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SCENARIOS AND STRATEGIES
A TOOLBOX
FOR PROBLEM SOLVING

by Michel Godet

with
Régine Monti, Francis Meunier, Fabrice Roubelat

- special issue -

Laboratoire d'Investigation en Prospective, Stratégie et Organisation
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A TOOLBOX FOR SCENARIO PLANNING

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SCENARIOS AND STRATEGIES
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Michel Godet with R.Monti, F.Meunier and F. Roubelat.

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WANTED : RIGOUR FOR AN INTELLECTUAL 'UNDISCIPLINE'
By Michel Godet[1]

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. Fast action is already urgently required ! Yet reaction is not an end in itself. Although desirable in the short term, it leads nowhere if not directed towards the firm's long-term objectives. As Seneca said,*" there is no favourable wind for the man who knows not where he is going "*. Action becomes meaningless without a goal and only anticipation points the way to action and gives it both meaning and direction.

Similarly *la prospective*[2] cannot generally be dissociated from strategy, hence the term *strategic prospective. Strategic prospective* is not only an exploratory approach (strategic anticipation) but also a normative one. Continuing the tradition of strategic planning and strategic management, *strategic prospective* emphasizes the importance of long-range and alternative thinking in strategic decision-making processes.

However, the complexity of strategic problems, and the need to resolve them collectively means using methods that are as rigorous and participatory as possible in order to recognise the problem and find acceptable solutions. Of course, we must keep in mind the limits imposed by formalisation and remember that people are guided by intuition and passion as well as logic. Our models are inventions of the mind that represent a world unwilling to remain locked up in a cage of equations. And all the better since without this freedom, any will driven by desire would lead nowhere ! As a result, our conviction is : use all the powers of reason while remaining aware of both the inherent limits and virtues. Intuition and reason are not opposite, but complementary faculties.

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[1]Professor and Holder of the Chaire de prospective industrielle du Conservatoire national des arts et métiers, Paris, France. Michel Godet is also the author of several works including the Strategic Prospective Manual in two volumes published in French by Dunod in 1997.
Manuel de prospective stratégique, T1: une indiscipline intellectuelle, T2 : l'art et la méthode, Dunod 1997.

[2]We use the French term "(la) prospective" where no appropriate translation in English is possible. To facillitate reading, the French word appears in itallics at the beginning of this document. *Prospective* refers to a preactive and proactive approach which is described on pp. 7-8. The English term *foresight* is perhaps the closest translation yet the idea of proactivity is less present.

People cannot be reduced to a rational mind (the left hemisphere); they are also driven by the emotional faculties (the right hemisphere). It is time we stopped opposing intuitive vision and rational thinking since both are necessary. The choice depends on circumstances. Rational and heuristic schools of scenario planning only appear to be in opposition; whereas, in fact, they are complementary. A sound initial reflection, imbued with relevance and consistency, reinforces the efficiency of action and reaction in the face of events. The same applies to reflexes; they are always better after an intensive workout.

1° STRATEGIC PLANNING, STRATEGIC MANAGEMENT AND THE STRATEGIC PROSPECTIVE APPROACH : HOW ARE THEY DIFFERENT ?

The concepts of *la prospective*, strategy and planning are intimately linked in practice, as a result, strategic planning, strategic management and the strategic prospective approach will be mentioned throughout this text. Each of these approaches refers to a set of definitions, problems, and methods whose specificity is weak, given the vague terminology.

How then can we make sense of all this ? Are these approaches not all very similar to one another ? Do we not already have a series of practical methods, all the more useful in that their limits are known ? We can answer these questions without hesitation. A toolbox for futures studies and strategic analysis does exist. Informed managers would be wrong to deprive themselves of the toolbox, as a common language could thus be created; the power of collective thought, increased, and the inevitable biases, reduced. To do this, however, there must be a return to the fundamental concepts and their history.
In order to be fruitful, the marriage between *la prospective* and strategy must be a part of daily life. It must be appropriated by all the actors involved, from the top of the hierarchy to the bottom. Although the union of *la prospective* and strategy may have been inevitable, it has certainly not cleared up any of the confusion in genres and concepts. Yet the ideas are much closer than is generally admitted. Thus the definition of planning put forward by Ackoff (1970)*" to conceive a desired future as well as the practical means of achieving it "* in no way differs from the one we suggest for *la prospective* where the dream fertilizes reality, where desire is the productive force of the future, where anticipation sheds light on the preactive and the pro-active.

How then does one find one's way around planning and strategic management ? I remember Igor Ansoff telling me in 1986, when discussing the choice of a title for my book in English (Godet, 1987) :*" you and I are well aware that it's the same thing, but sales will be better with strategic management "*. Every concept goes back to the previous one, putting the accent on an old dimension which appears all the newer after being neglected, then forgotten. What has been rediscovered with strategic management is that people and organisations are at the heart of the difference between efficient and inefficient firms. A part of the bias introduced by managerial fashions stems from the fact that consultants constantly need to remake themselves in order to stand out from the competition. Far too often the impression of novelty is acquired at the least cost by renaming an old concept.

Managerial fads come and go but always have one common denominator -- people need to be motivated through new challenges. Of course, the process of getting people involved is considered the goal to be reached no matter what the outcome. In this way strategic analysis can generate a synthesis of collective commitment, contrary to the ideas expressed by Henry Mintzberg (1994). Indeed, the real difficulty lies not in making the right choices but in making sure that all the participants ask themselves the right questions. A problem well asked and shared by those concerned is already half solved. This is exactly what Michel Crozier meant when he said "the problem is the problem!"

The rich heritage of strategic analysis remains with us. For example, the classical analysis using threats and opportunities coming from the general environment shows that we cannot limit our analysis to the competitive environment in the name of short-term profits, as the early writings of Michael Porter might lead us to believe. The fact that many uncertainties hang in the balance within the general context, especially over the long-term, underscores the need for broad scenario building to clarify the strategic options available and to ensure continued development.

The management market has been flooded by tools and approaches designed abroad, mainly in Japan and the USA. Indeed many American firms actually became victims of Strategic Business Unit (SBU) approaches. In fact, the relative or even absolute decline of entire sections of American industry, in comparison with Japan and Europe during the 60s and 80s, made moot any debate over a classic American approach. As Marc Giget (1998) put it, *"The revival in the 90s was generated from analyses labelled Made in America which were inspired directly by*

foreign models." Hence managers rediscovered the virtues of positioning themselves against the best *(benchmarking),* the value of a complete rehaul of processes and structures *(reengineering)*, as well as the importance of sticking to the basics *(downsizing)* and lastly, the power of innovation when it comes from the company's macro-competences. Therein lies the difference between winning and losing companies, as Hamel and Prahalad point out : *"The conclusion was obvious: some management teams simply showed more foresight than others. Some managed to imagine products, services and entire sectors of economic activity that did not yet exist and they sped up their arrival. They certainly did not waste time pondering how to position their firm within the existing competitive environment because they had already created new environments. Other companies, the so-called laggards, worried more about preserving the past than conquering the future."*

Let us look at the terms employed above. Strategy uses foresight and innovation;whereas pospective uses preactivity and proactivity, but we are talking about the exact same thing.

Given this similarity, the term *strategic prospective* has been circulating since the late 80's, especially in French (*prospective stratégique*). Yet we wonder how else a strategist could operate any other way than "seeing far, wide, and deep while taking risks and thinking about humanity"? We continue paraphrasing Gaston Berger (1964) who adds that "looking at the future disturbs the present". From this last point we firmly conclude that anticipation encourages action. By now we are convinced that *prospective* is often strategic if not through its outcome at least through its intentions and, similarly, strategy calls upon prospective to clarify choices made with the future in mind.

The abusive use of the term strategic

The so-called "rise and fall of strategic planning" has not exhausted people's interest. (This may be a relief for an author like Henry Mintzberg.) In fact there is no risk of a fall because of the independent nature of each of its constituents. *"An organisation can plan (take the future into consideration) without actually committing to planning (a formal procedure) even if it does draw up some plans (explicit intentions)."* In reality, the issue is not really planning but rather the manner in which planning is carried out. The graft of strategic planning only takes root if it is integrated into the corporate culture and identity. The wheels of development depend not only on logic, but also on human emotion and

behaviour. Hence the idea of strategic management, which is almost a pleonasm according to Boyer and Equilbey's definition of management (1990) : *"the art of managment is to make the organisation serve strategy."* Yet management in itself does not constitute a strategy. Strategy shapes management but also supposes objectives and related tactics (contingent decision-making). One wonders how authors as serious as Mintzberg reject these distinctions while quoting Rumelt : *"One person's strategy is another's tactic."* They are content to use *"the term strategic as an adjective describing something relatively important."* It is high time that these concepts be clarified so that the same word does not have different meanings and that different things are not named the same.

For traditional authors, such as Lucien Poirier (1987) and Igor Ansoff (1965) the notion of strategy refers to a firm's action on its environment and reflection on that action. Without hesitating, Lucien Poirier used the term *"stratégie prospective"*. The two notions are distinct but often associated. However some authors, including Fabrice Roubelat (1996), maintain that prospective has two sides to it. Roubelat bases his comments on Jacques Lesourne[3] who said that *"a strategic decision is either one that creates an irreversible situation for the entire organisation or one that anticipates an environmental change apt to provoke such an irreversible situation"*. In other words, according to Lesourne, *"a strategic decision would likely be a decision that forces the organisation to ponder its very existence, independence, mission, and main field of activity."* In short, this decision exists for a specific company and according to this definition, general forecasting sessions would not have any strategic value for the actor /company involved.

The main advantage of these rigid definitions is that they avoid the use of the word strategic to qualify anything that seems important. Of course prudence and common sense enter here so that prospective is not limited to asking about risks of rupture and that strategy is not reduced only to decisions of an irreversible nature for the company. It is true that the borders are fuzzy and impossible to redraw completely. The same may be said for decisions, for as Jacques Lesourne put it : *"major decisions are rarely made, they become increasingly improbable as the small decisions accumulate".*
For any organisation, prospective is not philanthropy but rather reflection with a view to clarifying action, especially action of a strategic nature.

[3]"For any organisation... the notion of strategy is inseparable from that of large scale irreversibility" Lesourne, J. "La notion d'enjeu stratégique", note to the EDF foresight committee, November 1994.

From desired futures to the realities of strategy

It is always tempting to take desires for reality. Although visions of the future or scenarios appear desirable, the choices and strategic direction of an organisation do not necessarily match a single pro-active vision. One must also be preactive and prepared for expected changes to the organisation's future environment.

Of course, not all scenarios are equally probable or desirable. There is an important distinction to be made between scenarios of the general environmental and scenarios of actors' strategies. The sucess of the word scenario has led to abusive use of the term and confusion with the term strategy.

It is therefore prudent to separate an exploratory phase of identification of future stakes from a normative phase. A normative phase is required to define strategic choices, in other words, choices that are possible and desirable in order to keep on course. The distinction between these two phases is all the more justified in that the choice of strategies is conditioned by the uncertainty weighing on the scenarios and by the contrast among the most probable of them.

Scenarios, which project both wishes and fears regarding the future, must not be confused with the choice of strategic options. Here willpower is in keeping with the principle of reality of foreseeable development in a company's environment. It is especially important to avoid confusion in that it is not the same internal actors who are on the front lines. The anticipation phase of organizational change must be collective and implies the involvement of the greatest number. At this stage, the strategic prospective toolbox suggests an open-minded think tank on future stakes and, possibly, an assessment of strategic options. On the other hand, for reasons of confidentiality and responsibility, the strategic choice phase is limited to a small number of people who are generally members of the company's executive committee. This last phase therefore does not require any specific method. Decisions must be made after consultation and consensus among executives, taking into account the form of management proper to the corporate culture as well as the temperament and personality of the executives.

Tools are useful for comparing choices but cannot replace freedom of choice. The methodologist can dream of constructing rational tools that link prospective and strategy on paper but will come up against resistance and natural rejection from flesh and blood people driven by passion who certainly have no intention of being subjected to machines.

From scenarios to strategies

Unfortunately there are no statistics for the future and often personal judgement is the only information available to deal with the unknown. It is therefore necessary to gather other people's opinions before forming one's own and then to place bets in the form of subjective probabilities. As in the case of a casino gambler, it is only on the basis of a series of games that one can judge the quality of his bets. Similarly, the competence of experts is often questioned. Our conviction is simple : inasmuch as an expert represents an opinion typical of one group of actors, it is interesting to consider that expert's point of view. Indeed, it is from this vision of the future, be it right or wrong, that these actors will chart their course.

The uncertainty of the future can be appraised through the number of possible scenarios within the field of probables. In principle, the higher the number, the greater the uncertainty. This is in principle only, however, because the difference in content between the scenarios must also be considered : the most probable can be very similar or highly contrasted. Experience shows that in general a third of the total possible scenarios is enough to cover 80% of the field of probables ; i.e., 10 scenarios out of 32 possibles for 5 fundamental hypotheses.

If uncertainty is low; i.e., if a limited number of closely related scenarios cover the major part of the field of probables, one could opt for either : a risky strategy (by betting on one of the most probable scenarios) or a robust strategy which would resist most probable developments. On the other hand, if uncertainty is high (over half the possible scenarios are required to cover 80% of the field of probables, or when the most probable are highly contrasted), it would be preferable to adopt a flexible strategy containing a maximum of reversible choices. 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.

The five basic questions asked in strategic prospective

Like two lovers locked in an embrace, prospective and strategy remain distinct entities and it is necessary to distinguish between :
1) a time for anticipation, in other words, the study of possible and desirable changes, and
2) a time to prepare action : in other words, the working out and assessing of possible strategic choices so as to be prepared for expected changes (pre-activity) and provoke desirable changes (pro-activity).

The dichotomy between exploring and preparing a course of action implies the five following questions : (Q1), what can and might happen ? (Q2), what can I do ? (Q3), what am I going to do ? (Q4), how am I going to do it ? and an essential pre-question (Q0), who am I ? All too often ignored, the last question is the starting point of Marc Giget's strategic procedure (1998). However this prelimary identification echoes Socrates' famous lesson, 'know thyself'.

Only the prospective approach with a preactive and proactive attitude focuses on the question " what can and might happen ? " (Q1) It becomes strategic when an organisation asks itself "who am I ? (Q0) and " what can we do ? " (Q2) Once these questions have been answered, the strategy goes from " what can we do ? " (Q2) to two further queries : "what are we going to do ? " (Q3) and "how are we going to do it ?" (Q4) Hence the overlapping between prospective and strategy. There are, of course, future studies containing no clear strategic character for an actor as well as strategic analyses of firms or sectors whose interest in the future is embryonic or even nonexistent. For the sake of clarity, the expression " strategic prospective "[4] will therefore be reserved for futures studies having strategic ambitions and endpoints for those undertaking them.

[4]some authors would also name it as "strategic anticipation"

2° A TOOL BOX FOR SCENARIO PLANNING

Although our problems may be complex, we are not without means. Yesterday's tools are still useful today. Indeed, the kind of problems encountered, even if the world changes, often remain similar. If we ignore our accumulated heritage, we deprive ourselves of powerful levers and waste a great deal of time reinventing the wheel. The memory of our methods must be kept alive so as to improve upon them.

The nail's dream and the hammer's pitfall

Of course, the utility of the tools used in the strategic prospective approach is fivefold : stimulate the imagination, reduce inconsistencies, create a common language, structure collective thought, and enable appropriation by decision-makers. Their limits and the illusions of formalisation must not, however, be forgotten : no tool should serve as a substitute for reflection or a check on freedom of choice. We are therefore fighting to eliminate two symmetrical errors : (1) being unaware of the hammer's existence when meeting a nail that has to be driven in (the nail's dream) or (2) conversely, with the pretext of knowing the function of a hammer, concluding that every problem is similar to a nail (the hammer's pitfall). We are involved in a paradoxical fight : distributing tools and spending a great deal of our time dissuading neophytes from using them inappropriately.

Of course the tools we are describing here do not pretend to equal the scientific calculations carried out in the physical sciences, .e.g. determining material resistance. Instead, we seek to use the most objective means possible to ascertain various realities fraught with unknowns. Unfortunately the correct use of these tools is often hindered by limitatons of time and of other means inherent to any collective thinking process. The use of such tools stems from a need for intellectual rigour, primarily so that we ask the right questions and reduce the possibility of inconsistency in our logic. However even if using these tools may stimulate the imagination, they do not guarantee any form of creation.

A talented forecaster also depends on natural gifts, such as intuition and common sense[5]. Just as prospective requires rigour to approach complexity, it needs sufficiently simple tools that can be appropriated by the users.

Whichever approach selected, it is advisable to start the process with a two-day seminar of training/practice to introduce the ideas of strategic prospective. This seminar enables participants to become familar with the main concepts and tools of scenario planning. The aim of this training stage, which can involve dozens of people, is to immerse them in prospective thinking as a prelude to strategic mobilisation. Prospective workshops give participants the opportunity to work together to identify and prioritize the main future stakes facing the firm within its environment, both national and international. At the end of the two-day session, participants are able to specify the priority objectives, as well as set up a schedule and method to follow when organising their own committee on strategic prospective.

In order to help managers in these methodological choices, we have organised the toolbox for scenario planning according to a typology of problems (initiating and stimulating the whole process of strategic prospective, asking the right questions and identifying the key variables, analysing issues and actor's games, scanning the field of possible futures and reducing uncertainties, establishing a complete diagnosis of the firm within its environment, identifying and assessing strategic choices and options). An inventory of the toolbox listing the methods by relevant problem follows. Naturally this list is not exhaustive. Other equally effective tools exist, but we highlight those that we have developed and used successfully. In a sense, we are the guarantors of the rigour and the increase in communication that these tools create when used with care, caution and enthusiasm.

[5]To find out more, the reader can refer to the bibliography and in particular to our handbook of strategic prospective, *From anticipation to action*, published in 1993 by Unesco. In French, we refer to the *Manuel de prospective stratégique* (Strategic Prospective handbook) in two volumes published in French by Dunod in 1997. The first one, *Une indiscipline intellectuelle* (An Intellectual Undiscipline) sets out the concepts and key ideas of prospective and offers another outlook on the world. The second, *L'art et la méthode* (The Art and the Method) explains the toolbox of the strategic prospective approach as well as the essential principles of managment that put people at the heart of the difference between efficient and inefficient firms.

Strategic planning using scenarios

Strategic prospective continues applying anticipation to action as this approach spreads through firms and the management sector. The last two decades have seen the popularity of strategic planning through scenarios soar, especially among large corporations in the energy sector, e.g. Shell and Elf.
A trend which must be a reaction to the effect of oil shocks past and present.

Since the early 80s we have sought to develop a high degree of potential synergy between prospective and strategy. The resulting synthesis was an integrated approach : strategic planning using scenarios.

The objective of this approach is to suggest strategic orientations and actions based on a firm's competences according to scenarios that reproduce the general and competitive environments.

Anticipation sheds light on action. Megatrends and wild cards disrupt the present thus stressing the need for strategy. Of course, strategy does question possible choices and the dangers of irreversibilities. In addition, since the 80s, strategic anticipation has made reference to scenarios, as Michael Porter's works demonstrate. Nevertheless, these approaches and tools often remain separate.

However, since 1989, we have been bringing them closer together using the competence trees developed by Marc Giget (1998) as a base. Naturally, the strategic process, defined using competence trees, lacked formal prospective for the competitive environment. Hence the mutually beneficial marriage between anticipation and strategy was arranged by matching up the scenario method and competence trees method.
Before presenting the complete process in nine phases, let us review the definition and origin of the scenario method.

A scenario is the set formed by the description of a future situation and the course of events that enables one to progress from the original situation to the future situation. The word scenario is often abused, especially when used to describe any set of hypotheses. Of course these hypotheses must simultaneously be pertinent, coherent, plausible, important and transparent to meet all our criteria.

Two major categories of scenarios can be identified :
- exploratory : starting from past and present trends and leading to likely futures,
- anticipatory or normative : built on the basis of alternative visions of the future they may be desired or, on the contrary, feared. They have been designed 'retroprojectively'.

These exploratory or anticipatory scenarios can, moreover, indicate a trend or be contrasted, depending on whether they take into account the most likely or extreme developments.

Somewhat surprisingly there is no single approach regarding scenarios. They were introduced into future studies by Herman Kahn in the United States and by Datar in France. Nowadays, the scenario method that we have developed at Sema and the Cnam, and that of the SRI (from the name of the American consulting firm) are the most frequently adopted approaches. The phases in these two methods are very similar.

The main stages of the scenario method are as follows :
- identify the key variables which is, in particular, the purpose of structural analysis ;
- analyse actor games so as to ask key questions for the future ;
- reduce uncertainty on key questions and pick out the most probable environmental scenarios using experts' methods.

Phases 3, 4 and 5 can be found, as they stand, on the left hand side of the diagram which follows.

In fact, *the first phase* attempts to analyse the problem posed and to define the system under examination. One must position the prospective process in its socio-organisational context so as to introduce and simulate the whole process by means of prospective strategic prospection.

Phase 2 is based on a complete X-ray of the firm, from know-how to product lines, represented by the tree of competences.

Phase 3 identifies the key variables of the firm and its environment by means of structural analysis (card 7).

*Phase 4 s*eeks to understand the dynamics of the firm's retrospective in its environment, its past development, its strengths and weaknesses in relation to the principal actors in its strategic environment. The analysis of a firm's battle fields and strategic stakes reveals the key questions for the future.

Phase 5 attempts to reduce the uncertainty surrounding the key questions for the future. One can use enquiry methods with experts to highlight megatrends, wild cards and finally to draw out the most likely environmental scenarios.

Phase 6 highlights coherent visions and projects, in other words the strategic options compatible both with the firm's identity and the most likely scenarios for its environment.

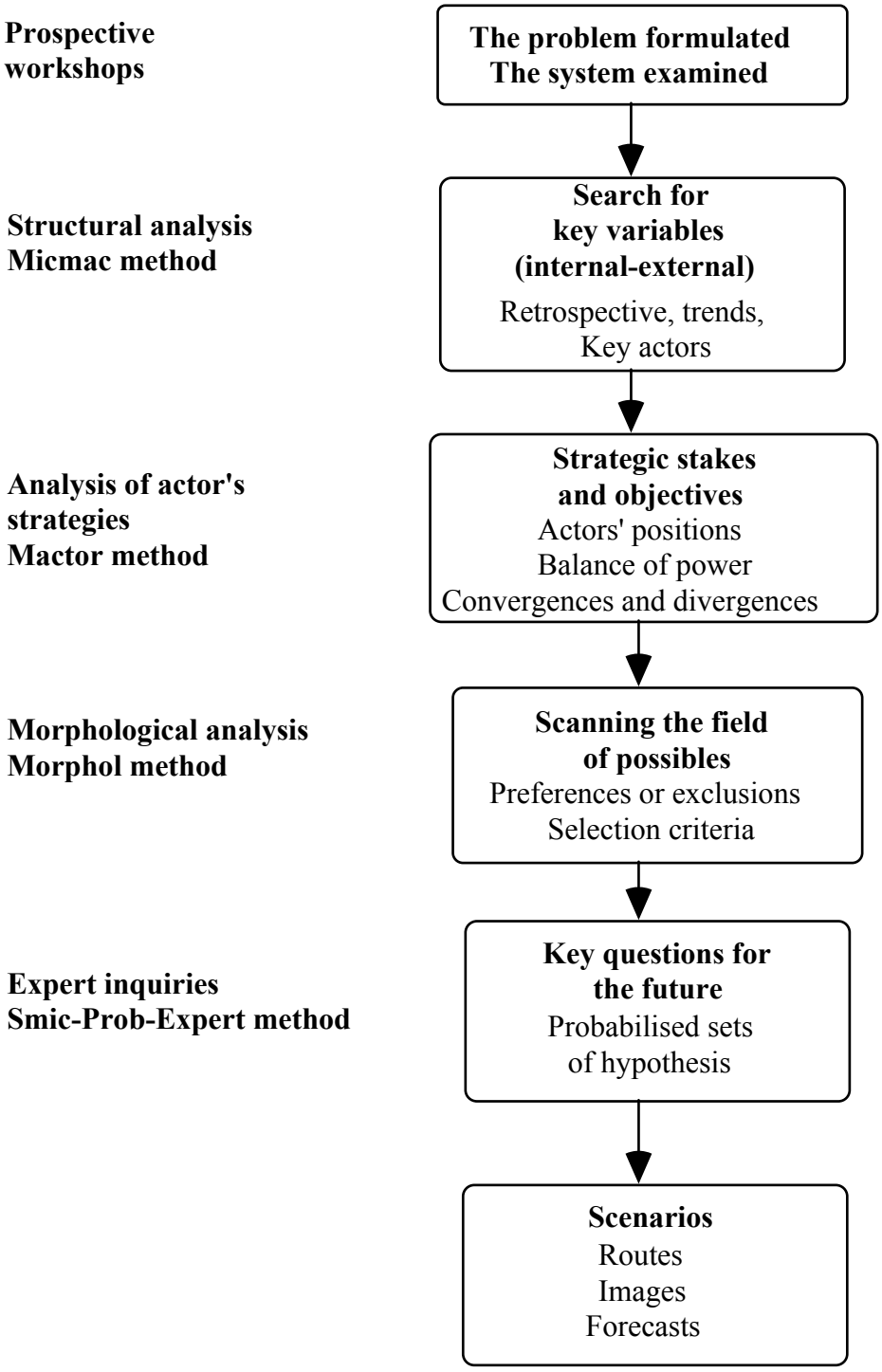
Phase 7 is wholly concerned with assessing strategic options; a rational approach would encourage the user to fall back on a method of multicriteria choices but this is rarely the case; the reflective phase prior to decision and action ends with this phase.

Phase 8 emphasises strategic choices and is crucial since it means moving from thinking to making a decision. The strategic choices and organisation of objectives into a hierarchy are the responsibility of a steering committee or its equivalent.

Phase 9 focuses entirely on implementing the plan of action; this involves contracts of objectives (negotiated or provoked), setting up of a system of coordination and follow-up and the development of a strategic watch-dog (external).

Note that the complete process does not have a totally linear progression. It includes several possible feedback loops, in particular, from phase 7 to phase 2. Implementation of the plan of action and the results of the strategic watch can lead, in certain cases, to the participants' reconsidering the company's dynamics within its environment.

THE SCENARIOS METHOD



The 5 objectives of the method

Relevance
Coherence
Plausibility
Importance
Transparency

In this complete pattern, the rational framework does not prevent the irrational from operating. Collective appropriation prepares for efficient action without a conflict with the restrictive and partially confidential nature of strategic decisions.

Moving from anticipation and prospective thought to strategic action presupposes appropriation on the part of the actors involved at each and every moment. This is to say that the staff, not only the managing directors, must be involved to the utmost in the different phases without, however, altering the necessarily confidential character of some strategic choices. To move from the act of thinking to action itself, it is necessary to appropriate.

The integrated schema of strategic prospective is designed primarily for companies which can be represented as competence trees. It can also be adopted for work on urban and regional planning. Not surprisingly, we are often asked if the tools most used in corporate forecaseting are suitable for regional forecasting. There has been some debate on the issue, including highly negative stances either based on theory or completely unfounded. Yet the facts speak for themselves, as seen in numerous territorial futures studies, e.g. the Basque issue, the Ile de la Réunion, Lorraine 2010, the Ardennes plus Vierzon, Toulon and Dunkerque. The upshot is that these tools may be equally useful in territorial futures studies when the methods are used to structure and organize collective thinking. They actually facilitate communication, stimulate the imagination and improve logical consistency. There remain, however, numerous other questions in general or sector-based prospective (demography, energy, industry...) for which the traditional scenario method suffices.

Selected examples

They say that a poor workman blames his tools. We say that the choice of tools depends on the problem, context, and usual limits of available time and information. In other words, the sequential approach to using the tools for strategic planning by scenarios as just described is not mandatory. Each tool is functional but its logical follow-up in the sequential approach is rarely carried out. Similarly, the scenario method is rarely carried out from A to Z. There usually is not enough time. Fortunately, the tools can be selected and used either individually or in combination.

In many cases, we enourage tinkering with the toolbox and and even innovating with new applications for the same tools to answer questions. Think of the humble screwdriver. It not only works on screws but also pops stubborn beer caps remarkably well! The following examples illustrate the practical use of tools within the strategic prospective process.

Two examples of specific tool combinations

At the end of the 80s, we took part in a forecasting session held by the French armament department (Direction Générale de l'Armament). The project under review was an individual infantry weapon with a horizon line in 2020. We went back to square one with the department's structural analysis that had already been dragging on for three years at that point. With the Micmac method, we set out the 57 variables in a hierarchy so that fifteen key variables stood out. Upon reflection, the participants saw that nine of these variables were components of the weapon itself (e.g. projectile, aim, energy source) and six other were critera related to evaluating arms (cost, competitiveness, anti-personnel effects). A morphological analysis of the nine components of the weapon, which could each take several configurations, followed and allowed us to identify 15.552 theoretically possible technical solutions. The combined use of the Multipol method for the multi-criteria choices and the Morphol method for the calculation of exclusion and preference restrictions enabled us to decrease the morphological space to fifty then some twenty solutions which were worth examining more closely using additional economic or technical analyses.

Ten years later, one of these solutions made the headlines at a public presentation of the operational prototype. The selected solution : a 'polyarm-multiprojectile ' model called PAPOP. This model has an indirect line of target and can be hidden while firing specific projectiles upon unmoving, armoured or mobile targets.

At a different forecasting session, this time for the commercial development of the French Electrical company (EdF) , the toolbox for strategic prospective acquired a new, innovative use. The horizon line was the year 2010. The structural analysis of the 49 variables considered led us to idenfy six key questions, such as energy consumption, competitiveness and margin of manoeuvre, We then grouped these questions under three categories or three 'future battle fields'.

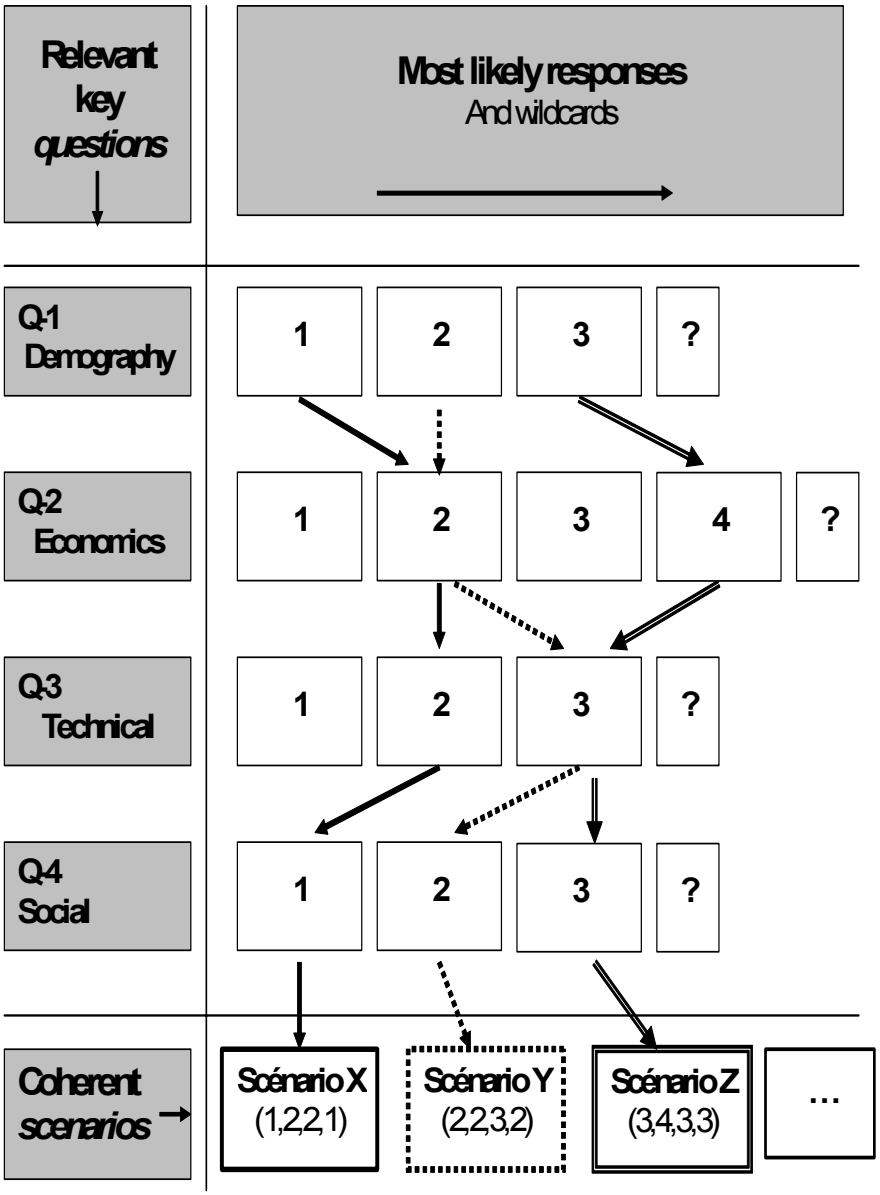
The morphological analysis of the possible answers for each of the six key questions and their various combinations enabled us to select the most probable scenarios. Of course the Smic-Prob-Expert method had already 'probabilised' the scenarios. In parallel, the Mactor method was used with some twenty actors involved in the three 'battlefields'. Their strategic positions were later optimised according to the scenarios studied.

The rediscovery of morphological analysis

Morphological analysis experienced a renaissance at the end of the 80s and became one of the most used tools. Oddly enough, morphological analysis had long been popular in technological forecasting but not in economic or sectorial prospective The following examples show how this tool works well in constructing scenarios.

Read the graph page 22

Relevance, coherence and plausibility of scenario-building through morphological analysis



? stands for all other possibilities
At least 320 possible scénarios : 4x5x4x4

In 1998, the corn growers association (AGPM) held a session that lasted only four or five working days. Given this timeframe, we turned to morphological analysis for the two classic phases; i.e., the prospective and strategic phases. The initial analysis provided development scenarios relevant to the future of corn production and its technical, economic and legislative environment.

Each scenario asks the corn growers strategic questions which may have several different answers. Once again, morphological analysis enabled us to structure the group's thinking on the strategic response profiles that were both the most relevant and coherent.

A case study in scenario planning[6]

Axa France, a leading French insurance company, brings together all the French subsidiaries of the Axa Insurance Group. The French units decided to explore future possibilities before drafting the 1996-2000 plan. The previous plan (1992-1996) had focused on reorganising new acquisitions, the fruit of various buy-outs, and on improving overall profitability. Since this previous plan stressed organisational goals using the distribution chain, no specific research had been carried out on the company's environment. Axa's internal goals had been reached, so the new plan was designed to integrate outside challenges and thus define the strategic axes for the next five years. The same plan had to take into account the Axa group's global objectives, quality and profitability requirements plus clarify the strategic axes with a ten-year future timeline. For those familiar with the insurance industry, note that this prospective exercise took place two years before the AXA UAP merger.

The procedure adopted by Axa France provides a textbook example of how the pactice of prospective has developed and how it is integrated into the planning process. Rushed into action, companies have less time to think. Yet there must be a way to meet the need ? How then can we hold a relevant, coherent and realistic session on the uncertainties or major trends of the future ? In other words, what can we really achieve in six working meetings ?

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[6]Cf. In French, "La planification par scénarios chez Axa" by Paul Benassouli and Régine Monti, *Futuribles* No. 203, November 1995. This prospective exercise was carried out with members of the French management committee from march 1994 to December 1995, under the authority of the Plan Budget Result.

Actually, for a relatively recently formed group like Axa France, marked by rapid integration, several acquisitions, shifting structures and heavy decentralisation, it would be impossible to carry out the 'full procedure' using a specialised department and taking executives away from various subsidiaries for the entire process. On the contrary, the idea was to have the general managers becomeactively involved. The ultimate goal was that they approach the future with a common vision and that they pinpoint threats, opportunities and potential ruptures so that the corporation would be ready to confront unexpected changes and would be prepared to foster desirable changes while combatting expected changes. In other words, they wanted to ask *what to do if x* ? and *how to handle y* ? It was therefore necessary to identify possible futures and to pinpoint the most probable. In a nutshell, the task was to construct scenarios for the environment of Axa France. The horizon line chosen was 2005.

Timeframe of Environmental Scenario Construction

Axa France

1) Hold prospective workshop: participants acquire analytical methods, identify and hierarchise factors of change affecting Axa France. They select the most influential environmental components for the furute of Axa in France (mid-March 1994)

2) Construct broad scenarios within a small group (April-June 1994)

3) Synthesise results of the various working groups and construction of the environmental scenarios (June 1994)

4) Survey evaluating the future of insurance in France (July-September 1994)

5) Determine probability, select and analyse scenarios (October 1994)

6) Select the main scenario and identify alternative hypotheses (November 1994)

7) Present the main scenario and alternative hypotheses to the different subsidiaries (December 1994)

8) Appropriate and integrate the main scenario and alternative hypotheses according to the subsidiaries (January 1995)

9) Draw up a plan in each subsidiary (February-June 1995)

10) Do arbitration and allocation of resources (4th quarter 1995)

Given the nine-month timeframe, we opted for two basic prospective tools : structural analysis to find key variables and actor role play to explore possible developments. In the end, we used three methods -- prospective workshops, morphological analysis and the Smic Prob-Expert -- which enabled us to construct scenarios while respecting the basic conditions of relevance, coherence, plausibility and transparency. All of the above must be accomplished while using time efficiently and encouraging appropriation.

3° CORRECT USE OF TOOLS

Over the past twenty years, the overall, systemic and long-term state of affairs has become important. In other words, the big picture.

With the exception of the Mactor method for issues analysis and actors games, standard methods of futures research have experienced little significant progress but have been widely distributed by means of multiple applications. It all happened as if practitioners had followed J.-N. Kapferer's recommendation :*"An operational imperfection is better than a perfection that it is not"*. Indeed, to tackle a complex world, what are needed are simple and appropriate tools precisely because they are appropriable.

In fact, increasingly prospective takes the form of a think tank, a mobilisation of minds in the face of change within the strategic environment. It is enjoying more and more success with regional organisations, local communities and firms. If some satisfaction may be found in this trend towards greater distribution and appropriation of prospective, a field formerly restricted to specialists, there is also some regret that methodological weaknesses survive, and even thrive. More serious is the marked decline, especially in the United States, in rationality in favour of intuitive approaches whose commercial success does not justify their drawbacks. Indeed, if following procedural rationality (Simon, 1982), a futures study must keep a heuristic approach[7], as opposed to an algorithmic one or a rough guess. In other words, an approach that does not reject formal tools when useful. From this point of view, constructing scenarios is often presented as mainly " the art of the long view " (Peter Schwartz, 1991). But one has to be as masterful as Peter Schwartz to succeed in such an exercise without techniques. The philosophy and steps behind the approach presented by Peter Schwartz are close to those that we advocate but the technique is all the less appropriable or reproducible due to its absence. This decline in formalisation, as we call it, is accompanied by collective amnesia that includes even the forgetting of words and names.

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[7]Here we would like to thank Alain-Charles Martinet for his useful comments on an early draft of this toolbox and especially for the clarification of the incorrect opposition between rational and heuristic methods.

Far too many budding prospectivists launch themselves into scenario construction without having integrated the accumulated legacy into their work and then they look surprised when someone speaks to them about morphological analysis or scenario probalisation. Little wonder they ask themselves : what is it all about ? is this really possible ?

Jacques Lesourne's (1989) plea for research into prospective was (and still is) all the more justified in that simple tools are often confused with simplistic tools. It should be remembered that the scenario method, as designed over twenty years ago, remains as useful as ever and has the great merit of imposing intellectual rigour as seen in the qualitative and quantitative analysis of serious trends, retrospective techniques, players games, identification of weak signals, tensions and conflicts, construction of complete and coherent scenarios.

Some tools specific to futures research, such as structural analysis, are currently experiencing an almost disquieting success for those who have worked on developing them. Structural analysis is too often applied in a mechanical manner that lacks usefulness and works to the detriment of deep thinking. The lesson to be learnt from all this is that time is needed before a tool comes into common use (almost twenty years) and even more time is required for it to be used correctly. Users must also be told what to avoid doing when presented with a method in a manual, so that they may use it to the best effect.

Scenarios : use and misuse

The very use of the word "scenario" may prove dangerous for the prospective approach. There is always the risk of an approach being swamped by media success with little or no respect for its scientific grounding.

We persist, however, and review two preliminary questions :

- does the term "scenario" for any combination of hypotheses or a given analysis, however attractive this may be, confer a degree of future respectability ?
- do future studies necessarily require full and detailed scenarios ?

The answer is most assuredly : "No !" on both counts. 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. Reality as the acid test, combined with some concern for efficiency, should be used to guide prospective thinking in order to gain a better mastery of history. A scenario approach can only be credible and useful if it meets our four prerequisites : relevance, coherence, plausibility and transparency.

In other words, one must ask the right questions, formulate the right hypotheses clearly and ascertain the coherence and probability of possible combinations. These are the keys to the future. Without this procedure, one risks leaving out 80% of all possible futures. With modern probability tools, such as the micro-computer package SMIC- Prob-Expert (cf the insert on iron and steel industry scenarios), it takes only minutes to provide results for a working group.

Oddly enough, certain proponents of the prospective approach refuse to submit their own thoughts on an issue to a system which is akin to a lie-detector, or which would at least reveal contradictions in their reasoning.

As mentioned above, transparency is the last prerequisite needed to ensure the credibility and usefulness of the scenario method. Here transparency means full transparency, from A to Z, which implies that: *"a clear concept can always be stated clearly* ". This should be the case for any problem, for the methods used to solve it, for the reasoning behind it, as well as for the results and conclusions of the scenarios envisaged. Unfortunately, either the simple reading of scenarios proves laborious because the reader must invest considerable effort in ascertaining the prerequisite conditions (relevance, coherence) or the literary quality is so low that the reader finds the text indigestible and sets it aside. Due to a lack of close and critical review, a number of scenarios remain credible somehow, i.e., they are given the benefit of the doubt. It is as if the reader were left feeling guilty about not finishing the text.

Without transparency, results will not be adaptable and will not motivate the actors (also the audience) that we wish to involve through the scenarios. Naturally the transparency and attractiveness of scenarios do not ensure quality of content. Some scenarios with catchy titles, presented in an emotion-ridden, pleasurable or doomsday style - such as Toffler's "Future Shock "- can be convincing. Such works are fiction, i.e., a literary genre which *per se* is quite honourable and often makes for superb reading. One famous example which

springs to mind is George Orwell's *"Nineteen Eighty-Four"*. Nevertheless, they rarely contain relevant, coherent or even likely scenarios.

By replying negatively to the second question about full and detailed scenarios, we want to make it amply clear that anticipation and scenarios are not synonymous. Too many futures studies become bogged down over time because a group decided to launch into *"the scenario method"*. But why, we may ask, did they do so ? A scenario is not an end in itself; it only becomes meaningful when its results and implications are embodied in real action. Undertaking a scenario approach is time consuming (12 to 18 months is not uncommon) and there must be several persons involved, to establish a team context and make the process viable. In fact after three years, the leaders of the OECD Interfuturs team (1976-1979) announced that they had had insufficient time to maximise their use of the scenarios ! (cf. J. Lesourne and D. Malkin (1979)). Of course, we can safely add on an extra year for circulating and valorising results after the exercise.

In most corporate and administrative organisations, such teams will be required to report within the year. In extreme cases, policy-makers may launch a future study that they wish to see finished in a matter of weeks. In which event the prevailing conditions are rarely ideal, yet it is better to light a candle than curse the darkness in this case. Sheer common sense dictates the simple questions that one should raise at the outstart : what can be done in the given time, using the means available ? How can it be done in such as way as to be both credible and useful to the decision-makers ?

From this point of view, it is often advisable to limit the scenarios to several key hypotheses, say four to six. Beyond such numbers, the sheer magnitude of possible combinations is such that the human mind simply gives up. Such straightforward scenarios are used as backgrounds for strategic options such as *"what* if... ?*"* or *"what for... ?"*. Short-cuts in the scenario approach make it all the more crucial to do some preliminary thinking about the key variables, the trends and the actors' strategies.

One final difficulty that arises when building scenarios and selecting methods relates to lead-times. Even if one had months or a few years to finish the

assignment, there is a risk inherent in the start-up phase because team members or even the team leader may change as the study progresses. A futures study rarely survives after the departure of the initiator. In major organisations -- given existing staff mobility factors -- it is preferable to limit the length of the project to one year and to plan for interim status reports.

It is also advisable to identify a preliminary exploratory phase, during which the elements at stake are identified, and a normative phase, during which the various strategic policy choices are defined in terms of items identified in the preceding phase.

The French Iron and Steel Industry

An Example of Scenario Building to Reduce Collective Biaises

Between 1990 and 1991, several months of prospective reflection on the iron and steel industry in France on the horizon of the year 2005, enabled participants to identify six relevant and consistent scenarios constructed around three general hypotheses : H1 (low GDP growth, below 1.8%); H2 (severe constraints on the environment); H3 (strong competition from other materials)

Black (S 1)	poor growth in GDP and strong competition from materials
Morose (S 2)	poor growth in GDP with no strong competition from others materials.
Tendential (S 3)	continuation of the current situation.
Ecological (S 4)	strong constraints from the environment.
Pink Steel (S 5)	strong growth of the GDP and competition favourable to steel.
Pink Plastic (S 6)	strong growth of the GDP and competition favourable to other materials.

Use of the Prob-Expert software has enabled one to pick out only six scenarios which covered only 40% of the field of probables :

S5 Pink steel and S4 Ecology	(010) = 0.147
S1 Black	(101) = 0.108
S6 Pink plastic	(001) = 0.071
S3 Tendencial	(000) = 0.056
S2 Morose	(100) = 0.016

Three new scenarios thus appeared which were far more probable :

The three remaining hypothesis configurations (60% of global probability) each have an implementation probability superior to the most probable of the scenarios previously retained.

S7 ecological black	(111) = 0.237
S8 Steel green	(110) = 0.200

S9 Plastic green (011) = 0.164

The pair (11.) in the first two hypotheses H1 and H2 had been eliminated because, in a context of sluggish growth, serious constraints from the environment seemed to be an improbable luxury. The pair (.11) had been eliminated because serious constraints from the environment (H2) seemed somewhat favourable for steel which at the same time was not subject to serious competition from other materials. But why did no one imagine plastics that could be recycled or were even bio-degradable as is suggested by pair (.11)?

The Art of Rebellious Rigour

The challenge of prospective is to keep the freshness of its intellectual rebelliousness while reinforcing the rigour of its approaches. Of course, tried and true methods are already a vital asset. In addition, the rich heritage of strategic analysis and prospective reveals the complementarity and high levels of convergence that exist between these two approaches and the possibility of listing tools for collective thinking in one single toolbox. We do not have to reinvent the wheel each time if we recognise a problem and then consider the suitable tools. In order to be creative, any disorder in our thoughts must be organised.

All the same, these tools should not be applied needlessly without concern for the type of problem and the time or means available. Using the tools described should not be fun for one but rather part of a group thinking process. They are designed for group thinking sessions which, although necessary, may prove difficult for lack of a common language or working method. The advantage of the methods suggested here is that they have been tested many times both in France and abroad.

Reading a recipe and breaking a few eggs does not make a gourmet omelet. Although the methods mentioned enable groups to structure their thinking while stimulating the imagination, they do not guarantee the quality of the group's ideas. Prospective remains an art which requires several other talents to succeed, e.g. non-conformism, intuition and common sense. Perhaps playing scales does not make a concert pianist, but to remain one, daily scales are necessary. Methods other than those described here may be possible and even desirable. It is possible for researchers and practitioners to keep the flame of innovation bright while relying on the accumulated wealth of information in

prospective as well as in strategic analysis. However, these innovations represent progress only in the sense that they enable us to ask more pertinent questions, to make our logic more consistent, and to appreciate the plausibility and importance of conjectures. Yet these new methods must be simple enough to be appropriated by others. Contrary to popular belief, complication is not the best weapon when confronting complexity. As old-fashioned teachers tell their pupils : *Good thinking is clear thinking*.

In order to help in these methodological choices, we have organised an introduction to this tool-box for strategic prospective in accordance with a typology of problems (initiating and stimulating the whole process of strategic prospective, asking the right questions and identifying the key variables, analysing actor games, scanning the field of possibles and reducing uncertainties, establishing a complete diagnosis of the firm within its environment, identifying and assessing strategic choices and options). An inventory of this tool-box can be found below in the form of technical cards describing the methods according to a common scale of analysis and listed according to the problem to which they refer. For each card, the scale contains the following headings : aim of the method, description, use and limits, practical conclusion, bibliography.

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2 - INITIATING AND STIMULATING THE WHOLE PROCESS

CARD 1

THE SCENARIO METHOD

AIM

The scenario method aims to construct representations of possible futures as well as the routes that lead there.

The purpose of these representations is to highlight the heavy trends and seeds of rupture in the general and competitive environment of the organisation.

DESCRIPTION OF THE METHOD

In fact, there is no single approach regarding scenarios. They were introduced into prospective by Herman Kahn in the United States and by Datar in France. Nowadays, the scenarios method that we have developed at Sema and the Cnam, and the SRI (from the name of the American consultancy firm) are the most frequently adopted approaches. The different phases in these two methods differ. Relying on a more advanced formalisation, the former, however, very little emphasizes the systematic examination of possible futures. It is the former method that we describe here and summarise in the diagram on page 28.

What is a scenario ?

A scenario is the set formed by the description of a future situation and the course of events that enables one to progress from the original situation to the future situation.

Two major categories of scenarios can be identified :
- exploratory : starting from past and present trends and leading to likely futures,
- anticipatory or normative : built on the basis of alternative visions of the future they may be desired or, on the contrary, feared. They have been designed retroprojectively.

These exploratory or anticipatory scenarios can, moreover, indicate a trend or be contrasted, depending on whether they take into account the most likely or extreme developments.

Phase 1 : Building the base

This phase plays a fundamental role in scenario construction. It comprises the building of a unit of representations of the present state of the system, made up of the firm and its environment. The base is thus an expression of a system of inter-related dynamic elements, with the system itself linked to its external environment.

The following steps should be taken:
1/ define the system and its environment,
2/ determine the main variables,
3/ analyse the actors' strategies.

In order to implement point 1, structural analysis (card 7) proves a valuable and standard tool. A retrospective study, which should be as detailed and quantified as possible, on the variables stemming from the structural analysis is recommended. This retrospective analysis avoids over-emphasising the current situation which one is often tempted to extrapolate into the future. Analysis of past trends can be used to reveal the dynamics of the changing system and the productive or counter-productive role of certain actors. Moreover, each actor must be defined according to his or her objectives, problems and means of action. We must then examine how the actors position themselves with respect to one another. To achieve this, we can draw up a table showing the actors' strategies. In order to analyse the situation, we use the Mactor method (cf.card 8).

Phase 2 : Scanning the range of possibles and reducing uncertainty

Once the key variables have been identified and the actors' strategies analysed, future possibles can be listed using a set of hypotheses which points to a continuation of a trend or, on the other hand, its cessation.

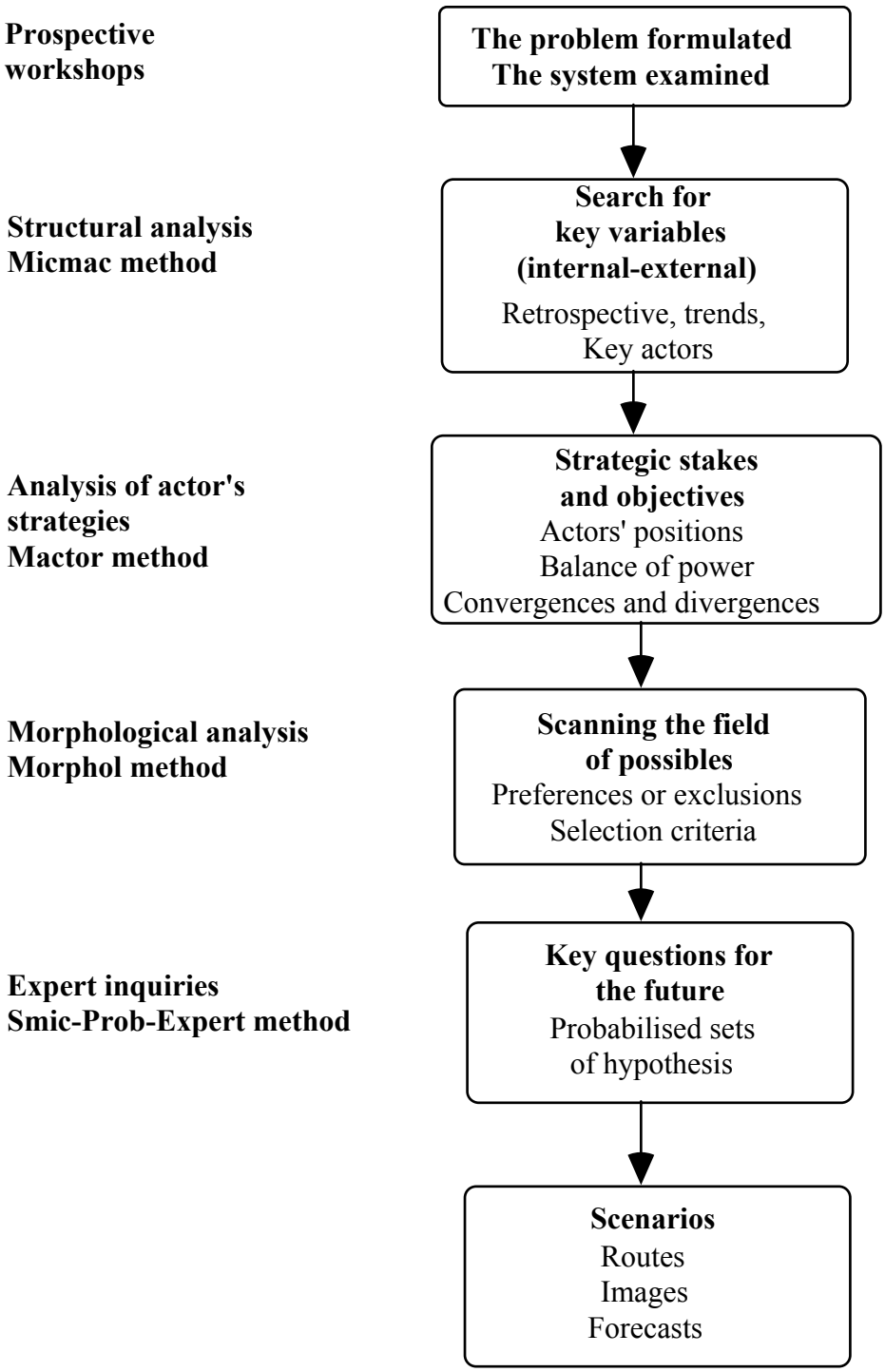
In this case, morphological analysis (card 9) can be used to break down the system under examination into essential dimensions and then study possible recombinations of the different dimensions, such recombinations comprise as many visions of the future as possible.

Expert methods enable us to reduce uncertainty by estimating the subjective probabilities of the different combinations occurring or different key events for the future (see the cards on expert methods : Delphi (card 10), the Régnier Abacus (card 11) and SMIC-Prob-Expert (card 12).

Phase 3 : Developing the scenarios

At this stage, the scenarios are still embryonic since they are restricted to sets of hypotheses, whether implemented or not. The next stage is to describe the route leading from the present situation to the final visions retained (the diachronic phase). Certain parts of the system's evolution may lead to adjustment of partial models and be processed by computer. However, the figures produced in this way should be seen as indicative only; they serve to illustrate system changes and enable a certain number of coherence checks to be carried out.

THE SCENARIOS METHOD



The 5 objectives of the method

Relevance
Coherence
Plausibility
Importance
Transparency

USEFULNESS AND LIMITATIONS

Scenarios throw indispensable light on the process of orienting strategic decisions. By maximising one's advantages, the scenario method can help in selecting the most appropriate strategy to be deployed, so as to reach the set target. The logical sequence (defining the system, retrospective analysis, actors' strategies, scenario development) has been tested during several dozen prospective studies.

Although the sequence is logical, there may be no need to go through it from start to finish. Much depends on the user's familiarity with the system under study and one's aims. The scenario method is a modular approach and one can limit the study to this or that module as, for example, structural analysis in the search for key variables, analysis of actors' strategies or an enquiry by experts into the key hypotheses for the future. Similarly, we are all too often satisfied with presenting the visions and stressing the heavy trends, discontinuities or key events, without spelling out the sequences.

One of the main constraints of the scenario method is time. Twelve to eighteen months are generally required to go through the sequence in its entirety, and at least half this time is taken up in building the base. If one only has three to six months to finalise the study, it is preferable to focus on what appears to be the most important module.

PRACTICAL CONCLUSIONS

The word scenario is often used mistakenly to describe any set of hypotheses. Yet for prospective and strategy, a scenarios hypothesis must fulfil five conditions simultaneously : relevance, coherence, plausibility, importance and transparency.

Even if scenarios and prospective are not synonymous, scenario building plays a central role in most prospective studies. Whether the different phases presented above are followed in their entirety or whether only some of the modules are put into practice, the presentation of scenarios, even reduced to combinations of hypotheses, contributes to highlighting the main stakes for the future.

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CARD 2

STRATEGIC PROSPECTIVE WORKSHOPS

AIM

The aim of these workshops is to introduce and simulate a complete prospective and strategic process in a group. In this situation, participants will become familiar with the tools of strategic prospective in order to identify and organise in a hierarchy the main stakes for the future, the main preconceived notions and find ways to act when encountering these stakes and ideas.

At the close of these workshops, participants will be in a position to understand the problem better, define together the prospective steps to be taken, and choose the right tools.

DESCRIPTION OF THE METHOD

In the area of prospective, the term "workshop" is often used to describe organised sessions where groups think over problems together. We have come across the term, both in French and English, for a number of years. The procedure presented here is one we developed and perfected during training seminars for executive managers at Renault in 1985.

These prospective workshops were most frequently part of a residential seminar lasting one or two days.

During this type of seminar, participants are introduced to the tools and methods that can help them. However, the group is not merely there to receive training, it is also there to produce ideas on the problem put forward. Everyone "dives in" during prospective and strategy workshops.

The rules of the game are simple. The working party divides into sub- groups made up of eight to ten people who meet during two- to four-hour sessions. They choose their subject of study from the three below :

1) anticipation and coping with change ;
2) debunking preconceived ideas on the company and its activities ;
3) past, present and future competence trees (see card 4)

At the end of the first two workshops, they have recognised and organised hierarchically the main stakes for the future as well as the conventional wisdom that requires closer inspection. The third workshop is equally important because if asking questions about the environment is useful, it is also good to represent the competence tree of the past, the present and then of the future with its roots (know-how), trunk (production), markets, products etc. This is the way to discover that our memory often plays tricks on us and that the present remains blurred. Of course before knowing where one wants to go, one must know where one has come from.

During a second phase, strategy workshops are organised, lasting two to four hours as well. Here it is a matter of translating the main stakes for the future (issuing from the workshops on anticipation) and mastering the changes and received ideas into objectives and sub-objectives, by means of actions and actions to be undertaken (cf. card 13 relevance tree). This way, the participants are not at a loss when faced with great challenges for the future since in a few hours they have already mapped out the course to follow. Moreover, they are quickly able to discover ongoing actions leading to uncertain outcomes and the important stakes for which new actions are imperative.

Whatever the subject may be, the workshops are organised according to two regulatory principles or guidelines :
- permit full freedom of speech to all speakers (individual time for thought in silence, feedback of all ideas in writing)
- channell the participants' production (especially through a strict time management and above all through systematic recourse to techniques like classification of ideas, hierarchisation, etc.)

Wrap-up sessions are organised at the close of the workshops. In these sessions, the different groups share and compare their thoughts. In this way, they acquire more thorough knowledge of the problems to be studied and the tools to be used. They are in a position to define together a working method adapted to the constraints of time, plus the means taken and the objectives saught. Note the method is not completely validated until after a cooling-off period.

USEFULNESS AND LIMITATIONS

Prospective workshops provide a truly practical training for the participants who are necessarily the caretakers of any participatory prospective reflection.

Moreover, the modular aspect of these workshops (half a day spent together), quick and easy set up (some flip charts, felt pens or markers and post-it notes

are the only material required) make them adaptable to any situation.
In the very simplicity and speed of setting them up, these workshops are similar to procedures like the "quick environmental scanning technique" (Quest) by Burt Nanus.

Lastly, participants are encouraged to go one step further during these days. It is the opportunity for executives, in particular, to start up a process of participatory prospective ; this can also represent a drawback if the former do not wish it.

The experience gained from several hundred cases confirms that it is difficult to find drawbacks in these prospective workshops since they are limited in time and get the participants very involved. In the worst possible case, the pooling of ideas will lead nowhere, but the training will definitely have had more impact than what would occur if no workshop took place.

PRACTICAL CONCLUSIONS

Prospective workshops can involve groups ranging in size from 10 to 100 people who have "common life experiences" and wish to reflect together on the possible and desirable changes in their environment with a view to controlling and re-directing them more effectively.

It is preferable to have at least two sub-groups on the anticipation for change, so as to compare their findings. Always have a sub-group on the look out for preconceived notions. Thus certain assumptions can be voiced and the workshop will play the role of watch-dog (and punching-bag) where everyone can work off his or her frustrations.
Workshops provide a precious if not indispensable preliminary stage to any prospective thinking. Simple to set up, the workshop procedure is easily appropriable. Generally they act first as a launching pad for the thinking process and then as a way to master change.

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3 - MAKING A COMPLETE DIAGNOSIS OF THE FIRM IN RELATION TO ITS ENVIRONMENT

CARD 3

COMPETENCE TREE

AIM

Competence tree attempt to represent the company in its entirety without reducing it to products and markets. In these trees, the roots (technical skills and know-how) and the trunk (capacity for implementation) are as important as the branches (product-market lines).

As part of the integrated procedure (card 1), the purpose of the trees of competence is to provide an X-ray of the company in order to consider its distinctive competences and dynamics when drawing up strategic options.

DESCRIPTION OF THE METHOD

The representation of a company in the form of a tree of competences originated in a strategic analysis of Japanese firms. It turned out that, whether implicitly or explicitly, most organisational structures in Japan were represented in the form of a tree ; thus, for example, three concentric circles symbolise research, then production and finally marketing which is also the representation of a tree projected onto a plan.

A complete competence tree represents a great deal of work, requiring thorough data from within the company (from know-how to product-market lines) and from its competitive environment. This comparative collection is essential for the strategic diagnosis of the tree, e.g. the strengths and weaknesses of the roots, trunk and branches. The diagnosis must also be retrospective before it is prospective because in order to know where one can go, one must know where one came from.

This approach should not be confused with that of technological trees in which the trunk (production function) does not exist and where the branches appear to stem directly from the roots. As Marc Giget (1989) stresses : "*It is a question of two concepts with distinct outcomes (...) making technological trees was generally done by research or communication directors who found in them a simple and positive way to present a coherent and complete image of the company's activity to the outside world".*

USEFULNESS AND LIMITATIONS

The image of the tree certainly has its virtues. It appears, primarily, to repeat Marc Giget's expression, that *"the company must not die with its product"*. Just because a branch is diseased, the tree trunk does not need to be chopped through. In this case it would be better to redistribute the sap ; i.e., the competences, towards the new branches of activity that correspond to its "genetic code". There are the French examples of Bolloré-Technologies, who went from cigarette papers to special packaging; Graphoplex, from slide-rules to precision thermoplastics or the Règle à Calcul, or slide rule, that went into distributing calculators and electronic products.

Yet, the image of the tree also has its limitations. The dynamics of a tree are not unidirectional, moving from roots to branches . In fact, things go both ways, as the branches nourish the roots through photosynthesis and through the humus produced from fallen leaves. The biological combinations are immense but there are also insurmountable incompatibilities. Obviously, a pine cannot turn into an oak, and a cherry tree cannot bear pears.

PRACTICAL CONCLUSIONS

This approach, set out by Marc Giget during the 80s, was taken up in a large number of French companies such as Renault, Elf, Péchiney, Sollac or Télémécanique. Its principles continue to be rediscovered in other forms. Hamel and Prahalad (1994), therefore, insist justifiably on the return to fundamental skills in determining strategic directions.

For some ten years now, we have used the representation of competence tree primarily as a tool for pooling ideas within prospective workshops (cf card 2). These trees enable an exercise in strategic prospective to get underway for either a territory or a firm.

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The Tree of competence and its dynamic

Roots: know-how and skills
Trunk: organization of production
Branches: product-market lines

The past is unique; analysing it allows us to understand the constants and continuity of the company's business, to improve our knowledge of the company project in its historical reality

The future is uncertain; its analysis allows us to identify the threats and opportunities presented to the company, and to define the issues and challenges it faces, in order to determine its desired future and to incorporate this into the company project

Source: Marc GIGET "La conduite de la réflexion et de l'action stratégique dans l'entreprise" © Euroconsult 1988

CARD 4

STRATEGIC ANALYSIS TOOLS

AIM

As in prospective, strategic analysis is made up of a set of tools and methods which, combined together, make up the procedure whose final goal consists in helping the manager choose and direct the firm's activities.

Without attempting to be exhaustive, we shall present below, as a reminder, the main tools and methods for strategic analysis which have been developed over the last decades. We have limited ourselves to the following tools :
- segmentation into strategic business areas,
- the life cycle,
- learning curves,
- models of business portfolios,
- analysis of basic resources, including competence trees and value chains.

1/ SEGMENTATION INTO STRATEGIC BUSINESS AREAS

DESCRIPTION

Two business activities are part of the same strategic business area (SBA) if they involve the same competitors, the same consumers or if they are closely linked together in production or distribution, so that any action on one of the business activities (change in price, quality or service) will have repercussions on the other.

A strategic business area is defined as a product-market pair, in the centre of which exist strong synergies of production and distribution. Each strategic segment represents a front for the firm on which it can fight.

The division into business units provides firms with a "map of the battle field". On this subject, H. de Bodinat (1980) notes that at the end of 1942, during the second World War, there were four distinct strategic areas : "the Russian front, the North African front, the Atlantic front and the Asian front". Synergy in combat was rather weak among these different fronts.

The division of the firm's business activities into units or strategic business areas rests on a fairly general definition as formulated by ADL consultants, H. de Bodinat (1979) and E. Ader (1983) : "a *strategic segment comprises a homogeneous collection of goods and/or services designed for a specific market with fixed competitors for whom it is possible to formulate a strategy".*

USEFULNESS AND LIMITATIONS

With the diversification of activities within firms, traditional strategic analyses with their non-differentiated character were becoming generally inoperable. However, segmentation of activities solved the problem as the company was divided into homogeneous business areas.

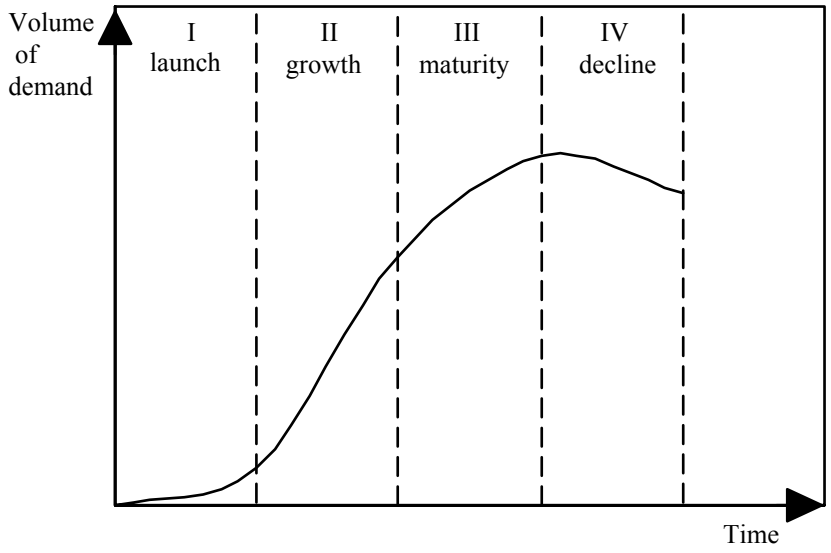
Dividing a company into strategic business areas is always a very delicate task as even products relying upon similar technologies and production methods can belong to different strategic business areas. Moreover, collecting the necessary information often presents numerous difficulties since the division into SBAs does not generally correspond to existing statistical data where approximations and estimations are even less verifiable because they are supplied confidentially by consultants. Be this as it may, segmentation is a useful exercise because, for one product sold in different segments, the same key success factors do not necessarily apply.

2/ THE LIFE CYCLE

DESCRIPTION

According to the famous biological analogy introduced by the American, R. Vernon, products behave like living beings and have a four-phase life cycle : birth, growth, maturity and decline. The development of a product's sales and market share in relation to time is represented as follows :
Phase I - product beginning life : monopolistic or oligopolistic market, problems in adjustment,
Phase II - product in full development (adolescent) : appearance of several new competitors, need for massive investments to acquire or retain market share,
Phase III - product having attained the age of maturity : few new competitors, very profitable product, requiring little investment,
Phase IV - ageing product : market in decline.

Life curve of products



Analyses of product life cycles were first used in marketing, especially to formulate and follow up a marketing-mix. Indeed, the concept of a product's life cycle is extremely important for the financial management of a firm ; for example, losses must be expected when launching a firm because of necessary initial investments. Return on investments will only become possible with the market's maturity. Of course, this depends on competion. When launching a company, for instance, only a few producers are in the market place; one can therefore have a higher price policy than in the development phase when numerous competitors are present.

The product's life cycle concept is also used in strategic analysis as a criterion for segmentation in portfolio analyses.

USEFULNESS AND LIMITATIONS

The main advantage of the life cycle concept for products has certainly been didactic since it enables one to spread widely and relatively simply the notion of dynamic product management, with realist examples such as borrowing at the outset in order to pay back during the maturity phase. This concept has subsequently been used to manage a portfolio of products, then it served, rather like an orchard, in which young trees would be planted to replace the old ones that had matured.

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However, many difficulties remain in the actual use of the concept:
1) products do not all have the same type of life curve; some seem eternal, others ephemeral. The predictive capacity of this tool depends therefore on the skill of the analyst in identifying the right curve,
2) identification of the different phases is not always simple and their duration is extremely variable. Furthemore, the follow-up of indicators considered objectives, such as the growth rate of product demand, can be disrupted by important developments in techniques or behaviour and economic cycles,
3) biological analogy therefore has its limitations since some products can experience renewed youth or accelerated adolescence due to technical, economic or social changes.

3/ LEARNING CURVES

DESCRIPTION

The learning theory applied to the firm means that with the repetition of identical tasks, the staff in a firm become more and more experienced, thus the firm's productivity increases.

Observations made in the American aeronautics industry in the 30s by Officer Wright showed that with time, and especially in relation to the cumulated production of airplanes, the number of working hours required for each new unit produced decreased progressively. At each doubling of cumulated production, there was a 20% saving in time. In learning curves, the fall in unit production costs cannot be explained by the sole effect of direct learning but depends also on economies of scale and the introduction of innovation.

USEFULNESS AND LIMITATIONS

In business activities where the volume of production increases rapidly, learning curves are a relevant tool for strategic analysis : one must go down along the learning curve as quickly as possible in order to have the lowest possible unit production costs. It is true that lower costs due to learning represent an obstacle for new producers entering the market. They are initially forced to accept higher costs and, as a result, lower profitability.

The "entry barrier" is also an "exit barrier". In this way, the main drawback of research into learning curves through production increase of given good is its

inflexibility. The weight of the investment implied is only one a such aspect. The historic example of Ford in the 30s reminds us all too well that a firm seeking the biggest market share has a tendency to lose its ability to adapt to the market and the competition. Common sense teaches us not to put all our eggs in one basket.

4/ BUSINESS PORTFOLIO MODELS

Business portfolio models depend on a segmentation of the firm's business activities and its positioning in relation to key factors of success that are commonly considered fundamental. These models give rise to dynamic product management, a form of management often linked to marketing and financial strategies. These different qualities have led to the success of the portfolio analysis matrix, the most well-known examples are BCG's, ADL's and Mac Kinsey's.

Every portfolio analysis method takes as its starting point two strategic questions that any firm asks itself once it has divided its business activities into segments or areas of strategic business :
- what is my market position in each of the SBAs?
- what is the present and future value (or interest) of these SBAs?

In order to understand the answers to these two questions, it is essential to have assimilated the preceding analysis tools (the product life cycle, learning curves, segmentation).

The BCG method

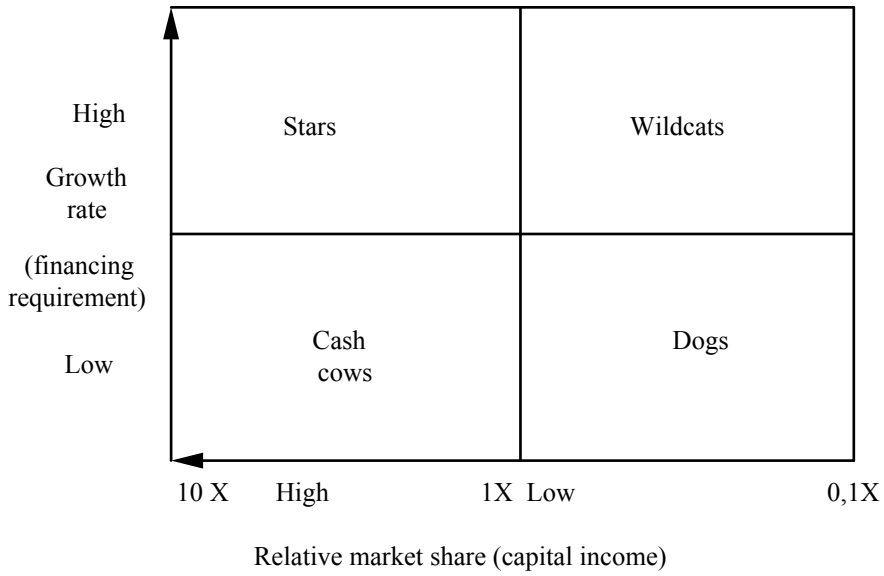
The Boston Consulting Group's (BCG) method may not be the best, but it has had notable success because of its simple and easy-to-understand design. Other methods are more appropriate for the complexity of reality, like the one from ADL, another consulting firm, and are at the same time more difficult to assimilate and as a result less appropriable.

To answer the first strategic question, the BCG method considers the relative market share as a good indicator of a company's competitive position in a given area. This choice is directly inspired by the principle of learning curves previously presented.

The answer to the second question can be appraised through an indicator of the market growth rate, itself closely correlated to a life cycle phase for the business

unit under consideration. By distinguishing two "high and low" levels for the two indicators, the BCG builds a matrix in which are represented :
- on the abscissa, the relative market share which will be high if the firm holds a market share that is above a value of C (C being the most important competitor's market share in the segment under consideration), low in the opposite case ;
- on the ordinate, the market growth rate for the strategic segment in question. No precise rule can enable one to say from which threshold growth will be considered high or low. A reasonable threshold can be the rates of strategic segment growth of firms in the same sector.

Matrix representation of a business portfolio : BCG method



The ADL method

Confronted with two fundamental strategic questions, ADL consultants offer answers that are fairly similar to those of BCG. Yet theirs answers rely on more criteria hence they are less brutal and more realistic :
- an area's value is appraised using the notion of sector maturity, the market growth rate being only one of the aspects. The four phases thus reappear: birth, growth, maturity and decline ;
- the competive position in an area is appraised through a series of criteria among which the relative market share is not necessarily the most important.

USEFULNESS AND LIMITATIONS

The success of portfolio analysis methods in companies cannot be contested. These methods bring together several assets in order to :
1) supply an X-ray of a firm's activities, based on cross-referencing analysis criteria which are simple and easy to understand (market share, market growth rate for the BCG ; competitive position and product maturity for the ADL)
2) visualise clearly and with expressive terms (milk cow, star, dilemma, dead load) all the business units that make up the business portfolio of a company,
3) highlight the strengths and weaknesses of a firm regarding the equilibrium of its business portfolio,
4) create future strategies to develop and rebalance the portfolio.

Without a doubt, the greatest advantage of portfolio analysis methods is that managers are now familiar with modern concepts of analysis and strategic management and can thus improve their diagnostic ability. Positive aspects, (ease of interpretation, role of learning, awareness of problems) must not, however, hide certain methodological limitations.

In fact, although interpretating the results of portfolio analysis appears easy, obtaining them is far more difficult. It presupposes a considerable effort of analysis to divide the company into strategic business units, an effort made all the more important in that the relevance of the final diagnosis is conditioned by the correct choice of the initial segmentation.

Beyond these practical difficulties, there are other limitations. Any analysis founded on two or three criteria is naturally very simplistic in relation to a given reality which is, moreover, increasingly complex and subtle. Market share is but one factor among others (product quality, image, technological lead, distribution and marketing factors) which must all be taken into account to appraise the competitive position within a given SBA. Yet it is indeed just such a medley of multiple factors that the ADL method needs in order to determine whether the competitive position is dominant, strong, favourable, unfavourable or marginal.

5/ RESOURCES ANALYSIS : CHAINS OF VALUE

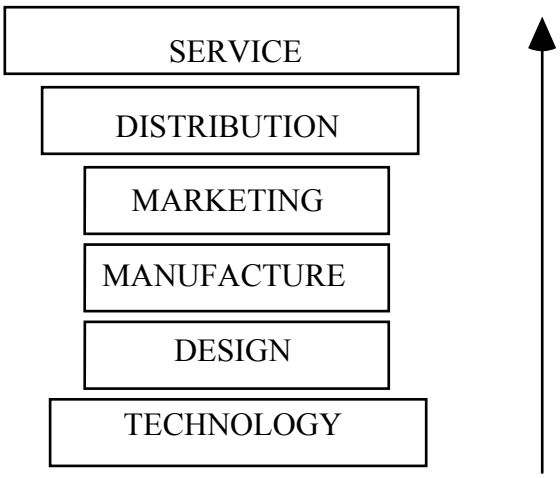
DESCRIPTION

Any production of goods and services (output) requires input that is subjected to conversion and value enhancement (technical and commercial). A complete

function chain of conversion going from research and development to after-sales via design, production and distribution.

A "value chain" is generally combined to this added function chain. In fact, Michael Porter (1980) has justly restored to this concept the importance it deserved.

The value chain is also the cross-section of a competence tree.



USEFULNESS AND LIMITATIONS

The structure of added value varies considerably from one sector to another. For the car, control of costs for primary parts (50% of the total) is a key factor in terms of competitiveness, whereas in clockmaking this element is secondary compared to the cost of distributing watches.

The notion of added value is partly illusory, however, for as long as the product has not been sold, all the company knows of the product is its necessary added costs of production. As Michael Porter remarks : *"the value is what customers are prepared to pay"*. It would therefore be preferable to speak of added *cost* chains and only then of dividing added value (the difference in value between the sales price and the added costs) among the firm's functions.

6/ PRACTICAL CONCLUSIONS

Strategic analysis tools (life cycle, learning curves, strategic segmentation, portfolio models, value chains) are part of the intellectual heritage of modern strategic analysis. Their past success and over-simplistic, systematic use of reality do not justify relegating them to oblivion or treating them with indifference. If no longer used by the large consulting firms as distinctive

approaches, it is primarily because such firms need to stand out in other ways and not only by their tools which have become commonplace. Firms do continue to use strategic analysis tools, however, on account of their simplicity.

Conversely, the same tools are far too often presented in management schools as abstract "scientific" methods with all the fewer case studies because those that do exist remain confidential. These theoretical presentations void of experience barely serve any educational purpose. Reality shows that these tools, like all the others belonging to the tool-box, are relevant only if used wise and without forgetting their limitations.

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CARD 5

STRATEGIC DIAGNOSIS

AIM

The purpose of internal diagnosis is to understand the strengths and weaknesses of the five fundamental resources of a firm (human, financial, technical, productive and commercial) at all levels of the tree of competences. Identifying assets and handicaps is not sufficient as there must also be an appraisal of their importance in the face of threats and opportunities coming from the strategic environment. Indeed, the latter is the purpose of the external diagnosis.

The standard approach has all too often led to a separation of these two diagnoses, internal and external, which only have meaning, however, when seen in relation to each other. Actually, what makes any weaknessor strength important are threats and opportunities in the environment.

DESCRIPTION

Internal diagnosis : strengths and weaknesses of the competence tree

Carrying out an internal diagnosis of the firm is imperative before even attempting the external diagnosis. In order to question intelligently any changes in the strategic environment, one must first have a thorough knowledge of one's products, markets, organisation, technique, personnel, and history. In short, what is called for is a complete retrospective X-ray of the tree of competences from the branches to the roots, if only to be able to outline the environment to be examined.

Traditionally, internal diagnosis involves a financial stage, an operational and functional stage for human and productive resources and a technological stage, to which must be added a cross-assessment of quality.

The financial diagnosis, strictly speaking, is generally conducted by means of ratios which enable one to appraise change in the firm with regard to the firm itself as well as its main competitors. The ratios of structure, activity or of management and result are traditionally used.

The operational and functional diagnosis of the tree focuses not only on the branches (products and markets) but also on the trunk (organisation of resources as a function of production).

Now that strategic analysis tools are commonplace (cf preceding card), it is surprising that many firms have only a hazy understanding of their range of products and corresponding markets, past development, their position in relation to the competition, costs and margins by strategic business area, and lastly their development perspectives.

The diagnosis for quality concerns the whole tree. The quality as well as the conformity of a product or a service can be defined as the customer's needs met at the fairest price. This is not a quest for perfection which, in any case, would be as useless as it would be costly, but rather a desire for overall quality, a tool which acts as a catalyst with precise objectives, designed to improve performance and guarantee processes and products. Recognising needless or unsaleable qualities is just as important as recognising "non-qualities".

The diagnosis of the roots (competences) focuses particularly on technical resources but also on all organisational and human know-how which make up what is called the company's business units.

External diagnosis : threats and opportunities

The importance of strengths and weaknesses pinpointed during the internal diagnosis depends on the nature of the threats and opportunities from the strategic and competitive environment. The firm must position its business portfolio in relation to this environment and reset the dynamics of change accordingly.

Our world is populated by real, flesh and blood people, so by analogy, a firm may be considered as an actor in a game played with partners from its competitive environment. This means actors from the immediate competitive environment on the one hand: competitors in the same market, suppliers, customers, potential rivals entering the market, producers of substitutes, to repeat Michael Porter's typology (1980) and on the other hand, actors from the general environment, public bodies, banks, the media, unions and pressure groups (lobbies). The firm must position itself in relation to each of the actors from its strategic environment.

The firm must position its strategic business areas in particular and ask itself four fundamental questions for each of these SBAs :
- what is my future ?
- what is my position regarding the competition ?
- what are the key success factors ?
- what are the distinctive competences available to me or that I must acquire to improve my position ?

The future of SBAs can be appraised through the notion of maturity of the sector in which the market growth rate is only one aspect. The four phases can thus be recognised (birth, growth, maturity and decline).

The competitive position in a SBA can be measured through a series of criteria in which the relative market share is not necessarily the most
important. There are other factors to be taken into account : factors of stock, production, marketing as well as factors of finance and technology.

Possible strategies :
interinal front, exterinall front : same combat

Over and above choices of strategy and technology, the human and organisational factor appears ever more clearly to be the main factor in competitiveness and excellence. Heading in the right direction is not good enough for strategy; also needed is a well-prepared crew that is ready and able to manoeuvre. For any firm, the external front and internal front make up one and the same strategic segment. The battle must be fought and won on both fronts at the same time; otherwise it is game over on both fronts. In other words, the future of a firm, faced with changes in the strategic environment, depends in large part on its internal strengths and weaknesses. Hence, the "management gap" is often more important than the "strategic gap".

The strategy and tactics associated with the gap depend on the results of previous diagnoses. The range of this strategic information is relative only. The utility of strengths and the handicap resulting from weaknesses depends on the nature of the threats and opportunities which the firm actually faces. For example, faced with a threat, for example, the firm will adopt offensive or defensive relief tactics depending on whether it is in a position of strength or weakness.

By comparing this strategic information, the firm can identify the strategic options and define associated tactics. Of course, it is imperative that the

relevant strategy work towards the objectives the firm has in its mission and plans for the future.

Three generic strategies have been identified by Michael Porter :
- cost domination ; for example, by seeking learning curves and a leading position in the maket through production volume;
- differentiation, which can focus on image, after-sales service or technological lead in very monopolistic markets ;
- concentration on certain narrow strategic business areas with specific characteristics (up-scale vehicle clientele, localisation) on which the firm will make the effects of volume or differentiation apply.

This classification is of use but should not be taken literally. Ideally, a firm should fight not only in existing territories but create new ones with the help of innovation. This conquest of the future through innovation must be backed up by distinctive competences. The firm that succeeds in making these competences a key factor of success has the advantage of blocking newcomers. Just like a genetic code, the "competences mix" is difficult to clone.

USEFULNESS AND LIMITATIONS

The choice of strategic options must confront several dilemmas which require arbitration. The concern for short-term profitability must not be to the detriment of long-term development and growth. Neither must diversification of business activities be confused with their strategic redeployment. The latter is achieved by finding the synergy between the basic competences of the firm. Product-market diversification on its own is generally ignorant of this and leads too often to a wastage of resources.

Division of a company's business activities into strategic segments was oversystemised in the 70s and 80s by finance analysts concerned with separating profitable activities from less profitable ones or those making a loss. The outcome of this was a carving up of large industrial groups into compartments resold separately. These restructuring policies and downsizing often occurred without taking account of the synergies of competences between the different business activities. In short, by cutting the branches, the trunk was also reduced and roots lost, to the detriment of the firm's strategic redeployment capacities based on its basic competences, as Giget, Hamel and Prahalad all mention.

It is not sufficient to determine the value of SBAs and their competitive position in each at a given moment in the present. One must also situate oneself in the

dynamic perspective of changes in these SBAs and the firm's position in relation to competitive and general environment scenarios. Technical ruptures, economic and social policies can take place and alter the map of the business portfolio. With this in mind, one must recognise which will be tomorrow's key success factors and ask oneself which best fit the firm's basic competences.

PRACTICAL CONCLUSIONS

This complete diagnosis of the firm's resources and environment seen as a tree of competences can be implemented. It can thus be inserted as one of the essential phases in the strategic prospective approach.

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And most of Card n° 4 references.

4 - ASKING THE RIGHT QUESTIONS AND IDENTIFYING KEY VARIABLES

CARD 6

STRUCTURAL ANALYSIS

AIM

Structural analysis is a tool that structures the pooling of ideas. This form of analysis describes a system using a matrix which combines the constituent components of the system.

This method identifies the main variables which are both influential and dependent : those which are essential to the evolution of the system.

DESCRIPTION OF THE METHOD

Structural analysis is carrried out by a working commitee made up of actors and experts from the field under study, but this does not exclude calling on external "advisers".

The different phases of the method are as follows : listing the variables, describing the relationship between variables and identifying the key variables.

Phase 1 : listing the variables

The first stage consists in listing all the variables which characterise the system under study and the environment (internal as well as external variables). This phase should be as thorough as possible and initially should not exclude any line of research.

Apart from prospective workshops (see card 3), the list of variables should be enriched by gaining information from non-directed interviews with representatives of actors in the system.

The final result is a list of internal and external variables for the system studied. Experience shows that this list does not generally exceed 70 or 80 variables if the system under study has been thoroughly broken down and outlined.

A detailed explanation of variables is indispensable to follow up the analysis and recognise relationships between the variables and generates a “database" to be made which is required for any prospective thinking. It is therefore recommended that one give a precise definition for each variable, relate former changes, identify variables which started the evolutions, characterise the present situation and recognise trends or future ruptures.

Phase 2 : Description of the relationships between variables

In a systemic approach, a variable exists only through its relationship with other variables. Structural analysis thus attempts to discover the relationships between variables in a dual-entry table called “structural analysis matrix”.

A group of about ten people who have previously taken part in listing and defining the variables, fills in the structural analysis table over a period of two to three days.

The filling-in must be qualitative. For each pair of variables, the following questions are asked : is there a relationship of direct influence between variable i and variable j? If there is not, one puts 0. If there is, one must ask if this relationship of direct influence is low (1), medium (2) high (3) or potential (4).

This filling-in phase helps to pose n x n-1 questions for n variables (approx. 5000 for 70 variables), some of which would have been evaded if such a systematic and thorough investigation had not been made. This questioning procedure not only enables one to avoid errors, but also helps to organise and classify ideas by creating a common language within the group. It also allows for a redefinition of the variables and therefore tends to make analysis of the system more accurate. Attention must be drawn to the fact that for all intents and purposes, a normal filling-in rate of the matrix is around 20%.

Phase 3 : identification of the key variables with Micmac.

This phase consists in identifying the key variables, that is to say, those essential to the system's development, first by using direct classification (easy to set up), then through indirect classification (e.g. Micmac for Impact Matrix Cross-Reference Multiplcation Applied to a Classification). This indirect classifcation is obtained after increasing the power of the matrix.

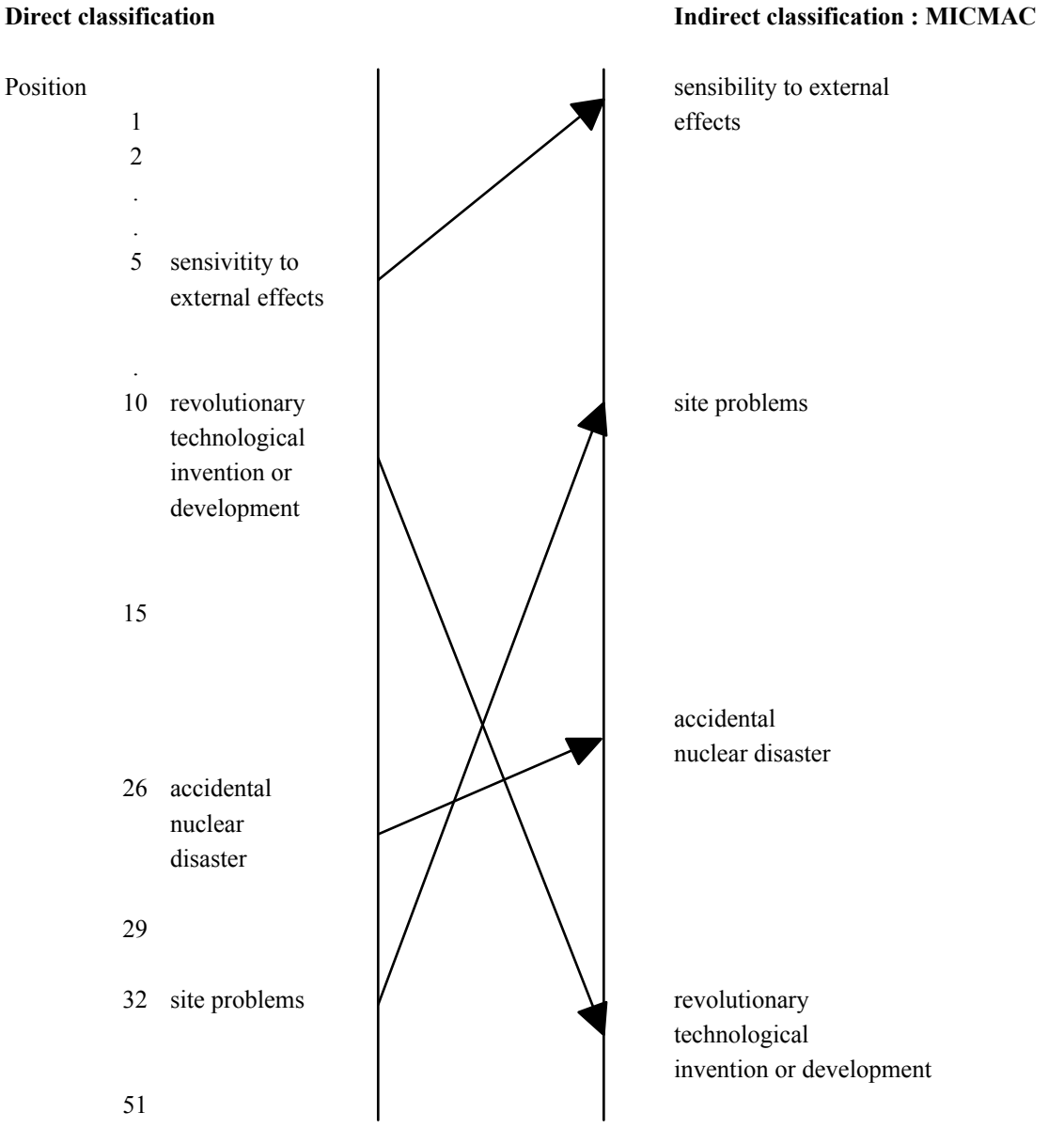
Comparing the hierarchy of variables in the various classifications (direct, indirect and potential) is a rich source of information. It enables one not only to confirm the importance of certain variables but also effect to uncover certain variables which, because of their indirect actions, play an important role (yet

were not identifiable through direct classification).

EXAMPLE - UNCOVERING HIDDEN VARIABLES

The following example is based on a prospective survey of nuclear power in France and was carried out in 1972 by the C.E.A. (French atomic energy commission).

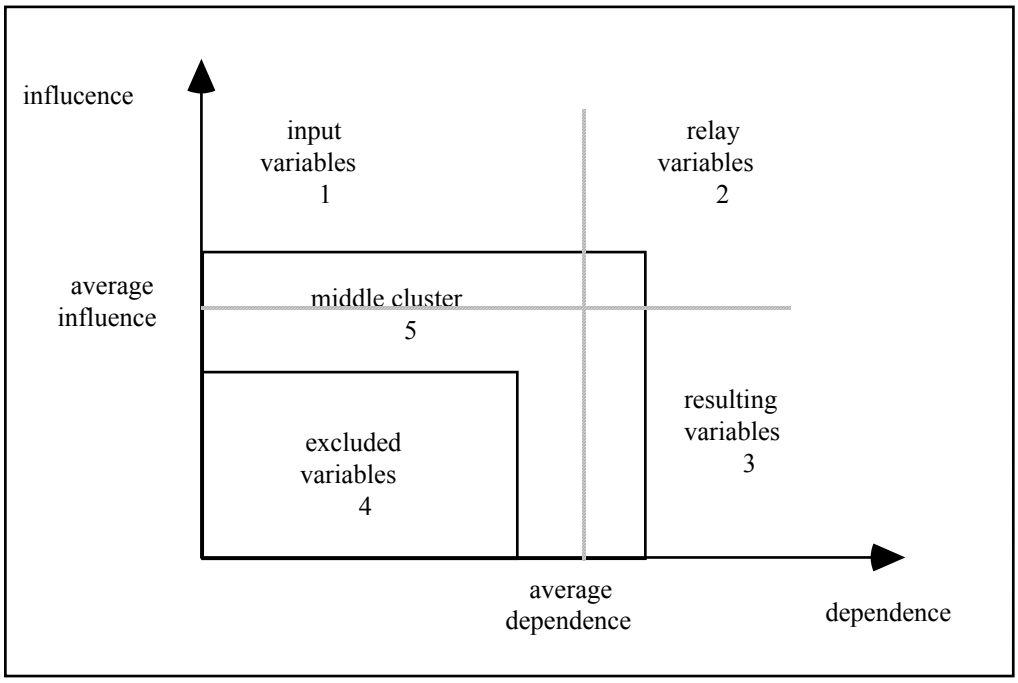
By adopting several viewpoints (political, economic, technological, etc.), the think tank for this survey prepared a list of 51 variables which should be taken into account.The results obtained are as follows:



The variable "sensitivity to external effects" moved up from 5th to 1st position. Thus, since 1972, structural analysis has enabled us to foresee how important group psychology and public opinion would be for the development of nuclear energy.

This shift is even more striking in the case of the variable "location problems for the siting of nuclear plants" which moved up from 32nd position in the first classification to 10th in the second. Thus , the kind of problems that EDF (French central electricity generating board) had to face at Plogoff had been identified almost ten years before they became a reality.

Influence-dependence plan



USEFULNESS AND LIMITATIONS

The primary advantage of structural analysis is that it stimulates thought and generates ideas among group members, thus encouraging them to think about counter-intuitive aspects of how a system works. Participants should not be taken literally but should be made to think. Obviously, there is no single "official" reading of the Micmac results and it would be preferable that the group form its own interpretation.

The limitations concern the subjective nature of the list of variables drawn up during the first phase, similar to that of the relationship between the variables (hence the significance of interviews with actors in the system). This subjectivity comes from the well-known fact that structural analysis is not a reality but a means of looking at reality. This tool enables a group to find a method to pool ideas by reducing the inevitable biaises. In fact, the results as well as the input data (list of variables and matrix) inform as much about the manner in which reality is perceived by the working group and therefore about the group itself, as about the system under observation. Lastly, structural analysis is a long process which sometimes becomes an end in itself and must not be undertaken unless the subject lends itself to it.

PRACTICAL CONCLUSIONS

Several months are required to carry out structural analysis. Naturally everything depends on the working commitee's work load and the time devoted to the task. Several pitfalls are to be avoided :
- sub-contracting the structural analysis entirely to someone in charge of research, or worse still, to external consultants. Investment into any prospective thinking must take place in the minds of those who will have to make tomorrow's decisions ;
- dispensing with the indispensable initial work on the variables. For example, filling in the matrix would thus become totally unreliable and worthless as the matrix will contain neither reliable information nor a common language.
- dividing up the completion of the matrix which ends up, once again, containing results which make no sense since the structural analysis is a tool for the collective structuring of ideas.

Eighty percent of the results obtained are self-evident and confirm the participants' initial intuition. They therefore provide confirmation of common. Above all, they lend weight to the remaining 20% of counter the intuitive results.

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5 - ANALYSING ACTORS' STRATEGIES

CARD 7

THE MACTOR METHOD

AIM

The Mactor method of analysing actors' games seeks to gauge the balance of power between actors and study their convergences and divergences when faced with a certain number of associated stakes and objectives.

By means of this analysis, the Mactor method aims to assist in making decisions so that actors can implement their alliances and conflicts' policies.

DESCRIPTION OF THE METHOD

The Mactor method comprises seven courses :

Phase 1 : constructing the table of actors' strategies

The construction of this table involves the actors who control the key variables generated from the structural analysis. The interaction of these "driving force" actors explains the evolution of the variables ordered. The ideal number of actors is between 10 and 20.

The information gathered about the actors is set out in the following way :
- first, an identity card for all actors is made : their objectives, goals, projects under way and maturing (preferences), their motivations, constraints and internal means of action (coherence), their past strategic behaviour (attitude) ;
- second, the means of action that actors have at their disposal to use on others to achieve their objectives is examined.

Phase 2 : identifying strategic stakes and associated objectives

The meeting of actors according to their goals, projects and means of action brings out a certain number of strategic stakes on which actors have convergent or divergent aims.

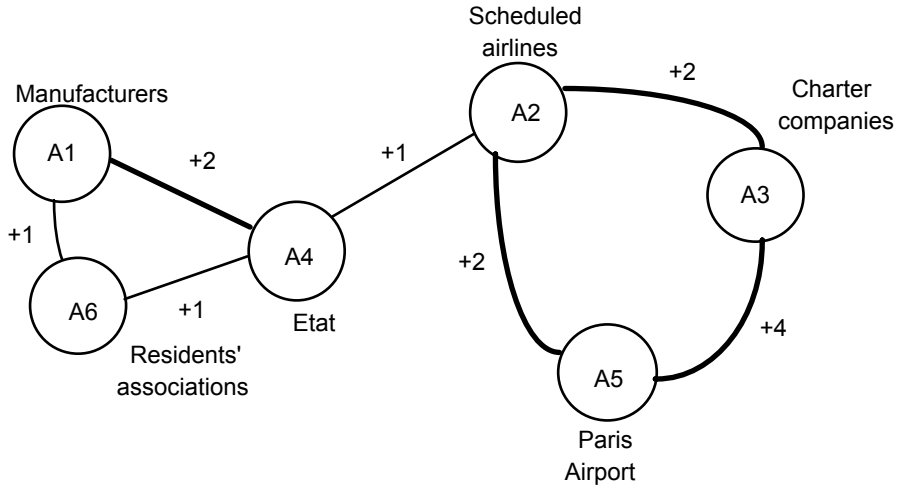
Phase 3 : positioning the actors in relation to objectives and identifying convergences and divergences (simple position)

During this phase, the attitude of each actor in respect to each objective must be described in a "actors x objectives" matrix by indicating agreement (+1), disagreement (-1) or neutrality (0).

In order to compile a list of sets of possible alliances and conflicts, the Mactor method specifies the number and objectives over which the actors, in pairs, converge or diverge.

First, two complete diagrams of convergences followed by possible divergences are made. They enable one to visualise the groups of actors that have a convergence of interest, to assess the degree of apparent freedom, to identify those actors who are potentially the most threatened and to analyse the stability of the system. The following diagram therefore illustrates the absence of common objectives between the Paris Airport, for example, and its administrator, the State.

First complete diagram of convergences



Phase 4 : ranking the objectives for each actor (valued positions)

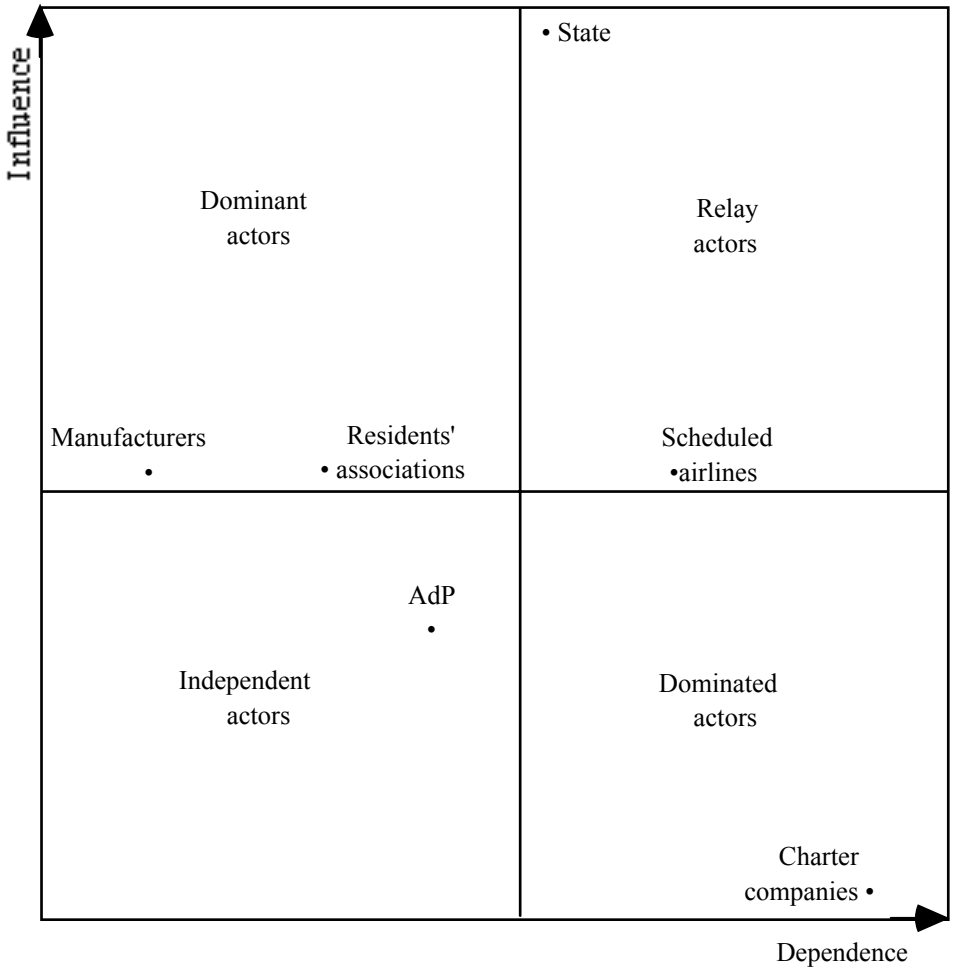
The previously constructed diagrams remain fairly elementary since they take into account only the number of convergences and divergences of objectives between actors. To bring the model nearer to reality, one must also take into account the hierarchy of objectives for each actor. The intensity of each actor's positioning is thus evaluated using a specific scale.

Phase 5 : evaluating the balance of power between actors

A matrix of direct influences between actors is constructed using a strategic table of actors by analysing each actor's means of action. Balance of power is calculated by the Mactor software package, taking both direct and indirect means of action into account, e.g., an actor being able to have an influence on another through a third person.

An influence-dependence plan of the actors is then made. Analysis of the balance of power between actors represents the strengths and weaknesses of each actor, their blocking possibilities, etc.

Actors' influence-dependence plan



Phase 6 : incorporating the balance of power into the analysis of convergences and

divergences between actors

To say that an actor has twice as much weight as another in overall balance of power implicitly gives double weight to his/her involvement in the objectives that interest him/her. Indeed the goal of this stage consists in incorporating all the actors balance of power into the intensity of their positioning in relation to the objectives.

New diagrams of possible convergences and divergences between all actors can thus be obtained. The comparison between the series of diagrams enables one to observe how potential alliances and conflicts become deformed by taking account of the hierarchy of objectives and the balance of power among actors.

Phase 7 : Formulating strategic recommendations and key questions for the future

The Mactor method brings to light the interplay of potential alliances and conflicts among actors and in this way helps formulating key questions for prospective and strategic recommendations. For example, the method helps to question the evolution of the relationships between actors, the emergence and disappearance of actors, role changes, etc...

USEFULNESS AND LIMITATIONS

One advantage of the Mactor method is that it works for a wide range of strategies involving several actors using a series of stakes and associated objectives. In this, it is different from research coming from game theory which often results in the construction of models which can be applied but are not applicable. Nevertheless, significant progress may be made through a closer relationship between the concepts of game theory and the Mactor method.

The Mactor method contains a certain number of limitations concerning the gathering of necessary information. A certain reticence on the part of the actors may be observed when they are asked to reveal their strategic projects and external means of action. There is the insurmountable element of confidentiality (one can nevertheless cross-check the data). Furthermore, representing an actor game on the basis of this method presupposes consistent behaviour on the part of each actor in relation to the outcome, which is often contradicted in reality.

In terms of tools, Mactor software currently requires only two tables of data from which several pages of result listing and diagrams can be obtained. Yet, this is the main danger that lies in wait for Mactor's users seduced, even carried away by the tide of results and comments generated, they forget that everthing

depends on the quality of the input data as well as the ability to pick out the most relevant results.

PRACTICAL CONCLUSIONS

At a practical level, the time it takes to analyse an actor's game in the Mactor method (2 to 5 months) is generally shorter than it is required for a structural analysis. The time needed for gathering and checking the information and then analysing it, however, must not be underestimated.

Althought the Mactor method fits into the scenario method, it can also be used on its own, either for prospective purposes or for the analysis of a given strategic situation.

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6 - SCANNING THE FIELD OF POSSIBLE FUTURES AND REDUCING UNCERTAINTIES

CARD 8

MORPHOLOGICAL ANALYSIS

AIM

Morphological analysis aims to explore possible futures in a systematic way by studying all the combinations resulting from the breakdown of a system.

The aim of morphological analysis is to highlight new procedures or products in both technological forecasting and scenario building.

DESCRIPTION OF THE METHOD

Morphological analysis is the oldest of the techniques presented in this tool-box. In fact, it was first developed by the American researcher F. Zwicky during the Second World War. Morphological analysis is implemented by Morphol software and comprises two phases :

Phase 1 : building a morphological space

In this first phase, the system or function under examination is broken down into subsystems or components. In this breakdown of the system, the choice of components is critical and requires considerable thought which can be based on results of the structural analysis. Initially, the components must be as independent as possible. They must also represent the whole system. Too many components avoid a clear analysis ; conversely, too few make for an oversimplified analysis. Obviously workable compromise must be found.

Each component can take on several configurations. In the example of global scenarios for which the morphological analysis grid is presented opposite, a given scenario is characterised by the choice of a specific configuration for each of the components. There are as many possible scenarios as there are combinations of configurations. All these combinations represent the field of possibles, still called the morphological space. The morphological space presented, composed of 7 components ; each having between three and four configurations, enables one to identify a large number of possible combinations, 2,916 to be exact, that is the product of the number of configurations (3 x 3 x 3 x 3 x 3 x 3 x 4). Morphological space tends to expand very quickly, a relatively common occurrence in exploratory prospective, so there is a risk of being swamped by the sheer number of combinations.

INTERNATIONAL CONTEXT OF THE EUROPEAN COMPUTER INDUSTRY ON THE HORIZON OF THE YEAR 2000 : MORPHOLOGICAL ANALYSIS

Demographic Trends in Western Countries	A1 Aging of populations Migrants control ethnic conflicts	A2 Migrant flows from east and south to western countries Integration problems	A3 New baby-boom in western countries and acceptable migration flows	
Geographical and Geopolitical Context	B1 Tensions and conflicts No regulator of interdependence	B2 Limited conflicts in the south and eastern countries Uncertainties in western countries	B3 New international order of a multipolar, interdependent world	
Role of Eastern Europe	C1 Disintegration regional wars refugees	C2 Unequal development Social and regional tensions	C3 Economic convergence and integration of the countries (east and west)	
European Integration	D1 Failure of the Europe of 12 Come back of smaller Europe	D2 Stable Europe of 12. Integration of markets only	D3 Political integration of Europe of 12 Extension to new members	
Conditions of Trade and Competition	E1 National protectionism (end of GATT)	E2 Regional protectionism (regional barriers and free trade within the block)	E3 GATT extension free trade Strong competition between firms	
Globalisation of Economy	F1 Reduced	F2 Variable according to the regions and sectors	F3 Intensive	
Annual rate of growth of the GNP	G1 Recession Less than 0.5 %	G2 Low with fluctuations 1.5 %	G3 Medium trend based 2.5 %	G4 Strong More than 3 %

Source : Godet M. et al. - "Scenarios globaux à l'horizon 2000", *Travaux et Recherches de Prospective*, n°1, June 1995.

Phase 2 : reduction of morphological space

However, certain combinations and even certain families of combinations are unfeasible, e.g., incompatibility between configurations. The second phase, therefore, consists in reducing the initial morphological space to a useful subspace, by introducing exclusion factors or selection of criteria economic, technical..., from which the relevant combinations can be examined.

USEFULNESS AND LIMITATIONS

The areas of application of morphological analysis are many : exploratory scenario building and all areas of innovation and search for new ideas.

Although the method has been used primarily in technological forecasting, it lends itself well to the construction of scenarios, in which the demographic, economic, technical and social dimensions (components) can be characterised by a certain number of possible states (hypotheses or configurations). A scenario thus becomes nothing more than a route, a combination bringing together a configuration for each component. Morphological analysis stimulates the imagination and enables one to scan the field of possibilities systematically. To avoid being swamped by the combinations, one must learn to navigate through morphological space using the selection criteria provided by Morphol software.

The first limitation of morphological analysis stems from the choice of components. By leaving out a component or simply a configuration that is essential for the future, one runs the risk of leaving out one complete facet from the range of possibles - a range which is not restricted but evolves through time.

The second limitation, of course, stems from the sheer bulk of combinations which can rapidly submerge the user. One of the solutions, as we have seen, is to introduce selection criteria, constraints such as exclusion or preference factors, and to exploit the useful morphological subspace.

PRACTICAL CONCLUSIONS

Morphological analysis is a fairly simple method to implement but the scale of possible combinations can give rise to a degree of apprehension. This fear explains why morphological analysis is not in widespread use.

Yet, the simplicity of the method and the availability of Morphol software have encouraged its use for some years now. There is a good chance that interest in the method will grow in the years to come, especially in global scenario building where morphological analysis provides a pretty exhaustive scanning process for possible scenarios.

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CARD 9

THE DELPHI METHOD

AIM

The Delphi method seeks to both highlight convergences of opinion and consensus on specific topics, by questioning experts through successive questionnaires.

The most frequent objective of Delphi studies is to provide enlightenment from experts in areas of uncertainty in order to help managers' decision making process.

DESCRIPTION OF THE METHOD

There have been numerous versions of the Delphi technique. However, what follow is original procedure.

Phase 1 : formulating the problem

Formulating the problem is a fundamental stage in carrying out a Delphi study. In an expert method, the importance of accurately defining the field of investigation is crucial, as we must be certain that the experts recruited share the same understanding about the area under study.

The questionnaire must be drawn up according to certain rules : the questions must be precise, quantifiable (for example, they must focus on the probability that hypotheses and/or events will be implemented, and most frequently on the dates when events will be implemented), and independent (the fact that an event foreseen in one question occurs on a given date must not have any influence on the realisation of another question).

Phase 2 : choosing the experts

This stage is all the more important in that the term "expert" is ambiguous. Experts will be chosen not so much in terms of their title, function or hierarchic position, but in terms of their capacity to envisage the future.

Experts' lack of independence may prove to be a drawback. For this reason, as a precaution, experts are separated from one to another and their opinions are collected anonymously by mail. In this way, one obtains the real opinion of each expert and not an opinion that has been falsified to a greater or lesser extent by peer pressure. In the Delphi method, there is no leader.

Phase 3 : implementation and use of results

Questionnaires are sent out to about one hundred experts but one has to accept that some participants will not answer and others will drop out halfway through. The final group should number no fewer than 25. The questionnaire is, of course, accompanied by a cover note explaining the aims and the spirit of Delphi system as well as the practicalities of implementing the survey, e.g. deadlines and a guarantee of anonymity. Moreover, the expert must assess his/her own level of competence regarding to each question.

The objective of the successive questionnaires is to reduce the spread of opinions and to identify a "mean" consensus opinion for the questions. In the second round, the experts, having been informed of the results of the first round, are invited to provide new answers and justify them if they feel there is a serious degree of divergence with respect to the group "consensus". In the third round, each expert is asked to comment on the arguments of the "dissidents". In the fourth round, experts give their definitive answer. This enables identification of group consensus (mean opinions) and the degree of deviation noted in the opinions.

USEFULNESS AND LIMITATIONS

One of the advantages of the Delphi method is that one can be almost certain of obtaining consensus through successive questionnaires. At the same time, a wealth of high quality information is gathered about events, trends, significant discontinuities which impinge on the future developments of the question under study. Nevertheless, it should be noted that convergence does not necessarily mean coherence. Finally, this method can be used equally well in business management, economics, technology and social sciences.

Several constraints limit the scope of the method which can be long, costly, fastidious and intuitive rather than rational. Furthermore, the constricting nature of the procedure (requiring several rounds) is debatable in that only those experts who "deviate" from the norm are asked to justify their positions. However, it can also be considered that the opinion of "deviants" is, in prospective terms, more interesting than those who toe the line. Finally,

possible interaction between the hypotheses under consideration is not taken into account and is even avoided in the construction. This has led the Delphi method's promoters to develop cross-impact probability methods (see card 12).

PRACTICAL CONCLUSIONS

The Delphi method appears to be a simple procedure and easy to apply within the framework of an expert consultation. However, failures or disappointments can lead "amateur users" to be discouraged. The method enables one to reach a consensus. It is therefore suitable for decision-making but must be adapted to the objective of the prospective study. In particular, there is no need to reach a mean consensus opinion at any price, but rather to highlight several groups of answers by analysing multiple points of convergence.

The Delphi method has certainly been the technique most applied throughout the world for the last forty years. Each application does not, however, follow the procedure described above. Some of them resemble Delphi in name alone and are merely questionnaires on prospective subjects sent through the mail.

Other approaches have been developed out of this original procedure. The mini-Delphi, for example, contains a real-time application for the procedure : i.e., experts are gathered together in one place and invited to debate each question before responding. More generally, the use of new modes of interaction with experts, i.e., like E-mail, are being developed, thus making the procedure faster and more flexible.

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CARD 10

THE REGNIER ABACUS

AIM

The Régnier abacus is an original method for expert consultation designed by Doctor François Régnier. It is designed to question experts and to process their answers in real time or by mail using a scale of colours.

As is the case for all expert methods, it is designed to reduce uncertainty, contrast the point of view of one group with that of other groups and, at the same time, increase the awareness of the extent to which opinions vary.

DESCRIPTION OF THE METHOD

The logic used by the abacus is that of the three traffic lights colours (green amber, red), plus pale green and light red to allow for more shades of opinion. White signals a blank vote, black an abstention. This is our colour decision scale.

Phase 1 : Gathering experts' opinions

First, it is advisable to define precisely the problem under study precisely so that it may be tackled with care and broken down into items. These items are basic statements which broaden the field of discussion about changes in the past and/or the vision of the future. Experts reach a decision on each statement individually by using the colour scale at their disposal.

Phase 2 : Processing the data

Colour responses are processed in a matrix form representing. Horizontally are the items defining the problem and vertically, the experts taking part in the study. The resulting mosaic gives an excellent overview of the qualitative information and makes each expert's position visible simultaneously on the matrix.

Phase 3 : Examining the results

On the basis of this coloured image, a debate and/or explanation of the vote can begin. The debating procedures remain open and each person may, at any

moment, modify his or her colour and justify that change of opinion.

USEFULNESS AND LIMITATIONS

The method is efficient, simple and rapid. It allows the "dissidents" to express themselves and gives importance to their points of view. It is an excellent communication tool because it is not so much consensus that is sought as debate and exchange of ideas among the participants.

However, the Régnier abacus does modify the usual working pattern of a group, hence the difficulty of persuading decision-makers to adopt it. For example, "bosses" may find themselves isolated since the method encourages others to give their opinion and show their "true colours". It therefore runs counter to customary corporate thinking. It is most often used in *ex-post* evaluation of training courses, since in this case there are no strategic decisions implied.

PRACTICAL CONCLUSIONS

The Régnier abacus is a registered trade mark and its products are marketed by Scoop. Its original form (which still exists) was manual (a magnetic board with coloured magnetic plaques). Today, the automated abacus (personal computer program) allows instantaneous processing of images. Management of the coloured frame gives a better reading of the picture (raw image, general histogram, reclassification of consensus on the items in decreasing order....).

All in all, the Régnier abascus is a practical tool enabling direct organisation of prospective study groups and takes only a short time. It can be used for smaller groups (colloquia, seminars) as well as larger ones by using mail-in votes. The abacus can be used in association with other techniques as a specific technique for voting, e.g., in joint application with the Delphi method (see bibliography).

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CARD 11

THE SMIC-PROB-EXPERT METHOD

AIM

Cross-impact probability methods aim to define simple and conditional probabilities of hypotheses and /or events, as well as the probabilities of combinations of the latter, taking into account interactions between events and/or hypotheses.

The goal of these methods is not only to tease out the most plausible scenarios for decision-makers, but also to examine combinations of hypotheses that one would have initially excluded.

DESCRIPTION OF THE METHOD

The "cross impact method" is a generic term for a family of techniques which attempt to evaluate changes in the probabilities of a series of events following the occurrence of one or several such events.

Here we describe here the Smic-Prob-Expert method (Cross-Impact Matrices and Systems). In practice, if one considers a system with n hypotheses, the Smic-Prob-Expert will enable one to choose - on the basis of the data provided by the experts - out of 2^n possible images (hypothesis configurations) those which merit more detailed study in terms of probability of occurrence. The Smic-Prob-Expert, together with the Prob-Expert software, outlines the most probable futures which then serve as a basis for scenario building.

Phase 1 : formulating the hypotheses and choosing the experts

A Smic-Prob-Expert survey starts with five or six fundamental hypotheses and some ancillary hypotheses. It is not easy, however, to study the future of a complex system with such a limited number of hypotheses, hence the interest of structural analysis-type methods (card 7) and a reflection on actors' strategies (card 8) which allow for a better identification of the key variables and better formulation of the basic hypotheses.

The survey is generally carried out by mail with a fairly satisfactory level of response : 25% to 30%. Around one and a half months is needed to carry out a Smic-Prob-Expert. The experts questioned should be chosen according to the same criteria as the Delphi method.

They are asked to do the following :
- appraise the simple probability of a hypothesis occurring by means of a scale from 1 (very low probability) to 5 (highly probable),
- appraise the conditional probability of a hypothesis if the others occur or not.
Given these questions, any expert is obliged to reveal the level of implicit coherence in his/her reasoning.

Phase 2 : probability of scenarios

The Smic-Prob-Expert program (traditional program for minimising a square law form under linear constraints) enables raw data to be analysed by :
- correcting the experts' opinions so as to obtain clear, coherent results (i.e. that comply with standard probability axioms),
- assigning a probability to each of the 2^n possible combinations of n hypotheses.

Using the mean probability assigned to each image by the whole set of expert groups, a hierarchy can be established for the images, and, consequently, the most probable scenarios.

It is then advisable to select three or four of these scenarios, among them a "reference scenario" (with a high average probability of occurrence), and contrasted scenarios, whose probability can be low but whose importance for the organisation must not be neglected.

The final stage consists in writing up the scenarios, e.g., the route from the present to final images, as well as actors' behaviour. This is part of the scenario method (cf. card 3).

USEFULNESS AND LIMITATIONS

The so-called probability interaction methods are a marked improvement on the Delphi method since they offer the advantage of taking into account interactions between events. In contrast to the Delphi method, the Smic-Prob-Expert takes into account the interdependence of questions asked and ensures a high degree of consistency in the answers. It is simple to implement, can be

completed in a relatively short time and the results are generally easy to interpret.

Finally, it is an excellent intellectual "buffer" which often helps to discard certain preconceived ideas (see chart below) and, above all, it allows one to check whether the scenarios studied cover a reasonable range of probable futures; i.e., there are at least six to seven chances out of ten that the future reality will correspond to one of these scenarios.

The Probability of Scenarios for the Iron and Steel Industry with some surprising consequences

Between 1990 and 1991, several months of prospective reflection on the iron and steel industry in France on the horizon of the year 2005, enabled participants to identify six relevant and consistent scenarios constructed around three general hypotheses : H1 (low GDP growth, below 1.8%); H2 (severe constraints on the environment); H3 (strong competition from other materials)

Black (S 1)	poor growth in GDP and strong competition from materials
Morose (S 2)	poor growth in GDP with no strong competition from others materials.
Tendencial (S 3)	continuation of the current situation.
Ecological (S 4)	strong constraints from the environment.
Pink Steel (S 5)	strong growth of the GDP and competition favourable to steel.
Pink Plastic (S 6)	strong growth of the GDP and competition favourable to other materials.

Use of the Prob-Expert software has enabled one to pick out only six scenarios which covered only 40% of the field of probables :

S5 Pink steel and S4 Ecology	(010) = 0.147
S1 Black	(101) = 0.108
S6 Pink plastic	(001) = 0.071
S3 Tendencial	(000) = 0.056
S2 Morose	(100) = 0.016

Three new scenarios thus appeared which were far more probable :

The three remaining hypothesis configurations (60% of global probability) each have an implementation probability superior to the most probable of the scenarios previously retained.

S7 ecological black	(111) = 0.237
S8 Steel green	(110) = 0.200
S9 Plastic green	(011) = 0.164

The pair (11.) in the first two hypotheses H1 and H2 had been eliminated because, in a context of sluggish growth, serious constraints from the environment seemed to be an improbable luxury. The pair (.11) had been eliminated because serious constraints from the environment (H2) seemed somewhat favourable for steel which at the same time was not subject to serious competition from other materials. But why did no one imagine plastics that could be recycled or were even bio-degradable as is suggested by pair (.11)?

Care must always be taken, however to avoid an over-mechanical application of this type of method. Participants must not forget that the probabilities obtained remain subjective probabilities, i.e., they are not based on observable frequencies but on opinions.

The information gathered during a Smic-Prob-Expert survey is substantial as there are as many hierarchies of scenarios as there are experts questioned. There is therefore the problem of aggregating the answers provided by several experts. One solution is to draw up a typology of experts based on the closeness of their responses or to consider them in terms of actor groups. Analysing responses from the different expert groups also helps to highlight certain groups of actors' games. The raw, clear data obtained (represented most frequently in the form of histograms), enables one to identify certain consensus, to bring out schools of thought by using sensitivity analyses, and thus identify certain groups of experts or actors.

PRACTICAL CONCLUSIONS

Set up by Michel Godet between 1972-1973 at the French Atomic Energy Authority (CEA), then developed by SEMA, the Smic-Prob-Expert has long been applied both in France and abroad. Many other methods of probability interaction have been developed since the mid-sixties in the United States as well in Europe.

The Smic-Prob-Expert technique can now be used on computer with the Prob-Expert software, developed and published by Heurisco. It is therefore possible to drive a Smic-Prob-Expert in real time with a group of experts (over one day, for example). This does not, however, preclude a more traditional application of the method, i.e., using traditional or E-Mail.

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7 - EVALUATING STRATEGIC CHOICES AND OPTIONS

CARD 12

RELEVANCE TREES

AIM

The most frequent objective within the framework of the integrated approach is to identify coherent projects; i.e., seek strategic options that are compatible both with the identity of the firm and the most probable scenarios for the environment.

The method, originally used mainly in technological and military domains, aims to rationalise the selection of elementary actions or operations with a view to achieving overall objectives.

DESCRIPTION OF THE METHOD

The purpose is to relate the different hierarchy levels of a problem, moving from the general level (top down) to the particular (lower levels). This method is made up of two phases : construction and grading of the relevance tree.

Phase 1 : constructing the relevance tree

During this phase, the outcome (higher levels including politics, assignments, objectives) and the means (lower levels, grouping the means, subsystems and subsets of actions and elementary actions).

The various levels correspond therefore to either the increasingly detailed objectives of the decision system or the means implemented. Note that the tree is usually broken down into five to seven levels.

The apparently simple process of constructing the tree must comply with certain specified conditions :
- there are no links between nodes at any given level (elements at the same level are independent),
- there is no direct link between nodes on non-adjacent levels
- when filling in the contents of the levels at the top, one must balance them out at the base in order to stabilise the construction.

The concrete choice of objectives and actions can only be made after prior analysis of the system studied, using two complementary
approaches :
- the ascending approach, which starts with the actions compiled, analyses their effects and examines the objectives reached by means of these effects ;

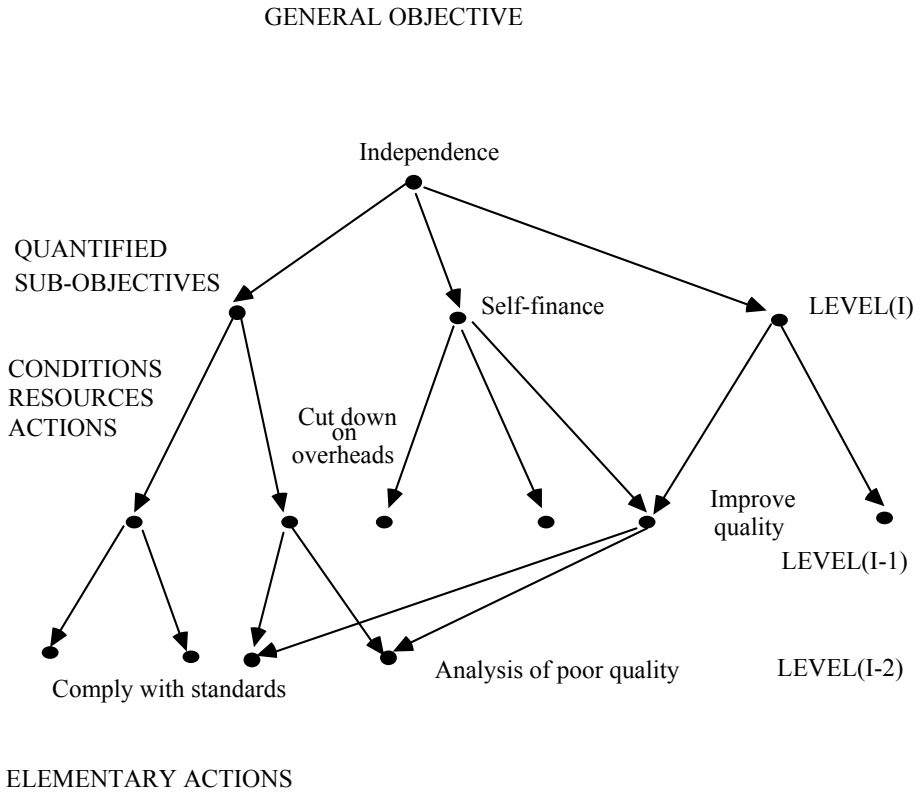
- the descending approach, which starts with a list of final explicit objectives and seeks out and analyses the appropriate resources needed to attain such objectives, and the variables likely to modify them.

Each element (action or objective) must be clearly specified so as to maintain a precise and detailed sense of meaning at all times, i.e., knowing what we are talking about.

Example :

For a firm whose general purpose is to reinforce its independence, the tree is as follows :

RELEVANCE TREE



Phase 2 : grading the aggregation chart

The objective of this phase is to measure the contribution of each action to the objectives of the system. In order to do this, a grade (called relevance) is given to each line of the chart (the tree). The grade given to an action at level (i-1) specifies its contribution to the achievement of actions at the level immediately above (i).

At this stage of the study, different methodologies (Pattern, CPE) can be used to rank the decision routes according to the significance of their contribution to the achievement of the initial objective. This is the aggregation phase. What is proposed here is a simple methodology in which the action at level (i) constitutes an evaluation criterion for actions at level (i-1). Matrices (multi-criteria grids) are set up for each level. The rows contain the m items (actions) at level (i-2) and the columns the n criteria at level (i-1). For each criterion, one evaluates the contribution of each action towards satisfying that criterion.

USEFULNESS AND LIMITATIONS

This method is an excellent thinking aid which allows one to avoid redundancy (N.B. no imbalance in the tree), discover new ideas by throwing light on obscure areas : objectives which have no connection with resources and *vice versa*, clarify the choices made, improve coherence and, finally, structure objectives and the means of achieving them.

A partial qualitative utilisation (phase 1); i.e. only the construction of the tree, is relatively easy and can prove very useful and productive for a group of actors at certain stages of the strategic prospective thinking process.

However, the relevance tree method when applied fully (phase 2 : grading the charts and aggregation) can prove difficult and awkward to implement : representation in the tree form is somewhat inflexible and allows little room for uncertainty.

PRACTICAL CONCLUSIONS

In practice, the use of a flip chart and post-it notes can make for a dynamic, flexible construction of the relevance tree by a group of people.

The method is used especially during "strategy workshops" in the initiation phase of the procedure (see card 2). It works well at this point because the

construction of relevance trees highlights our basic principle : "accurate anticipation leads to action".

In conclusion, the method is worth applying in many cases because of its inherent and because of the simple and appropriable nature of its qualitative component.

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CARD 13

MULTIPOL

AIM

Like any multi-criteria method, Multipol seeks to compare different actions or solutions for problems according to multiple criteria and policies.

Multipol's aim is to help decision-making by drawing up a simple and evolving analysis grid of the different actions or solutions available to the decision-maker.

DESCRIPTION OF THE METHOD

The Multipol method short for *Multi*criteria and *pol*icy is the easiest of the multicriteria methods but by no means the least useful. It is based on the evaluation of actions by means of a weighted average, just as the pupils in a class are assessed by credit weighted units.

In Multipol we find the various classical phases of a multicriteria approach : listing of possible actions, analysis of consequences, development of criteria, evaluation of actions, definition of policies and classification of actions. The originality of Multipol lies in its simplicity and flexibility of use. Therefore, in Multipol, each action is assessed with respect to each criterion, using a simple grading scale. This assessment is obtained through questionnaires or expert meetings, with an attempt at consensus being a necessary requirement.

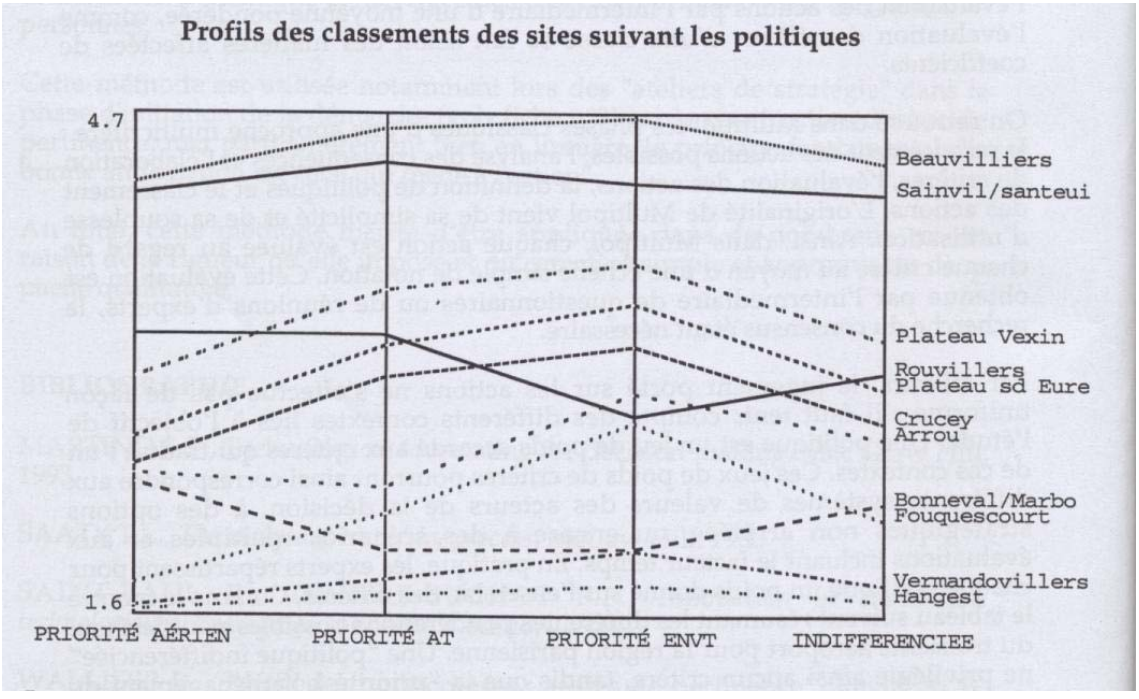
Moreover, the assessment of actions is not undertaken in a uniform manner : one must take into account the different contexts linked to the objectives of the study. One policy is a weighting scheme applied to the criteria in order to interpret one of the various contexts. Such weighted criteria could also correspond to the various value systems of the actors involved in making the decision, to undecided strategic options or again to multiple scenarios and to evaluations which include a time factor. In practice, the experts apportion a given total weight to all the criteria for each policy. This can be seen in the following chart which summarises the different weighting possible for the choice of a third airport in the Paris region. An "undifferentiated policy" does not give greater importance to any criterion, while the "priority given to urban planning" pays no heed to the criterion of "quality of air space".

Chart showing the interplay of the weight of different criteria

Criteria _____ Policies	Quality of air space	Land access	Environ-ment	Pool of customers	Pool of employees	Sum of weighting
Air priority	4	3	1	4	3	15
Urban Planning priority	1	4	3	3	4	15
Environmental priority	1	3	6	2	3	15
Undifferentiated	3	3	3	3	3	15

For each policy, the Multipol procedure attributes an average score to actions. We can thus generate a chart with profiles of a comparative classification of actions according to policies. As the graph below illustrates, (still in respect to the study comparing possible sites for the building of a third Paris airport, the sites of Beauvilliers and Sainville/Santeuil are ranked highest whatever the weighting of the criteria. Interestingly, the site of Rouvillers resists weighting less well because it gives priority to environmental constraints.

Outlines of placing of sites according to different policies



One must also take into account the risk related to uncertainty or conflictual hypotheses and this is accomplished through a plan which stabilises the placement of actions based on the average and typical difference between average scores obtained for each policy. It is thus possible to test the robustness of the results of each action. Of special interest would be those actions which had a high average but a strong typical difference : that would make them considered hazardous.

USEFULNESS AND LIMITATIONS

Multipol is a simple and appropriable method which takes uncertainty into account and allows for testing of the robustness of the results from different policies. Thanks to its simplicity, it is also an evolutive method. In fact, it allows users to incorporate new criteria, weighting or actions easily, not only during the survey but after it as well, with a view to enriching the analysis. The simplicity of the aggregation criterion (weighted average). Moreover, eliminates any incomparability between the actions.

However, if the goal is to draw up a plan based on several actions, difficulties might appear in that account must be taken of synergies, incompatibilities and redundancies among the actions retained. Of course, this handicap is valid for all multicriteria methods : hence the need for more sophisticated analysis, there as elsewhere.

PRACTICAL CONCLUSIONS

The need to take into account the existence of multiple criteria in problems of decision-making has encouraged the development of numerous sophisticated methods which are based on a wide range of concepts and procedures (fuzzy logic sets, the utility function, simplex...). As mentioned in the introduction of this card, Multipol is a simple, operational response which avoids the pitfalls of excessive formality yet still enables one to organise and structure decision-making aids.

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