

## Creating a Scenariologic – Design and Application of a Repeatable Methodology

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### Abstract

*Context scenarios are widely used for assessing the robustness of strategies and policies in both the private and the public sector. Royal Dutch Shell, for instance, has become renowned for its strategic use of context scenarios in the seventies and developed a methodological stepwise approach for scenario construction. Nowadays context scenarios have become one of the standard tools of policy analysts and strategic planners. A context scenario is a creative narrative description of a future situation sprouting from causal processes and constructed through logical reasoning. Designing a good scenariologic, the skeleton of the scenarios, is the main step for designing creative, plausible and internally consistent scenarios. A sound scenariologic is the basic requirement for good scenarios and group support systems can be of great help for designing such a scenariologic.*

*Many practitioners and facilitators stress that except for the product scenarios itself, raising awareness about uncertainty and the experience of going through the process of scenario construction itself are important too. Traditional scenario construction workshops therefore can be quite time-consuming, but short intensive workshops using GSS do support these goals too. It will be shown that due to the intensive interaction, GSS supported workshops are well-suited for creating a sound scenariologic, for raising awareness about uncertainty in policy making and do create a social base for policy-in-the-making.*

*In this paper the methodology and the successive application of basic GSS thinkLets in this creative scenario construction process will be described. Illustrations will be taken from a number of scenario-workshops in which a stepwise approach for the construction of context scenarios was used*

### Introduction

Scenarios are images of the future and are increasingly popular as analytical tools for assessing the impacts of policies and as tools for assessing the robustness of policy measures in case of unanticipated events. In many organizations scenario construction is an important step in their strategic planning process. Royal Dutch Shell, for instance, has become renowned for its strategic use of context scenarios in the seventies, which allowed the company to be successful in anticipating the effects of the oil producing countries production cutback. Scenario thinking can help countries, companies and institutions to be better prepared for unexpected events. Scenarios neither predict the future, nor prevent the unexpected from happening. In retrospect, most scenarios turned out to be wrong and future events mistakenly predicted. [1] Most planners and futurists therefore reject the idea that planning should be conducted against one single “most likely” or “most wanted” image of the future. Rather, sets of scenarios should be used in planning. [2] Scenarios, however, do teach us to anticipate the unexpected and to be flexible and that is what counts for survival.

Designing plausible and internally consistent scenarios is not simple but a methodological challenge to many policy analysts, especially for those who work with participants in interorganizational and/or interdisciplinary settings. In this paper a repeatable method for designing a scenariologic will be sketched and illustrated by case material. The presented method is the result of a cross cases analysis and based on many years of experience in scenario construction. The challenge that had to be met was designing a short intensive workshop allowing participants to experience and learn from the process of scenario construction meanwhile resulting in methodological sound scenariologics. In the scenario workshops the participants were challenged to identify factors and trends, rank the driving forces by uncertainty and importance and design a preliminary scenariologic. All workshops had the same basic ingredients, derived

from the method described by Schwartz [3]. This same method has also been used by many other practitioners (see: [4,5,6]) and has been practiced by the author with hundreds of MSc-students.

As argued by Weatherall and Hailstones [7] there are three stages to a workshop: pre workshop preparation, the workshop itself and the post workshop delivery. A successful workshop will only be attainable when all three stages are well done. In this paper we will only focus on the workshop itself, while concentrating on the possible contribution of GSS to the systematic and methodological construction of context scenarios. In the next section the learning experience of participants in the process of scenario construction will be discussed. In the third section the method will be described of which practical illustrations can be found in the case studies presented in section four. In section five the focus will be on the contribution of GSSs to the process of scenario construction and the thinkLets [36] that were applied in the scenario workshops. The final section presents some final remarks and recommendations.

### The scenario experience

Many practitioners and facilitators stress the importance of awareness raising (about uncertainty) and the experience of going through the process of scenario construction itself. Participating in a scenario exercise is an exiting event as scenario construction is a rare combination of art, craft and science. The outcome of the process is often a unique mixture of creativity and rationality, using the best parts of both right and left side of the human brain. There is an exiting tension between expertise and fantasy people experience when involved in scenario construction. Others emphasizes that scenario analysis is not just the stories told, but it is foremost a process of analysis. Heijden [8] and Jaworski [9], building on their Royal Dutch Shell and 'Mont Fleur' experiences in South Africa, attribute much importance to a lengthy process of relatively unstructured generation of ideas by a scenario team for team-building and confidence building purposes: the generation of mutual trust and understanding in a sensitive political situation.

In many cases, however, time is scarce and expensive and the participative process must be completed as quickly as possible to minimize cost and to receive benefit as soon as possible. For that reason short and intensive workshops are often preferred in practice, which is the reason to design short and intensive workshops. The scenario workshops depicted in this paper were restricted to designing a scenario-logic or scenario-skeleton, which was to be detailed by a small team at a later stage. Stakeholder participation and interdisciplinarity was considered important both for improving the knowledge base, for creating social support, and for being believed to generate more creative ideas [2];[10];[11];[12];[13];[14]. Selected specialists from different backgrounds and

disciplines were invited to participate in the workshops [15];[16];[17];[18].

### Context scenario's

Context scenarios are widely used for assessing the robustness of strategies and policies in both the private and the public sector. A scenario can be defined as a rich and detailed portrait of a plausible future world or as a future state of a system [19]. Plausibility is what distinguishes scenarios from mere fantasy. A scenario is not a prediction or a specific forecast per se; rather, it is a plausible description of what *might* occur. Scenarios are narrative descriptions of the future that focus attention on causal processes and decision points [20];[21]. Geels [22] says: "a scenario should be positioned in the continuum between expertise and fantasy". Such narratives of plausible futures should always be sufficiently vivid to help a planner to clearly see and comprehend the problems, challenges, and opportunities that such a possible environment might present in the situation.

Two types of scenarios should be clearly distinguished: policy scenarios and context scenarios. Policy scenarios depict how the future might look like if specific alternative policies are successful, partial successful or not successful at all. They show a wanted or unwanted normative future situation and how to reach this situation through our policies. Context scenarios depict possible future environments of these policy fields; they show how the world might look like *despite* our policies.

Nowadays context scenarios have become one of the standard tools of policy analysts and strategic planners for assessing the robustness of tactics, policies and strategies. [23]. When this form of *ex ante* evaluation shows that specific tactics and strategies are effective in most of these plausible futures they are considered to be robust policy options and the future can be met with some degree of confidence.

### The method of scenario construction

As Bell [24] and Tjink et al [25] claim, scenario construction is a science when the right methodology is used. Designing a good scenariologic, the skeleton of the scenarios themselves, is the main requirement for designing creative, plausible and internally consistent scenarios. Numerous methods have been developed to create scenarios and can be found in the literature ranging from simplistic to complex, from qualitative to quantitative [3];[21];[26];[27];[28];[29]. Many methods have similarities, although they may have unique features and use different terminology [30]. Most approaches recognize the need to understand the system under study and to identify the trends, issues and events that are critical to the system. Royal Dutch Shell too, developed a methodological stepwise approach for scenario construction, which was used as format for the scenario construction in the scenario-workshops described in this

paper. Schwartz [3], a member of the Royal Dutch/Shell scenario team too, distinguished seven steps in the scenario development process.

### Seven steps

The first step in Schwartz' method is the identification of the focal issue or decision. A clear delineation of the focal issue or problem and its context is important for distinguishing policy scenarios from context scenarios [31]. In the case study on university staffing presented in this paper the organizing staff had done the delineation of the problem area beforehand and in other case: the transition workshop, the participants in the morning session of the workshop did it.

The second step, the identification of the factors, key forces and trends in the environment is usually organized as a free brainstorm for identifying factors, skipping to nominal group technique for organization and identification of the driving forces or megatrends. [28] The description and delineation of these megatrends should be considered crucial for the quality of the design process and its outcomes. The content of these driving factors (their definition) and the mutual understanding of this definition by all participants is a prerequisite for the ranking exercise, which is to follow. Moreover, in the discussion the participants should pay attention to the reciprocal independence of these megatrends, as interdependencies might hurt the consistency and logic of the -to be constructed- scenarios. For instance, many times the 'economical situation' (growth or decline) is seen as one of the driving factors together with 'technological innovation', without realizing their interdependence. As said before, another important distinction is between those factors and driving forces that are within the systems and within reach of the policy maker and those factors that are independent and cannot be controlled by the policy maker. The latter are crucial in constructing context scenarios. For that reason these two activities; generating factors and trends and identification of the driving forces are separated in the repeatable method that will be presented in this paper.

As a next step these contextual driving forces and megatrends are ordered according to importance and uncertainty. Preferably those driving forces that rank highest in both respects are taken as axes in the scenariologic. A check and discussion should then take place on the outcome, both for creating a social basis and for conformation of the basic assumptions of the scenariologic. In practice this discussion on the outcomes often leads to re-definition of the megatrends as hidden interdependencies become clear and consequently this discussion leads to a re-assessment of the megatrends. The resulting megatrends create the scenariologic, which in turn is the basis for the scenarios. The latter have to be filled out, either by the participants or the organizers in the next step. The final steps are the assessment of the

implications on policymaking and the selection of indicators and signposts for monitoring purposes. The latter two steps are not part of the method described here. In the half-day workshop set-up described here, the participants restrict themselves to indicating the major characteristics of their favorite scenarios and some indicative naming of these scenarios. Detailing takes place at another time.

### Some cases

Out of a large number of scenario building exercises two cases will be presented as examples of the applied repeatable methodology. As told, the method has been used many times, both by the author and other practitioners, mostly without support by GSS. Clearly the use of GSS in these two cases made the workshops run smoother, focused energy and effort of the participants. The first workshop was oriented towards designing context scenarios for the staffing policy of a Dutch university. (See: [15];[16].) The second case describes the design of context scenarios for the discussion on safety regimes for the Dutch river system - the transition process to a new regime, by the Ministry of Transport and Water Management. (See: [17];[18].)

### Case 1: Context Scenarios for the University's Staffing Policy

Delft University of Technology faces the problem of the university's ageing scientific staff, resulting in a required replacement of the top-level scientists (full professors and senior researchers) of 50% in the next ten years. At the same time the demand for experienced engineers and scientists is high and commercial competitors are offering better salaries as well as better secondary conditions. The university board felt challenged by these circumstances; what strategy should be deployed to maintain the position of a leading European technical university? How to deal with this competing environment? Scenarios were thought to be a good approach for learning about these issues and for selecting proper staffing policy measures. Consequently a scenario workshop was organized in which Group Support Systems (GSS) was employed to support brainstorming and ranking activities as GSS was expected to raise general productivity, eliminate production blocking and limit evaluation apprehension [32];[33];[34]. The invited participants were experts in the field of university staffing policy, managers of various university bodies and experts from two Ministries and the national employers organizations. As the staffers had delineated the problem in a preceding study, the participants in the workshop were to take four steps:

1. focus on factors determining success and failure in realizing adequate staffing,
2. articulate 'megatrends' or 'driving forces' behind those factors,

3. estimate the relative importance and the level of uncertainty of these megatrends.
4. create a scenariologic

In a number of iterations between participants and project team the results of the workshop were worked out; the scenario-logic was agreed upon and five scenarios were written describing possible future environments of the universities staffing policy.

**Group systems**

In the workshop GSS was applied. After warming up by a 'war on positions', a free brainstorm on the factors determining success and failure of staffing policies was used for creating divergence. As Dennis and Gallupe [34] suggested electronic support for brainstorming proved highly effective producing 233 factors after 30 minutes of input by the 12 active participants. In a second round the driving forces or megatrends behind those 233 factors were identified. Convergence was reached through nominal group technique. In first instance eleven driving forces were identified and ordered through an electronic rank order device. Among these were for instance: the position of science and technology on the political and economic agenda, the societal need for highly educated technologists, European research policy and the growing orientation on economic survival and competition.

The criteria for ranking were (1) relative importance and (2) unpredictability/beyond control.

The results clearly showed two megatrends standing out in this ranking: (a) the societal idea on what the university should look like and (b) the interest in (technical) scientific work. These two factors were considered both to be of utmost importance and largely beyond the control of the university. High agreement existed on the

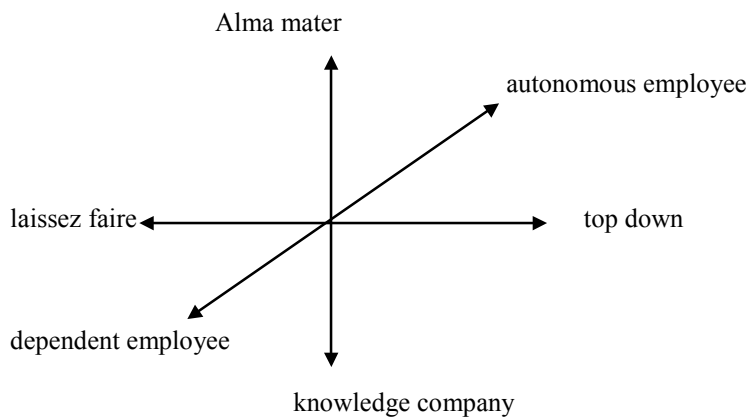
fickleness and uncontrollability of the political and economical agenda, which highly influences the funding base of the university.

The result of the ranking exercise aroused fierce debate in the expert panel. They discovered that many of the eleven factors, even the two apparent independent megatrends mentioned above were related to one another. An instance was that new scientific breakthroughs getting high public attention would spur the public interest in technical scientific work and should be considered beneficial to the image of the university. In the discussion that followed three major factors or megatrends were distilled from the discussion on the outcomes of the ranking exercise. Consequently the project team drew up a scenario skeleton based on these three megatrends, which turned out to be largely supported by the expert panel (see Figure 1).

**Scenario-logic**

The first megatrend was called 'Ideas in society on the nature and function of the university'. Two opposing societal images of the university were sketched on this axe: the 'Alma Mater' and the 'knowledge company'. Alma Mater implies that society expects the university to concentrate on academic knowledge, to be curiosity driven and focus on traditional scientific values. If seen as a knowledge company and a motor for the economy, then the university is a competitor in a market for education and research.

The second axis focused on the level of external influence, especially the political and economical agenda. The extremes on this axis were named 'Laissez-faire' and "Top-down".



**Figure 1.** Scenario-logic of the university's staffing policy

The third axis in the environment of the universities staffing policy relates to the 'attitudes' of individual employees. This trend related to megatrends such as individualization and privatization. On this axis two

extremes were sketched: the dependent and the autonomous / entrepreneurial employee. The three axes spanned a three-dimensional space. After the workshop

the staff team worked out five possible scenarios. These are shown in the next table:

**Table 1.** *The dimensions of the scenarios on university staffing*

Scenario name	Ideas on university	External influence	Attitude
“Social Confidence”	Alma Mater	Laissez Faire	autonomous
“Freedom in Ties”	Alma Mater	Top Down	dependent
“Free Market”	Knowledge Company	Laissez Faire	autonomous
“Planned Competition”	Knowledge Company	Top Down	dependent
“Organized Free Competition”	Knowledge Company	Top Down	autonomous

With the description of these five scenarios in the final report the first five steps of Schwartz’ approach [3] were set

**Case 2: a robust transition process**

The Dutch river dike system is renowned but not infallible. Extremely high waters during the last decade forced the authorities of several polders in the central river area to issue evacuation orders; more than 300.000 people were evacuated. In the end the river dikes did not collapse, but government agencies are now evaluating the durability and reliability of this traditional safety concept. In a research project a new safety concept was explored in which in the very long term (after 100-200 years) the rivers would get a free flow. Various impact studies and *ex ante* evaluations of this new safety management regime were made and the research project continues. A new safety paradigm might be getting shape, but can it be made acceptable to the Dutch citizen and the inhabitants of the Dutch polders? [18];[31]. A one-day workshop was organised in which policy makers and university professors gathered for discussing the requirements and possible design of such a transition process. This design took into account the heavy resistance and emotional burden of the effected population and a number of context scenarios were sketched for the environment of this transition process. The second half of the day was devoted to constructing the scenariologic of these context scenarios. Once more the workshop design was based on the approach outlined by Schwartz [3]. As a number of preliminary plans for a transition had been made in the morning session, the afternoon could focus on the factors, trends and design of a scenariologic.

**Brainbox**

In the workshop a simple, first generation electronic meeting support system, nicknamed ‘brainbox’ was used for brainstorming, organizing and ranking of factors and megatrends. The first step: identification of factors was

done by free brainstorming and resulted in 43 factors by eleven participants in some 10 minutes. Nominal group technique was used for identifying the driving factors. Participants were invited to make a ‘private list’ of driving factors and were then invited to send in their favorite/most important one to the joint list. After organization of these eleven factors and condensation into 8 remaining factors a second and third round were made. This led to a total of 15 driving factors or megatrends (out of a total of 41 on the private lists).

The 15 driving forces were assessed through an electronic rank order device. The criteria for ranking were (1) relative importance and (2) uncertainty / beyond control. Clearly the participants largely agreed on the importance of the driving factors: natural process will become leading, human-nature partnership, makeble society, and prosperity. On the other hand not one single megatrend was considered as standing out on uncertainty except for ‘natural process will become leading’. Noticeable the participants were rather sure about ongoing trends as globalization, makeble society, economic growth, our changing relation with nature and the Netherlands as a multi-cultural society.

The ranking exercise did not give clear cues for the axes of a scenariologic, so we spent two hours discussing this choice. It was important to stress the meaning of context scenarios as stories depicting the environment of the transition process rather than a prospective scenario - a picture of a possible wanted or unwanted future. In the end, from the fifteen driving forces we were able to distil and define three independent axes: the relation to nature (compliance or mastery), use of space (conscious or consumption) and social responsibility (individual or social). A scenariologic was constructed accordingly (see Figure 2).

The next steps in the workshop were to choose for the elaboration of a limited number of possible scenarios and a first empathization and naming of these scenarios. The possibilities and choices are shown in Table 2.

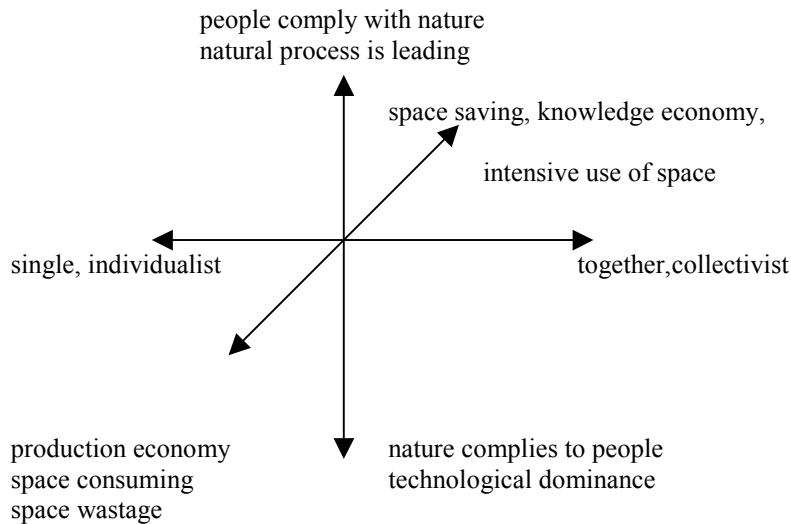


Figure 2. Scenario logic Case 2

Table 2. Scenario possibilities

people comply	single individualist	space saving	living on a mound / the Chinese hermit
		space wasting	Brasschaat / villa country
	together collectivist	space saving	Randstad / compact city
		space wasting	the new manors
nature complies	single individualist	space saving	flat-dwellers
		space wasting	sub-urban paradise
	together collectivist	space saving	working-class cottages
		space wasting	Flying doctors

**GSS contribution to scenario design**

The examples in the previous section illustrate the many challenges the facilitator of a scenario-design workshop faces. Focusing on the design of the scenario logic alone, the facilitator faces many challenges:

- he has to make clear the concept of context scenarios as opposed to policy scenarios
- he has to make clear the conceptual difference between factors and driving forces
- he has to arouse creative thinking
- he has to organize and structure abundant information
- he has to get people committed to the process and its outcomes.

In the cases described in this paper GSSs were deployed. These systems proved to be very supportive in collecting and organizing the generated information and in quickly ranking and showing results of voting sessions. Apparently the application of GSS led to clearer choices and clearer preferences for a limited number (three) of driving forces than in cases without GSS as described by Thissen [5] and Hakvoort et al. [4] It should be noted, however, that in the transition-case the outcome of the

ranking exercise on uncertainty was not conclusive at all. Rather it spurred confusion on the goal of the exercise – referring to the first two challenges mentioned above. Moreover, in both cases the presentation of the outcomes of the ranking exercises raised intensive debates; clearly the confrontation with their ‘objectified’ preferences shocked the participants and led them to re-define megatrends and re-evaluate and improve upon their earlier assessment. The cases illustrate that for solving the occurring conceptual problems the methodological and content expertise of the facilitator seemed decisive. The immediate availability for discussion of the voting outcomes was a clear advantage of the use of a GSS. Due to the improved efficiency of the information handling GSS allowed for intensive interaction between the participants focused on the assignment. Consequently we can conclude that GSS supported workshops too are well suited as a process tool for raising awareness about uncertainty in policy making and for going through the scenario experience as valued by Heijden [8].

As the design and construction of context scenarios requires a systematic way of thinking, which is widely applied in strategic decision making; it is worthwhile to

elaborate on the repeatable pattern and thinkLets that might be used for a scenario design workshop.

**GSS ThinkLets for scenario development**

Above case studies showed the outcomes of a method for the creation of a scenariologic. Through successive application of basic GSS thinkLets [36] a clear repeatable pattern can be discerned. (see: Fig. 3). The central line in Figure 3 is the repeatable pattern, which is supported by some GSS thinkLets in the bottom line. The top line gives the successive activities in the scenario workshop. First activity is the presentation and delineation of the focal

issue and a warming up exercise related to the issue at hand. Second is the identification of the factors, key forces and trends in the environment of the focal issue. Third activity is the identification of the ‘driving forces’ or megatrends, followed by (4) a ranking exercise in which the ‘driving forces’ are ordered by importance and uncertainty. Step five was the discussion on outcomes, culminating in the creation of a scenario-logic. The sixth and final step in the workshop was the preliminary choice and naming of a limited number of scenarios to be elaborated at a later stage.

Scenario workshop activities:

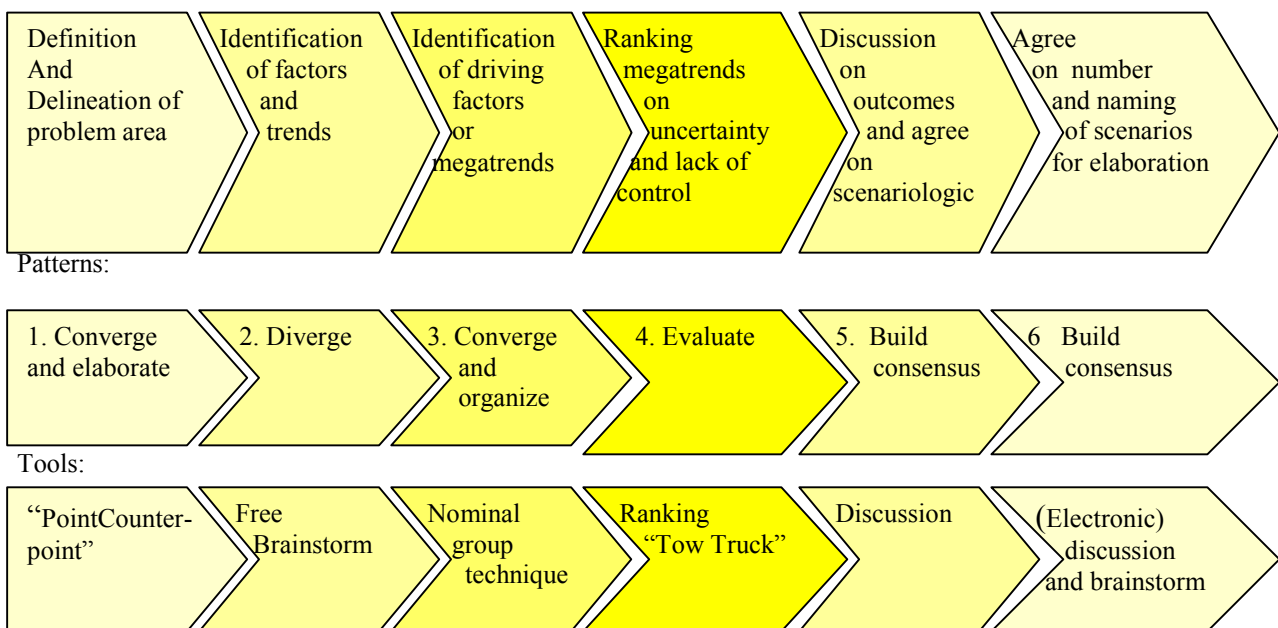


Figure 3. GSS Patterns and tools for a scenario workshop

The first activity is the ‘warming up’ to loosen up and to get acquainted with the GSS that will be used. In scenario exercises it proved well possible to combine getting acquainted with the system and loosening up with an introduction to the topic by organizing a dialectical debate between participants. “Point-Counterpoint” proved to be a useful thinkLet, as it confronts participants with a discussion statement they have to support or reject with arguments [37]. The script applied in this workshop does not require the creation of consensus by formulating bridging arguments. The discussion statements need be well prepared beforehand and should focus on key issues in the policy field under scrutiny. In this way all kind of pro’s and con’s are generated and the problem area gets introduced in an active fashion without the need of lengthy presentations. This activity is labeled as “converge and elaborate” in Figure 3, which is to express that the activity helps to define and delineate the problem area.

Two hurdles have to be overcome in this stage: participants are hesitant to start using their computer, sit idle or start reading other peoples messages, and some of them will be reluctant to play the devil’s advocate and do not want to think up arguments opposing their own view. Sitting idle and ‘reading only’ will be prevented by the set up of the ‘War on positions’. In this script only one statement at a time will be presented to each individual; it will only disappear to be replaced by the next one after the participant has taken action. Next, some individual participants will be hesitant to think up arguments their opponents might want to use. At this stage it will be sufficient to remind them that this warming up exercise is only a game. If they still do not go along they can present their own position and at least part of the goals of the exercise will be reached: they will accustom themselves with the instrument and the subject. Not going along in this intellectual game of argumentation can be a sign of inflexible personality or non-commitment of this

participant the facilitator should be aware of. Some extra attention during the workshop for these participants might be necessary to get them committed.

The second activity is a free brainstorm on factors that influence the problem or policy area. The objective is to get insight in all kind of factors and relations in the policy field. Divergence, outscoping is the objective and pattern. However, we do not follow the traditional three-tier system of brainstorming: generation, elaboration and structuring/organization. The activity is restricted to divergence: the generation and elaboration of factors, which will be kept till after the workshop for detailing of the scenarios. The outcomes of this brainstorm are the basis for generating driving factors or megatrends. For the facilitator it is important to stimulate the participants generate and introduce as much of their own ideas first before they start reading and reacting on each other's ideas: the more ideas the better. Participants can show off and let off steam while generating ideas and interacting. Only after some ten minutes the facilitator can ask them to read each other's input and react on that. There is a clear advantage in skipping the organization and structuring activity, as the latter in general is quite time consuming and takes away the energy generated in the brainstorm. On the other hand, leaving the output as it is, one has to convince participants that their output will be of big value at later stages of the process.

As described when designing context scenarios the important third step is to get to a short list of driving factors or megatrends. These are the factors that cause changes in the factors generated previously. Factors cause changes in the outcome of a policy process, they influence the system from within; driving forces or megatrends are the forces that influence the factors and that are beyond control or influence of the policy maker. This distinction should be clearly explained to the participants. When designing policy scenarios this third step will be different; then the focus will be on the factors that can be influenced by the policy maker.

Creating a joint list of megatrends is a matter of in-scoping, convergence. Nominal group technique is very much suited for this fourth step. Each participant is asked to make his or her own short-list of driving factors. After preparing the private list, he can send his most important one to the joint list, which is then presented on the public screen, and open for discussion and organization. In principle all driving forces or megatrends are collected. After two rounds of inventory making and organization there will be only one or two participants left who will think they need to add to the list. In practice one will end up with a list of 15 to 20 driving forces. At this stage elaboration and discussion between participants is important. As the next step is a ranking exercise, the participants should have a clear understanding of the meaning of the topics on the list. Lengthy discussion between participants might be needed to reach mutual

agreement and sufficient understanding. FastFocus might be an alternative and useful thinkLet to apply at this stage as it allows to quickly extract a list of key issues from a brainstorming activity. [37]

The next, fourth step is the ranking exercise during which the driving forces are ranked according to both their impact/importance and to the uncertainty and/or unpredictability. For designing context scenarios we are looking for the most important and most uncertain megatrends. Sometimes the outcomes of this evaluation exercise are not conclusive. Sometimes the results are surprising and need extensive debate to generate sufficient support. Sometimes the results are clear but the participants disappointed. In all situations the outcome of the ranking exercise has to be presented and extensively discussed as this outcome determines the basis for scenario construction: the scenariologic. Consensus on the selection of the driving forces is important; without consensus the social support is lacking and this might become an obstacle for using the scenarios at a later stage. The standard deviation is one of the means the facilitator has, to check whether important differences in opinion exist. In the examples "Tow Truck" was used as a variant of the thinkLet StrawPoll because it forces participants to decide on what is more or less important or more or less uncertain and because it makes explicit disagreement. Be careful as Briggs and Vreede [37] say "not to read too much meaning in small differences".

The number of driving forces or megatrends that can be taken as a basis for designing scenarios in principle is unlimited. In practice, however, it is more convenient to select a limited number of axes or dimensions. In the case studies presented the scenariologic was based on three axes. The latter has the clear advantage that three or four axes or dimensions is still within the limits of human imagination, which makes it possible to have a complete overview of the scenario space created by these dimensions. Especially when it comes to the selection of a limited number of scenarios for detailing and for the actual work on detailing it is convenient to have a limited number of axes or dimensions to start with.

In both case studies it turned out that the results of the ranking exercise revealed that the megatrends that had been defined earlier needed refinement as it showed they were interdependent and not always clear to all participants. Redefinition of the megatrends and reassessment of the ranking results is of extreme importance for building consensus and for creating support for the scenariologic.

Choosing the number and position of scenarios for further detailing is the sixth and final step in the workshop design. Not all possible futures have to be detailed. Important is to convey the message that context scenarios are plausible/possible futures for assessing the robustness of policy proposals; not expected most probable futures. When deciding on what possible futures to work out in

detail it is more challenging not to take the obvious combination but to choose for those combinations that are surprisingly unknown. Once consensus has been reached on what combinations to work out into detailed scenarios a new round of out-scoping can start with making small groups that will make a first draft on headlines and will think up a compelling name for the future they are describing.

The preliminary naming of those scenarios that will be detailed is helpful for sending across a first message and for creating a joint image and a mutual expectation and understanding of what this unexpected, still unknown future might look like. Choosing and naming can be done both with or without electronic support. As by this time the participants have been working for several hours and the main job has been done successfully, oral discussion will be preferred by the participants.

### Conclusions and Recommendations

Creating a methodologically sound scenariologic can be done very well in short intensive GSS supported workshops. Moreover, the support of a GSS enhances the 'scenario experience' advocated by Heijden [8] and Jaworski [9] as was illustrated by the concern of both facilitator and participants to define really independent megatrends for building the scenario skeleton.

A difficult issue is the crucial distinction between factors inherent to the system and the megatrends or driving forces, which are outside the system and outside the range of control of the parties involved in policy making. Related to this issue and in need of the facilitator's attention is the definition of the various factors and trends and the participants understanding and interpretation of these definitions. Is the meaning of words clear and the same to everyone?

The facilitator should be critical as to the interdependence of the megatrends; he should ask the participants too to be critical in this respect. As the case studies illustrated a re-evaluation was needed after discussing the outcomes of the ranking exercise. Only after being confronted with the question to prioritize the issues on the list, participants were forced to really think about the meaning of the words and statement and about the interrelatedness of the factors and trends they have generated! This learning is important both for methodological soundness of the scenariologic but even more for attaining the 'scenario experience'.

As shown in this paper, scenario workshops are an exiting experience both for the facilitator and for the participants. Improvement is possible especially with respect to the above issues of definition and interrelatedness of factors and megatrends. How to improve on these issues is part of the ongoing research of the group of policy analysis at the Faculty of Technology, Policy and Management of TU Delft.

### Literature

- [1] Geels, Frank W., Wim A. Smit, 2000. "Failed technology futures: pitfalls and lessons from a historical survey", *Futures* 32 (2000) 867-885
- [2] Schoemaker, P.J.H., 1993. Multiple scenario development - its conceptual and behavioral foundation. *Strategic Management Journal* 14: (3) 192-213
- [3] Schwartz, Peter. 1991. *The Art of the Long View: Planning for the Future in an Uncertain World*. New York: Doubleday.
- [4] Hakvoort, Rudi A, Selinde Biesheuvel, Ivo Bouwmans, Bert Enserink, Sietske Herder, Bob Paap, Philip Vergragt, Ad H.M Verkooijen, 1999. "Power 4 Worlds – Scenario Analysis of the European Electricity Infrastructure" in: Weijnen, M.P.C and E.P. ten Heuvelhof, *The Infrastructure Playing Field in 2030*. Proceedings of the First Annual Symposium Delft Interfaculty Research centre Design and Management of Infrastructures. Noordwijk, November 1988. Delft University Press. pp. 131-152
- [5] Thissen, Wil A.H. 1999. A scenario approach for identification of research topics in: Weijnen, M.P.C and E.P. ten Heuvelhof, *The Infrastructure Playing Field in 2030*. Proceedings of the First Annual Symposium Delft Interfaculty Research center Design and Management of Infrastructures. Noordwijk, November 1988. Delft University Press. pp. 5-10.
- [6] Ruijgh-van der Ploeg, Tineke, Annemiek Verhallen, 2002. *Envisioning the future of transboundary river basins with case-studies from the Scheldt river basin*. Delft Technical University and Wageningen University and Research.
- [7] Weatherall, Alan, Frank Hailstones, 2002 Risk Identification and Analysis using a Group Support System (GSS), *Proceedings of the 35<sup>th</sup> Hawaii International Conference on System Sciences (HICSS-35'02)*
- [8] Heijden, Kees van der, 1996. *Scenarios; the art of strategic conversation*, Chichester, Wiley.
- [9] Jaworski, Joseph. 1996. *Synchronicity. The inner path of leadership*. Berrett-Koehler Publishers San Francisco
- [10] Osborn, A. (1957), *Applied imagination: Principles and procedures of creative thinking* (rev. ed.), New York: Scribner's.
- [11] Berk, M.M., C.E. van Daalen, M. Hisschemöller, 1998. Participative Integrated Assessment and the Utilisation of Scientific Knowledge, *Milieu*, 1998/5, pp.275-285
- [12] Beierle, Thomas C. 1999. Using Social Goals to Evaluate Public Participation in Environmental Decisions, *Policy Studies Review*, 16:3/4, pp.75-103
- [13] Randolph, John, Michael Bauer, 1999. Improving Environmental Decision-making through Collaborative Methods *Policy Studies Review*, 16:3/4 pp.168-191
- [14] Pelletier, David., Vivica Kraak, Christine McCullum, Ulla Uusitalo, Robert Rich, 1999. The Shaping of collective values through deliberate democracy: An empirical study from New York's North Country. *Policy Sciences*, 32: 103-131.
- [15] Enserink, Bert., 1999. Integral assessment: the role of safety management. *Proceedings of the Sixth Annual Conference of The International Emergency Management Society*, June 7-11, 1999, Delft, The Netherlands, pp. 402-410
- [16] Enserink, Bert., 2000a. "Buiding Scenarios for the University" *International Transactions in Operational Research*, Vol. 7, No. 6. pages 569-584. ISSN 0969-6016
- [17] Enserink, B. 2000b. *Transitie en Scenario's voor het project RivierenLand*. Rapport aan de Dienst Weg- en Waterbouwkunde, Directoraat-Generaal Rijkswaterstaat, Ministerie van Verkeer en Waterstaat. 26 pag.

- [18] Enserink, B., I van Bemmelen en O. Kuiper, 2000. *RivierenLand Ex-ante evaluatie van het Transitieproces - een scenariostudie*. Rapport aan de Dienst Weg- en Waterbouwkunde, Directoraat-Generaal Rijkswaterstaat, Ministerie van Verkeer en Waterstaat. 32 pag.
- [19] Beroggi, Giampiero E.G., 1997. *Decision Modeling in Policy Management, An Introduction to the Analytic Concepts*. SEPA, Delft
- [20] Kahn, H and Wiener, 1967., *Toward The Year 2000*. MacMillan, New York
- [21] Rotmans, Jan., marjolein van Asselt, Chris Anastasi, Sandra Greeuw, Joanne Mellors, Simone Peters, Dale Rothman, Nicole Rijkens, 2000. "Visions dor a sustainable Europe" *Futures* 32 (2000) 809-831
- [22] Geels, Frank, 1997. *Met de blik vooruit. Op weg naar socio-technische scenario's*. Universiteit Twente, Enschede
- [23] Walker, W. 1988. "Generating and screening alternatives", Miser, H.J. and E.S. Quade (eds.) 1988. *Handbook of Systems Analysis*. John Wiley & Sons, Chichester/New York, pp. 217-234
- [24] Bell, W. 1987. Is the futures field an art form or can it become a science?: *Futures Research Quarterly*, 3(1), pp. 27-44
- [25] Tijink, D., Van der Heijden, R.E.C.M., Thissen, W.A.H., 1994. Scenario's op het OCV-toneel: reflectie op OCV-toepassingen van scenario-workshops. Voortgangspaper promotieonderzoek.
- [26] Godet, M., 1987. *Scenarios and Strategic Management*. Butterworth Scientific, London
- [27] Huss, W.R., 1988. A move towards scenario analysis. *International Journal of Forecasting*, 4, 377-388
- [28] Porter, M.E., 1985. *Competitive Advantage*. The Free Press, New York
- [29] Reibnitz, Ute von. 1988. *Scenario Techniques*. Germany: McGraw-Hill.
- [30] Porter, Alan L., A. Thomas Roper and Thomas W. Mason, Frederick A. Rossini, Jerry Banks, Bradley J. Wiederholt., 1991. *Forecasting and Management of Technology*. New York, John Wiley & Sons, Inc.
- [31] Enserink, Bert, 2002. Thinking the unthinkable - the end of the Dutch river dike system? Exploring a new safety concept for the river management, *Journal of Risk Research* 5 (4) (forthcoming).
- [32] Connolly, T., Jessup, L., Valacich, J. (1990), Effects of anonymity and evaluative tone on idea generation in computer-mediated groups, *Management Science*, 36, 689-703
- [33] Valacich, J. Dennis, A., Connolly, T. (1994), Idea generation in computer based groups, *Organizational Behavior and Human Decision Processes*, 57(3), 448-467.
- [34] Vreede, Gert-Jan, de, Robert O. Briggs, Ron van Duin, Bert Enserink, 2000. Athletics in Electronic Brainstorming: Asynchronous Electronic Brainstorming in Very Large Groups *Proceedings of the 33<sup>rd</sup> Hawaiian International Conference on System Sciences*, Maui.
- [36] Dennis, A.R., R.B. Gallupe, 1993. A history of group support systems empirical research: lessons learned and future directions, Jessup, L.M., J.S. Valacich (eds.) *Group Support Systems - New Perspectives*, MacMillan, New York
- [36] Briggs, Robert O., Gert-Jan de Vreede, Jay F. Nunamaker, David Tobey, 2000. ThinkLets: Achieving Predictable, Repeatable Patterns of Group Interaction with Group Support Systems (GSS)
- [37] Briggs, Robert O. Gert-Jan de Vreede, 2000-2001. thinkLets, Building Blocks for Concerted Collaboration, GroupSystems.com