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Futures 37 (2005) 795–812
FUTURES
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The origins and evolution of scenario techniques in long range business planning

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Available online 24 May 2005

Abstract

Scenario Planning has been around for more than 30 years and during this period a multitude of techniques and methodologies have developed, resulting in what has been described as a 'methodological chaos' which is unlikely to disappear in the near future (A. Martelli, Scenario building and scenario planning: state of the art and prospects of evolution, Futures Research Quarterly Summer (2001)). This is reflected in the fact that literature reveals an abundance of different and at times contradictory definitions, characteristics, principles and methodological ideas about scenarios. It has been suggested that a pressing need for the future of scenarios is amongst other things, to resolve the confusion over 'the definitions and methods of scenarios'. This paper makes a beginning at this need by tracing the origins and growth of scenarios and the subsequent evolution of the various methodologies; a classification of the methodologies into three main schools of techniques is given and the salient features of these schools are compared and contrasted.

1. Introduction

In the last few years, scenario planning as a strategic planning tool appears to have enjoyed a revival in popularity judging by the increasing attention the topic has been

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doi:10.1016/j.futures.2005.01.003

receiving in practitioner and academic journals. Schnaars [35] states that most of what is known about scenario planning techniques comes from three sources, namely articles, many of which are written by scenario practitioners describing how scenario planning is undertaken in large companies and offering experienced-based advice on the process of carrying out scenario projects; articles from the future research literature which offer numerous models for constructing scenarios, 'many of which are impractical and most of which have never been adequately tested'; and finally, a small body of research based on empirical studies of related topics, which 'offer some evidence as to the value of scenarios' as a long range planning tool.

In reviewing these three sources, a number of observations can be made, the first of which is that rather than any consensus as to what framework scenarios belong to, there appears to be several overlapping camps of opinion, testimony to which is the fact that the terms *planning*, *thinking*, *forecasting*, *analysis* and *learning* are commonly attached to the word scenario in the literature. The second is that there appears to be virtually no area in scenarios on which there is wide-spread consensus; the literature reveals a large number of different and at times conflicting definitions, characteristics, principles and methodological ideas about scenarios. Mason [27] observes that the term scenario has become as ill-defined as the term strategy, while Simpson [37] suggests that the term elicits 'all kinds of vague and loosely defined concepts'. Godet and Roubelat's [10,13] view on this is that the term scenario is increasingly 'misused and abused'. The consequence of all of this according to Khakee [18] is that 'few techniques in futures studies have given rise to so much confusion as scenarios'. The third observation is that there are a plethora of scenario development models and techniques, the result of which is that the 'present methodological chaos' which 'will not fade away in the foreseeable future' [26].

As a consequence of the foregoing, Millet [30] suggests that one of the major issues to be addressed 'for the future of the scenario method' is to 'resolve the confusion over the definitions and methods of scenarios'. The contribution this paper seeks to make to the literature is to begin to address this confusion by tracing the origins and growth of scenarios and the subsequent evolution of the various methodologies, which are classified into the main schools of techniques, and the salient features of these schools are then compared and contrasted. In doing so, it should be recognized that the province of scenario planning is wide ranging and includes the following:

- crisis management such as civil defense exercises in which scenarios are used in the form of simulations of future crisis situations, to design and test the suitability of systems and equipment to respond to the situations, and to increase response preparedness;
- the scientific community who use scenarios as a means of communicating the increasing degree of complexity of scientific models and theory in a more readily and widely understandable format. Examples of this include scenarios for the development of climate change based on environmental computer models and scenarios for economic development based on econometric models;
- public policy makers who are increasingly using scenarios as forum to involve multiple agencies and stakeholders in policy decisions, enabling joined-up analysis and creating an accommodation platform to assist policy implementation. An example in this area is

the UK government's 'modernisation programme for local government' described by Saunders [34]:

- professional futurist institutes of which there are many; most are independent research and membership organizations working to spread ideas regarding critical trends that will shape the future, and to promote future research methodologies;
- educational institutes which aim to promote the research and development of future studies theories and methods, and create a learning environment so that issues are considered within an evolving futures context. Well known institutes in this context include the Hawaii Research Centre for Future Studies within the University of Hawaii at Manoa and the Australian Foresight Institute at Southern Cross University; and
- businesses which use scenario planning as a long range planning tool.

While the first half of this paper on the origins of scenarios applies to all of the above, the second half which focuses on the evolution of scenarios, does so primarily in the context of long range business planning.

2. The origins of scenarios

The concept of scenarios is an old one, since earliest recorded time people have been interested in the future and have used scenarios as a tool for indirectly exploring the future of society and its institutions. In this context, scenarios have usually taken the form of treatises on utopias and dystopias and as such, have a long history which can be traced back to the writings of the early philosophers, such as Plato's description of his ideal *Republic* [41,45] and visionaries from Thomas More to George Orwell. However, as a strategic planning tool, scenario techniques are firmly rooted in the military and have been employed by military strategists throughout history, generally in the form of war game simulations [2]. Despite their long history in the military the first documented outlines of what today might be regarded as scenarios, do not appear until the 19th century in the writings of von Clausewitz and von Moltke, two Prussian military strategists also credited with having 'first formulated the principles of strategic planning' [41]. Modern day scenario techniques however, only emerged in the post-war period, and the1960s saw the emergence of two geographical centres in the development of scenario techniques, the USA and France.

3. Foundations of 'The USA Centre'

After World War II, the US Department of Defense was faced with the task of deciding what projects should be funded for the development of new weapons systems, a difficult undertaking given the increasing complexity of weapons systems arising from advances made in the sciences during the war years. Adding to the difficulty of the assignment was the significant uncertainty faced on three fronts by the decision makers. Firstly, the end result of the development of new weapons systems which generally required long lead times was itself uncertain. Secondly, with the lowering of the 'iron curtain' there was

a high degree of uncertainty as to the future political environment under which the systems being developed would be deployed; and finally uncertainty as to the effectiveness of the systems ultimately developed as this would be largely dependent upon what weapons systems other nations were developing [33].

The decision making in this situation gave rise to two specific needs, namely:

- the need for a methodology to capture the reliable consensus of opinion of a large and diverse group of experts; and
- the need to develop simulation models of future environments which would permit various policy alternatives and their consequences to be investigated.

The need to elicit and synthesize expert opinion inspired the development of the Delphi technique, and the need for simulation models led to the development of an approach known as 'systems analysis', from which emerged the explicit use of scenario techniques [33]. Both these techniques were developed in the 1950s by The Rand Corporation (an acronym from Research and Development), a research group which evolved out of a joint project between the US Airforce and the Douglas Aircraft company in 1946 and which up until the 1960s, was engaged almost exclusively in Defense management studies for the US Airforce [4].

It was the combination of the development of computers (which provided the data processing capability required for simulating solutions for 'otherwise intractable problems'), game theory (which provided the theoretical structure for the investigation of social interaction) and the US military's need for war game simulation models, which provided the platform for the emergence of scenario techniques at the Rand Corporation [36]. Using this platform, Herman Kahn, the ranking authority on Civil Defense and strategic planning at the Rand Corporation in the 1950s, began developing scenarios for the Air Defense System Missile Command, a large scale early warning system. Kahn, variously described as a 'supergenius' and a 'policy intellectual of unquestioned genius' developed a disturbing critique of US military strategy in the thermonuclear age [3]. Credited with having coined the phrase 'thinking about the unthinkable', Kahn demonstrated through a combination of facts and logic, that military planning tended to be based on wishful thinking rather than 'reasonable expectations'. The existing doctrine he contended was disastrous, and he demonstrated this by developing scenarios of a 'nuclear war by miscalculation' [30]. The objective of using scenarios as a vehicle to think about the unthinkable was to search for serious alternatives to annihilation and surrender, and his work had a major impact on the Pentagon's thinking in the 1950s and 1960. However, due to the specialised and classified nature of this work, the content and methodology of this modern day pioneering scenario work were not widely publicised until 1960 when Kahn published a book entitled *On Thermonuclear War*.

In 1961, Khan left the Rand Corporation and established the Hudson Institute where he began to apply his scenario methodology to social forecasting and public policy. He subsequently authored or coauthored numerous newspaper, magazine and journal articles and published books many incorporating 'futuristic' scenarios, the most controversial of which was *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years*,

written with Wiener and published in 1967 [9,36]. This book has since come to be regarded as a landmark in the field of scenario planning because according to Raubitschek:

- it provided one of the earliest definitions of 'scenarios' and introduced the word into the planning literature;
- it demonstrated the use of scenarios as a methodological tool for policy planning and decision making in complex and uncertain environments;
- it strongly influenced the subsequent development and diffusion of scenario techniques as planning tools in the US, by providing a methodological foundation for other similar future studies; and
- it generated much controversy which led to numerous counter studies, for example, the Club of Rome Reports, *The Limits to Growth* (Meadows, D.H., Meadows, D.L., Randers, J. and Behrens III, W.W., 1972) and *Mankind at the Turning Point* (Mesarovic and Pestel, 1974), which were just as controversial and served to heighten the focus of attention on scenarios and scenario techniques.

As a consequence of the above, Kahn is often referred to in the literature as the 'father' of modern-day scenario planning [4].

Soon after his departure from the Rand Corporation two other Rand alumnae, Helmer and Gordon also left and founded the Institute of the Future. Encouraged by the publicity and controversy caused by Khan's books, Helmer, Gordon and Dalkey along with several individuals at the Stanford Research Institute 'Futures Group' (SRI) and the California Institute of Technology, began to experiment with scenarios as a planning tool and became the pioneers in the field of future studies in the US. Although as with Kahn, these pioneers were concerned initially with scenarios as a tool for public policy planning, it was not long before their work migrated to the business community and the first widely documented use of scenarios in the context of business was the experience of the Royal Dutch Shell company (Shell) which adopted scenario planning as a permanent strategy in 1972–1973 [23] and along with the work of SRI, gave rise to what Godet [11] describes as the Anglo-American School of scenario planning for obvious reasons, but it is better known in the literature as the 'Intuitive Logics' school or methodology of scenario planning [16].

3.1. The intuitive logics school

In 1967, Shell initiated the 'Year 2000' study, a project to study the business environment that would exist in 2000. The study revealed that there would be a discontinuity in the oil industry, the historical trajectory of year-on-year expansion of the industry could not continue to 1985, let alone 2000. As a consequence of this revelation, a number of Shell companies were tasked in 1969, to look ahead to the year 1985 in an initiative known as the 'Horizon Planning' exercise. Pierre Wack, a planner at Shell Francaise, one of the participating companies in the exercise, was familiar with the scenario approach developed by Kahn, and decided to experiment with the technique using France as the testing ground. The initial attempt at scenarios was not a success in that it resulted in what Wack [44] labeled 'first generation scenarios' which were useful in gaining a better understanding of situations, but provided no insights beyond what was

already known. At the same time however, it did result in the realisation that 'we had discovered a useful search tool' and 'the technique had promise'. Meanwhile the Horizon Planning Initiative had confirmed the findings of the Year 2000 study which prompted the decision in Shell to experiment with scenario planning as a potentially better framework for thinking about the future rather than continuing to rely on conventional forecasts which were likely to be wrong in the face of a discontinuity [19,44]. The initial scenarios developed in 1971 on an experimental basis and presented to senior management in 1972, proved extraordinarily successful in that they correctly identified an impending scarcity of oil and an ensuing pointed increase in oil prices; shortly thereafter scenario planning was extended throughout the company.

Coincidently, GE began to experiment with scenarios at about the same time as Shell and in 1971 produced four alternative scenarios of global and US economic and socio-political conditions in 1980. However, unlike Shell, there is very little in the public domain regarding GE and scenarios, and Shell has become the most celebrated corporate exponent of scenarios, its definition of scenarios and process methods have become the de facto 'gold standard of corporate scenario generation' [30] which is why the intuitive logics methodology is sometimes referred to as the 'Shell approach' to scenarios.

Numerous variations of the intuitive logics model have since been published, each identifying a number of discrete steps, varying from five [7] to 15 or more [42], depending on what features of scenarios are highlighted or ignored. Some practitioners have elaborated and branded proprietary scenario developmental models, examples of which are *Future Mapping*®, an approach used by Northeast Consulting Resources Inc. based in Massachusetts [27]; *TAIDA*™ (an acronym for 'Tracking, Analysing, Imaging, Deciding, Acting'), an approach developed at Kairos Future in Sweden [20], and *Idon Scenario Thinking*, an approach using visual tools developed by the Idon Group in Scotland [8]. At the same time, there have been efforts to develop simpler and less resource intensive models which focus on scenario planning as a process of learning, as is demonstrated in the work of Mercer [28] and van der Heijden et al. [39] with MBA students in UK Business Schools.

In fact when it come to the intuitive logics model, a large part of the 'methodological chaos' referred to in the introduction arises from the observation that there are almost as many ways of developing scenarios as there are practitioners in the field. However, while the intuitive logics methodology has received most of the attention in the literature, almost in parallel with it a further 'school' of scenario techniques involving the probabilistic modification of extrapolated trends evolved out of the work of Gordon, Helmer and others at the RAND Corporation in the USA.

3.2. The probabilistic modified trends school

This school of scenario planning incorporates two distinct methodologies, Trend-Impact Analysis and Cross-Impact Analysis.

3.2.1. Trend-impact analysis (TIA)

The TIA model developed in the early 1970s in the field of futures research, and is most often associated with the Futures Group based in Connecticut. According to Gordon [14],

TIA evolved out of the fact that traditional forecasting methods relied on the extrapolation of historic data without considering the effects of unprecedented future events. The concept of TIA is a relatively simple one designed to modify simple extrapolations and in essence, involves four steps:

- historical data relating to the issue being examined is collected;
- an algorithm is used to select specific curve-fitting historical data and extrapolate this to generate 'surprise-free' future trends;
- a list of unprecedented future events which could cause deviations from the extrapolated trend is developed; and
- expert judgments are then used to identify the probability of occurrence of these unprecedented events as a function of time and their expected impact, to produce adjusted extrapolations.

Although, Gordon [14] states that 'the TIA method is used frequently', references to TIA in context of scenarios, are relatively few in the literature.

3.2.2. Cross-impact analysis (CIA)

The CIA model was developed by Gordon and Helmer in 1966 at the RAND Corporation as a forecasting game for Kaiser-Aluminium, and subsequently programmed by Gordon and Hayward. A range of causal and correlation cross-impact variants have since been developed by researchers, along with a number of proprietary methodologies including IFS (Interactive Future Simulations—previously known as BASICS) developed by the Battelle Memorial Institute [30], INTERAX (Interactive Cross-Impact Simulation) developed by Enzer at the University of California, and SMIC (French acronym for Cross Impact Systems and Matrices) developed by Duperrin and Gabus [14].

As with TIA, the CIA methodology attempts to evaluate changes in the probability of occurrence of events which might cause deviations in the naïve extrapolations of historical data. The processes underlying the two methodologies are similar but CIA incorporates an additional layer of complexity in that rather than accepting the a priori probabilities attached to future events by experts, it attempts to determine the conditional or proportional probabilities of pairs of future events given that various events have or have not occurred, through cross impact calculations. The premise of CIA is that it is essential to take cognizance of the interdependencies of events in order to move from a system of 'unprocessed initial probabilities' to a set of 'corrected probabilities' [9].

Although TIA and CIA began life as essentially standalone probabilistic forecasting tools, they generate a range of alternative futures rather than a single point naïve extrapolation of historical data, and when combined with judgments and narratives about the events in these futures, they constitute scenarios.

4. Foundations of 'The French Centre'

In Europe meanwhile, the French are reputed to have been the first to have systematically studied the 'scientific and political foundations of the future' using scenario

techniques, and as in the US, the pioneering scenario work was almost exclusively associated with public policy and planning. At the same time that Khan was developing scenarios for the military in the 1950s, Gaston Berger a French philosopher founded the Centre d'Etudes Prospectives where he developed a scenario approach to long-term planning, which he named prospective thinking or *La Prospective*. This approach reportedly emerged as a consequence of the repeated failure of 'classical' forecasting approaches [9].

Berger was concerned with the long-term political and social future of France and the underlying philosophical premise of his work was that the future is not part of a 'predetermined temporal continuity' but something which is to be created and which can be 'consciously modeled to be humanly beneficial'. The primary objective of the Prospectives centre was to formulate an acceptable scenario-based methodology for developing positive images or 'normative scenarios' of the future and to lead these images into the political arena where they could serve as a guiding vision to policy makers and the nation, providing a basis for action [15,43]. Although Berger died in 1960, the Prospectives centre flourished and by the mid 1960s it had begun to apply the *La Prospective* methodology to a range of public issues including education, the environment, urbanisation and regional planning, the first reported application being the study of regional futures by an interdepartmental government organization known as DATAR (the Office for Regional Planning and Development) [12].

The pioneering work of Berger was continued on through the 1960s and 1970s by two individuals, Pierre Masse and Bertrand de Jouvenel. As the Director of national economic planning in France in the 1960s, Masse introduced the use of the prospective scenario approach in the development of the fourth French National Plan (1960–1965) and subsequent national economic plans have purportedly continued to use prospective scenario techniques [14]. Meanwhile, de Jouvenel, the founder of the Futuribles Group (Association Internationale de Futuribles) which became a catalyst in the development of the international futures movement, joined the Prospectives centre in 1966. de Jouvenel [5] postulated that it was the particular view of the future held by small but dominant political groups within a nation, which determined how the future of that nation unfolded. This could be avoided he argued, by encouraging futurists to act as catalysts in articulating idealistic images of what the future could be like and which could serve as a blueprint for the nation. The thrust of de Jouvenel's work therefore was in using scenarios to construct positive images of the future or 'scientific utopias' and then specifying ways in which these could be brought about to improve the life of ordinary people [6].

Since the 1970s, the work of the French pioneers has been expanded on by Michel Godet, who has spent many years 'honing the tools of *La Prospective*' [11].

4.1. The La prospective school

In the mid-1970s Godet, the then head of the Department of Future Studies at SEMA (a firm active in the defense sector), 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 (Micmac, Mactor and Smic are all acronyms for specific computer programmes developed by Godet). 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*; however the term covers a range of concepts, and Godet [12] suggests that as used by him, the term is best translated as 'strategic scenario building'.

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 [43]. 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 which have their roots in TIA and CIA. Thus while Godet [11] characterises *La Prospective* as a 'blend of tools and systems analysis', it is to a large extent, a blending of the intuitive logics and probabilistic modified trend methodologies.

Although as can be seen from the foregoing, the *La Prospective* school has been in existence for almost as long as the intuitive logics and probabilistic modified trends schools, it has received considerably less attention in the literature on scenario planning. This asserts Godet [11] is a consequence of the 'Anglo-American domination in any area related to strategy'.

5. The growth of scenarios

Studies of European companies by Malaska [24], Malaska et al. [25] and Meristo [29] clearly indicates that in Europe:

- scenario planning was not widely used until after the first oil crises in 1973, following which the number of 'adopters' of scenario planning almost doubled; and
- there was a further surge of adoption in the period between 1976 and 1978. This led Malaska et al. to conclude that the adoption of scenario planning 'is associated with the increasing unpredictability of the corporate environment that took place in the 1970s'.

The above findings also hold in the US. Studies by Linneman and Klein [21,22] found that there were few business users of scenario planning techniques prior to 1974 but in the two year period (1974–1975) following the first oil crises, the number of adopters doubled and then more than doubled again in the period between 1977 and 1981. They estimate that in the early 1980s, almost half of all US Fortune 1000 industrial firms, US Fortune 300 non-industrial firms and Fortune Foreign 500 industrial firms were actively using scenario

techniques in their planning process. As with Malaska et al., Linneman and Klein posit that there is a correlation between the adoption of scenario planning and 'environmental discontinuities and instability'.

The 1981 US based survey evidence of Linneman and Klein also revealed that the use of scenarios was not uniform among various industry groupings and that the adoption of scenario techniques in business appears to be related to three factors, these being:

- the size of the company; by 1981, 46% of the Fortune 1000 industrials reportedly used scenarios. Among the largest of the Fortune 1000, the Fortune 100, the reported usage was in excess of 75% of the companies surveyed;
- the length of its planning horizons; the majority of companies (72%) that used scenarios had planning horizons of 10 or more years; and
- capital intensiveness; the majority of scenario users tended to be in capital intensive industries such as aerospace, chemicals and petroleum refining.

In Europe, the survey results of Malaska et al. [25] revealed a similar picture, i.e. that the highest proportion of scenario users were large companies operating in capital intensive industries with long strategic planning horizons, namely, oil companies, vehicle manufacturers, electricity suppliers and transport companies. The finding that scenarios are used predominantly by large companies is perhaps explained by the fact that it is generally large companies which have both the resources and the inclination to experiment with new planning models.

The research of Linneman and Klein and Malaska et al. discussed above clearly indicates that there was substantial growth in the adoption of scenario techniques throughout the 1970s, although by 1981 the rate of adoption of scenarios in the US was markedly higher than it was in Europe. The growth in scenario popularity is, however, contradicted by van Doorn and Vught, [40] who state that between 1973 and 1980 there was a 'decline in preference for scenarios', especially in the US where the preference for scenarios moved from 'high' to 'medium' (Table 5, page 510). The basis of their research is the analysis of four studies, two in the US (1973 and 1980) and two in Europe (the Netherlands in 1976 and the FDR in 1978) of how individuals and organisations rated techniques of future studies. They attribute this decline to the fact that from simple beginnings in the 1960z, scenario methods quickly evolved into 'a complex of sub-techniques' which rendered it difficult to implement and 'impossible to toss off a few complete scenarios on a rainy afternoon'. To justify this assertion, they cite research findings [1,31] which indicate that the perceived usefulness of a technique and ultimately its adoption is directly proportional to the effort and the sophistication required to implement the technique.

There is no empirical data in the literature which documents the popularity of scenario techniques between the early 1980s and today, although there is anecdotal evidence to the effect that scenarios declined in popularity during the 1980s. Martelli [26] suggests that while the use of scenarios 'goes and comes in waves', it has 'grown in the last one or two decades but not that much and probably less than could be expected'. Several reasons are offered for this including the contention that 'scenario practitioners have so far had only limited success in finding a good balance between an excess of technicality on the one side, and a relapse into superficiality on the other'.

Piore [32] contends that "futurology as a kind of faith is gone" and "futurists no longer have entree to the corridors of power", but he also notes that "in some sense the early pioneers were influential beyond their wildest dreams. The forecasting techniques, the trend analysis and market predictions spawned by futurologists are today widely used in government and private business". This would presumably include scenario techniques. Thus while futurology may have declined in popularity, scenarios it would appear are now enjoying a resurgence in popularity, as measured by the recent number of articles and conferences on the subject [27]. Although there is no empirical survey data to substantiate this, a search of the Science Citation Index database reveals a dramatic surge in scenario references beginning in 1992 and continuing through to 2000. At the same time, there has been a proliferation of examples of scenario work in the public domain, as even a cursory search of the web will confirm. Thus while there popularity of scenarios may have moved in waves which correlate to the state of uncertainty in the business environment, they are here to stay concludes Martelli [26].

6. Discussion

In a widely cited paper, Huss and Honton [16] identify three major categories of approaches to scenario development, namely 'Intuitive Logics', 'Trend-Impact Analysis' and 'Cross-Impact Analysis'. There is no discussion on the *La Prospective* methodology, testimony in part perhaps to Godet's assertion that Anglophones have tended to dominate the world of strategy and its tools. This paper aims to remedy this omission; at the same time, it is our contention that although TIA and CIA are standalone techniques, they share a common foundation which is the mathematical amelioration of extrapolated time series data; they can therefore be justifiably viewed as a coherent group of techniques which for convenience we have labeled the as 'probabilistic modified trends' (PMT) methodology. Consequently, we argue that there are indeed three major categories of scenario 'schools' or techniques, but they are the Intuitive Logics, the Probabilistic Modified Trends and the *La Prospective* methodologies. A comparison of the salient features of each of these three schools is detailed in Table 1 and discussed below.

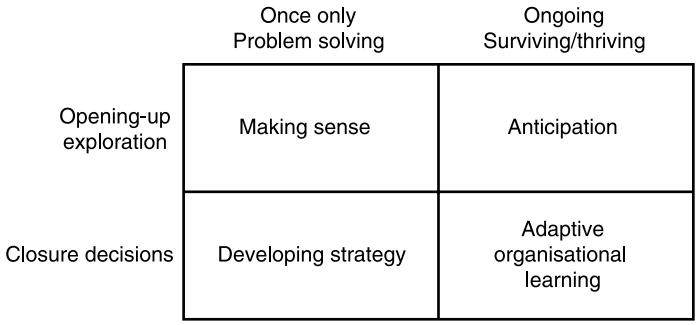

Fig. 1. Purposeful Scenario Work.

The decisive factor between success and failure in scenario work according to van der Heijden et al. [39] is the degree to which a scenario project is 'purposeful'. Although, no empirical evidence is offered to support this, the authors contend that the purpose of scenario work can be categorised along two dimensions: (1) the work can either serve specific one-off content needs, or an on-going general process aimed at longer-term survival capability; (2) the work can be undertaken either to open up an organizational mind for exploration, or to achieve closure on specific decisions and actions. Combining these dimensions provides a two dimensional matrix as illustrated in Fig. 1, which identifies four main areas of purpose in scenario work:

- making sense of a particular puzzling situation;
- developing strategy;
- anticipation; and
- adaptive organisational learning.

The flexibility of the intuitive-logics methodology lends itself to a wide range of scenario purposes as it evidenced by the fact that examples of the application of the methodology to all four of the above 'purposes' can be found in the literature. While both the *La Prospective* and PMT may be theoretically applicable to a range of purposes, the objective of scenario work under these methodologies is generally to determine the most likely evolutionary development of a particular phenomenon with a view to improving the effectiveness of policy and strategic decisions. Consequently, scenario work under these methodologies generally falls in the left-hand quadrants of the 'purposeful scenario work matrix'—the work tends to be a one-off exercise associated with 'making sense' of a particular situation or with 'developing strategy'.

At the same time, whereas the perspective of intuitive-logics base scenario work can be either descriptive or normative and the scope extremely broad as in the development of global scenarios or narrowly focused on a particular issue, both the *La Prospective* and PMT models tend to be descriptive in perspective, and focus on a specific phenomenon and the set of key variables which bear on the future of that particular phenomenon. The PMT models are further limited in terms of the scope of issues to be investigated by the need to have detailed and reliable time series data. Common to all three methodologies is that the scenario horizon year typically spans a period of between 3 and 20 years, but longer horizon periods are also found, particularly where the focus of the scenarios is a broad one.

The methodological orientation of the intuitive logics methodology is firmly a process orientation as evidenced by quotations in the literature indicating that the insights and learning arising from the process are more important that the reliability of the content of the end product, the scenarios. The approach taken to develop scenario can be either inductive or deductive, but all approaches are subjective and largely qualitative in nature, relying fundamentally on what Jungermann and Thuring [17] refer to as 'disciplined intuition'. Meanwhile the *La Prospective* and PMT are both essentially outcome oriented. Subjectivity and intuition of course play a role in both these methodologies, but in the main the approaches used are directed and objective and revolve largely around complex

Table 1
Comparison of the Salient Features of the Three Schools of Scenario Techniques

	Intuitive-Logics Models	*La Prospective* Models	Probabilistic Modified Trend Models
Purpose of the scenario work:	Multiple, from a once-off activity making sense of situations and developing strategy, to an ongoing activity associated with anticipation and adaptive organisational learning.	Usually a once-off activity associated with developing more effective policy and strategic decisions and tactical plans of action.	A once-off activity to enhance extrapolative prediction and policy evaluation.
Scenario perspective:	Descriptive or normative.	Usually descriptive, can be normative.	Descriptive.
Scope of the scenario exercise:	Can be either broad or narrow scope ranging from global, regional, country, industry to an issue specific focus.	Generally a narrow scope but examination of a broad range of factors within the scope.	Narrow scope focused on the probability and impact of specific events on historic trends.
Scenario horizon year:	Varies: 3–20 years.	Varies: 3–20 years.	Varies: 3–20 years.
Methodological orientation:	Process orientation - inductive or deductive, essentially subjective and qualitative in approach relying on disciplined intuition.	Outcome orientation - directed and objective, quantitative and anlytical approaches (with some subjectivity) relying on complex computer-based analysis and mathematical modeling.	Outcome orientation-directed and objective, quantitative and analytical approaches (with some subjectivity) using computer-based extrapolative forecasting and simulation models.
Nature of scenario team participants:	Internal - scenarios developed by a facilitated from within the organization.	Combination of some key individuals from within the organization led by an expert external consultant.	External - scenario exercise undertaken by expert external consultants.
Role of external Expters:	Experienced scenario practitioner to design and facilitate the process; periodic use of remarkable people as catalysts of new ideas.	Dominant - expert-led process using an array of proprietary tools to undertake comprehensive analysis and expert judgments to determine scenario probabilities.	Dominant - expert-led process using proprietary tools and expert judgments to identify high impact unprecedented future events and their probability of occurrence.
Tools commonly used:	Generic - brainstorming, STEEP analysis, clustering, matrices, system dynamics and stakeholder analysis	Proprietary - structural (Micmac) and actor (Mactor) analysis, morphological analysis, Delphi, SMIC Prob-Expert, Multipol and Multicriteria evaluation.	Proprietary Trends Impact and Cross Impact Analysis, Monte Carlo simulations.
Scenario starting point:	A particular management decision, issue or area of general concern.	A specific phenomenon of concern.	Decisions/issues for which detailed and reliable time series data exists.

(*continued on next page*)

Table 1 (*continued*)

	Intuitive-Logics Models	*La Prospective* Models	Probabilistic Modified Trend Models
Identification/selection of key driving forces:	Intuition - brainstorming techniques, analysis of STEEP factors, research, and discussion with remarkable people.	Interviews with actors involved in the phenomenon being studied and comprehensive structural analysis using sophisticated computer tools.	Fitting curves to historical time series data to identify trends and use of expert judgment to create database of potential high impact unprecedented future events.
Establishing the scenario set:	Defining the scenario logics as organizing themes or principles (often in the form of matrices).	Matrices of sets of probable assumptions based on key variables for the future.	Monte Carlo simulations to create an envelope of uncertainty around base forecasts of key indicators.
Scenario Exercise Output:	Qualitative - set of equally plausible scenarios in discursive narrative form supported by graphics, some limited quantification. Implications, strategic options and early warning signals increasingly a part of scenario output.	Quantitative and qualitative - multiple scenarios of alternative futures supported by comprehensive analysis incorporating possible actions and their consequences.	Quantitative - baseline case plus upper and lower quartiles of adjusted time series forecasts. may be embellished by short storylines.
Probabilities attached to scenarios:	No, all scenarios must be equally probable.	Yes, probability of the evolution of variables under assumption sets of actors' behaviour.	Yes, conditional probability of occurrence of unprecedented and disruptive future events.
Number of Scenarios generated:	Generally 2–4.	Multiple.	Usually 3–6 dependent on the number of simulations.
Scenario evaluation criteria:	Coherence, comprehensiveness, internal consistency, novelty - underpinned by rigorous structural analysis and logics. All scenarios equally plausible.	Coherence, comprehensiveness, internal consistency - underpinned by rigorous structural and mathematical analysis; plausible and verifiable in retrospect.	Plausible and verifiable in retrospect.

mathematical, extrapolative forecasting and computer simulation models in their development of scenarios.

Significant differences exist between the three scenario methodologies in terms of the nature of scenario team participants and the role of experts in the scenario process. Under the intuitive logics methodology the scenario development process is customarily carried out by a team of individuals from within the organization undertaking the scenario work. External experts are used in two ways; firstly the process is commonly designed and facilitated by an experienced scenario planning practitioner. Secondly, outside experts in

the form of 'remarkable people' [38] who have some knowledge of the industry and are acute observers of the environment, may be brought into the process at particular junctures in order to challenge and stimulate the thinking of the scenario team. The starting point of scenario work under this methodology depends on the purpose of the scenario undertaking, but is generally related to a particular management issue or area of general concern, which in turn determines the focus in terms of the driving forces to be examined. Although the processes and tools used by scenario practitioners to achieve this vary, they are basically generic and include desk research, individual and group brainstorming and clustering techniques, contextual environment analysis using the Societal, Technology, Economic, Environment, Technology (STEEP) framework or its derivatives, matrices, systems dynamics, stakeholder analysis and discussions with remarkable people.

The above contrasts sharply with both the *La Prospective* and PMT techniques in which external experts unavoidably play a dominant role as consultants in designing and then carrying out the scenario exercise. This is because the complex and sophisticated mathematical analysis, forecasting and modeling tools utilized by *La Prospective* and PMT are not ordinarily resident in organizations, they are usually the proprietary tools of consulting organizations. In the case of *La Prospective*, having identified the specific phenomenon of concern to the management of the client organization as the starting point, key individuals from within the organisation are then generally involved in various stages of the process; however, the process is essentially that of an external consultant-led exercise employing an arsenal of sophisticated structural analysis and cross impact tools to identify "as exhaustive a list as possible of the variables which define the system formed by the phenomenon under study" [12]. Under the PMT process the starting point of the scenario work similarly revolves around management decisions and concerns, but as previously noted, is constrained by issues for which reliable historic time series data exists. Involvement of individuals from within the client organization is in most cases nominal, and the primary role of the consultant is to gather the expert judgments of external experts as input to their sophisticated, computer-based tools including Monte Carlo simulations, to arrive at modified time series forecasts.

The final output of the intuitive logics methodology is a coherent set of logically linked scenarios in discursive narrative form and the narratives are often embellished with pictures, newspaper clippings and vivid graphics for effect, most of which are contrived. Both the *La Prospective* and PMT techniques also result in scenarios to which narratives are commonly attached; the scenarios may include numerical data in graphical form, but the data is not contrived, and pictures and other visual material are seldom added for effect. However, the foremost difference between scenarios developed under the intuitive logics methodology versus those developed under a *La Prospective* or PMT methodology, is the issue of probability. Scenarios developed under the latter two approaches are presented as the 'most probable' scenarios, i.e. a base case plus upper and lower limit scenarios based on probabilities assigned to the scenarios, whereas the hallmark of scenarios developed under intuitive logics approaches is that all scenarios presented are equally probable. Consequently, while 'coherence', 'plausibility', 'internal consistency' and 'logical underpinning' are the common baseline criteria by which all scenarios are evaluated regardless of developmental methodology, unique to the intuitive logics model is the additional

criteria of equal probability of all the scenarios within a set. At the same time, given the outcome rather than process orientation of scenario work under the *La Prospective* and PMT methods, scenarios derived under these approaches are subject to an additional evaluation criteria, 'verifiability in retrospect'.

All of the above discussion summarized in Table 1 focuses on the main points of commonality and departure between the three major schools of scenario planning. Two final observations in this respect are that:

- firstly while the differences between the intuitive logics and the PMT approaches and *La Prospective* and PMT are readily apparent, the distinction between intuitive logics and *La Prospective* approaches has blurred somewhat. Fundamental differences still of course exist particularly in terms of methodological orientation, nature of participants and the role of experts in the process, but the range and sophistication of tools advocated in some of the more recent variants of the intuitive logics models are similar in nature to those on which the *La Prospective* model functions;
- secondly the 'plethora of scenario development models' noted in the introduction, relates primarily to intuitive logics models and the 'methodological chaos' stems from the fact that the methodological differences between some of these approaches in not insignificant. Examining and categorising these approaches in terms of their differences and similarities remains an open task.

7. Conclusions

As can be seen from the foregoing, although scenario techniques have a long history, the application of them to strategic planning in the business context is a relatively new phenomenon. This along with the observation that the growth in popularity of scenarios has happened for practical reasons rather than theoretical ones may go some way to explaining Khakee's contention that scenarios have given rise to so much confusion. A reasonable starting point in attempting to untangle this confusion is to understand the historical origins and evolution of the three dominant schools of techniques and the features which differentiate them, which is what this paper has attempted to do.

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