

Foresight – using scenarios to shape the future of agricultural research

Patrick Schwab, Fabio Cerutti and Ute H el ene von Reibnitz

Patrick Schwab and Fabio Cerutti, Swiss Federal Office of Agriculture, CH-3003 Bern, Switzerland.

E-Mail: patrick.schwab@bfs.admin.ch Fax: +41 (0)31 322 26 34, Tel. +41 (0)31 322 25 67 and fabio.cerutti@blw.admin.ch

Fax +41 (0)31 322 26 34, Tel. +41 (0)31 322 59 50

Ute H el ene von Reibnitz, SCENARIOS + VISION, F-06140 Vence, France. E-mail: reibnitz@scenarios-vision.com

Fax +33 493 58 68 30; Tel. + 33 493 58 25 00

Keywords *Switzerland, Agriculture, Strategic planning, Health, Food safety*

Abstract *In the year 2000, the Agricultural Research Business Unit (ARBU) of the Swiss Federal Office of Agriculture (FOA) decided to carry out a foresight process. Foresight means taking a systematic look at the future in order to be able to draw conclusions about actions taken or not taken in the present. Foresight is now best practise and is applied internationally by a growing number of countries and organisations, particularly in the areas of research and development, regional planning and business planning. The scenario technique seemed to us to be a suitable way of tackling the assignment. Over recent months we held a total of four scenario workshops, each of several days. Participants included people from a wide area connected with agricultural research together with representatives of related social fields. The result was two very different, but internally consistent scenarios (alternative ideas of the future). Based on the two scenarios developed, we drew up a master guideline with concrete measures fit to face the future. The results show that as far as organisational measures are concerned, staff motivation and training are key factors. With regard to technical measures, much attention is focused on the topic of food safety and health. It is now up to decision makers to determine the extent to which they accept and implement the recommendations of foresight in strategic business planning.*

Advantages of the scenario technique

Various methods are used to carry out a foresight process. It is important to note that all foresight concepts differ from classical “forecasting”[1]. Different developments in related fields have to leave open several possible developments (Fink et al., 2001). It is

important that a reductionist view is ruled out from the beginning. We chose a scenario technique for our foresight process, combined initially with a wide consultation of experts. The scenario technique offers us an approach with several alternatives. A scenario is an extensive and detailed portrait of a possible future world. The advantage of scenarios is that they do not describe just one future, but that several possible or even desirable futures are placed side by side in order to learn to deal with what might happen. Moreover, in the scenario technique, so-called “wild cards”, that is disruptive events, are also included. These are events whose probability is often judged to be low according to present criteria, but which have enormous impact should they occur. By forward thinking, or put simply, by thinking ahead, conditions are created for preventive action, since often crises have to be tackled which are not even recognizable as such, for example in the field of food safety. The scenario technique is also a means of early recognition of future opportunities and risks. With it we can “buy time”, i.e. weak signals should be recognised early in agricultural research. Specifically, we selected the scenario technique of Ute H el ene von Reibnitz, one of the founders of the method in the German-speaking world. She also facilitated the



The Emerald Research Register for this journal is available at <http://www.emeraldinsight.com/researchregister>

The current issue and full text archive of this journal is available at

<http://www.emeraldinsight.com/1463-6689.htm>

project, wrote the text for the scenarios and developed the master guideline – the main result. The method comprises eight steps (see Figure 1), which are described below.

Participatory approach

As in other participatory methods, the scenario technique depends to a great extent on the participants. Therefore, it was necessary to put together the team from as many disciplines as possible. In order to get a broad spectrum of knowledge and opinion, representatives were invited from the whole related area of agricultural research, i.e. representatives of producers, society and the environment. Such a collective and participative method reduces the risks of incoherence and at the same time offers a valuable opportunity to build up joint experience and knowledge. Michel Godet (cited in Arcade et al., 1999) states, however, that you cannot rule out the fact that even a team can make collective mistakes.

Analysis of influence

After an is-analysis (step 1) by the ARBU, in which a strengths and weaknesses profile was drawn up, it was then a matter of acquiring knowledge of the system dynamics of the associated area (step 2). In short-term planning with a period of a few years, it can be sufficient to work with internally available data. In ARBU's research with planning and thinking horizons of well over five years, the closer and wider associated area becomes not only more important, but also more uncertain. It is therefore necessary for all relevant influential factors, including their mutual dependence, to be taken into account in the foresight process. This makes it possible to recognize the driving and driven forces and to learn how to deal with them. The review must go beyond the so-called operative or market field such as customers, competitors and research and include the global area such as politics and legislation, economics, society and ecology. In this step, the typical external areas of influence affecting

agricultural research were identified and their mutual influence analysed (see Figure 2).

Technology/science and politics/legislation were found to be active areas of influence. These driving forces have a strong influence on the other elements, but can only be slightly influenced themselves. The areas of economics and environment/ecology are considered to be ambivalent, i.e. these elements have a strong influence on the system, but can themselves also be strongly influenced. Less ambivalent are the areas of competition and society, which can only be slightly influenced, but also only have a slight influence on the system. The rather passive system element customers/beneficiaries can be strongly influenced. Overall it can be noted that the system, in which the ARBU moves, has a strong dynamic shown by the concentration in the upper right square of the system grid.

Projections for 2020

History teaches us by way of some striking examples (oil crisis, collapse of the USSR, BSE scandal etc.) just how dangerous it is to project the future in only one direction and to exclude alternative developments. Time and again serious changes take businesses or organisations by surprise, because they have not thought of or planned for alternatives. The future is never totally predetermined, however strong a trend might be. Several different futures are always possible. In the case of a trend, we must reckon today with the fact that the opposite can just as well be true. Therefore, there is an important ground rule. In case of uncertainty – and this is always given for the question of future developments – descriptors (= neutral parameters) must be creatively thought out in advance as alternatives and must be well founded. A further advantage of the scenario technique comes in useful here in the fact that minority votes can also be taken into account. This part of the scenario workshop (step 3) called for particularly visionary thinking ability. Descriptors were looked for within the different areas of

Figure 1 — The eight steps of the scenario technique

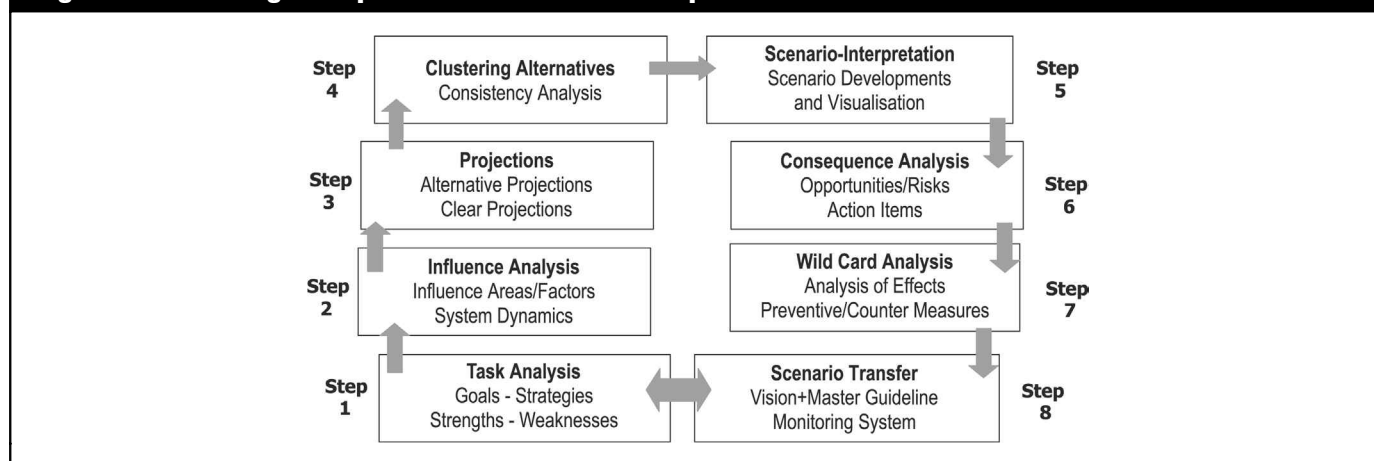
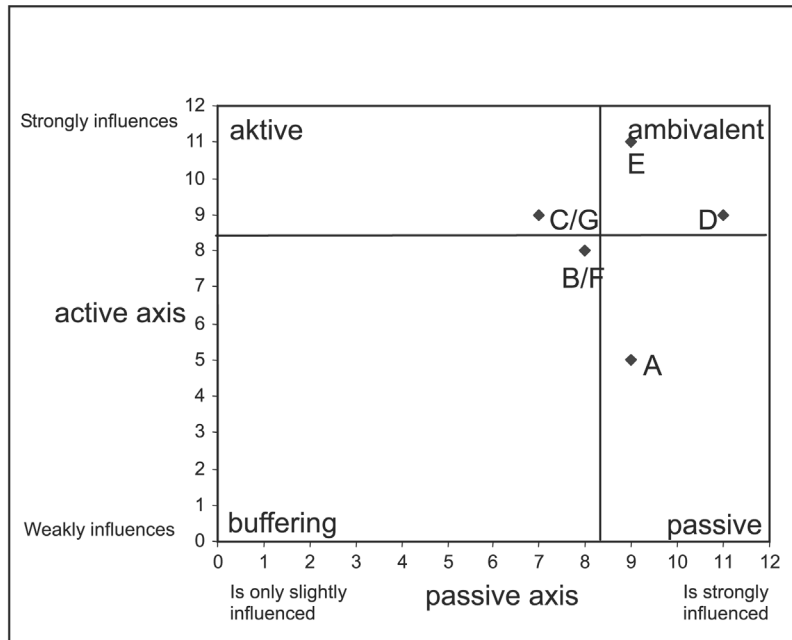


Figure 2 — System-grid

- A – CUSTOMERS/BENEFICIARIES
- B – COMPETITION
- C – TECHNOLOGY/SCIENCE
- D – ENVIRONMENT/ECOLOGY
- E – ECONOMY
- F – SOCIETY
- G – POLITICS/LEGISLATION



influence, e.g. in the area of politics “integration of Switzerland in the world”. A projection to the year 2020 was made in alternative developments for each of these descriptors. “Inquiring forward thinking” asks what is possible and not what is desirable. So in the case of the aforementioned descriptor (“integration of Switzerland in the world”) two projections were considered; on the one hand, total economic and political integration of Switzerland in a larger political structure, and on the other, complete independence. In a further step (step 4), these future developments were checked against each other for consistency – using a consistency matrix. Here is an example to help clarify the subject of consistency: a growing population and increasing food consumption are highly consistent, whereas a strong environmental orientation in society and politics does not go together with unrestricted licensing of GMOs. In view of the large number of descriptors, the scenarios were calculated using the CASCAL (computer aided scenarios calculation) computer program. We chose the two most consistent scenario-basic structures, which were also as different from each other as possible, as basic types or archetypes[2], so that the spread of possible future developments is optimally considered in the scenarios.

Drawing up the scenarios

Two scenarios are sufficient for the von Reibnitz scenario technique (1992). However, these must reflect the whole associated area, must be consistent within themselves and must be very different from each other. According to the

philosophy of this method and proof in practice, the following applies: if an organisation is able to deal successfully with these two very different futures, then it must also be capable of coming to terms with all other variants between the two. A third scenario is deliberately avoided since there is a danger of creating a “middle of the road scenario”, which the participants then prefer for reasons of convenience (there is no need to change as much with this one!) and the genuine alternative scenarios are not taken seriously. Both scenarios consist of formulated descriptions of the individual descriptors in the different areas of influence (a summary of the two scenarios is given in Table I). Each of the two scenarios is an extensive and detailed portrait of a plausible future world. The scenario texts must be excitingly written and transport the reader into the worlds of tomorrow like in a time machine. The scenarios are therefore not forecasts or specific predictions per se, but rather a plausible and imaginative description of what might happen. Scenarios simply describe events and trends, as they might occur.

Recognizing opportunities and risks

In the analysis of consequences (step 6), it was a question of deducing possible opportunities and risks for the ARBU for each descriptor on the basis of the two scenarios. Then measures were drawn up for these opportunities and risks of how opportunities could be utilised and how risks could not only be minimised, but above all transformed into opportunities. An advantage of the scenario technique was thinking not in probability models, but in possibilities so that the participants could bring in all their ideas without

Table I — Short description of the two scenarios in headings (selection of developments from the different areas of influence)

Scenario A 2020: "Paradise for a few winners work hard and flourish"	Scenario B 2020: "Swiss harmony on a small scale modest prosperity for all"
<p><i>Politics</i> Switzerland is integrated into a larger political unit The State now only sets the framework conditions Administrative operations were dismantled and transferred to the private sector Privatisation of education and research</p>	<p>Independence and regionalism are the new principle for success The State feels responsible for its citizens and intervenes More public service The State takes care of education and research</p>
<p><i>Technology</i> Technical progress allows completely new forms of food production GMOs have become generally accepted Agriculture has become a biological high tech branch independent of the soil</p>	<p>Further development and improvement of existing methods of food production Refusal to carry out scientific experiments whose effects are not known Homogeneous, sustainable agriculture throughout Switzerland</p>
<p><i>Economy</i> Global overexploitation of natural resources continues Global open economy has prevailed Polarisation into rich and poor Agriculture was absorbed by other sectors</p>	<p>Only renewable resources Regional economy with closed ecological cycles Sufficient prosperity for all Agriculture remains independent</p>
<p><i>Society</i> Young multicultural population Negative consequences of consumption and "enjoyment" are fully under control with drugs</p>	<p>Rise in ratio of old people in Switzerland Health is the highest good. Healthy lifestyle is a must</p>
<p><i>Competition</i> Internationalisation of research A charge is made for research results</p>	<p>Regionalisation of research Free access to research results</p>
<p><i>Environment</i> Environmental protection is only practised where it is profitable Global warming races ahead With the abandonment of agriculture, areas have been freed for other uses and natural landscapes</p>	<p>Environmental standards are met Climate variations are within the normal range Agriculture continues to be carried out extensively</p>
<p><i>Customers</i> Large food groups decide what research will be carried out The State has withdrawn from many areas and only concentrates on sovereign tasks</p>	<p>Farmers have a big influence on research In addition to sovereign tasks, the State intervenes where the market is not functioning</p>

worrying. In this way, futuristic-seeming ideas such as the development of a "chicken in a bottle" from tissue cultures were accepted just as much as the cultivation of medicinal herbs and the development of programmes for treating modern ailments. Particular attention was paid to transforming possible risks into opportunities, which requires a high degree of creativity. Experience shows (Liebl, 2000) that businesses often approach strategy work from the point of view of avoiding weaknesses, instead of concentrating on generating positive distinctiveness in competition. Especially in Europe, there is a tendency to focus more on risks and weaknesses, whilst strengths and opportunities are neglected. The measures were then assessed for their degree of novelty and attractiveness for the ARBU. In addition, all those measures were selected which were valid for both scenario A and scenario B. At the end, an initial draft guideline was created in the form of a so-called trimaran or outrigger boat: in its central hull were

integrated all activities which are compatible under both scenario A and scenario B. All measures which, even with attempts at modification, can only be carried out under one scenario landed in the relevant outrigger of this scenario. This structure allows optimal preparation for all future eventualities and gives the greatest possible room for manoeuvre for strategic navigation.

Include disruptive events think even the "unthinkable"!

The great difference between classical forecasting techniques and the scenario technique becomes clear when so-called "wild cards" or disruptive events are included in the scenario technique (step 7). Trends are diagnosed, not predicted. This is the reason why individual events with a low probability of occurrence are not even taken into account in the planning process. There are numerous examples of where events with the lowest possible probability at the time

of evaluation have occurred with dramatic effects. “Chernobyl” and “11 September 2001” are examples of this. Consequently, it is not the probability which is important for a disruptive event, but the strength of the impact. Moreover, nowhere can such glaring mistakes be made as in evaluating future probability. Will today’s probability criteria still be valid tomorrow? Are there new ones? If so, what are they? It is therefore advisable to adopt strength of impact as the selection criterion rather than playing the probability lottery. In the workshop, the participants described such disruptive events with their possible impact on the ARBU for both scenarios (Table II).

On the basis of this, we tried to find preventive and reactive measures for these events. It is clear that many of these events, such as a GMO-MCA (maximum credible accident), an epidemic outbreak of a disease such as new variant Creutzfeldt-Jakob disease (nCJD) or a global collapse of computer systems, have a very alarming effect. In everyday life, such disruptive events are often dismissed on the grounds that “what mustn’t happen, won’t happen”. Therefore, preventive measures, which include preventing and immunising against such events before they occur, as well as possible reactive measures for rapid damage limitation after the event, were worked out. Naturally the ARBU can have no influence over certain events such as e.g. a worldwide economic crisis. However, it can develop effective immunisation and reactive measures. This proactive approach to disruptive events is very important for the participants, because they realise that they are not at the mercy of such wild cards. The preventive measures, which were helpful in the case of several disruptive events, were also integrated into the guideline, in order to make these even more robust and crisis-proof.

Evaluating strategies and measures

In step 8 the strategies and measures developed in the previous two steps were evaluated. The first criterion in the evaluation was its contribution to ARBU’s primary aim. We drew up this primary aim beforehand using the vision of the ARBU:

- *Vision. Agriculture for man and the environment – we carry out research for health foodstuffs and for a landscape worth living in;*
- *Highest aim. In agricultural research, we are the driving force for sustainable undertakings in the agricultural, food and environmental sectors for Switzerland and for the Alps.*

This step is necessary because, in a foresight process, it is not only important to know where the development could go, but also where we want it to go. Although we created possible futures in an explorative way when drawing up scenarios, the vision acts as the standard, i.e. a desirable future. The prioritised strategies and measures show us the way to achieve this goal. We can bring about desired changes by proactive action.

Highly motivated and well trained staff

The results of prioritising measures make it clear to us how important highly motivated and well trained staff will continue to be in the future. They determine the quality of research of the ARBU and represent it to the outside world. The excellent internal training of specialists should therefore be retained or improved. Moreover, the necessary specialist knowledge can often only be in demand internally. These specialists must be retained at all costs, by integrating them into the ARBU’s processes of change and enabling them to identify themselves with the ARBU. In order to achieve better corporate identity and to increase knowledge, staff should be given greater mobility both internally and externally, for example by job rotation or sabbaticals. As a countermove and conditional on hierarchies with few management levels, staff will take on more responsibility and in this way will be able to look after customers better. Furthermore, initiatives for innovative developments should be offered and spin-offs or start-ups from within the ranks should be encouraged.

Representation of interests and financing at all levels

Apart from technical skill, efficient representation of interests and information have a strong influence on possible external

Table II — Description of disruptive events

Disruptive events according to areas of influence	
For Scenario A:	For Scenario B:
<p><i>Technology and politics</i></p> <ol style="list-style-type: none"> 1. GMO-MCA 2. Trade war in agricultural sector (e.g. dumping prices) 3. Error in the execution of legal tasks <p><i>Economy, society, environment and customers</i></p> <ol style="list-style-type: none"> 4. New technology with damaging effect for man 5. Social collapse 6. Loss of property rights 7. Global collapse of computer systems 	<ol style="list-style-type: none"> 1. Stop on state financing 2. Destruction of gene banks 3. Beneficial organism used damages ecosystem 4. Economic crisis 5. Rebellion against “Heidi land” system 6. Massive immigration

financing. The ARBU can only make its voice heard outside successfully and reliably with a strong corporate identity. Highly motivated and technically highly skilled staff are the prerequisite for being able to represent interests over a broad area and to participate in national and international research projects (e.g. EU research projects). Moreover, participation in working parties and committees can increase the technical skill and “us feeling” of staff.

Promoting co-operation

Co-operation, both nationally and internationally, should be intensified. In areas in which the ARBU is weak or in new areas, the ARBU should build up the necessary expertise through co-operation. Co-operation with complementary competitors in areas of mutual interest is also possible. As a matter of priority, the ARBU must reach critical mass in its research fields. Furthermore, co-operation should not only be across disciplines, but beyond disciplines (inclusion of customers and social aspects). Networking at a geographical level can also be set up. By networking with other regions (with a similar structure to ours in Switzerland, e.g. Rhône-Alpes, Lake Constance etc.) and through the knowledge acquired in this way, scientific bases can be worked out for the characterisation of regional and local products, which also includes the landscape.

Co-operation in the form of mutual exchange of information and experience already exists and can be intensified. In the medium term, however, closer forms of co-operation are aimed for such as joint generation of knowledge, for example a joint venture with other institutes or enterprises. Finally, the aim is to enter the market in conjunction with partners with a strong image, under either a joint trade mark or label.

Improving customer care

Better co-operation is also being sought with customers. This should take place in the form of closer co-operation in the development of methods and products. In the short term, it is still a question of using and improving existing structures. In the medium term, the aim would be to link up with customers in a tight network with short lines of communication, in order to reduce innovation times – from development to application.

“Old” and “new” products

We noted in the technical measures groups that it is already possible to introduce those measures which are mainly concerned with maintaining, improving and protecting what is already in place. By this is meant areas in which it is essential to minimise risks, such as in the quality of agricultural products, the quality of the environment or the preservation of species diversity. On the other hand, very few or no funds are available for measures which are concerned not only with minimising risks, but with actively seizing

opportunities. This is particularly true of the new areas of health and recovery of waste/energy. In recovery of waste/energy, it is primarily a matter of increasing efficiency. This also applies to a certain extent to the area of environment, where measures have to be drawn up which not only protect the environment, but also regenerate it.

Verifiable benefit for consumers

The measures drawn up in the foresight process in the area of health go far beyond the sphere of food safety. Agricultural products should not only be improved and contain no contaminants or pollutants, but have an active health benefit for consumers. Based on the results of the foresight process, the most important element seems to be an increase in added value for the consumer in terms of health. The measures drawn up show clearly that the ARBU will focus much more on the end users, or consumers. This requires an expansion of research to include the possible positive and negative effects of end products. In future, the legal control tasks will also be more strongly linked with the area of health. New quality standards are needed for this, which if necessary can be defined by the ARBU.

Co-operation with specialist institutions in the health field will therefore become increasingly important for the ARBU and can open up great opportunities (see Table III).

Foresight recommends

Constant updating of its own strengths and weaknesses profile is a prerequisite if the ARBU is to be able to take targeted action in line with a particular strategy. Measures are now evaluated and analysed according to their contribution to the highest aim and the availability of their resources. The need for action is thus clear. ARBU decision makers can integrate measures into their strategy and implement them. In concrete terms, this means that short-term measures with available funds can be introduced directly. For medium- and long-term measures, it is a question of checking the importance of these by means of the early warning system, and then, when necessary, providing the funds required to implement them. At this point it should be mentioned that the foresight process can only make recommendations. At the end of the foresight process will lie human decisions. The decision makers must undertake actual implementation of the measures and choose the strategy. They decide whether to try to cover as many allied situations as possible in order to maintain flexibility in the form of a broad range of research, or whether forces should be concentrated on a few areas of research. The first choice carries the risk of dissipating efforts, whilst the second fails to cover all allied situations and is only partially “fit to face the future”. If a high-risk strategy is chosen, the installation of an early recognition system is all the more important. This should periodically survey the allied

Table III — Summary of the most important future subject areas for the ARBU

“Strategic forecast” or: What will be important in future?	
Agricultural production	Improving agricultural products (quality and quantity) Legal tasks, which encourage production and minimise risks in agriculture
Customers:	Proximity to customers/Innovation: shortening the time between development and application
Health:	Research must be more directed towards end users/consumers: Healthy products with no residues Health-promoting products (ingredients etc.)
Region:	Support of production adapted to regional special characteristics
Environment:	Reduction of undesirable substances Protection of the environment and species diversity Direct intervention measures, e.g. as part of the regeneration of nature
Waste/energy:	Increase efficiency in agriculture (energy, nutrients) Recreation of closed ecological cycles

area with the aim of diagnosing possible new trends or alternative developments.

Developing a Foresight culture in the ARBU

To sum up, we can say that the foresight process is a success, particularly when we view the ARBU as a “learning organisation”. The foundations are laid for a successful continuation – a foresight process is never ending – for, unlike other countries such as France, Great Britain or The Netherlands, we were not able to fall back on national foresight programmes and an existing foresight culture. To some extent this was noticeable. Strategy evaluation (Fink et al., 2001) in particular is a thorny step in the process of strategic alignment, because it can quickly touch upon existing habits and internal structures. However, once this is formulated, it can be seen as a “way to vision”. The measures described above must also prompt changes.

Notes

- 1 In the past, attempts were often made to predict the future as accurately as possible.
- 2 Synonyms of archetype: ideal, modern, pattern.

References

- Arcade, J., Godet, M., Meunier, F. and Roubelat, F. (1999), *Structural Analysis with the MICMAC Method and Actor’s Strategy with MACTOR Method, AC/UNU Millennium Project, American Council for the United Nations University, Washington, DC.*
- Fink, A., Schlake, O. and Siebe, A. (2001), *Erfolg durch Szenario-Management: Prinzip und Werkzeuge der strategischen Vorausschau, Campus Verlag, Frankfurt, New York, NY.*
- Liebl, F. (2000), *Der Schock des Neuen: Entstehung und Management von Issues und Trends, Gerling Akademie Verlag, München.*
- Von Reibnitz, U. (1992), *Szenario-Technik: Instrumente für die unternehmerische und persönliche Erfolgsplanung, Gabler, Wiesbaden.*