership of the project from the outset it is important that the principal client, normally the chief executive, should be involved in setting the frame for, in shaping the project, and announcing it to senior executives and more widely in his/her company"²².

Grinyer makes another important point, believing that maintaining divergent viewpoints, especially on sensitive topics, is important to creating scenarios based on as wide a range of opinions as possible, and so it is vital that confidentiality with interviewees is maintained. Furthermore, he defines seven key questions which it is useful to ask at the interview stage in

²¹ Grinyer, Peter. (2000). *A Cognitive Approach To Group Strategic Decision Taking: Discussion Of Evolved Practice In The Light Of Received Research Results*. *Journal of Operational Research Society*, 51

²² Ibid

order to best understand what the most important factors affecting the client's business are: "what questions would you put to a trusted clairvoyant and with respect to what time horizon?", "paint an optimistic but realistic scenario for this horizon", "describe a scenario that might occur for this horizon if things went badly, and what factors are most crucial for determining whether the optimistic or pessimistic scenario occurs", "please describe the situation today focusing on the factors that most affect current performance and the future strategic position, including internal situation, customers, stakeholders and competitors", "what immediate changes would improve the chances of the optimistic scenario" and "what would you like to be remembered for on leaving your organisation?"²³.

Because he believed it to be important to maintain divergent viewpoints at the discussion stage of the process, Grinyer advised that the discussion phase of the project would be more effective if an external facilitator be used, as "an internal facilitator may find it difficult to resist attempts to dominate by, say, the chief executive"²⁴. Finally, Grinyer believed that the workshop should always finish with a consideration of the strategic implications; "a workshop should not conclude before options have been generated, analysed, decisions made to reject, explore further by collection and analysis of further data or accept each"²⁵.

The theorist Ian Wilson also focused on how scenarios should be used once generated, detailing four different strategic approaches to the results of a scenario planning process in his 2000 article, "From Scenario Thinking To Strategic Action". The first technique he recommended is the sensitivity/risk assessment approach, whereby scenarios are used to evaluate whether or not to pursue a particular strategic option. The set of conditions that would justify a 'yes' decision are defined first, and then the scenarios are used to compare how resilient or vulnerable a 'yes' decision would be under each scenario. This simple technique can be quite effective for simple yes/no decisions, however it lacks the versatility to deal with more complex strategic decisions or to generate new strategic options. The second technique is the strategy evaluation approach, which is best employed in testing a current

²³ Grinyer, Peter. (2000). *A Cognitive Approach To Group Strategic Decision Taking: Discussion Of Evolved Practice In The Light Of Received Research Results*. Journal of Operational Research Society, 51

²⁴ Ibid

²⁵ Ibid

strategy, and involves examining what the key objectives and purpose of the strategy are, and how successful the current strategy would be at achieving those in each scenario. This technique has the advantages of being easy for managers to understand, and will also appear more relevant to them as it targets the organisation's 'bottom line' objectives, however, it is not so effective at encouraging managers to 'think the unthinkable' or to generate new strategic options. The third and fourth techniques recommended by Wilson target strategic option generation more directly, but differ in how they use the scenarios. Under the scenario development (with a planning scenario) approach, several scenarios are developed, and assigned subjective probabilities. The most probable scenario then becomes the 'planning scenario', and forms the basis of a strategic plan of how to react to the occurrence of that scenario, and the resilience of the plan is tested against what would happen under the other scenarios.

Although Wilson recognises that there is a danger that managers will ignore the less likely scenario, he points out that as a result, it can form a useful stepping stone between the forecasts that they may be useful and the less quantitative and tangible approach of scenario thinking. The last technique recommended by Wilson is the strategy development (without a planning scenario) approach, where managers are encouraged to ignore the varying likelihoods of each scenario occurring, and to formulate a plan that would be resilient to the occurrence of any of the scenarios, and maximise the achievement of their objectives no matter what happened, by investigating what the ideal strategy for each scenario would be, and attempting to combine them. This last method is the most likely to produce effective strategies, and avoids the problems associated with assigning subjective probabilities, but is also the most difficult for managers to understand and participate in.

Since 2000, Van Der Heijden has been one of the biggest contributors to the literature on scenario thinking, working in conjunction with a number of other theorists such as Schutte (2000) and Burt (2003). Van Der Heijden described the scenario thinking process by, "essentially we put ourselves at a future vantage point and describe what is going right now

as if we were looking at what is happening today from the perspective of a future historian”²⁶. He also suggests that in order to facilitate the move from creating scenarios to embodying their results in strategic action, “it is important to clearly formulate the wider organisational objectives one is pursuing in advance”²⁷, an important step in formulating strategic vision, however it does also raise the risk that the scenario development will be biased towards conditions that make the achievement of the organisations’ goals more likely.

In order to determine which scenario thinking process ought to be followed, Schutte and Van Der Heijden (2000) defined eight questions which can effectively elicit the necessary information to plan how to approach the scenario thinking process: “to what degree are management involved in the process”, “are the builders also the users, and what is the role of the experts”, “how much research and technical support is required”, “how will the scenario use process be organised”, “what resources are available for process support”, “what approach will be used”, “what is the scope of the planning project” and “how challenging must the scenarios be?”

In order to use the scenarios, Van Der Heijden defines a typology according to whether the scenario process is a one-off action (content) or whether it is ongoing (process), and whether the purpose is to encourage management to think about the variables affecting their company and how they may develop in the future (thinking) or whether the purpose of the scenario thinking process was to guide subsequent strategic action. This typology is shown in figure 1.5:

| | Content | Process |
|-----------------------|------------------|-------------------|
| Thinking (Opening up) | Making Sense | Anticipation |
| Action (closure) | Optimal Strategy | Adaptive Learning |

Figure 1.5

²⁶ Van Der Heijden, Kees. (2004). Can Internally Generated Futures Accelerate Organisational Learning? *Futures*, 36: pp. 145-159

²⁷ Van Der Heijden, Kees and Schutte, Peter. (2000, February/March). *Look Before You Leap: Key Questions For Designing Scenario Applications*. *Scenario and Strategy Planning*, Vol. 1, Issue 6.

Although the prevailing wisdom of theorists in the 1990s suggested that scenarios should be assigned quantitative outcomes, Goodwin and Wright disagreed with this viewpoint, pointing out that “the psychological biases associated with subjective probability estimation, such as overconfidence in prediction, have been widely researched and documented”²⁸.

Goodwin and Wright define three different heuristics for promoting action based on the scenarios developed. The lexicon heuristic examines the most important objective in each scenario only, and examines which strategy would perform best at achieving this objective. This method has the advantage of simplicity, but this is also a disadvantage, as there is rarely only one important objective, and even if there is only one significant objective, it is still important to examine how the future conditions affect the achievement of the other objectives. If there are two or more objectives of equal importance in the scenario, then Goodwin and Wright recommend the use of the semi-lexicon heuristic, where the strategic options that maximise the achievement of the second or third most important objectives are selected, avoiding some of the problems of the rather simple Lexicon heuristic without adding too great a level of complexity. Finally, the elimination-by-aspects (EBA) heuristic sets cut-off values for each important objective in each scenario, and any strategic options which fail to meet these cut-offs are eliminated. This approach has the advantage of using the available data more fully, but can be more difficult for managers to use and understand.

In addition, Goodwin and Wright contributed to the development of the scenario thinking process by defining a powerful checklist of five qualities that a good scenario thinking approach should have: transparency that makes it easy for users to understand how the scenarios were generated, ease of judgement to allow them to make decisions on the basis of the understanding that can be gained from the scenarios, the versatility to deal with a variety of different organisational objectives, the flexibility to be able to accommodate changes in perspective as new insights are gained and incorporated, and also theoretical correctness.

Finally, Van Notten has been the most recent theorist to update the scenario typology defined by theorists such as Martelli, explaining a typology of six different approaches, based on the

²⁸ Goodwin, Paul and Wright, George. (2001, January). *Enhancing Strategy Evaluation in Scenario Planning: A Role For Decision Analysis*. *Journal of Management Studies*, 38:1, citing the research of Hogarth and Makridakis in 1981 and Tversky and Kahneman in 1974

goals of the scenario building process, the actual design of the process and the content of the scenarios. Where the goal of building scenarios is to raise awareness of the effects of future variables (this was one of the most important results of Pierre Wack's pioneering work at Royal Dutch/Shell), the scenario process can be said to be exploratory. If the purpose is to support decision making, then the causal factors that drive the evolution of particular futures are examined. An intuitive process is defined by Van Notten as using mostly qualitative data and logics, in contrast with the formal design, which makes a greater use of quantitative data and analytical techniques. Descriptive scenarios are defined by Van Notten as those scenarios which look at a variety of possible futures, rather than normative scenarios, where the focus is on very particular scenarios – either the most plausible or preferable to the company.

Areas of effectiveness and drawbacks

Having reviewed how the term 'scenario' is defined in the literature, and the different techniques and processes that the key theorists recommend using, we will next review the reasons given by the most influential writers in the field for using scenarios, considering where they are most effective and what their function is. However, we will also examine the weaknesses of the scenario approach, the areas where biases and errors can occur and where it can be inappropriate to use scenario thinking.

As one of the pioneers of the civilian use of scenarios, Wack believed that scenarios were an effective way to encourage firms to adapt to their environment, and to try to predict what changes may be required; "from studying evolution, we learn how an animal suited to one environment must become a new animal when the environment undergoes severe change"²⁹. Based on this, Wack suggests that, "scenarios serve two main purposes: the first is protective – anticipating and understanding risk. The second is entrepreneurial – discovering strategic options of which you were previously unaware"³⁰.

²⁹ Wack, Pierre. (1985, November-December). *Scenarios: Shooting The Rapids*. Harvard Business Review. Number 6

³⁰ Ibid

However, an important focus of Wack's work was on making the scenario thinking approach understandable and accessible to managers, as "managers will only accept scenarios when their common pre-determined elements enter and unfold in their minds...scenarios on their own, that is mere descriptions of alternative courses of events would be alive in the minds of managers as long as a tree without roots"³¹. The quote demonstrates Wack's awareness that one of the main drawbacks of the scenario planning approach is that it is more difficult for managers to understand, particularly compared to a forecast, and so it may be difficult to ensure that managers accept the scenario thinking approach and are prepared to act on its results.

Porter's view of the importance of scenarios focused extensively on the data itself, and the analysis, largely ignoring the effect of the scenario generation on management's preconceptions about their environment. Porter believed that, "a scenario must seek to expose the second-order effects of structural changes that result from one industry change affecting others"³². Porter goes on to explain that, "each scenario is, in effect, a full analysis of industry structure, competitor behaviour and the sources of competitive advantage under a particular set of assumptions about the future"³³. Porter's description of the scenario thinking process is also focused towards providing a guide for the development of strategic decisions, especially that, "scenario variables and their causal factors should be the focal points for gathering market intelligence. Changes affecting scenario variables are warning signs of industry structural change"³⁴.

Despite this focus on the use of scenarios in strategy generation, Porter also effectively emphasises a key limitation to the scenario thinking process, that "the industry scenario tool is *not* sufficient for strategy formulation in and of itself. Rather, scenarios provide a framework for formulating strategy under conditions of uncertainty"³⁵. The identification of this limitation is important, as it is one that can lead to a misuse or misunderstanding of the scenario thinking tool by managers, and the extra thought that is required in order to bridge the gap between

³¹ Ibid

³² Porter, Michael. (1985). Competitive Advantage. New York: The Free Press

³³ Ibid

³⁴ Porter, Michael. (1985). Competitive Advantage. New York: The Free Press

³⁵ Ibid

scenarios and the generation of strategic options can be seen as a weakness in the process by some managers.

Whereas Porter focused particularly on the potential of scenarios for generating and evaluating strategic options, Schoemaker's descriptions of the applications of scenarios focused more on the 'anticipation' purpose that Wack defined in 1985, stating that "the focus is not on forecasting the future, or fully characterising its uncertainty, but rather on bounding the uncertainty"³⁶ and that "scenarios explore the joint impact of uncertainties, which stand side-by-side as equals"³⁷. Further to this, Schoemaker (1995) defines a useful list of seven areas where the use of scenario thinking is particularly important: when uncertainty is greater than management's ability to predict or adjust to, where costly surprises have previously hurt the firm, where the quality of strategic thinking and option generation is low, when the industry has or will experience significant change, if the company wants to develop a common language, where strong differences of opinion exist or if the competition are using scenario thinking.

Throughout the scenario thinking literature, the complexity of understanding and acting on scenarios is cited as one of its greatest weaknesses, and as one of the biggest hurdles that scenario planners must overcome if fundamental change is to result from their efforts. Gareth Price sums this up particularly well, commenting that, "scenario planning is a more complex challenge for managers than responding to a forecast. With a forecast, they only have to match what is indicated. If the forecast is wrong, the fault can be laid with the forecast"³⁸. It is for this reason that it can be inappropriate to use scenario planning if the organisation's culture is particularly quantitative.

However, Price also points out one of the biggest advantages of scenario planning; "an essential requirement is that of exploring when a trend might break. Exponential growth does not go on for ever"³⁹. The point here is that the use of scenario thinking can alert managers to

³⁶ Schoemaker, Paul. (1991). *When And How To Use Scenario Planning*. *Journal of Forecasting*, Vol. 10

³⁷ Schoemaker, Paul. (1995). *Scenario Planning: A Tool For Strategic Thinking*. *Sloan Management Review*, Winter

³⁸ Price, Gareth (1994). *Scenario Planning As Discipline*. *University of St Andrews Draft Working Paper*

³⁹ Ibid

the fact that the conditions they are used to can change unexpectedly, and this awareness can stretch their mental models and allow them adapt better than the competition to the changes that may about to affect their industry.

Like Schoemaker in the 1990s, Van Der Heijden's work since the 1990s highlights the capability of scenarios to bound and understand the future uncertainties that the business may face; "the main purpose of the scenario approach is to make users aware of the uncertainties relating to possible new issues and 'business logics', sensitising them to relevant signals in the environment"⁴⁰. However, like Price he also recognises the powerful effect that the scenario thinking process can have on broadening the perceptions of managers, stating that one of the purposes of scenario thinking is, "acknowledgement that the world at large is too complex to render notions of true and false meaningful and refocusing on navigation through the world of evolutionary principles based on trial and error"⁴¹. Importantly, the discovery of new strategic options is also listed as a key strength of scenario thinking, as a result of the broadening perceptions of managers – a useful advantage to state when trying to sell the use of scenario thinking to doubting managers. Hence, Van Der Heijden's questions of; "will perceptions be broadened, are mental models being stretched, are new opportunities being discovered, is understanding shared, is a vision of the future emerging?"⁴² provide a good checklist for appraising the effectiveness of a scenario thinking process.

Another theorist who acknowledges the ability to stretch the mental models of managers as a vital strength of the scenario thinking process is Grinyer, who points out that, "there is a continuing need for senior managers to develop coherent, well-articulated cognitive structures or mental models which accurately map the key aspects of their business and its environments"⁴³.

⁴⁰ Van Der Heijden, Kees and Schutte, Peter. (2000, February/March). *Look Before You Leap: Key Questions For Designing Scenario Applications*. Scenario and Strategy Planning. Vol. 1, Issue 6.

⁴¹ Van Der Heijden, Kees. (2004). *Can Internally Generated Futures Accelerate Organisational Learning?* Futures, 36: pp. 145-159

⁴² Van Der Heijden, Kees and Schutte, Peter. (2000, February/March). *Look Before You Leap: Key Questions For Designing Scenario Applications*. Scenario and Strategy Planning. Vol. 1, Issue 6.

⁴³ Grinyer, Peter. (2000). *A Cognitive Approach To Group Strategic Decision Taking: Discussion Of Evolved Practice In The Light Of Received Research Results*. Journal of Operational Research Society, 51

Wilson also believed that scenarios have a major advantage over forecasts in their ability to broaden the perceptions of managers, stating with particular effectiveness by writing “however good our futures research may be, we shall never be able to escape the ultimate dilemma that all our knowledge is about the past and all our decisions are about the future”⁴⁴. Wilson also acknowledges the contribution of Schoemaker to the literature, and like him he defines scenarios by, “scenarios, as a collection of futures, are intended to establish the boundaries of our uncertainties and limits to certain futures”⁴⁵. Like Porter and Price however, he recognises that, “although developing coherent, imaginative and useful scenarios is certainly important, translating the implications of the scenarios in to executive decisions and ultimately into strategic action was the ultimate reason and justification for the exercise”⁴⁶. Godet backs up Wilson on this point, stating that, “a scenario is not an end in itself, it only becomes meaningful when its results and implications are embodied in real action”⁴⁷.

In Stevenson’s 2001 article, “The future of future studies,” Stevenson criticises the scenario thinking approach for being too far removed from actual strategic action, saying that they are “often used for forecasting alternative scenarios rather than envisioning them. It often works with two scenarios, remaining in an either/or world of binary oppositions, good and bad. Multiple alternatives are not so common, thus restricting innovation”⁴⁸. Although this may be true of much scenario work, it cannot truly be counted as a inherent flaw in the scenario process, as there are many authors (Wack 1985, Schoemaker 1991, Price 1994, Godet 2000) that recommend the construction of at least three scenarios, and can only be considered a true criticism of a flawed approach taken by individual scenario planners.

Stevenson also points out that many scenarios under-use their key strength in long-term planning, and that “much scenario work is also too timid in terms of time. It looks merely five to ten years ahead. Little qualitative change can be expected in such short-term horizons”⁴⁹. Again, this criticism is not entirely justified – perhaps the most famous use of scenarios and display of their effectiveness was Wack’s work on scenarios at Royal Dutch Shell, where the

⁴⁴ Wilson, I. (2000). *From Scenario Thinking To Strategic Action*. Technological Forecasting and Social Change. 65. pp. 23-29

⁴⁵ Ibid

⁴⁶ Wilson, I. (2000). *From Scenario Thinking To Strategic Action*. Technological Forecasting and Social Change. 65. pp. 23-29

⁴⁷ Godet, Michael. (2000). *The Art Of Scenarios and Strategic Planning: Tools and Pitfalls*. Technological Forecasting and Social Change. 65. pp. 3-22

⁴⁸ Stevenson, T. (2001). *The Future of Futures Studies*. Futures

⁴⁹ Ibid

effectiveness of scenario thinking in helping managers to understand the future just two or three years ahead was crucial to the success of their application, and to Shell's rise from the smallest to the biggest of the world's major oil firms.

As well as criticising the actual application of the scenario process, Stevenson also criticises the idea of using data on the past to forecast the future, complaining that "projecting into the future from the past can easily carry forward the problems and limitations of the past. The past and present is perpetuated, whether qualitatively more or less of the same"⁵⁰. Although he raises a point that challenges nearly every method of understanding the future available to strategic planners, he cannot suggest an alternative, proving the dilemma described by Wilson, that "however good our futures research may be, we shall never be able to escape the ultimate dilemma that all our knowledge is about the past and all our decisions are about the future"⁵¹. McKay and McKiernan agree with this criticism of using the past to predict the future with their work on the dangers of counter-factual reasoning, explaining that, "one significant cause of faulty reasoning when generating scenarios is the analysis and use of historical data, and how thinking about the past can distort our ability to understand the future. In short, hindsight influences foresight"⁵².

The most recent works on scenario thinking still focus on many of the traditional strengths of the scenario approach; that "the objective of scenario planning is to generate a set of scenarios that collectively bound the perceived range of possible futures. This is achieved by permutating those uncertainties that will have the greatest perceived impact, positive or negative, on the issue of concern"⁵³ and that "scenarios do not attempt to predict or forecast the future, but to understand the critical uncertainties that organisations face in their strategic context. Such processes aim to challenge mindsets and provide learning for the future"⁵⁴.

This is a sign of the literature's consistency in explaining the advantages and drawbacks of scenario thinking, with the ability to anticipate and understand risk (Wack 1985, Wilson 2000, Price 1994, Van Der Heijden 2004) and to "treat the uncertain elements that drive future

⁵⁰ Ibid

⁵¹ Wilson, I. (2000). *From Scenario Thinking To Strategic Action*. Technological Forecasting and Social Change. 65. pp. 23-29

⁵² MacKay, Brad and McKiernan, Peter. (2004). *The Role of Hindsight In Foresight: Refining Strategic Reasoning*. Futures. 36: pp. 161-179

⁵³ Goodwin, Paul and Wright, George. (2001, January). *Enhancing Strategy Evaluation in Scenario Planning: A Role For Decision Analysis*. Journal of Management Studies. 38:1

⁵⁴ MacKay, Brad and McKiernan, Peter. (2004). *Exploring Strategy Context With Foresight*. European Management Review. 1: pp. 69-77

conditions in an internally consistent way so that the frontiers of people's reality can be expanded, and thinking the unthinkable, understanding the unthinkable and being prepared for the unthinkable becomes a sustainable source of competitive advantage"⁵⁵. The latter advantage allows scenarios to be an effective guide, although no more than a guide, to generating new strategic options and strategic vision (Schoemaker 1995, Van Der Heijden 2004).

However, it can also be difficult for scenario planners to convince managers to accept and act on scenarios due to their complexity and the fact that they are only a guide to strategic action, they are not enough by themselves to bring about fundamental changes in the companies' outlook or strategic planning capability (Stevenson 2003, Price 1994, Porter 1985, Wilson 2000, Godet 2000). Furthermore, there are some questions about the validity of using data from the past to predict how the future will evolve (Stevenson 2003, MacKay and McKiernan 2004).

⁵⁵ MacKay, Brad and McKiernan, Peter. (2004). *The Role of Hindsight In Foresight: Refining Strategic Reasoning*. Futures, 36: pp. 161-179

Literary Review Conclusion

Having reviewed how the term 'scenario' is defined by the different key theorists, which approaches each of the main contributors suggested and where the strengths and weaknesses of the scenario thinking approach lie, we found a large, though not universal, degree of consistency within the literature.

The term 'scenario' was generally taken to refer to an internally consistent set of future conditions that describe a plausible future which may come to pass at after a particular time horizon. Later definitions have emphasised the hypothetical nature of scenarios, referring to them as "stories"⁵⁶ or "postcards from the future"⁵⁷, making the point that they are not forecasts, nor are they strategies.

The basic scenario building process outlined consists of starting with a diagnosis of the issues seen by the contributors as important, followed by an exploration of a variety of plausible future developments of the most critical drivers, before finally bringing these developments together to form a set of coherent scenarios, and trying to link these to strategic action. The specifics of this process vary, although all of the theorists agree that it is vital to involve senior management in the process as fully as possible if fundamental change is to occur.

Scenarios are credited in the literature with two main areas of effectiveness: anticipating and understanding the risks the future may contain (Wack, Wilson, Price, Van Der Heijden), and stretching the mental models of managers so that they can think and understand the unthinkable, facilitating the generation of new strategic options which they may previously have been unable to imagine (MacKay and McKiernan, Schoemaker, Van Der Heijden). However, it must also be remembered that scenarios are not strategies, but useful tools to aid strategic planning, and because they are more complex and harder to use, they may also be less accessible and less readily accepted by managers than quantitative forecasting techniques.

⁵⁶ Van Der Heijden, Kees and Schutte, Peter. (2000, February/March). *Look Before You Leap: Key Questions For Designing Scenario Applications*. *Scenario and Strategy Planning*, Vol. 1, Issue 6

⁵⁷ MacKay, Brad and McKiernan, Peter. (2004). *Exploring Strategy Context With Foresight*. *European Management Review*, 1: pp. 69-77

A Comparison with other Methodologies

The following methodology section provides an overview of the various methodologies available when building futures and offers an analysis of the accuracy, reliability and utility of each approach. A summary table is given at the end of the section that demonstrates the value of scenario thinking against other approaches and how it is superior to others in analysing and preparing organisations for the future.

Forecasting

“Wrong when it hurts most.”

-- Pierre Wack, 1985

Forecasting continues to be one of the most favoured approaches to understanding and preparing for the future and when successful, it can provide an excellent estimation by often providing an accurate prediction of future events. However, this insight into the future is not absolved from inaccuracy as the reliability of the forecasting approach is greatly weakened when a stable operating environment becomes more changeable. Forecasting is especially rendered useless when the environment approaches a volatile state. As Pierre Wack further noted in his work with Royal / Dutch Shell;

“The most perilous forecasts to list to, are those, like the UPM, which have recently been correct, because probably they have been right for the wrong reasons, and you are tempted to believe them. Sooner or later their forecasts will fail when you need them most.”⁵⁸

Whereas forecasting attempts to predict the future by identifying patterns that have previously emerged in the past and endeavours to provide concrete predictions about future developments, scenario thinking offer a less precise though not necessarily less accurate approach. The forecasting and scenario thinking methods are contrasted by a quantitative and qualitative approaches to the future respectively.

As a result, the predictions that forecasting offer are frequently incorrect and whereas it can offer a good prediction in a stable environment, Scenario Thinking offers a superior approach that can prepare the organisation for a number of possible futures in a more volatile environment.

⁵⁸ MacKay, B. and McKiernan, P. 2005 *Lecture One, MN4225 Lectures Series*, University of St Andrews

The Delphi Technique⁵⁹

This method offers a creative exploration of ideas or the production of suitable information for decision-making and has been widely used to generate forecasts in technology, education, and other fields.⁶⁰ The Delphi Method is based on a structured process for collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback (Adler and Ziglio, 1996).

The following steps provide the basic format of the Delphi Method:⁶¹

1. Formation of a team to undertake and monitor a Delphi on a given subject.
2. Selection of one or more panels to participate in the exercise. Customarily, the panellists are experts in the area to be investigated.
3. Development of the first round Delphi questionnaire for decision making
4. Testing the questionnaire for proper wording (e.g., ambiguities, vagueness)
5. Transmission of the first questionnaires to the panellists
6. Analysis of the first round responses
7. Preparation of the second round questionnaires (and possible testing)
8. Transmission of the second round questionnaires to the panellists
9. Analysis of the second round responses (Steps 7 to 9 are reiterated as long as desired or necessary to achieve stability in the results.)
10. Preparation of a report by the analysis team to present the conclusions of the exercise

There are three key themes in the above steps that ensure the quality of the process, namely: structuring of information flow, offering feedback to the participants, and allowing anonymity for the participants.

The Delphi method works best when the group is geographically dispersed but who can interact with each other at regular intervals. The technique works best when the group

⁵⁹ Researched from the Illinois Institute of Technology; Forecasting the Impact of Technology at: <http://www.iit.edu/~it/delphi.html>

⁶⁰ Cornish, 1977

⁶¹ Fowles, 1978

members are experts in a particular field as it allows them to deal systematically with a complex problem or task. The decision questionnaires are designed to elicit and develop individual responses to the problems posed and to enable the experts to refine their views as the group's work progresses in accordance with the assigned task. The strength in this process is that it can overcome the disadvantages of conventional committee action by anonymity, controlled feedback, and statistical responses.⁶² The group interaction in Delphi is anonymous, in the sense that comments, forecasts, and the like are not identified as to their originator but are presented to the group in such a way as to suppress any identification. The underpinning strength is that the Delphi method allows the usual problems of group dynamics that can often hamper creativity and effective group work to be completely bypassed.

The Delphi method recognizes human judgement as legitimate and useful inputs in generating forecasts. Single experts sometimes suffer biases; group meetings suffer from "follow the leader" or Groupthink tendencies and a reluctance to abandon previously stated opinions.⁶³ In order to overcome these shortcomings the basic notion of the Delphi method, theoretical assumptions and methodological procedures developed in the 1950s and 1960s at the RAND Corporation.

Before deciding whether or not the Delphi method should be used, it is very important to consider thoroughly the context within which the method is to be applied (Delbecq et al. 1975). A number of questions need to be asked before making the decision of selecting or ruling out the Delphi technique (Adler and Ziglio, 1996):

- What kind of group communication process is desirable in order to explore the problem at hand?
- Who are the people with expertise on the problem and where are they located?
- What are the alternative techniques available and what results can reasonably be expected from their application?

⁶² Fowles 1987

⁶³ (Gatewood and Gatewood, 1983, Fowles, 1978)

Only when the above questions are answered can one decide whether the Delphi method is appropriate to the context in which it will be applied. Adler and Ziglio (1996) further claim that failure to address the above questions may lead to inappropriate applications of Delphi and discredit the whole creative effort.

The most extensive critique of the Delphi method was made by Sackman (1974) who criticizes the method as being unscientific and Armstrong (1978) who has written critically of its accuracy. Martino (1978) underlines the fact that Delphi is a method of last resort in dealing with extremely complex problems for which there are no adequate models. Helmer (1977) states that sometimes reliance on intuitive judgement is not just a temporary expedient but in fact a mandatory requirement. Makridakis and Wheelright (1978) summarize the general complaints against the Delphi method in terms of (a) a low level reliability of judgements among experts and therefore dependency of forecasts on the particular judges selected; (b) the sensitivity of results to ambiguity in the questionnaire that is used for data collection in each round; and (c) the difficulty in assessing the degree of expertise incorporated into the forecast.

Martino (1978) lists major concerns about the Delphi method:

- Discounting the future: Future (and past) happenings are not as important as the current ones, therefore one may have a tendency to discount the future events.
- The simplification urge: Experts tend to judge the future of events in isolation from other developments. A holistic view of future events where change has had a pervasive influence cannot be visualized easily. At this point cross-impact analysis is of some help.
- Illusory expertise: some of the experts may be poor forecasters. The expert tends to be a specialist and thus views the forecast in a setting which is not the most appropriate one.
- Sloppy execution: there are many ways to do a poor job. Execution of the Delphi process may lose the required attention easily.

- Format bias: it should be recognized that the format of the questionnaire may be unsuitable to some potential societal participants.
- Manipulation of Delphi: The responses can be altered by the monitors in the hope of moving the next round responses in a desired direction.

In general, the Delphi method is useful in answering one, specific, single-dimension question. There is less support for its use to determine complex forecasts concerning multiple factors. Such complex model building is more appropriate for quantitative models with Delphi results serving as inputs (Gatewood and Gatewood, 1983). This point is supported by Gordon and Hayward (1968) who claim that the Delphi method, based on the collation of expert judgement, suffers from the possibility that reactions between forecasted items may not be fully considered. The need for the cross impact matrix method of forecasting integrated with the Delphi method is pointed out by many researchers (Gordon and Hayward, 1968; Gatewood and Gatewood, 1983; Adler and Ziglio, 1996). An improvement in forecasting reliability over the Delphi method was thought to be attainable by taking into consideration the possibility that the occurrence of one event may cause an increase or decrease in the probability of occurrence of other events included in the survey (Helmer, 1978). Therefore cross impact analysis has developed as an extension of Delphi techniques and this is discussed later in this report.

Morphological Analysis

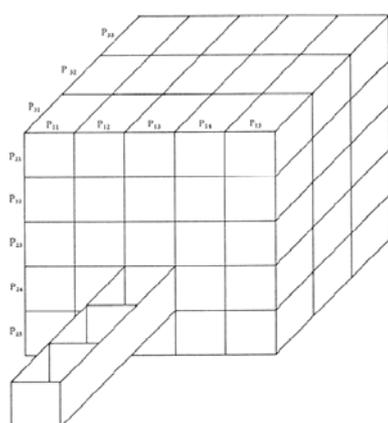
This method was developed by Fritz Zwicky, a Swiss-American astrophysicist and aerospace scientist based at the California Institute of Technology as a method for structuring and investigating the total set of relationships contained in multidimensional, non-quantifiable, problem complexes.⁶⁴ Zwicky applied this method to such diverse tasks as the classification of astrophysical objects, the development of jet and rocket propulsion systems and the legal aspects of space travel. More recently however, morphological analysis has been recognised

⁶⁴ Extensive method description on this matter can be found at: <http://www.swemorph.com/>

for its utility in scenario thinking, and it has been applied by a number of researchers in the US and Europe in the field of futures studies, policy analysis and strategic modelling.⁶⁵

The following five steps describe the morphological analysis process:

1. The problem to be solved must be very concisely formulated.
2. All of the parameters that might be of importance for the solution of the given problem must be localized and analyzed.
3. The morphological box or multidimensional matrix, which contains all of the potential solutions of the given problem, is constructed.
4. All the solutions contained in the morphological box (See diagram 2.5 below)⁶⁶ are closely scrutinized and evaluated with respect to the purposes that are to be achieved.
5. The optimally suitable solutions are ... selected and are practically applied, provided the necessary means are available. This reduction to practice requires in general a supplemental morphological study."



3-parameter Zwicky box
Figure 2.1

A morphological analysis is essentially a method based on a fundamentally scientific approach of alternating between analysis and synthesis, and is often strengthened by a "cross-consistency assessment". For this reason, it can be trusted as a useful, conceptual modelling method for investigating problem complexes, which cannot be treated by formal mathematical methods, causal modelling and simulation and is therefore ideal for approaching the

future. However, it is exceptionally important that no normative judgments should influence the cross-consistency assessment. As is the case with all methodologies, the output of a morphological analysis is no better than the quality of its input. However, even here the morphological approach has some advantages. It expressly provides for a good deal of in-

⁶⁵ Ritchey, T 2004 *Developing Threat Scenarios and Strategy Models with Computer Aided Morphological Analysis*, Military Government and Aerospace Simulation Symposium

⁶⁶ Zwicky, 1969, A 3-parameter Zwicky box containing 75 cells from: <http://www.swemorph.com/ma.html>

built “garbage detection”, since poorly defined parameters and incomplete ranges of conditions are immediately revealed when one begins the task of cross-consistency assessment. These assessments simply cannot be made until the morphological field is well defined and the working group is in agreement about what these definitions mean.

This type of garbage detection is something that strategy analysis and futures studies certainly need more of. Therefore, a morphological analysis can often be used at a later stage in a scenario thinking process as it can further corroborate the outline of a scenario and specify the scenario to a further level of detail.

Intuitive logics⁶⁷

Intuitive Logics is a very open-ended method that tends to rely on both the generative methods such as brainstorming and future imaging, as well as the simple systems methods of a four field analysis such as the scenario cross to develop an initial outline scenarios.

The approach was first described by Pierre Wack in 1985 and later developed by SRI the Global Business Network and Shell. The method is best suited to use every available information about the future as it generates new ideas and it can help in identifying underlying patterns. However, intuitive logic is also strictly connected with the experts who work on the scenario and as the techniques are assembled together in the most varied way, it is consequently difficult to check the validity of the particular approach adopted from a scientific point of view.⁶⁸

⁶⁷ Sometimes referred to as the ‘*Shell approach*’ to Scenario Thinking

⁶⁸ Huss, Honton 1987, Martelli 2001

The French School

“La Prospective is a blend of tools and systems analysis”

--M. Godet 2000

The French School, otherwise also known as the *La Prospective School* was recognised after the work in the mid-1970s by Godet, the then head of the Department of Future Studies at SEMA (a firm active in the defence sector) that began to develop scenarios for several French national institutions such the electricity company (EdF) and Elf. Although firmly rooted in the La Perspective methodology developed by Berger, Godet began to develop his own largely mathematical and computer-based probabilistic approach to scenario development, which he suggests, “stands apart because of its more integrated approach and use of mixed systems analysis tools and procedures”, including morphological analysis for scenario building, Micmac for identifying key variables, Mactor for analysis of actors’ strategies and Smic-Prob-Expert for determining the probability of scenarios.⁶⁹ Despite these differences, the collectivity of the systems developed by the Futuribles Group and Godet have since come to be known as the French school of La Prospective; and Godet suggested that the term is best translated as “strategic scenario building”.⁷⁰

The main differentiating feature between the US and the French centres of scenario development is that whereas the early scenario work in the US tended to be of a global nature, scenario development in France was more narrowly focused on the socio-political foundations of the future of France itself. There has since been a diffusion of scenarios into the business community, however scenario work in France continues to have an important role in public sector planning. Meanwhile although the La Prospective approach to scenarios incorporates certain features of the Intuitive logics methodology, it is a more elaborate, complex and more mechanistic rather than an openly intuitive approach to scenarios development, relying heavily on computer-based mathematical models.⁷¹

⁶⁹ NB. Micmac, Mactor and Smic are all acronyms for specific computer programmes developed by Godet.

⁷⁰ Bradfield, R. 2004(10) *Origins and Evolution of Scenario Techniques in the Context of Business*, Working Paper Series, The University of Strathclyde, Graduate Business School

⁷¹ Ibid

Scenario Thinking

“An internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome”. --Michael Porter

Research + data analysis + intuition + thinking + creativity = Scenario Thinking

At least three general strategic modelling methods are available when applying a scenario thinking approach; a trend-impact analysis, a cross-impact analysis and a decision scenario analysis.⁷² A trend-impact analysis is concerned with the effects of trends in markets or populations, over a period of time and although the following examination of the data that is subsequently undertaken to isolate important trends is similar the method chosen, it differs in that the preferred scenario thinking approach is looking for the unexpected - what is likely to upset trends, as opposed to maintaining the status quo. Cross-impact analysis is a method used for analysing complex systems and concentrates on the ways in which internal and external forces of an organization may interact to produce effects that are essentially bigger than the sum of the parts, or to magnify the effect of one force because of feedback loops. This system can be used successfully when the dominant forces can be identified, and the modelling mechanism can be used to increase management’s understanding of the relative importance of various factors.

Lastly, the Decision Scenario approach is the chosen method used in this report, and is derived from Pierre Wack’s ‘Intuitive Logics’. Essentially, The essence is to find ways of changing mindsets so that managers can anticipate futures and prepare for them. The emphasis is on creating a coherent and credible set of stories of the future so as to test business plans or projects by wind-tunnelling or otherwise considering contingency plans and strategic options available to an organisation.

The purpose of scenario planning is not to pinpoint future events as many of the other methodologies do, but instead it highlights large, macro-sized forces that may push the future

⁷² These three methods of strategic modelling are summarised by Mason, D, 2005 *Future Scenarios*, NRC Scenarios, available at: <http://www.moyak.com/researcher/resume/> are described here.

in different directions. The outcome of the process is to make these forces visible, such that if a specified scenario or combination thereof comes to pass, the planner will in the very least recognize them and have the opportunity to begin a planned course of action. Ultimately the process is essentially a learning tool that allows leaders make better decisions today.⁷³

Scenario-based planning is not a scientific or restrictive method of building futures, but is inherently very creative in nature. In this way, scenarios compel managers to begin the planning process by considering what could happen and not what has already passed. They explore different future business patterns and do not follow extrapolations of historic behaviour as used in forecasting. The method is a forward-looking, open-ended search for patterns that might emerge in an industry or field of business, and when scenario thinking works best, it is able to identify entirely new patterns that have not yet been recognised or considered. Scenarios offer a fresh perspective, and a new language and framework that can be used to encourage dialogue and strategic thinking on the challenges and opportunities we face, especially as often possible as well as uncomfortable scenarios are presented. This opportunity for a fresh perspective is another strength of the method as it allows scenario thinkers to engage with management in asking some of the toughest questions on the future of their organisation without fear of sounding absurd. What is unthinkable today, may well come to pass in the future, so scenario thinking is a method of allowing analysis the freedom to question everything and allows managers to deliberately try to break the rules of their business. All the stereotypes, all the traditions, cherished ideas, and sacred cows can be challenged.⁷⁴

As a result of this open and unrestricted dialogue scenarios are rarely explicitly 'right' or 'wrong', but instead allow managers to dig down to question the assumptions and perceptions that underpin the imaginations in each scenario that can create plausible, credible and consistent scenarios.⁷⁵ Furthermore, for scenarios to truly work, they must be relevant, internally consistent, plausible, have holistic gestalt and have the acceptance and ownership

⁷³ Mason, D, 2005 *Future Scenarios*, NRC Scenarios, available at: <http://www.moyak.com/researcher/resume/>

⁷⁴ Ibid

⁷⁵ The evaluation of plausibility, credibility and consistency of the scenarios detailed within this report are discussed later in this document.

of the highest level of management such that their findings can have real use in strategic planning.

Why the Scenario Thinking Approach is Superior to other Future Building Analyses

In this methodology section, a number of alternative methods to future building have been considered, and it has emerged that there are clear benefits to using the Scenario Thinking method over other approaches. Although it is not without fault, the Scenario Thinking Method offers a balanced approach that is most appropriate when determining the long-term future effects of current events and identifies clear trends in the present environment. It has often been argued that the Scenario Thinking process is in fact exceptionally appropriate for the current 'information age' today, particularly because of the ability to pick up information nuggets in the environment. This is one of Scenario's greatest assets, that is often not strongly emphasised enough in other methods, as noted by Watkins and Bazerman,

"The signs of an impending crisis often lie all around us, yet we still don't see them. Fortunately there are ways to spot the data before it's too late."⁷⁶

This ability for Scenario Thinkers using this approach to identify small 'seeds' in the present environment - and then gather them as trends developing in the operating environment offers a non-technical, though highly reliable method of recognising different 'future worlds' from which the division or allocation of resources, as well as a psychological preparedness can be made.

The underlying key to this is that Scenario Thinking does not attempt to rigidly determine the future, by creating a single prediction that holds managers or other organisation decision-makers to that one future. Consequently, by considering all possible futures, Scenario Thinking allows us to understand the future, with necessarily knowing what exact events will come to pass.⁷⁷ It is this same fact that makes Scenario Thinking a superior method to contingency planning, which otherwise prepares for only one future scenario in a very similar way to forecasting. The true benefit in considering more than one or two contingency plans, is not only that more future scenarios are considered, but that together they are to some

⁷⁶ MacKay, B. and McKiernan, P. 2005 *Lecture One, MN4225 Lectures Series*, Quoting Watkins and Bazerman, 2003, [Harvard Business Review](#), Harvard University Press.

⁷⁷ As first noted by the Greek philosopher, Pericles.

extent, mutually exclusive and collectively exhaustive in considering what scenarios may come to pass in the future. Similarly, however, the intuitive logics approach, whilst useful and valid in practice, also lacks reliability because of its less technical or numerate approach to understanding the future. Practitioners of this type of approach do not believe the future can be projected by any 'rational' or directed approach, but suggest instead that the future emerges from a complex and ever-shifting convergence of powerful trends and individual actions. Therefore, the best way to grasp the future is to gather information broadly then allow unconscious or intuitive information processing to yield actionable insights. However, without later processing this information and forming distinct drivers and trends out of this mass of information means that the view of the future is to some extent viewed very much as chanceful and prone to volatile change.

The Delphi method, whilst similar in nature, is also prone to forecasting, as it is itself a form of iterative forecasting. Whilst the predicted future in the Delphi method is likely to have a greater level of accuracy than that of normal forecasting, or even the formation of information from intuitive logics, it is not necessarily an improvement on understanding the future, as it still limits the practitioners to one or possibly just two futures. However, the Delphi method itself, again is also used as part of the scenario planning process as it encourages the use of iterative discussion of information that amongst other things, also removes the likelihood that a scenario is built on group-think, or any other inaccuracy.

Whilst a morphological analysis similarly offers a sophisticated, multi-factorial extrapolative method from which to help determine the future, it can often fail as a result of the inaccuracy of the inputs to the model. Whilst morphological matrices such as the 'Zwicky box' offer a method for discovering new products and processes by combining the features of existing ones, it is highly conditional on the quality and choice of those variables. Furthermore, whilst the subsequent process is exceptionally well defined, and consistent in its approach within a mathematical model, weaknesses arise in whether those inputs are valid. Scenario Thinking, poses less emphasis on the forecasting style quantitative accuracy of the subsequent analysis, by instead shifting that focus towards the accuracy of the inputs to the process and

the holistic quality of future worlds that are later explored for consistency, plausibility and overall gestalt. Similarly, at the same extreme, the French, School offers a comparable structural scenario method that aims at constructing representations of probable futures as well as the formal rules and routes that lead there, using a mixture of facilitated group interaction and formal quantitative techniques (i.e. prospective workshop, structural analysis, analysis of actor's strategies, morphological analysis and expert inquiries). Although this method is perhaps the closest to the St Andrews method as a derivation of the highly popularised Royal / Dutch Shell method in the 70's, it offers a formulaic and rigid approach that can hinder the creativity of the process and the breadth of input that would lead to a varied, albeit considered and thoroughly tested outcome.⁷⁸

Ultimately, by comparing a number of the methods above, Scenario Thinking offers a clear strength in helping organisations prepare for the future. Whilst other methods have been discounted to some extent, it is clear that a combination of them are often used as inputs to the process and 'feed' into the overall development of future worlds in a Scenario Thinking Methodology.

The role of Scenario Thinking in determining strategy

Increasingly, organisations have begun to enhance their learning capabilities through the use of scenarios as tools to adjust managers' mental models of the future, and allow them to consider the looming changes in their competitive environment.

The underlying effect is that whilst all companies learn, the crucial element is to be able to learn fast enough to sustain a competitive advantage. This is becoming increasingly important in today's fast-changing world. Unfortunately, teaching is a very ineffective way to communicate information. Sometimes changing or suspending corporate rules can accelerate learning. A very effective learning tool, which can be described as a form of game playing, is developing multiple "what if" scenarios and planning responses to them.

⁷⁸ Camponovo G., Debetaz S., Pigneur Y. 2004, *A Comparative Analysis Of Published Scenarios For M-Business*, forum paper from the Third International Conference on Mobile Business 2004

Alternative Methodologies

The following is an evaluation of the alternative methodologies available for building, analysing and preparing for the future.

| Quality Criteria <i>(Poor, Good or Excellent)</i> | Future Building Methods | | | | | |
|--|---|---|---|---|---|---|
| | Forecasting | Delphi Method | Morphological analysis | Intuitive logics | The French School | Scenario Thinking |
| Accuracy | <ul style="list-style-type: none"> ● Excellent (conditional): <p>Excellent under stability, weakened under volatile environment</p> | <ul style="list-style-type: none"> ● Good: <p>Effectively filters the expertise of group members to reach an accurate forecast</p> | <ul style="list-style-type: none"> ● Good (conditional): <p>Good approach to complex problem through scientific, but non mathematical method</p> | <ul style="list-style-type: none"> ☉ Poor: <p>Ultimately accuracy is not favoured, although generative methods may offer a good overview of futures.</p> | <ul style="list-style-type: none"> ● Excellent: <p>Offers a wide variety of input resources that create a number of collectively accurate scenarios.</p> | <ul style="list-style-type: none"> ● Excellent: <p>No one world will usually come to pass, but a combination thereof is very likely.</p> |
| Reliability | <ul style="list-style-type: none"> ☉ Poor: <p>Unreliable under any condition other than a stable and repeat-process environment.</p> | <ul style="list-style-type: none"> ● Good: <p>Similar to forecasting methods, heavily dependent on analysis team to filter themes.</p> | <ul style="list-style-type: none"> ● Good (highly conditional): <p>Quality of approach is highly dependent on the quality of the input factors and must utilise a cross consistency analysis</p> | <ul style="list-style-type: none"> ● Good: <p>Identification and ranking of drivers will allow good overview of available future courses.</p> | <ul style="list-style-type: none"> ● Good: <p>Heavily dependent on technology and algorithm process that may hinder the creativity of the process.</p> | <ul style="list-style-type: none"> ● Good: <p>When fully researched, and major macro-forces identified, provides high level of reliability.</p> |
| Utility in strategy preparation | <ul style="list-style-type: none"> ● Excellent (conditional): <p>Provides precise directional strategy when forecast comes to pass due to excellent level of accuracy.</p> | <ul style="list-style-type: none"> ● Good: <p>Provides a general idea of direction, discounts any others not considered.</p> | <ul style="list-style-type: none"> ● Excellent: <p>If consistency is applied the method provides a thorough understanding of the various options that strategy can build on.</p> | <ul style="list-style-type: none"> ● Good: <p>Creativity and cognitive approach offers a good foundation to build strategy, but lack of correct direction can lack strategic accuracy.</p> | <ul style="list-style-type: none"> ● Excellent: <p>Provides a wide range of inputs to consider and build strategy from.</p> | <ul style="list-style-type: none"> ● Excellent: <p>A number of scenarios can prepare leaders to change the allocation of resources or strategic direction.</p> |

References and Sources

- Duncan, Norman E., and Pierre Wack. "Scenarios designed to improve decision making." *Planning Review*, Jul/Aug 1994, Vol. 22, No. 4, p. 18.
- Godet, Michael. (2000). *The Art Of Scenarios and Strategic Planning: Tools and Pitfalls. Technological Forecasting and Social Change*. 65. pp. 3-22
- Goodwin, Paul and Wright, George. (2001, January). *Enhancing Strategy Evaluation in Scenario Planning: A Role For Decision Analysis. Journal of Management Studies*. 38:1
- Grinyer, Peter. (2000). *A Cognitive Approach To Group Strategic Decision Taking: Discussion Of Evolved Practice In The Light Of Received Research Results. Journal of Operational Research Society*. 51
- Kleiner, Art. 1996. "The Age of Heretics." New York: Currency Doubleday.
- Mason, David H. "Scenario-based planning: Decision model for the learning organization." *Planning Review*, Mar/Apr 1994, Vol. 22, No. 2, p. 6.
- Martelli, Antonio. (1996). *Scenarios And Business Strategy. CEMS Business Review*. The Netherlands: Kluwer Academic Publishers.
- Mackay, Brad and McKiernan, Peter. (2004). *The Role of Hindsight In Foresight: Refining Strategic Reasoning. Futures*. 36: pp. 161-179
- Mackay, Brad and McKiernan, Peter. (2004). *Exploring Strategy Context With Foresight. European Management Review*. 1: pp. 69-77
- Pine, B Joseph II. "Peter Schwartz offers two scenarios for the future." *Planning Review*, Sep/Oct 1995, Vol. 23, No. 5, p. 30.
- Price, Gareth (1994). *Scenario Planning As Discipline. University of St Andrews Draft Working Paper*.
- Porter, Michael. (1985). *Competitive Advantage*. New York: The Free Press
- Quinn, Lucia Luce, and David Mason. "How digital uses scenarios to rethink the present." *Planning Review*, Nov/Dec 1994, Vol. 22, No. 6, p. 14.
- Ringland, Gill. 1998. "Scenario Planning: Managing for the Future." Chichester: John Wiley and Sons.
- Rosell, Steven et al. 1995. "Changing Maps." Carleton University Press.

- Schriefer, Audrey. "Getting the most out of scenarios: Advice from the experts." *Planning Review*, Sep/Oct 1995, Vol. 23, No. 5, p. 33.
- Schriefer, Audrey. "Getting the most out of scenarios: Advice from the experts." *Planning Review*, Nov/Dec 1995, Vol. 23, No. 6, p. 37.
- Schoemaker, Paul. (1991). *When And How To Use Scenario Planning*. *Journal of Forecasting*. Vol. 10
- Schoemaker, Paul. (1995). *Scenario Planning: A Tool For Strategic Thinking*. *Sloan Management Review*. Winter
- Schoemaker, Paul. (1996). *Disciplined Imagination*. *International Studies Of Management And Organisation*. Vol. 27, Issue 2.
- Schwartz, Peter. 1991. "The Art of the Long View: Planning for the Future in an Uncertain World." New York: Currency Doubleday.
- Schwartz, Peter. "Post-Capitalist." *Wired Magazine*, Jul/Aug. 1993, Vol. 1, No. 3.
- Stevenson, T. (2001). *The Future of Futures Studies*. *Futures*.
- Schriefer, Audrey. "Getting the most out of scenarios: Advice from the experts." *Planning Review*, Sep/Oct 1995, Vol. 23, No. 5, p. 33.
- van der Heijden, Kees. 1996. "Scenarios, the Art of Strategic Conversation." Chichester: John Wiley and Sons.
- Wack, Pierre. "Scenarios, uncharted waters ahead." *Harvard Business Review*, September/October 1985.
- Wack, Pierre. "Scenarios, shooting the rapids." *Harvard Business Review*, November/December 1985.
- Whole Earth. "Scenarios: A Heartful Look at Thinking the Unthinkable." Spring 1999.
- Wilkinson, Lawrence. "How to Build Scenarios: Planning for 'long fuse, big bang' problems in an era of uncertainty." *Hotwired*. Available at:
<http://www.wired.com/wired/scenarios/build.html>.
- Zwicky, F. 1969. *Discovery, Invention, Research - Through the Morphological Approach*. The Macmillan Company, Toronto.
- Zwicky, F. and Wilson A. (editors). 1967. *New Methods of Thought and Procedure: Contributions to the Symposium on Methodologies*. Springer, Berlin.