Chapter 6
Futures thinking methodologies and options for education

by
Jonas Svava Iversen¹

This chapter by Jonas Svava Iversen gives a user-oriented view of a range of scenario methodologies. The author presents scenarios as involving four phases, and elaborates each in terms of their purpose, techniques to achieve them, and insights about successful practice and potential pitfalls.

i) Mapping and delineation of the subject matter is a critical first step.
ii) Identification of critical issues and trends is the second, and this is divided into analytical and participatory methods.
iii) Creating scenarios is itself sub-divided into five: identification of drivers, consolidation of trends, prioritisation of trends, identification of scenario axes, and actor analysis.

The fourth step, iv) using scenarios, looks at three main uses: developing shared knowledge, strengthening public discourse, and supporting decisions.

Delineation and mapping

It is important to establish what exactly the scenario is going to be used for, which processes will be used, and which level of complexity is chosen² (i.e. delineating). This calls for a first overview of the most salient elements

¹ Senior Consultant, Policy Analysis and Innovation, Danish Technological Institute.
² This delineation is based on the discussion in the chapter by Van Notten (Chapter 4).
in the area on which the scenarios will focus, i.e. a mapping exercise. Delineating and mapping sets the ground for the rest of the work, giving focus to the identification of trends and issues and the building of scenarios, and helping to ensure that design is thought through and not missing important elements.

**Delineation**

“Delineating” means making choices about the goals and processes of the scenario analysis, where decisions related to goals influence decisions related to processes and *vice versa*. The choice of design should be based on an evaluation of the goal of the process, the capacity and the “work-culture” of the participants involved, and the context in which the scenarios are going to be used and disseminated.

The goal of scenario analysis in a policy context may be positioned between the poles of *exploration* and *pre-policy* research. Exploration is traditionally the most common objective of scenario work. Scenarios may be used to explore a wide range of areas, from certain macro trends to particular subjects of interest in an area of policy. Exploration primarily uses scenarios as a vehicle of learning rather than a tool for decision making. Pre-policy research also involves exploration but is at the same time directed at serving more specific policy-oriented goals. This range of purpose means that the study design must incorporate different methods for bringing the scenarios into a strategic and decision-oriented framework.

The analytical design of a scenario process may call more on analytical approaches (convergent thinking) or on intuitive approaches (divergent thinking). Convergent thinking, on the one hand, is essentially about traditional problem solving. It typically involves bringing material from a variety of sources to bear on a problem, in such a way as to produce the “correct” answer. This kind of thinking is particularly appropriate in science and technology, and it involves description, observation, deduction, and/or prioritisation. Divergent thinking, on the other hand, is a skill broadly related to the creative elaboration of ideas prompted by a stimulus. Conventionally, such thinking is regarded as more suited to artistic pursuits and studies within the humanities.

The mix of convergent and divergent thinking found in any scenario study is related to such issues as the use of qualitative vs. quantitative data; participatory vs. model-based scenario design; and inclusive vs. exclusive approach to the identification of the participants in the participatory processes. Scenario analysis may be very simple through to being quite complex. Scenarios used for pre-policy research tend to be less intuitive and more complex than those for exploration.
**Mapping**

While delineation is related to the goals and design of the scenario process, “mapping” is about establishing an overview of the subject matter. This may be done with the help of desk research, interviews and relevance trees. Desk research should involve a wide variety of sources. The Internet is an obvious tool for this and good sources of information are government agencies, non-governmental organisations, international consultancy companies, research communities, and on-line and off-line journals related to the subject. This research may also be used for the identification of experts for the various forms of interviews and participatory processes that may be used during the scenario analysis. In this phase of scenario projects, interviews should be with experts with a broad knowledge of the subject matter, since the aim is the mapping and general description of the subject under analysis. Creating relevance trees is like mind-mapping and may be useful to understand how a given subject relates to other similar subjects, and they may also be used to help identify the scenario team’s knowledge of the different subjects.

**Identification of critical issues and trends**

**Data analysis**

On any subject, there will be a range of information which may be transformed into interesting insights on trends and issues. Methods for these types of analysis draw from different scientific fields.

Biblio-metric analysis may be used to track the development of the interest in a given subject and as such it may act as a trend indicator. But there may be other benefits from such form of analysis. An integral part of the biblio-metric approach is an “actor” analysis where the main experts in a given field can be mapped out and called on later in the scenario exercise. The success of any biblio-metric analysis is strongly connected to the identification and use of key search terms.

Extrapolation of historical trends or theorems may also inspire the assessment of different possible developments. As a “rule of thumb”, the uptake of technologies, products, and ideas in particular markets and society follow S-curves rather than developing in a linear pattern. This means that uptake or participation will be slow in the beginning but at a certain state tend to reach an almost exponential growth rate before the concept “matures” and the growth stops. On this view, the challenge is to estimate the nature of and location on such an S-curve.
The potential use and development of technology is often an important driver of change in scenario analysis. One way of analysing this quantitatively is to conduct *patent analysis*, since the patterns of patents help indicate the potential interest and breakthrough of technology. Good patent analysis may be an important quantitative input to a scenario analysis and there is range of patent analysis services and tools available. There are, however, at least three pitfalls to note. First, companies may use patents as a strategic tool to discourage other companies from doing research in a given technological field so it is not objective. Second, there is a “black box” effect, since patents only become public some time after they have been filed. Third, patent research may be very time-consuming if knowledge is needed on a very specific technology, since every patent needs close study to understand the specifics of a given patent.

*Participatory methods*

Although desk research and data analysis are very useful, experts will often help provide insights and new perspectives on a subject. The input of experts and stakeholders is thus of key importance to a successful scenario analysis. Identifying the right experts may well present a challenge. Experts with different perspectives and backgrounds may well be needed, as with different stakeholder perspectives.

Once the experts have been identified, their views may be sought face to face, via telephone, or in focus groups, and this may be through structured, semi-structured, or unstructured interviews. Face-to-face interviews should be used for key experts and stakeholders, allowing the interviewer to interpret body language and other “secondary” sources of information. Most often, face-to-face interviews will be semi-structured in order to facilitate the unfolding of a natural conversation kept within certain boundaries by the interview guideline. Telephone interviews are the obvious solution when resources are unavailable to conduct face-to-face interviews. Focus groups can be a very effective way of gaining input from a range of different experts and stakeholders at the same time. Most focus groups are conducted on the basis of a set of questions that are addressed in a relatively unmoderated discussion by the participants.

Although it is often described as if it were an alternative methodology to scenario development, a *Delphi analysis* may be used as the basis for a scenario process. Delphi analysis is a structured brainstorming process carried out iteratively through rounds, usually two to four, of semi-structured questionnaires. A range of experts is asked for their input on a given subject, and through the iteration of questionnaires each is confronted with the inputs of the others. They are then asked to evaluate responses of the other experts and restate any of their initial responses. This process is
intended to lead to consensus among the experts involved. *Consensus conferences* are a form of real-time Delphi analysis where the method requires that participants come to agreement on a complex question. Different parties are allowed to state their case, but at the end of the day a degree of consensus must be reached. If this cannot be achieved through discussion, a vote may be taken to give a tangible result.

The public may be involved through the same methods as experts but it should be noted that Delphi analysis is intended for experts and may not extend very constructively to the public. Face-to-face interviews and telephone interviews are very resource-demanding and are often reserved for experts, while the opinions of members of the public may be most effectively introduced via focus groups and questionnaires.

**Scenario creation**

The purpose of this phase is to develop a set of internally consistent scenarios. Scenarios may be developed and used in either a normative or an exploratory manner. Normative scenarios are like visions for the future. Often only one or two scenarios need to be developed, and their main purpose is to identify the “perfect future” for a given subject. The scenarios may then be used as a tool to identify actions to be taken by different actors if these visions for the future are to be realised. This method is most often used by organisations which have a very clear political agenda and a set of goals they wish to pursue without too much debate on the uncertainties of the future. For education which is full of uncertainties, exploratory scenarios will usually be more appropriate. These are created in order to understand just how different the future may become and what may drive these changes. Exploratory scenarios should be: *plausible* (logical, consistent and believable), *relevant* (highlight key challenges and dynamics of the future), *divergent* (differ from one another in strategically significant ways) and *challenging* (challenge fundamental beliefs and assumptions).

Much of the scenario content is often created by a group of people (a scenario group), guided and facilitated by a scenario team that has performed the preparatory work of the first two phases described above. The scenario group may consist of representatives from the customer and/or experts appointed by the customer in combination with the scenario team. In this phase, the task of the team is to use the knowledge generated in the first two phases as input to the development of the scenarios. The scenario creation process itself will take varying time to complete, depending on the complexity of the issues involved and the goals to be met, and will often move through the following phases:

- Identification of drivers and trends.
• Consolidation of trends.
• Prioritisation of trends.
• Identification of scenario axes.
• Actor analysis.

Identification of drivers and trends

Although the scenario team may already have identified a wide range of drivers and trends in their preparation, it may well be important for the scenario group to get the opportunity to brainstorm on drivers and trends. This can identify the areas and possible trends that were not well covered in the second phase.

Box 6.1. Techniques for “out of the box thinking”

- Drawing on the stream of consciousness concept from literature, one tool is to ask a participant to do a stream of consciousness on a concept or picture. While the participant is doing his or her stream of consciousness, the other participants are inspired to come with new drivers and trends which they write down.

- Ask one or more of the participants to use metaphors to describe the dynamics and drivers of change. An example could be to describe an organisational unit and the potential developments of its external relations as if it were a Savannah in Africa – who are the lions, who are the untouchable elephants, is there a waterhole and, if so, is it full of crocodiles? The other participants may then be inspired by the internal logic of the Savannah system to see new trends and drivers of change in the subject domain.

- Work with forced pairs in which two categories of different concepts both related to the subject are prepared by the scenario team. For example: if the subject is the school of the future, one category could be concepts of possible breakthrough technologies and the other category concepts of traditional learning and social activities in the school. Participants take turns drawing a concept from each category and will then have to create a story-line based on the pair. While the storyline is being developed, the other participants may write down new drivers inspired by the forced pairs.

To get participants to think “out of the box” is a difficult task. A brainstorming session therefore typically consists of two parts. In the first,
everybody is asked to write on post-its all the drivers and trends influencing the subject which are then displayed for all to see. When the participants have seen all the post-its, they may then add a few if inspired by the contributions of the other participants. This first part will typically reproduce many of the ideas generated by the scenario team through the convergent methodologies. Therefore, different tools are applied in the second part to facilitate “out of the box thinking” and stimulate participants to come up with trends not previously thought of (see Box 6.1).

**Consolidation of trends**

When the brainstorming phase is finished, the participants will typically have produced between 50 and 200 post-its with description of drivers, many of which will be the same or be very closely related to each other. In order to reduce the degree of complication, the drivers and trends should therefore be consolidated into some generic categories. There may be anywhere between 10 to 30 generic categories which are then be used in the future work.

**Prioritisation of trends**

The aim of this phase is to gain some perspective on the relationship between the drivers and identify those which seem most suitable and interesting to form the back-bone of the scenarios. Different open and closed voting systems may be used to determine the most important factors.

*Cross impact analysis* for example, is a useful tool to illuminate the relationships between the different drivers and trends identified in the consolidation phase of the scenario workshop. Each driver’s influence on the other drivers is valued on a scale from 1-10 (10 meaning strong impact). The numeric values entered may then be used in different ways. One way is to take the three highest scoring factors as the most important since they have the strongest impact on the other factors. Another way is to determine as the most important factors those which influence the largest number of the other factors which score more than 6 points. In other words, the calculations may be made in different ways as long as it is done in a consistent manner which allows the comparison of the trends and drivers and identifies the most “important” ones, according to different specifications of what this means.

A *rabbit race* is a faster but less analytical tool. Each factor is written on a post-it note and displayed on a “race track” consisting of a starting line, a finish line and 7 to 10 steps in between. In a number of rounds each participant takes turns moving a factor 1 step closer to the goal line. Each
round, a number of post-its move closer to the finish line, as the participants physically move the post-it of their choice. When a certain number (say, 2-4) have reached the goal line, the exercise is stopped with the main factors thereby identified.

Although it is intuitively appealing to make the strongest drivers the backbone of a scenario, a **priority matrix** shows other considerations and approaches (see Table 6.1). For example, there may be great uncertainties with some drivers, while others are much more certain (demographic developments are a good example of the latter). Another issue is the organisation’s opportunity to influence or act on a given driver. As a rule of thumb, the most “interesting” drivers to work with in a scenario context are those positioned in the “strategic uncertainties” quadrant.

**Table 6.1. Priority matrix: types of drives by degrees of uncertainty and influence**

<table>
<thead>
<tr>
<th></th>
<th>Low degree of influence</th>
<th>High degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>High uncertainty</td>
<td>Wildcards</td>
<td>Strategic uncertainties</td>
</tr>
<tr>
<td>Low uncertainty</td>
<td>Trends</td>
<td>Given factors</td>
</tr>
</tbody>
</table>

*Source: Author.*

**Identification of the scenario structure**

The challenge in this phase is to manage the complexity of the many drivers in a way that will allow the team to create a range of internally consistent scenarios. There are many ways to make a scenario structure of which two of the most popular are presented below.

A structure is created by selecting two of the most important drivers identified in the previous phase to create a matrix of four different scenarios. The advantage of this method is that it is a relatively simple way to create scenarios, without too many drivers with too many different values. The rest of the identified drivers are then expanded within the logic of the four different scenarios to see how they would play out. This can be excellent for developing in scenarios through participatory methods. The disadvantage is primarily in the uncertainties of the two selected drivers that are played out, which may lead to the “scenario space” being too confined (Box 6.2).
Box 6.2. Example of a matrix with four scenarios

An example of a matrix with four scenarios could be the following on “The School in Europe in 2015”. The driver “parents’ social values in relation to their children’s education” is considered to be the most important driver of change. The two different values of this driver are: a “my kids first” culture and a “social responsibility” culture. The other important driver is “national governments’ investments schemes in schooling”, and the values of this are “visionary” and “conservative”.

<table>
<thead>
<tr>
<th>Social responsibility</th>
<th>Conservative investment</th>
<th>Visionary investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>My kids first</td>
<td>More burdens to the communities</td>
<td>Shared faith and visions for all</td>
</tr>
<tr>
<td></td>
<td>Private schools rule</td>
<td>The choice is yours</td>
</tr>
</tbody>
</table>

A multiple-driver scenario approach increases the level of complexity of the work, but may result in scenarios that are closer to reality. In principle, any number of drivers greater than 4 may be used in this method. Values are identified for each driver in the same manner as in the previous method. This means that if nine drivers have been identified, then $2^9$ scenarios may be developed. Clearly this number of scenarios is impractical, so the challenge is to identify the three to four scenarios that best fill the “scenarios space”. The advantage of this method is that it allows practitioners to develop complex yet consistent scenarios which lend themselves to work on possible implications of the different scenarios. The disadvantage of this approach is the difficulty of managing the decision on which scenarios to choose, since choosing four scenarios out of so many is not an obvious matter.

**Actor analysis**

The aim of this form of analysis is to enrich the focus on drivers and trends with one on actors. Who are the most important actors in the scenarios and how may they be expected to act in the scenarios? These questions are important if the scenarios are to be plausible and usable tools for identifying the implications of different possible futures. Identifying the actors can be done using the same methods as to identify trends. Once a
range of actors has been identified, their importance should be evaluated; again this may use some of the same methods as with the drivers.

Using the scenarios

The result of the previous phases is a set of snap-shot scenarios—“snap-shots” because there may be little accompanying information on the events leading to the situations they depict. When the scenarios are to be used for decision making and problem solving, more work may usefully be dedicated to understand how they came into being. The main approach to this is back-casting, where the story of the scenario is told backwards from the future “snap-shot” back to the present. A method for back-casting is to describe “headlines”, retracing the situation in the scenario back to the present year by year, asking questions like: we now know what the future will be but what would the situation one year earlier have had to have been for this to be realistic?

Once a richer scenario structure has been developed, it may be used for different kinds of strategic analysis and/or policy formulation. Scenarios are tools for a structured conversation and analysis of the future, and the temptation should be resisted of picking the most preferred and/or likely scenario to analyse how it may be realised. Instead, the goal should be to understand the dynamics of change and use the insights generated to identify initiatives that may do well under all the scenarios options and under most circumstances.

The scenario method may be used in policy context in different ways ranging from the exploration of different issues to being aides to explicit decision-making: most uses of scenarios lie somewhere on the spectrum from, on the one side, exploration to, on the other, supporting the decision-making process. Here, three main uses of scenarios are discussed, as well as their implications for design.

Developing shared knowledge of the environment

The exploratory aspects of scenario development can prove to be invaluable for policy and administration. Often, there are deeply rooted and culturally-based assumptions about the nature of the environment of the administrative unit and its policy area. Working with scenarios may help the participants to challenge and re-conceptualise their understanding of the administrative environment and the dynamics and trends that shape it. The major outcome of using scenarios may indeed be in challenging existing understandings. This may call for a rapid and uncumbersome project design,
if the main objective is to sharpen understanding of the policy, organisation or the sector’s environment instead of using this in problem-solving activity.

If this is the case, relatively few resources are used in phase two; the desk research conducted in phase one can be complemented with some interviews with key personnel to ensure that a correct understanding of the subject matter has been formed. Phase three can also be designed with minimal resources. Trends and drivers may be identified through the metaphor tool and prioritised in a rapid, simple manner, perhaps via the “rabbit race”. Finally, the scenarios can be developed with the “two by two matrix”, allowing the participants themselves to create the scenarios relatively quickly. The actual work developing the scenarios may last no longer than a full-day workshop. In phase four, the results of the previous phases are reported and a list of recommendations and/or activities related to the subject may be formulated.

**Using scenarios to strengthen public discourse**

There may be a political interest in initiating or strengthening a public discourse, including as many stakeholders as possible, and again scenarios may prove useful to this end. Different scenarios may help to frame the issues and hence may be a way to guide public discourse. Stakeholders may be included at an early phase of the process, thereby taking ownership of it at an early stage as well as the dissemination of results. This calls for a more robust and resource-intensive process design, since a greater number of information sources and stakeholders must be involved and there are greater demands on the scenarios to be consistent and precise if they are to be so used publicly.

This means in the first phase that more attention needs to be paid to mapping the subject area, especially stakeholders’ relationships to the subject. In phase two, stakeholders should be involved, perhaps via focus groups, conferences, and/or workshops, and the team needs to ensure the adequate documentation of the stakeholders’ input. In phase three, a group of the major stakeholders and experts on the subject would usually develop the scenarios so as to ensure the quality of the process and the reflection of the stakeholders’ inputs. Since the trends should be evaluated thoroughly, cross-impact analysis is a good tool to identify the key trends. To be a useful tool for debate, the scenarios should not be too complex, and often the “two by two matrix” is appropriate.

To generate debate, workshops or focus groups with representatives from the dominant stakeholders can usefully present and discuss the major conclusions and questions from the study. Using the feedback from these sessions, the final reports can be fine-tuned and a communications strategy
can be developed. The communications strategy will depend on the subject, but may usefully include interactive and participatory activities such as conferences or discussion forums on the Internet if the public discourse is to be strengthened.

**Using scenarios for decision support**

A third widespread use of scenarios in a policy context is to support decisions on complex issues with long-term implications. This use requires very well-researched and robust scenarios, normally with a large amount of quantifiable data.

In phase two, interviews with key personnel and focus groups can be devoted to broadening the understanding of the subject and possible trade-offs among the different decisions to be taken. In phase three, it is important that the design group needs to be clear as to how uncertain are the different drivers and how these drivers may themselves be influenced, as strategic decisions will be taken on the basis of the different scenarios. The priority matrix may well be used to identify the most important drivers, but if resources permit, a cross-impact analysis may be very useful as well. Since the scenarios are to be used as an analytical tool, the multiple-driver approach will often be the most appropriate.

Once the scenarios have been created they are put into action. They can be “back-cast” in order to understand plausible lines of development leading to each one. Different tools can be used for the assessment of how decisions may play out in the different scenarios. If the decisions are closely related to an organisation, a “Strengths, Weaknesses, Opportunities and Threats analysis” (SWOT) may be conducted in order to assess the implications of the different scenarios for the organisation. Based on these inputs, a more informed decision can then be taken. Once it is taken, a set of criteria should be developed to measure the key drivers and trends identified in the scenarios. This will allow the team and administrative unit to monitor future progress towards the scenarios. In the case of major discrepancies between scenarios and reality, the decisions and pathways need to be reviewed.

**Conclusions – enhancing success in using scenarios**

It is useful to consider in conclusion a number of factors that will increase the success of using the scenario method. The dynamics of bureaucracy tend to make administrative personnel (and politicians) risk-averse. Much of the policy and administrative discourse is tied into “objective” macro economic discourses and models which can be related to economic rules, which also has the effect of taking responsibility beyond the
individual employee. This poses two challenges for working with scenarios in a policy context. First, scenarios are often considered to be anything but objective but they can be just as fact-based as reasoning within a macro economic discourse. It helps to bring this to the fore. Second, habits and conservatism may be hard to overcome and there is an element of risk involved in engaging in a totally new method where the results may be hard to predict. For this reason, it is important that all scenario procedures be made clear for everybody.

Creating ownership is needed for the scenario process to become successful. Leadership of the organisation or unit involved must support it for it to succeed as often it differs from the regular ways of doing business and hence can create anxiety: clear supportive statements from management may help to alleviate this. Participants from all levels must engage wholeheartedly throughout the entire process in order to develop robust and thought-provoking scenarios.

When deciding which stakeholders and experts to include in the process the team responsible should try to think as broadly and inclusively as possible. It is often beneficial if those involved are diverse so as to stimulate a certain creative tension throughout the process. If not all important actors can be directly involved, extra expert committees or advisory groups can be created and given an opportunity to contribute.

Scenario development may involve anxiety and frustration. The initial uncertainties and openness of the process mean that participants may find it difficult to see how it will lead to sound and consistent results. Therefore the scenario team must do its best to describe the logic behind the design and every phase in it to minimise the anxiety of participants and stakeholders.

A well-designed future study must balance divergent and convergent thinking. Convergent thinking is essentially about traditional problem solving while divergent thinking is a skill broadly related to the creative elaboration of ideas prompted by a stimulus. These two ways of thinking need to be combined in order to facilitate a process that is exploratory and creative, yet factually-based with explicit assumptions.

So, notwithstanding that scenarios should be made fit for purpose, there are some general success factors that offer guiding principles for working with scenarios.
References


