Imagination: Scenarios and Alternative Futures

7

7.1 Introduction

In ForSTI, scenarios are systematic accounts of particular configurations of future possibilities—a scenario is a systematic account (we might say "appraisal", and people often talk of "vision") of a possible future state of affairs and the paths of development leading to it. There are many uses for scenarios in ForSTI, for example, to:

- illustrate and communicate features of forecasts and future-relevant analyses—working as a tool for communicating appraisals of long-term prospects, and making abstract accounts more concrete
- structure and guide discussion so that appraisals, their constitutive elements, and the assumptions that underpin them, can be explicated and elaborated.
- provide contexts within which vignettes can be elaborated, so as to enable closer scrutiny of possible implications of developments in environment, technology and society
- allow for different views of the future to be integrated and/or contrasted (e.g. brought together into single scenarios or form the bases of multiple scenarios)

As with most, if not all, other methods used in ForSTI, then, scenarios may be brought into play in various phases of the activity. Scenarios, especially those produced as background inputs to an exercise or derived from earlier studies, may be used to inform and guide horizon scanning; they may be used as tools for communicating the results of an exercise. Scenarios are often used as a way of integrating different elements of a study, a scenario is underpinned by a model of the focal object and its context; and roadmapping can be seen as a specific kind of scenario process. But we will particularly stress the role of scenarios in the phase of ForSTI we have labelled as ForSTI.

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This phase of the ForSTI activity particularly requires creative and divergent thinking. Input gained from the Intelligence phase is synthesised around models and scenarios about the Future. Various ways of representing our understanding of the systems we are dealing with may come into play: narratives (storytelling), visual illustrations of systems (their elements and the relationships between them) or situations.

7.2 Introducing Scenarios

The term "scenario" has various meanings—in film and theatre productions, in information systems design, and elsewhere.[1] In ForSTI work, as already stated, a scenario deals with a possible future state of affairs and the paths of development leading to it. The focus can be more or less on (1) a dynamic sequences of events or developments of trends ("future histories"), or (2) more static features of a future point in time ("images of the future") as illustrated in Fig. 7.1.

Of course, often we have a combination of the two, but the emphasis will typically be evident on one or other aspect: in either case we can see a scenario as being a *systematic account of future possibilities* (Miles 2005). The term *systematic* implies (a) internal consistency and (b) covering developments in a fairly holistic way, going beyond simply profiling the future in terms of one or two key variables, as might be the case in simple models and extrapolations. A scenario presents a more fleshed-out picture, linking many details together. Typically the account of a scenario will combine quantified and non-quantifiable

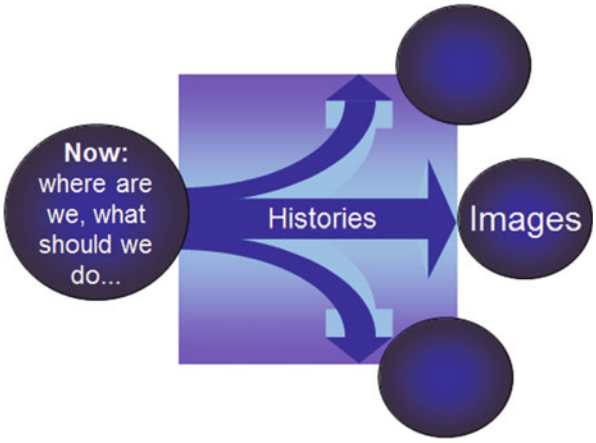


Fig. 7.1 Future images and histories

[1]For an interesting discussion of the etymology, stressing Herman Kahn's contribution, see http://english.stackexchange.com/questions/147450/what-is-the-real-history-of-the-word-scenario (accessed on: 17.04.2014).

components. It may involve narratives (illustrated with vignettes, snippets of fiction and imitation newspaper stories, etc.), or be presented in the form of tables, graphics, and similar systematic frameworks. In multiple scenario analysis, alternative scenarios can be tabulated against each other, revealing key points of convergence and divergence.

Scenarios can be distinguished from **Profiles of the Future**, which specify a future state of affairs in terms of very few variables. A profile may represent a desirable or feared state of affairs (e.g. "this technology is in widespread use for these applications"), or a combination of key end-states (e.g. a future where this technology is in wide use, and where economic growth is proceeding rapidly). Scenarios are more multidimensional accounts, which relate at least some variables together; profiles are stark specifications of a few trends or end states. Scenarios also differ from **Vignettes**, which are more or less detailed accounts of particular features of a scenario, often constructed in the form of a localised "story" or sequence of events (e.g. how a particular technology might be used, what a specific lifestyle might be). Vignettes are often used to provide a more in-depth and vivid account of how a scenario might feel. In areas like information system design, the term "scenario" is often applied to vignettes of technology use constructed to aid the design process. Occasionally in ForSTI we find several vignettes set within essentially the same scenario, but that are described as "multiple scenarios". [Examples include Scase (1999) and Coates et al. (1998)]. In this chapter, we will also sometimes refer to "**Sub-scenarios**", by which we refer to discussions of the implications of a particular scenario for some specific area of the focal topic—for instance, for one set of applications of a new technology (Example: in a scenario study of nanotechnology, we worked with break-out groups in a scenario workshop, these groups focusing on application areas like nanoelectronics, tissue engineering, and the like). If scenarios are accounts of the whole "body", then a profile is like the skeleton, while vignettes and sub-scenarios are like specific limbs or organs.

Scenarios can be produced in many ways; and, whatever some futurists and consultants may say, there is no single right way of developing scenarios. There is a diversity of possible approaches, and on occasion unfamiliar approaches may be most relevant.[2]

Scenario workshops gain a great deal of attention, and rightly so, because they are valuable ways of provoking creative inputs and engaging relevant people. But scenarios can be constructed from small group discussions, deskwork, or even survey analysis or computer modelling. We outline some of the alternatives, and discuss some key practical issues, in the following discussion.

Probably the best-known approach in the ForSTI area is to construct a 2×2 scenario matrix; this may be developed by experts or (commonly) in a group

[2]There are many partial discussions of scenario approaches—for a rare presentation of a range of views from established practitioners, see the special issue of the journal *Technological Forecasting and Social Change*, vol. 65, no. 1, September 2000, edited by Godet and Roubelat.

workshop, on the basis of an analysis of major uncertain drivers.[3] This method, which we will describe in more detail later, can build on prior horizon scanning and assessment of drivers influencing the focal object. But some scenario exercises examine alternative futures associated with multiple uncertainties around each of the critical influences—there might be several scenarios generated around each driver. Wild cards or weak signals, too, may be used to generate scenarios. Yet other approaches involve exploring scenarios that are built around end-states rather current uncertainties—how might we evolve toward futures of particular kinds that are of special interest, towards one or other profile of the future in the terminology introduced above.

A long-established, distinction in futures and forecasting studies is between approaches to scenario development (and futures work in general) that are commonly (though problematically)[4] labelled:

Exploratory Approaches These start from the present and posing "what if" questions: What if the growth rate is $x^{\%}$ or $y^{\%}$? What if events W or Z happen? What if this set of drivers gains in strength, while another set diminishes? What if the government or the competitors pursue one or other strategy?

Normative Approaches These start with an idea about future developments (e.g. a profile) and asking "how" questions: How could a particular future or trajectory of development come about? What would it have taken to have reached a future where the parameter of interest is x% greater than its current value? What would have led us to situation Y? (Sometimes this is called "backcasting".[5] Note that "Normative" approaches need not mean looking for positive images of the future—they can also include possibilities that we will want to avoid, though often the approach centres on an aspirational scenario).

Figure 7.2 graphically contrasts the two approaches.

In practice, these approaches are often used in combination. A set of exploratory scenarios may be developed in a first workshop, and then used to inform a second, normative workshop, or a roadmapping exercise (see Chap. 9 for roadmapping). Some scenario methods are in effect a mix of the two approaches.

[3] In at least one case , a 2×2 matrix was formed by a statistical appraisal—factor analysis—that grouped survey responses to a range of questions into two main dimensions that captured much of the variance (Rush and Miles 1989).

[4] To continue a discussion of the exploratory-normative distinction, begun in Chap. 2: all scenarios are full of normative content—including the choice of "what if" and "trend rate" variables. Hopefully, too, they will encourage the analysts to explore options. Thus the terminology is misleading, but alternative descriptions such as "outward-bound" and "inner-directed", have not taken root.

[5] However, again the term has other meanings. For example, a computer simulation's validity may be tested by a form of backcasting, where we take the data on the current situation, and run the model backwards to see if it accurately depicts historical events.

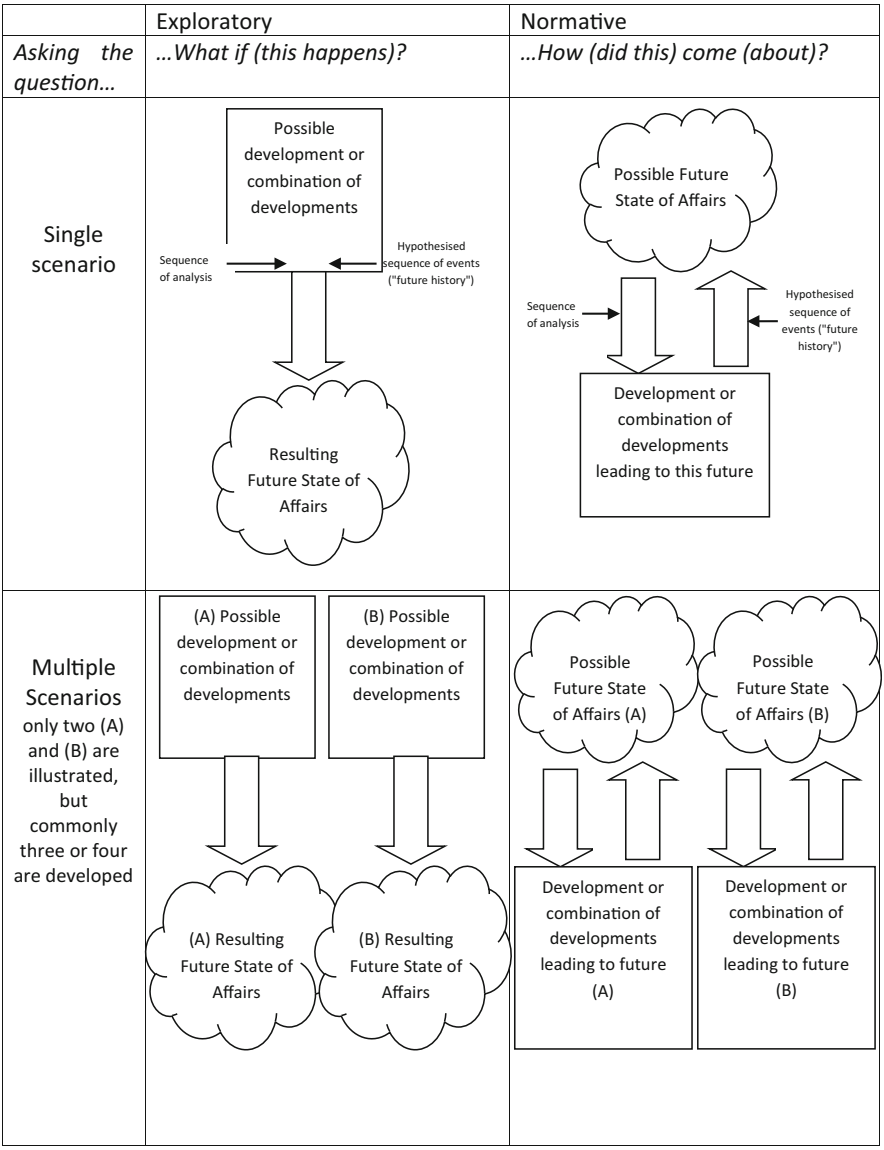


Fig. 7.2 Contrasting exploratory and normative approaches

7.3 Scenarios: One or Many?

Some ForSTI work focuses on a single scenario—often because it has been decided to focus on one desirable and feasible set of possibilities, and to consider how this could be achieved. This is at the heart of aspirational and "success scenario"

approaches, and most roadmapping exercises, where we may estimate the effort required achieving positive change, and seeking to mobilise and coordinate the inputs required from various stakeholders. But with the complex focal objects and circumstances of ForSTI, it is important to conduct a wide-ranging review of alternative possibilities, wild cards, and uncertain influences. Given that the future is uncertain, examining alternative prospects is required to develop and share understanding about the range of opportunities and challenges that are liable to confront us, and that our actions may help create or reduce.

Thus multiple scenarios are often developed for ForSTI work, for example:

- A useful and relevant set of alternatives can be applied to examining and assessing the plausibility of several, possibly diverse, futures. This may be important for expanding horizons—not only for warning about challenges that may be confronted. An example of this is a scenario workshop that applied several profiles for participants to explore, based upon a simple set of alternatives for applying technologies. One option was initially felt to be outlandish, since it required extensive capital investment. By the end of the workshop, most participants had come to believe that high-value (if low-volume) production would be the way forward; the "outlandish" scenario was seen as not just feasible, but as desirable (Institute of Innovation Research 2003).
- Multiple scenarios can give more sense of how different trends and countertrends might unfold and interact. They encourage expert teams or workshop participants to examine how different driving and shaping forces may be related to each other, where one trend might undermine another or provoke a countertrend, etc. This means that we have to elaborate our mental models of the situation or system we are confronting: often this requires people to share their implicit mental models, and thus to explore where these contradict, or complement, each other (scenario development can be accompanied by a more formal effort at qualitative or quantitative modelling, as discussed below in Chap. 8).
- The use of more than one scenario allows for a test of the robustness of policy and strategy conclusions across different paths of development (e.g. Ringland 1988, discusses this use of scenarios for examining alternative company investment strategies). This is sometimes known as "windtunneling".
- Multiple scenarios can be elaborated so as to provide guidance as to signals that we are on one or other path, signposts as to possible turning points, etc. Such applications were highlighted in much of the earlier work of scenario development for military/security purposes, but often come into play in ForSTI studies.
- Finally, different scenarios may be built around substantially different mental models. This can be a way of admitting unpopular views into the debate, and of facilitating dialogue among proponents of different viewpoints. The different scenarios then reflect distinctive "paradigms", "worldviews" or "ontologies"—perspectives on what the fundamental drivers of change are and how they interrelate. Freeman and Jahoda (1978) and Wagar (1991) build scenarios around contrasting radical, reformist and conservative perspectives, for

example; though it is not common to find such explicit use of this approach, probably because it runs risks of getting bogged down in political arguments.

The question arises, then, of how many scenarios should be used. There could in principle be an almost infinite number of scenarios, varying in minor details as well as in fundamentals. The answer depends on user demand and practitioner supply issues.

On the demand side, sometimes a sponsor will already propose a number of scenarios that are required, though this is not often explicitly the case (and when it is, it seems to be mainly a matter of how many scenarios were being presented in previous studies). More commonly, ForSTI practice needs to take account of the attention span and absorption capacity of the sponsors and audiences of the work. Practitioner lore suggests three or four scenarios are about as many as can be absorbed by most managers and policymakers—and these are the numbers common across most exercises. However, if the exercise is addressing different sets of users, there might be a case for having different scenarios for distinct groups. For example, when specific intended audiences have responsibilities that bear particularly on specific trends and drivers, we might design scenarios that focus on these influences.

On the supply side, scenario development takes time and resources. Thus, there are practical limits to a ForSTI team's ability to develop and depict multiple scenarios in sufficient depth and at sufficient quality. Even if a computer is used to generate numerous alternative futures from its core model,[6] there is still the task of interpreting them. So, while more scenarios may be generated than are actually deployed for users, there is bound to be a process of selection of those to be articulated and applied. The key issue is selecting scenarios that can help explicate major driving forces and the different futures that these can create, and be useful for tasks such as windtunneling as described above.

7.4 Methods for Scenario Development

Scenario methods are extremely wide-ranging, and can range from completely informal approaches, close to science fiction, through to highly codified and systematic teamwork or modelling activities. Scenarios of many kinds can be generated through deskwork. Here, individuals elaborating their informed speculations about the future ("genius forecasters") may use scenarios to illustrate and enliven their accounts—sometimes as brief and casual afterthoughts, sometimes implanted more deeply into their accounts; or, expert panels prepare

[6]RAND researchers suggest (and provide some case studies to support the idea) that it is becoming possible to generate huge numbers of scenarios using computer models, and then to automatically examine how robust policies would be across different scenarios, and to find the most policy-relevant scenarios in terms of challenges posed. See Groves and Lempert (2007) and Lempert et al. (2003).

scenarios to communicate their work, or to provide a more systematic comparative appraisal of different possibilities. In these cases, the framework of scenarios may be derived from intuition, discussion, literature review or conceptual analysis. Survey results can be analysed to determine if there are different clusters of views about the future that can be considered representative of different scenarios.[7] Cross-impact and similar methods can be used to identify the scenarios possible from a combination of variables (and estimates of the mutual influences, again derived from expert judgements, may be used to associate probability estimates with the different scenarios). Computer simulations of various types can be employed—"Monte Carlo", for instance, involves repeated runs of a probabilistic computer model, while another approach is to request a model to calculate what the results would be when a few key parameters are varied (this is commonly used in sensitivity analysis, for instance). Workshop methods are often used in ForSTI, and we focus especially on these below. Workshops can construct or elaborate on scenarios, with a structured process of dialogue that enables creative exchange of views and information among workshop members. We examine the methods used here in more depth below.

7.5 Scenario Workshops

Scenario workshops are frequently used to build scenarios, sometimes "from scratch", sometimes by further developing scenarios created, in at least a rough form, in an earlier step. The workshops bring together a range of knowledgeable and experienced participants, usually stakeholders of one kind or another, within a structured framework of activities. Scenario workshop methods allow for sustained analysis of alternative futures that are relevant to the key decisions that are confronted, and allow for the generation of reasonably articulate and consistent visions of these futures. They can be used to trigger such inputs to planning as identification of priorities, setting of objectives and targets, defining useful indicators of progress, etc. While a major aim is liable to involve creating a communicable finished scenario, there are also benefits from involving members of an organisation or community in the activity.

Workshops bring people together and can allow them to achieve some integration of the knowledge that they possess. When key actors are involved in scenario generation, they should gain deeper understanding of the underlying processes and key strategies, and a sense of identification with the choice and elaboration of the scenarios. This allows the participants—hopefully some of whom are, or can influence, decision-makers, to:

- exchange information, views and insights
- identify points of agreement, disagreement and uncertainty

[7]For example Tapio (2003) and Rush and Miles (1989).

- create new shared understandings
- develop action plans and other instruments so as to help mobilise future activity—with greater legitimacy than those produced by a smaller expert group or visionary guru (this requires the workshop to have drawn upon a reasonable range of participants appropriate to the decisions in question)
- have "ownership" of the scenarios, in terms of understanding their internal logic, having deeper insight into the considerations that have entered into the scenarios, and being equipped to be "carriers" of the scenarios to the outside world by virtue of having such background knowledge

There are a range of scenario-building techniques in use in workshop settings, and variations on these are developed quite frequently. For convenience we will discuss the workshop process in relation to four sets of approaches.[8]

7.6 Scenario Approaches

Approach 1: Cross-cutting Drivers (the 2 × 2 Approach)
This approach, pioneered and promoted by the Global Business Network (Schwartz 1991), can be seen as largely an exploratory, "what if?" approach. The key elements involve determining critical drivers of change whose future development (or impact of expected developments) is extremely uncertain. Two main drivers, or two main sets of drivers that can be aggregated together, are selected, and each is dichotomised into two major paths of development. By cross-cutting each of these, a 2 × 2 matrix of possibilities is arrived at.[9]
There are many examples of such an approach in ForSTI activities. One example is the scenario development undertaken as part of an examination of prospects for the development and deployment of Personal Health Systems (PHS) to the year 2020. PHS involve application of new IT for monitoring, communication, assistance and other services related to healthcare. Codagnone (2009) reviewed a large range of drivers of change in the PHS context, before elaborating four scenarios, set out in the 2 × 2 matrix in Fig. 7.3 (The accompanying discussion draws to a great extent on Codagnone's account).
The scenarios are created by cross-cutting two axes designed to capture many of the drivers that may change the wider context of healthcare provision, the context within which PHS may be applied. The ongoing development of the technological capabilities was seen as fairy certain. The uncertainties are more a matter of how PHS will be applied and adopted—for example will they be mainly used by elites,

[8] A useful guide to several approaches, and to overall organisation of the approach, is provided by Rhydderch (2009).

[9] A detailed and free guide to this approach has been prepared by Waverley Management Consultants (2007).

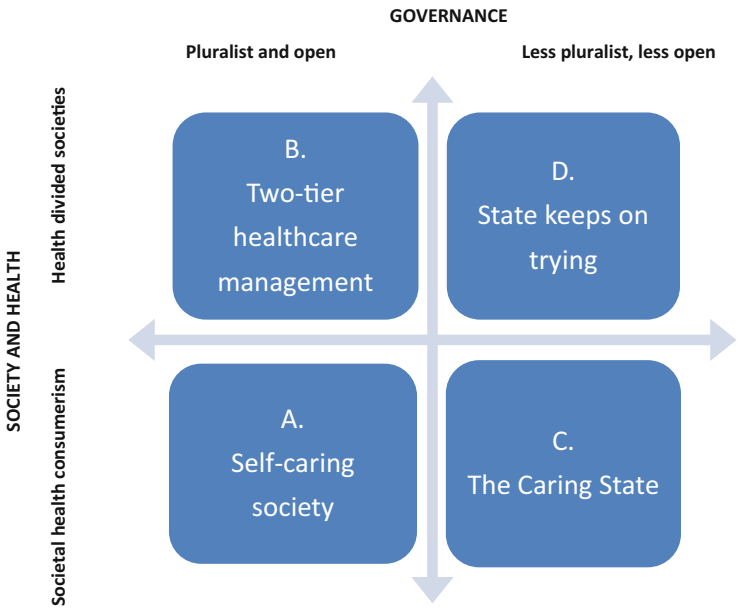


Fig. 7.3 Four scenarios for the future of health systems. *Source:* based on Codagnone (2009)

rolled out on a mass scale, or some mixture of these developments in relation to different qualities of PHS?

The first axis is **Governance**: The issue is whether or not drivers operate so as to push governments to play much reduced roles in production and delivery, control, standards-setting and financing of health services, and in seeking to shape the attitudes and behaviours of consumers/patients. If this happens, these roles are taken on to greater or lesser extent, by new players; if not, these players involvement in healthcare remains limited. One possible extreme pole is a ***more pluralist and more open*** governance and delivery of health care—where the government will focus mostly on policy making and monitoring of healthcare outcomes, will reduce its direct financing role, will introduce regulations and measures leading to new financing and business models, will stimulate public healthcare organisations and professionals to relinquish their full control on service provision, creating many new spaces for third party players to operate within. At the other pole is a ***less pluralist and less open***, and more government-dominated, governance—where the state and its network of healthcare organisations and professional remain the dominant players, where public financing will continue to be the main source of funding along already existing output based models and with third party players confined to very limited niche markets (The terminology of open/closed, pluralist/government-dominated is that of the original report: we would note that other terms might be used to refer to democratic accountability versus private markets, which might give the scenario accounts a different flavour. These "exploratory" scenarios thus have a rather "normative" feel).

The second axis is **Societal Differentiation**. This reflects uncertainty as to how far various drivers promote a fairly homogeneous society, with some tendency for individual attitudes, behaviours and capabilities in relation to health (and also to technology, and to payment) to converge; or instead promote increasing social differentiation, well beyond today's levels. One extreme pole is ***Societal Health Consumerism***, where high levels of confidence in technology prevail,[10] including acceptance of PHS providing remote treatment with little intervention from health professionals; at the other pole ***Health Divided Societies*** feature persistent and even exacerbated social differentiation, with serious problems of social exclusion.

Four scenarios were derived from examination of the combinations of these drivers, of the evolutionary paths that might result from their operating in different ways. In Scenario **A**, "**Self-caring Society**", government withdrawal and an open and pluralist framework of governance coexists with a health consumerist society which poses relatively few social exclusion challenges. In Scenario **B**, "**Two-tiers Healthcare Management**", there is also a lighter touch government, but this is confronted by a split society: a two-tiers management is chosen, with a plurality of delivery players and models for the health consumerist segment of society, but with government traditional delivery of health services where social exclusion issues persist. Healthcare's tiers result from conscious political choice. In contrast, in Scenario **C**, "**The Caring State (Good Big Brother)**" government retains full control and leverages social conditions to fully develop and use selected technology-driven PHS. The diffusion of such technologies, and strong lifestyle guidance, help contain rising healthcare costs and can produce positive outcomes for citizens/patients (though some consumers find their choices more limited than they desire). Scenario **D** is closest to a simple extrapolation of the current situation, where there has been failure to cope with its more problematic features. The "**State Keeps on Trying**", but difficulties in leveraging technologies and shaping attitudes and behaviours result in both steeply rising costs and *de facto* tiered healthcare system(s), with a worsened quality of publicly provided healthcare and social gaps between those who can or cannot pay for better and more sophisticated services, including PHS. The tiered nature of healthcare here results more from exacerbating trends, while in the "**Two-tiers Healthcare Management**" Scenario B, it results more from a conscious choice to cope with social exclusion issues.

Approach 2: "Archetypes"

Various organisations have applied one or other version of the "archetypes" approach.[11] This approach involves proposing a set of possible futures, defined only in terms of very abstract profiles, and asking workshop participants to consider

[10]These attitudes have permeated as much as 95 % of the adult population, implying that potential problems of social exclusion are not a matter of concerns about PHS.

[11]The authors have been very much inspired by work carried out by the Institute for Alternative Futures, using their versions of the archetypes approach. There are various ideas of where the approach was first developed, with the Hawaii Research Centre for Futures Studies suggested as a major influence in the 1970s. C.f. Bezold (2009).

what drivers would plausibly create a scenario aligned with each profile, and what this scenario would look like in more detail. Usually three or four profiles are provided, with various combinations. Sometimes one profile might be "Business as Usual", a (usually broadly optimistic) extrapolation of trends with few disruptions. But there are almost certainly going to be factors reshaping business as usual, and scenarios resulting from this profile are unlikely to be very provocative; they run the risk of reinforcing the mainstream view that progress can be expected without need for structural change or adaptation to discontinuities. They may also be rather attractive to managers who prefer to emphasise them at the expense of other plausible futures—as a result, so some ForSTI practitioners (the authors included) prefer to avoid them.

A more challenging set of archetypes involves three or four non-business as usual profiles. For example, we may pose two profiles that challenge expectations, such as having the focal topic develop *better*/*worse* or *faster*/*slower* than expected. This of course means discussing what such terms mean, which is itself a worthwhile exercise. It is possible to introduce a profile that resembles the "success scenario" approach discussed below—for example, asking participants to envisage the "*best feasible*" scenario. Likewise we could request a "*problem-plagued, hard times*" profile; though there can be problems of acceptance of really grim scenarios, even if these display vividly some of the contradictions of business as usual. However, negative scenarios may be exactly what are needed when the ForSTI activity is intended to contribute to risk assessment.

Often the most interesting results emerge from asking about profiles that are "*different from*" expected. This encourages creative thinking, and can be pushed more by deliberately proposing that scenarios be built around profiles involving "*transformative change*" or "*paradigm shifts*". While such scenarios are typically going to imply longer-term futures, they may be inspired by weak signals that are already attracting attention—or represent creative thinking based on historical analogies, cases of past paradigm change, for example. It is possible, too, to specify that the profile involves progress—just that progress here is taking on different features to those generally expected. In one workshop on the focal topic of e-science in Europe, the scenario of radical change created from this profile came to be seen as a particularly telling one. Better-than and worse-than scenarios basically involved different speed of roll-out and extent of uptake of the systems now under construction, led by the public agencies who are now in charge. The idea that new private sector actors could well disrupt this ongoing public sector led development of systems and infrastructures, was seen to be especially persuasive. Many of the participants concluded that even if the particular scenario developed—some Google-like firm, perhaps from an emerging economy, offers free or very low price access to massive data storage, sophisticated scientific programs, and supercomputer-like data processing, challenging the plans of the science establishment—failed to emerge, the chances of some disruption from external forces was rather high.

Another workshop using an archetypes approach of this kind was for a British Research Council: the focal topic was the possible contributions of, and demands

upon, social research, posed by the rapid development of genomics STI.[12] The participants in four break-out groups explored the implications of each scenario for social research, and developed possible signpost events that could indicate movement towards each scenario.

- In **Genomics, Inc**. "better than expected", the benefits are primarily for the developed countries, the affluent, and corporations. Social science would need to consider impacts of genomics on various sectors of society, concepts of well-being, ethics and NHS use of genomics, the new industrial structure and property rights, as well as the growing divide genomics would contribute to. Signposts that this scenario is coming would include continuing mergers, increasing divide between public and private sectors, and growing inequalities among individuals (a genetic divide alongside the digital divide?).
- In **Genomics for All**, "positively different than expected", sees genomics developed to increase equity and sustainability. Social science research would support the development of international institutions that can regulate, for example, bioweapons; identifying genomic products and applications that will support equity and sustainability; comparative analysis of scientific and political change, using ICTs as an example, historical research on international institutions, understanding how "cultural creatives" unite politically and affect corporations, developing value impact assessment for new technologies. Signposts indicating this emerging future include international agreements on genomics treaties and standards, intellectual property concessions for developing countries, and new potentials being established through genomics for orphan drugs.
- In **Broken Promises**, "worse than expected", genomics works poorly, with applications developing slowly and having fewer benefits than anticipated. Social research contributes to re-evaluations of the notion of progress; reflexive social science would research alternative lifestyles and product use; better understanding of political change; the new approaches to risk are established that include the inevitability of "normal" disasters and the need to prepare for them. Some of the sorts of event that might constitute signposts on the road to this future include Greens winning in Tunbridge Wells (a conservative small British town), the biotech/agribusiness firm Monsanto facing bankruptcy, and Golden Rice being burned in India because of unforeseen side effects.
- In **Out of Our Control**, "radically different than expected", genomics STI is highly effective (for good and ill), but its applications are a destabilising force internationally and environmentally. In the scenario that was elaborated, China takes the lead in genomic STI, in the face of more stringent regulation in developed countries. Social research would consider the comparative

[12]This exercise is documented in a series of articles in a special issue of the journal *Foresight*, vol 4 no 4, in 2002 (Available at: http://www.emeraldinsight.com/toc/fs/4/4, accessed on: 21.01.2016).

advantages and disadvantages of nation states, their relations to transnational corporations, and the nature of international organisations. The sorts of events that could be signposts supporting this scenario include a Chinese body buying Monsanto, and European protestors attacking Greenpeace for obstructing their access to GM products.

Approach 3: Profiles and/or Starter Scenarios

Profiles may be developed that represent end-states of particular interest for those concerned with the focal area. For instance, they may be constructed around a particular set of possibilities that reflect the concerns of managers or policymakers—what would futures look like when one or other power is dominant, for example, when one or other technology path is closed off or proves unsuccessful, and so on. In a workshop, participants are requested to consider what forces might plausibly create such profiles, and what the resulting scenarios might look like.

Two examples illustrate that such an approach can be applied in various ways, adapted to the focal object and stakeholder concerns.

- The first example is a workshop whose focal topic was the application of Bioscience to Non Food Crops (NFCs) (Institute of Innovation Research 2003). Debate about the use of Genetically Modified Organisms (GMOs) in agriculture has almost entirely involved food crops and public concerns about health (at least in the UK, where food and related health scares have been prominent since the 1980s), with environmental issues and concerns about corporate control of agriculture also being raised. Four profiles were developed by the ForSTI team, all assuming that bioscience will continue to develop and widen its range of applications. The profiles varied in terms of the extent and style of development of applications of bioscience to NFCs in the UK, in particular the extent to which GMOs were allowed in agriculture. They ranged from Scenario 1, where regulatory and other developments making it possible to exploit the new technologies on a wide scale, to Scenario 4 in which there was practically no commercial use of GMOs in agriculture, though bioscience is still applied in other novel ways in crop breeding, etc. The other profiles suggest some use of GMOs in contained environments (not open fields), such as greenhouses, sealed polytunnels, etc. Scenario 3 restricts GMO use for NFCs to contained environments; Scenario 2 is one where some limited development of "open" GMO-based agriculture accompanies these contained methods. These profiles were developed into fleshed-out scenarios by break-out groups, who considered prospects for different types of NFC in each profile. The discussion led participants to conclude (to the surprise of many) that the most desirable and viable future would be likely to involve contained agriculture of high-value NFCs—not bioenergy or large-scale oilseed production, for example, but rather things like biopharmaceuticals and cosmetics).

- The second example derives from SANDERA, a study of possible future relationships between the European Research Area (ERA) and defence STI; ERA research and innovation activities have predominantly involved civilian activities, but technology spill-overs, new security issues, and other developments could destabilise this (James and Miles 2010). Four profiles were established, representing different types of relationship between ERA and security/defence research (Fig. 7.4). These profiles, focusing attention on different relationships between the major sets of activity (from indifference to close cooperation), proved a useful framework for exploring the dynamics that might lead to these different outcomes.

In contrast to such skeletal profiles, some workshops use "off the shelf" scenarios prepared in other work, possibly even published ones, as a starting point for the workshop activity. This could be used, for instance, to provide the workshop participants with a base against which to frame their own scenario(s). They may proceed to develop them in more detail ("What would this mean for my particular objects of concern?/for my particular communities of interest?"), to interrogate them more thoroughly ("How could this really come about? Would these resources be made available?" etc.), to criticise them ("fails to take into account....", "misrepresents the technical feasibility of...." etc.). Earlier scenarios may be used as a launchpad for constructing aspirational scenarios or the roadmaps associated with these. A workshop would be organised to systematically appraise the received scenarios and their scope for reuse.

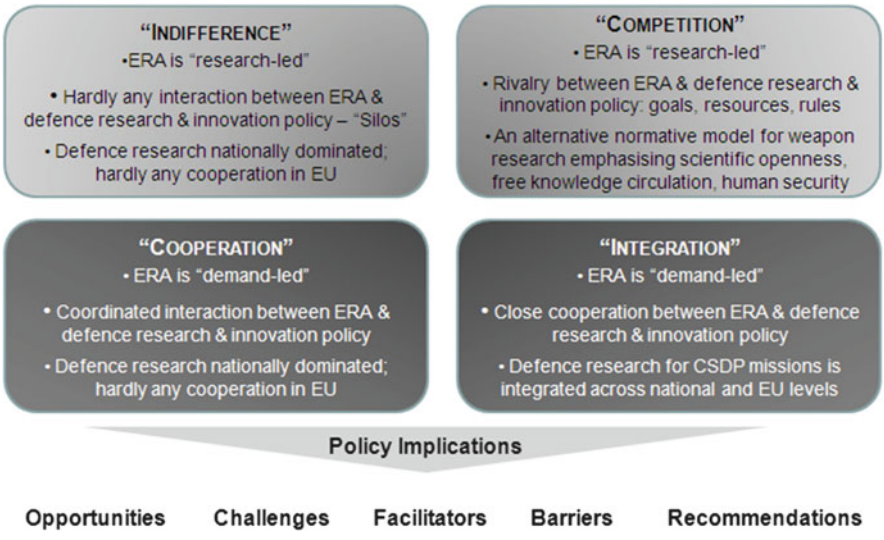


Fig. 7.4 SANDERA's four profiles. *Source:* James and Miles (2010)

Some scenarios have been used in a succession of workshops, sometimes with the aim of deepening the content and/or elaborating implications for specific sectors or regions. This was the case for a set of scenarios developed in the UK Foresight Programme around the turn of the century (cf. Berkhout and Hentin 2002). The initial scenario framework has as its focal topic environmental issues and climate change, but it was subsequently used for studies with a variety of other focal topics. This 2×2 framework of these scenarios dichotomised developments in social and political **values** and the nature of **governance** (see Fig. 7.5). The 'values' dimension ranges from an 'individual' pole private consumption and personal freedom dominate, to a 'community' pole emphasis concern for the common good and future generations, with stress on equity and participation. The other parameter is 'governance', involving political and economic power structures. Its 'interdependence' pole involves power away from the national state level to more international governance, its 'autonomy' pole sees high exercise of economic and political power at national and/or regional levels. The intersection of the two dimensions affects how far governance is seen as a matter of regulating free markets and securing law and order, how far civil society plays a strong role, etc.

Berkhout and Hentin (2002) summarised a wide range of studies and policy activities in which these scenarios were used (and they appeared subsequently in several other ForSTI studies, being elaborated to throw light on, for example, issues of flooding); they remained a point of reference within several UK policy bodies for several years, and seem to have inspired scenarios developed by subsequent European projects. We know of work at the city level in 2015 that clearly draws on this framework.

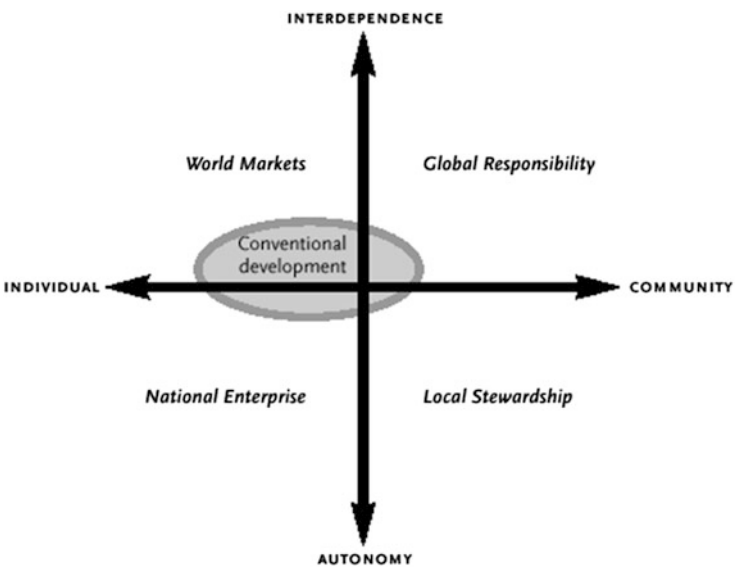


Fig. 7.5 UK Foresight "Environment" scenarios. *Source:* Berkhout and Hentin (2002)

In another example of reuse of existing scenarios, the PHS2020 scenarios from Codagnone (2009), mentioned above, were employed in 2013. This was in a scenario workshop seeking to extend the time horizon from 2020 to 2030 and examine business models and occupational roles that might be confronted. PHS2020 was an impressive study, and it had been expected that its scenario results would remain relevant. Thus the Codagnone scenarios were used as starters for the workshop discussion. However, perhaps because of the rapid changes underway in public health and in technology, and accumulation of experience in the PHS field, this was only partly true. The starter scenarios were not readily appropriated by the break-out groups to whom they were assigned: each group was quite critical about its scenario. The demarcation between a world of high state control versus that of a high measure of privatisation was seen as being too stark: a wide constellation of different public-private mixtures, varying across countries and health-related activities, was probable. For a longer term view—the horizon was now 2030—the starter scenarios were seen to be unstable, and ultimately to have been replaced by different models. The break-out groups proceeded to reformulate their starter scenarios to what they considered more plausible forms. Even while PHS were very likely to be introduced on a large scale over the coming decade and a half, they anticipated relatively incremental change in health systems and institutions. Nevertheless, they did generate rather different accounts of business and service models, the key actors organising PHS, the roles of various organisations and occupational groups, and the outcomes across society. The groups' proposed names for the three scenarios they generated—"The Dream Scenario", "Transitional scenario", and "Shared responsibility for a healthy society"—convey something of the flavour of their work. Despite the substantial revision of the starter scenarios, rich accounts of possible future developments were yielded, and the workshop could further explore how particular types of medical pathway would be transformed in the various futures.[13]

Approach 4: Aspirational or Success Scenarios

More obviously "normative" approaches usually focus on a desirable state of affairs (though it is possible to warn against particular negative outcomes, as well). An aspirational approach will attempt to identify the outline of a future with specific desirable features (how these are determined is, of course, very important) and then map out the routes whereby this may be achieved, and provide a more detailed appraisal of the nature of this future.

These approaches ask "how" questions. They were classically developed in the context of large programmes—such as that aimed at getting the first American on the moon. Bezold (2009) argues that the aspirational approach "involves understanding what might happen (likely and alternative futures) and a clear, shared commitment to creating the community or organization's preferred future. Both the

[13]See the report of the PHS scenario workshops at http://www.phsForSTI.eu/reports (accessed on: 09.09.2014).

understanding of the future and an effective commitment to creating it are essential... Being aware of the 'plausible' and the 'preferable' is critical. The plausible considers what might happen, the preferable what we want, often with some degree of commitment to making it happen... We acknowledge the power of scenarios to explore plausible future space. We add that the plausible space scenarios explore should include paths to visionary outcomes" (p. 81).

The "success scenario" approach typically develops a single scenario, and may well follow on from an earlier phase of multiple scenario workshops. The aim is to explicate a plausible and desirable course of development that stakeholders can broadly sign up to; to identify the steps required to get onto this pathway, and the indicators of progress in the right direction. The success scenario combines:

- **Desirability.** The scenario captures a vision of what could be achieved or aspired to, by the sponsoring organisation or a wider community that it represents.
- **Credibility.** The scenario is developed with the assistance of, and validated by, a sample of experts in the area, chosen to reflect a broad range of interests (and usually including both practitioners and researchers).

The scenario is described in terms of a set of goals that can be achieved, forming a "stretch target", challenging those concerned to aim for excellence, and to think beyond the boundaries of "business as usual". The development of indicators moves the scenario beyond vague aspirations, and allows for clarity as to what precisely is being discussed and whether and how far goals are being achieved. Action points are developed and priorities may be established, with the merit of having been derived from a participative process. The scenario is a communicable, tangible product of the process, which can be used to share the vision and mobilise other actors. The workshop process itself—discussing background inputs, debating and agreeing upon goals and indicators, and identifying feasible actions is valuable for creating mutual understanding and sharing of knowledge. This can establish platforms for putting in place the actions proposed.

Success Scenarios can be regarded as a hybrid of conventional scenarios and some elements of roadmapping. While systematic roadmapping (described in more depth in Chap. 9) often requires several workshops (in which participants determine the key events and actions, and fit them together across different layers of the roadmap), Success Scenarios usually involve more rapid and less structured appraisal. A success scenario activity may be the prelude to a roadmapping exercise–or actually draw upon the results of roadmaps generated in prior deskwork or workshops.[14]

[14]For instance, a series of basic roadmaps for specific applications of nanotechnology were developed before the main SSM workshop on this topic was conducted; they outlined the likely global development of these technologies, and enabled discussion in the workshop as to what might be accomplished within the UK. See Advisory Group On Nanotechnology (2002) *New Dimensions for Manufacturing: A UK Strategy for Nanotechnology*. London: Department of Trade

7.7 Scenario Building and Analysis in Workshops

We have just outlined some variant approaches to developing scenarios, and the examples used to illustrate these approaches largely involve their application in workshops. Across this range of techniques, a scenario workshop activity typically has a number of key steps, much like the overall ForSTI process itself; these are outlined in Fig. 7.6, with Table 7.1 summarising key elements and the ways in which each of the scenario approaches differ in the way they take these steps.

It is easy to forget that the workshop itself is not the only part of the exercise: there needs to be much planning before it, and ideally there will be a programme of follow-up activities. We include these phases in the outline that follows.

The Pre-workshop Phase

Before the Worksop can be conducted, a number of activities should be undertaken in the **Pre-Workshop Phase**. We follow Fig. 7.6 in discussing these:

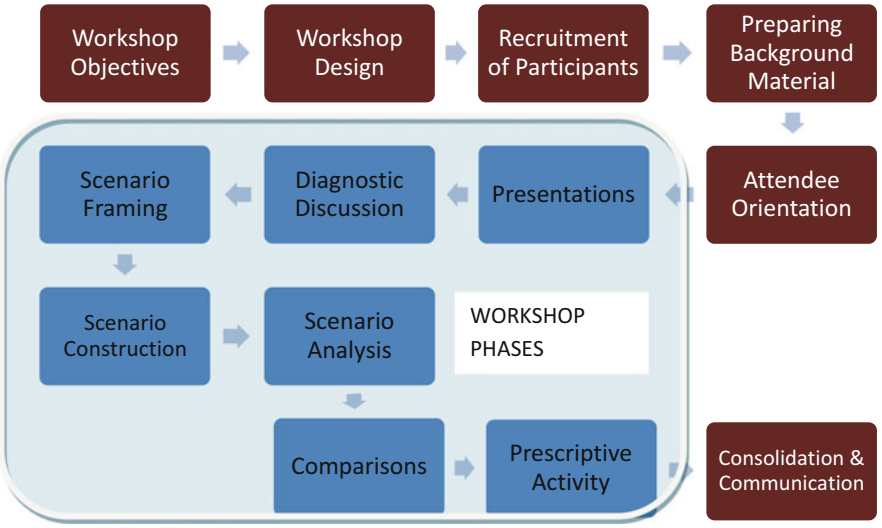


Fig. 7.6 A scenario workshop exercise

and Industry, DTI Pub 6182 2k/06/02/NP, URN 02/1034, Originally published online at http://www.dti.gov.uk/innovation/nanotechnologyreport.pdf (but removed); now available at http://www.innovateuk.org/_assets/pdf/taylor%20report.pdf; and Miles, I. & Jarvis, D. (2001), *Nanotechnology – A Scenario for Success in 2006*. Teddington, UK: HMSO. National Physical Laboratory Report Number: CBTLM 16 (available at: http://www.npl.co.uk/publications/nanotechnology-a-scenario-for-success-in-2006, accessed on: 14.01.2016). The initial roadmaps were regarded as confidential, and are not reproduced in these reports.

Table 7.1 Steps in workshop activities in different types of scenario workshop

	Scenario types			
Workshop Steps ↓	"Classic" 2×2 approach	Archetype profiles	Other profiles/ Starter scenarios	Success scenario
Introductions and presentations	Begin with a review of the aims, purposes and programme of the workshop. Participants often introduce themselves (briefly!), though this may be handled in smaller groups, perhaps with some ice-breaking exercises. Some presentations on the main objects of concern, and related background material, provide participants with further orientation and some common information.			
Diagnostic discussion	Typical activities here involve identifying most important drivers that are shaping the system, and exploring views as to how these may operate and change into the future. In many workshops there will be an effort to target the levels of uncertainty associated with each of the main drivers; this is an essential step in the 2 x 2 approach.			This step may be curtailed, e.g. if the background presentations have already adequately discussed key stakeholders' broad strengths or weaknesses.
Scenario framing	Two highly important drivers, whose future development and operation is highly uncertain, become the basis for the 2×2 matrix of four scenarios. This step will often involve some work amalgamating drivers identified earlier, so as to reduce the numbers involved and capture wider change processes.	Current trends and future prospects are discussed, and the archetypes introduced and explored—what would it mean to be better than/ worse than/ (radically) different from/ expected? This may lead to discussions of "success" (cf. the success scenario); if several versions of "different" are proposed, select a plausible and issue-raising example.	Here it may be a matter of introducing a set of predetermined profiles with relatively little content associated with them, or of reporting on the "starter scenarios" developed in an earlier exercise (which may have more content, but will need elaborating and perhaps updating or critical revision in the current workshop).	Framing here concerns the meaning of "success"—how is it to be understood? For example, does it involve research excellence, commercial exploitation, large-scale adoption of innovation? What is the importance of policy goals such as regional and social inclusion, or protection of environment, civil liberties, etc.?

(continued)

Table 7.1 (continued)

	Scenario types			
Workshop Steps ↓	"Classic" 2×2 approach	Archetype profiles	Other profiles/ Starter scenarios	Success scenario
Scenario analysis	The participants are split into four groups, and each is assigned one scenario from the matrix. Each break-out group is invited to consider "what if" the drivers were to operate as specified in this cell of the matrix, what sorts of event might unfold and what scenario would follow. Actions required to make the scenario more or less likely and/or to cope with it are identified.	The participants are split into groups corresponding to each of the profiles developed in the previous step. Each break-out group is invited to consider "how come?"—what drivers had to operate in what way to lead towards this profile; what developments could plausibly have taken the future in this direction, what implications follow about what the scenario would look like in more detail. Actions to promote more desirable futures and to avoid or ameliorate less desirable ones are identified.		With only one scenario to work within, break-out groups are typically invited to consider what success would look like in each of several areas/subtopics, and what would be needed to achieve this. Usually there will be efforts to suggest targets and indicators of progress.
Scenario (or sub-scenario) comparison	Scenarios are presented to a plenary session, where their plausibility can be debated. Some effort may be made to render the scenarios more distinctive, so that the polar opposite scenarios differ from each other in terms of secondary drivers and not just the two major ones forming the matrix.	Scenarios are presented to a plenary session, where their relative plausibility can be debated. One question to ask is how far drivers that are taken to be decisive ones for each scenario are similar (drivers operate in different ways) or distinctive (different drivers are coming into play). This allows for the scenario narratives to be developed so that a wider range of drivers and their possible roles is encompassed.		The work of the break-out groups is presented to plenary, and efforts are made to detect common issues and possible contradictions across the treatment of various elements of the scenario.

(continued)

Table 7.1 (continued)

	Scenario types			
Workshop Steps ↓	"Classic" 2×2 approach	Archetype profiles	Other profiles/ Starter scenarios	Success scenario
Prescriptive phase	All scenarios are plausible, though some may be seen as likely to be closer to the eventual future than others. Likewise, they vary in desirability. The actions suggested by each group can be viewed in this light—are they trying to create, change, or cope with a possible path of future development?	The "better than expected" scenario is liable to involve too many elements falling into place to be completely convincing, but actions to help realise it—and those welcome aspects of "different" scenarios, and those that help to avoid, or help to cope with, the "worse" scenario should be accumulated.	Some revision of starter scenarios may have taken place, with modifications of ideas as to key drivers. There may be some amalgamation of, or move away from, initial profiles/ scenarios. Otherwise, the points made in the "classic" 2×2 approach apply here too.	Each break-out group should have generated a number of proposals for action based upon requirements of its area. These can be regrouped in terms of key actors addressed, timespan, etc.
	The proposals deriving from each break-out group are brought together, new proposals generated (and proposals organised into categories—e.g. actors—and related to targets) by group brainstorming, "carousel method", etc.			
	Subsequent approaches to selection or prioritisation of proposed actions range from simple methods—participants may vote for preferences, or rate each proposal in terms of feasibility/cost and of benefits/impact—through to more complicated multicriteria analyses or roadmapping efforts.			

Objectives
The purpose of the scenario work should be established, the people responsible for conducting the activity should be commissioned, and initial decisions about financing, location, timing and required outputs established. For example, how far is the aim to gather in a wide range of opinion from external sources, and how far to build shared understanding within an organisation?

Design
Workshop design is an important task. Most often it is a matter of the core team discussing the best approach among themselves and perhaps with the sponsor. In some cases, a scenario design workshop, drawing on a range of expert and interested parties, may be constituted before the main scenario workshop, and view of (for example) other futurists and users of the work may be drawn upon. The design tasks include:

- Identifying participants for the scenario workshop—it is vital to include the right range of knowledge and expertise, and as far as possible key end-users of the results
- Determining what background research might need to be conducted, what background materials collated, to provide participants with some common informational resources
- Defining the workshop procedures (what scenario methodology is to be deployed; what areas of study within the domain of interest should be selected, what specific questions might be used in the workshop)
- The design tasks should result, too, in specification of who is going to do what (presentations, facilitation, etc. at the event), and also of the facilities required (rooms, computers, flip-charts, post-its, etc.).

Recruitment
The nature of the participants required should be established (see also Chap. 4). Typically various types of expertise are needed, often with different types of stakeholder (e.g. researchers, business communities, policy communities, civil society) engaged. However, it is important that the participants should be open-minded people who are prepared to dialogue, to listen and to present their ideas in relevant ways (not just to give standard lectures, not just to present their organisations' current standpoint). If there is a design workshop, potential participants may be discussed there, along with good ways of motivating their participation.

Preparation of Background Materials
It is common practice to provide participants with some shared information, terminology and the like. Texts may be mailed out and/or weblinks supplied to relevant resources. There will need to be some specification of the project and its main areas of concern, for example. Typically such material will have been prepared for the workshop and/or the wider ForSTI programme of which it is

part. But material may also derive from other ForSTI or similar exercises, from routine reports on competitive or strategic circumstances, and the like. In business settings, SWOT analysis of the organisation's position in the area of concern is often used; policy analyses also use SWOT or benchmarking inputs to compare the region, country or organisation with relevant others. Other material may involve academic or consultancy analyses of relevant trends and problems, statistics of research related to this area; relevant Delphi material; results of computer simulations and econometric analyses. It is probably better to avoid apparently definitive claims about future eventualities, and instead to indicate what available literature and thinking suggest might be possibilities, challenges and opportunities.

Attendee Orientation
A brief programme of the event, with specification of objectives, desired outcomes, and suggestions as to how the work is to be conducted (e.g. what degree of anonymity can be involved, how participants will be asked to contribute). People who are being asked to make presentations or play other roles should be briefed about this. Facilitators should be provided with a clear understanding of their roles (for example, they are usually encouraged to join into discussions, but have important functions to perform in terms of ensuring that discussions are kept to time and remain focused on the intended mission). It is helpful to prepare a highly detailed version of the programme for facilitators, with suggested timing for different steps of the discussion, examples of tasks and questions that may prompt discussion or provide ways around difficulties (for instance, if a groups discussion is failing to reach consensus on a point such as the most important drivers, suggestions can be provided about ways in which voting can be organised).

7.7.1 The Workshop Itself

A scenario workshop may be undertaken in a very short time period (a matter of hours—in which case some of the activities discussed below may need to be truncated or dropped altogether), or extend over a day or several days. The workshop may involve from 10 people upwards—it is common to engage 20–30 people (with "break-out groups" of say 6 to 12 people exploring different scenarios in detail), though we have experienced workshops with up to a hundred participants (which requires a great deal of planning, since there is not usually time or energy for listening to reports back from a large number of break-out groups).

Scenario workshops typically feature periods of extensive exchange of ideas and debate about them, and periods where ideas are being written down and listed, where different lists are combined, and so on (This is a familiar evolutionary process—there is exchange, generation of novelty, selection among options). The process usually involves much dialogue, and use of such instruments as whiteboards and flip charts, though computer-based ("groupware") tools may be

used effectively (The danger with these tools is that participants spend much time staring into their screens, and not enough in dialogue with others. The tools can overwhelm the important face-to-face interactions, so they need to be used carefully, for specific activities). The workshop will be conducted with inputs from at least one facilitator each, and often other helpers will be engaged to take notes, record material from flip charts, and deal with logistic issues as they arise (for example, it may be necessary to reschedule lunch or coffee breaks, to shift activities from one room to another, to replace flip charts or pens…). Typically such facilitators have acquired their skills through involvement in these and similar group activities; they may have received some training in other workshop methods (from T-groups through management workshops to academic seminars).

There is often a degree of improvisation in workshops, as activities overrun their estimated time, events (such as fire alarms) intervene, new options are posed by participants, and so on. The convenors should maintain a relaxed composure when experiencing such pressures. Steps taken in the **Workshop Phase** include, in roughly the typical order: Introductions and Presentations, a Diagnostic Discussion, Scenario Framing, Scenario Construction, Scenario Analysis, Scenario Comparisons, and a Prescriptive Activity. We discuss them sequentially below, with Table 7.1 summarising the main steps and the variants taken by the four workshop types outlined earlier.

Introductions and Presentations

Usually participants will be asked to briefly introduce themselves—though in a large workshop introductions may be saved for break-out groups. Sometimes, ice breaking exercises will be employed, or the group will have shared a meal and got to know each other to an extent before the real work begins.

The scenario workshop will typically begin with a presentation from the convenors and/or sponsors, about what the purpose of the activity is, and the programme that is to be followed. Some ground-rules will usually be explained, usually involving anonymity if people do not want comments attributed to them, the need for open-minded and nonaggressive conversation, and so on. There will then often be some presentation of background material that has been prepared especially for the workshop, or perhaps material concerning the focal topic drawn from the wider ForSTI exercise. Examples could be: a SWOT analysis of the organisation's position in the area of concern, a benchmarking input that compares the region or country with relevant others, a summary of a research project, of a set of interviews, or a literature review. Other inputs might include statistics or other data related to this area; relevant Delphi material; results of computer simulations and econometric analyses—even roadmaps or other peoples' scenarios! The material should help participants establish common understandings of terminology, trends and dynamics; it should be prepared in such a way as to indicate what informants and available literature suggest might be possible.

Diagnostic Discussion

STEEPV (see Chap. 5) is one tool for eliciting ideas and grouping material, often used in the workshop or in the preparation of background material. Participants are asked to identify factors and issues under the headings Social, Technological, Economic, Environmental, Political, and Value-Based factors.

This forms a useful prompt to make sure that a comprehensive range of issues are covered, and to permit a division of labour across subgroups, rather than necessarily providing a framework for categorising drivers and shapers for further work and communication purposes. Often the approach adopted will involve break-out groups identifying a small set of key drivers and shapers and bringing these back to be presented in a plenary session. One group may be asked to consider drivers associated with S and T, for example, one with the two Es, and one with P and V. Sometimes different "prompts" and categories will be employed, for example in one ForSTI study we looked at such headings as public attitudes, skills and training, regulatory and institutional environment, scientific capabilities, market environment, etc. Box 7.1 reproduces the definition of STEEPV categories and the working instruction issued to groups in one large-scale scenario workshop, for the work of break-out groups and the subsequent plenary discussion.

The workshop itself may go on to grouping of "driving" factors. Typically there will be a plenary in which each break-out group presents its complete set of drivers, or probably some reduced set—its "top ten" for example. These will be discussed and clarified, and any overlaps may be grouped together. Then some procedure—usually voting (especially in a large group), using computer tools or techniques as simple as allocating votes via post-it notes or pen marks against the list of drivers assembled on a wall or a set of flip charts. Thus a "hit list" of factors that the workshop has identified as critical influences on which path of development is taken is created.

A useful adjunct exercise, particularly important for the 2×2 approach, is to have the most important drivers also rated in terms of uncertainty—how far development of a particular trend, for example, can be taken for granted, or is a matter of considerable conjecture; or whether a particular trend might result in one set of changes or in another completely different set. This highlights key areas where early warning of potential breaks may be required, where research into possible reactions could be helpful, where strategies need to be robust, etc. The plot of uncertainty against importance can often be very revealing, and even if it is not used as a starting-place from which to develop scenarios, it can help demonstrate how far members of the workshop share similar views about major issues and debates.

Box 7.1 displays the instructions used for a low-tech voting method used in one workshop to elicit ratings of importance and uncertainty. The end result was a visually compelling clustering of stickers, and of stickers of different colours, across several flip charts that had been attached to the walls of the meeting room. This provided an excellent focus for subsequent discussion.

Box 7.1: STEEPV and Group Instructions Used in a Scenario Workshop

Break-out Groups

We suggest three break-out groups of approximately 8–12 members each. Each group will address two of the STEEPV categories. (These categories have been introduced in the presentations, and are explicated a little more below.)

YOUR ROLES:

Each group should appoint a chair and a rapporteur at the outset.

Chair's role: to keep the break-out groups to their tasks; to ensure that all participants have a say and that people are not being excluded due to other people's forcefulness or superior status, to defuse conflicts. To prevent people giving long lectures and not engaging with the task or listening to others.

Rapporteur's role: to keep notes on the process and decisions, and be prepared to report these back to the workshop, in a succinct way. To prepare a 5–10 min presentation. It helps to write down ideas as they emerge onto a whiteboard and/or flip charts, etc. This demonstrates that ideas are being captured and gives a point to reflect back on. They may also be useful for the plenary presentation.

Everybody's role: Remember that you are being asked to participate as an individual, not a representative of an organisation. Please talk on the basis of your views, your knowledge—not just echoing the "line" of a particular organisation. One ground-rule of Foresight work is that remarks are not attributed to individuals, and people should be free to express their views, and to debate each other's views, in the spirit of constructive dialogue!

TASKS:

For the first part of the morning, we will identify a wide range of **influences** that are liable to shape the topic. What are the factors that are liable to speed up / slow down / change the direction of a path of development? These could be trends or events. They are **not** the end-points of a path of development (e.g. social goals like better health in 2020). But peoples' aspirations for such goals (e.g. political pressure to improve health or living standards) can be an important influence. Early moves in the direction of a particular goal could also be an influence (e.g. better health outcomes over the next few years could have effects on people's attitudes and behaviour towards innovation, reforms, etc.). In later parts of the morning, we will group and select among these drivers, considering which ones are most important to the topic considered, and which ones are least certain in terms of future development.

TASK 1: STEEPV Brainstorming in Break-Out groups

(Note that each group should have appointed its chair and rapporteur at the outset!)

Time allocated: First 45 min of the morning break-out (10.14–11.30)

(continued)

Box 7.1 (continued)

The immediate task is to brainstorm drivers that are liable to be important influences on the development of your topic over the time period in question. Breakout groups will focus on sets of drivers as follows:

Group I—focus on factors S and T

Group II—focus on factors E and E

Group III—focus on factors P and V

Each group should use flipcharts—begin with one of the two categories and brainstorm ideas, then move to the other.

First of all, spend **20 min** on each of your STEEPV factors, aiming to come up with a list of bullet points representing different drivers that could be important for your topic.

STEEPV is the acronym for the categories Social, Technological, Economic, Environmental, Political and Values. These form an aide-memoire for classifying relevant trends or drivers influencing the topic we are looking at. We would like you to use these categories to make a note of factors which you think could be major influences on the topic over the *next decade* or 15 years. The set of categories is intended to be sufficiently wide-ranging and comprehensive so that we are encouraged to consider a wide range of topics (perhaps a wider range than is habitual), and to provide a convenient way for grouping them together.

The list below provides examples of the sorts of things that can be grouped into each category. Do not feel constrained to cite only items from this list! And do not send a lot of time fretting about which category an issue belongs to: to first important step is simply to generate lots of influences on the topic.

TASK 2: Working with the outputs of STEEPV Brainstorming in Break-Out groups

Time allocated: Second 30 min of the morning break-out

The task now is for each break-out group to work through its suggestions. The aim is to come up with the top *3 to 5 MOST IMPORTANT influences* under each of your STEEPV drivers.

This means discussing the drivers, combining those that deal with essentially the same idea, explaining why they are more or less important. You may well discover that several of the ideas that have been generated are very similar or closely related, so it may make sense to group them together under a new heading

Write the main ideas very briefly (a few words per driver) in large and legible text, onto a set of flip charts (one for each category—one S chart, one T chart, and so on).

You may well want to further group drivers under new headings: form any such groups if they apply to drivers that you think are important.

(continued)

Box 7.1 (continued)

Now the difficult bit: Select your top 3–5 drivers for each STEEPV area by group discussion: try to reach a consensus.

What if this is taking too long? Remember, you only have 15 min per category! One solution is to take a vote. For example, if you are divided about which of two drivers should stay on the list and which go, you could take a show of hands. If things are more messy (they often are), or you simply have not had enough time to explore everything, then you can vote onto the flip charts where the drivers are listed. Each participant can be given three votes to nominate what they think the most important drivers are. These votes may be made with a marker pen, or by sticking post-its against the topic. We count up all the votes and choose the top 3–5 items for further work.

Finally: Your rapporteur should now have a set of flip charts, each containing a list of 3–5 drivers under an individual STEEPV heading, on which they can report to other groups in the plenary that follows. It is convenient if these drivers can each have a succinct label!

TASK 3: STEEPV Reporting Back to Plenary

Rapporteurs: Each rapporteur should report back to the plenary group on the set of drivers that they consider most important in influencing their topic area. Please try to make a strong case for these being important drivers. Please make brief presentations—5 min at the absolute maximum.

Put the flip charts up on to a wall, or set of stands, so they are clearly visible. Discussion at this point should be mainly a matter of clarification and points of information.

It is just possible that some items from one group will be seen as highly relevant to influences mentioned by another; it is possible that the same basic driver has come up in more than one STEEPV category—in which case, we may well want to combine these (if possible) into a single driver. We should put all the flip charts up next to each other for comparison purposes.

TASK 4: Reviewing STEEPV Issues (Plenary)

Time allocated: 15 min

Each participant is allocated three post-it notes to stick against most important influences—or asked to register three votes by marking the flip-charts with a pen (or by voting by sticking post-it notes against the influences).

At the same time, we want to capture ideas about how much uncertainty there is about how the influences will develop or shape the NHS.

Each participant: Your task now is to use these as "votes" to nominate which of the drivers you believe to be most important in shaping the pattern of development of the topic.

You vote by sticking the post-its or making pen marks next to those drivers that you consider most important. You can put all three votes against one

(continued)

Box 7.1 (continued)
topic is you think this is overwhelmingly critical, or distribute them in some other way.

But there is an additional element to this task: we also want to get a sense of how uncertain you feel about how the influence might evolve. We would like you to use different colours to indicate whether you feel:

(Red) = highly uncertain about how the influence might evolve or what influence it might have;

(Yellow) = moderately uncertain about how the influence might evolve or what influence it might have;

(Green) = see the influence as fairly predictable.

Scenario Framing

The structure of Scenarios may be created during the workshop on the 2×2 basis, given the importance-uncertainty votes acquired by the procedures outlined above. In this case, the challenge is liable to be that of choosing between, or compositing, a number of different highly important/highly uncertain parameters. While the organisers may well use their experience to move this process along, it is often possible to ask workshop participants themselves for views as to which would be the most interesting and/or informative parameters to select, or whether it is possible to step back a little and see two broad classes of parameters as being linked together in some larger set of variables.

On occasion, it may be that the range of alternative courses of development associated with a single parameter or cluster of parameters is so regarded as being important by the workshop members that scenarios can be constructed around this parameter alone.

Other approaches to scenario involve applying more a priori frames and profiles. We may re-use scenarios developed in earlier studies or workshops. In such a case, these "starter" scenarios need to be introduced, and the break-out groups assigned one or other to consider. Whether they are encouraged to be critical of the scenario or simply to work on deepening it or extending it to a specific focal topic or subtopic, will depend upon the mission of the workshop. We may take this as an opportunity to introduce the archetypes or success scenario profiles as the frame for scenario construction, in which case there will be need to discuss the content of the terms in question mean (see Box 7.2). Whose expectations are being "bettered", and what does this mean? What is really "different"? What are the key criteria of "success"—for example, if we are talking about some set of innovations, is success a matter of invention, production, diffusion, or application ... being a matter of a particular social or geographic unit? In some cases it may be possible to employ a set of descriptions of such characteristics, and ask the workshop members to discuss or vote on which are the critical ones for the scenario.

This is an important discussion in its own right, but it will be necessary to reach some compromises—there are liable to be more objectives, interests, alternative

circumstances to consider than can reasonably considered in depth in one workshop. It is worth making a note of topics that have been put on one side, for further discussion, and including these in reports that are circulated more widely.

Box 7.2: Introducing Profiles

Brief instructions as used with the "archetypes" approach

We will form three break-out groups. Each will be given a "Profile" to work with. The three profiles are:

α—"Better than expected": things develop very well for the focal topic that concerns us, so that current goals are substantially exceeded (quantitatively or qualitatively).

β—"Worse than expected": things develop very poorly for the focal topic that concerns us, so that achievements fall well short of current goals—though this is not "falling off a cliff", total abandonment of efforts to manage the focal topic.

γ—"Different than expected": things develop in directions that represent a new paradigm of development, a substantially different context for the focal topic.

Brief instructions as used with the "success scenario" approach, when applied to the success of a particular country in successful application of a specific set of innovations

We will shortly be working in a set of break-out groups where we will be considering various aspects of this focal topic. In each case, we want to be considering what would be a desirable, yet feasible, state of affairs for [our organisation/country/etc.]. [For example, w*hat would it mean for our country to be a world leader in the development and application of at least some areas of this set of technologies?*]

Before we do so, we would like to briefly consider what success might mean. Do we mean success in social, commercial, environmental terms? Should success for the whole country/organisation mean that different parts of the community are participating to more or less equal extents? How far are we talking about widespread or routine use of these innovations, how far about their effectiveness in achieving the intended aims?

When we are focused on a "success scenario", we may want to characterise this success in terms of various possible goals and elements of success. In the FISTERA project (Pascu et al. 2005) the success scenario could be viewed in terms of various goals laid out for the European Union in its statements about a desirable future (e.g. the Lisbon Objectives for Europe in 2010). Having considered the alternative scenarios generated in an earlier workshop, participants in this workshop outlined the features of a success scenario (by rating it in a computer-based system).

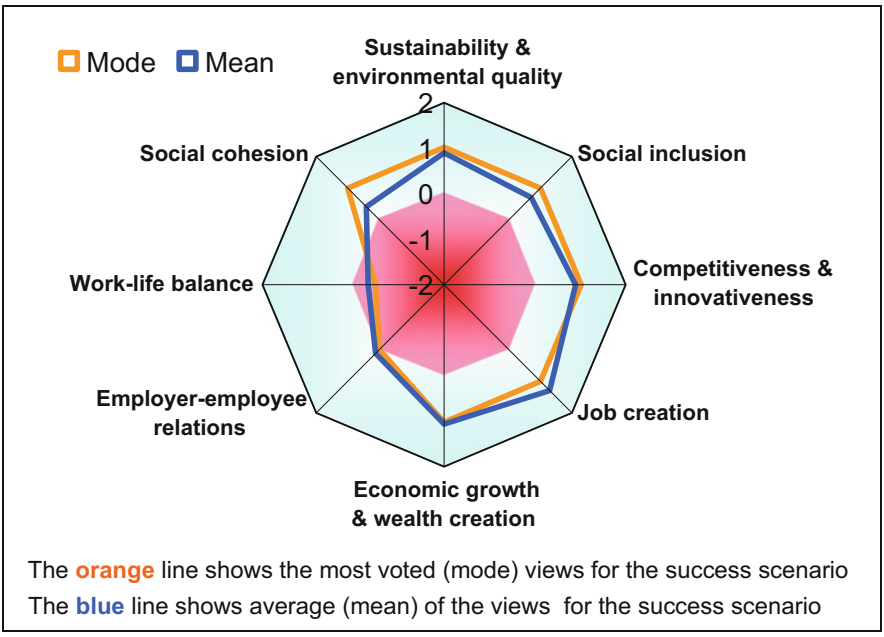


Fig. 7.7 Profile of a success scenario. *Source:* Green et al. (2005)

Figure 7.7 displays the results. It will be apparent that the goal whose attainment was least plausible in this scenario was "work-life balance".

Scenario Construction

This activity is usually undertaken in small break-out groups of 4–10 people. It is helpful to have a facilitator, to explain the task to the group; often this person can help move things along by making notes of points raised on a flip chart (This provides a point of reference for participants, and shows clearly that ideas are being listened to and registered). The facilitator will be provided with a detailed set of the activities that the group is to undertake, with suggested timings and types of outcome. Larger groups should appoint (or have appointed) a chairperson, too, to moderate discussion—in particular, ensuring that proceedings are not dominated by one loud person and that all participants have a voice, and to help keep the group on track. A rapporteur is needed to report back to plenary sessions.

Whatever the specific mission of the group and the overall workshop, a first task will be that of achieving familiarity with the profile or starter scenario they have been provided with. Often what happens is that a first working consensus is reached on the main features of a plausible scenario that may arise from the set of drivers or the movement towards the profile suggested. It can be helpful to prepare a succinct statement of just what the scenario is (30 words maximum); and create a (catchy and telling) name for it one that communicates some key features, providing an aide

memoire to help identify the scenario, to distinguish it from alternatives, and to communicate it better to others.[15]

The overall task is to put flesh on the bones the group has been given, to define and describe a plausible scenario corresponding to the operation of drivers or the profile in question. This needs to be a realistic prospect, not one that requires too much good or bad luck, or that is contingent upon unexpected positive or negative wild cards. The scenario is then developed, for example by examining such questions as:

- What is the role of the various **drivers** in promoting the development of the scenario? Can we piece together a story of the scenario's evolution and its outcome in terms of these drivers?
- What would the role of the key **actors** be in this future history? (An indicative list of actors relevant to the focal topic can be provided)
- What are the main events that are likely—can particularly resonant examples be suggested? (It can be helpful to capture such events in terms of newspaper headlines)
- How would we know whether or not we were on this path of development? What are useful **Signposts and Indicators** of movement toward the scenario? Can we express these in terms of statistical trends or, again, as headlines in the media?
- What does this future look like in more detail—how does the focal topic appear in this future, what are the achievements and problems of the organisations or social groups that most concern us?

Each of these tasks should result in the collection of many points on flip charts or computers/projectors. The main points of the discussion, and especially the conclusions reached (for example, the top three points in the answers generated for each of the questions) should be summarised in a coherent form, for rapporteur to present to the plenary, when they will only have a few minutes in which to explain the group's thinking and to "sell" the scenario to the plenary as presenting a significant plausible future that needs to be considered seriously.

Some workshops will now move directly to the task of comparing scenarios, which is then followed by a consideration of implications for action. In some workshops there is first a period of "touching base" with the plenary, so that participants are aware of the different scenarios (or sub-scenarios) that are being considered, and can reflect on whether there are challenges raised for the assumptions that they have been working on. In some workshops the break-out groups continue to develop implications for action of their specific scenario (or sub-scenario) and bring these back to the plenary as part of the presentation and subsequent discussion.

If the break-out group continues to work on the implications of its scenarios for the policy or business strategy areas related to the focal topic, there are a number of

[15]This naming of the scenario is less relevant in the success scenario approach.

approaches to pursue. One interesting issue is how far thinking through the alternative scenarios challenges the assumptions under which the organisation has been used to working? Then, for each scenario we need to examine what key issues arise for the organisation: for example, what are the 3–5 top priorities in terms of issues that demand further study, where there are challenges for received wisdom and routines, what practical issues may arise concerning who should take what action. The workshop will typically be organised to move from analysis of multiple scenarios one by one, to achieving an overview across the scenarios.

Following this activities are typically introduced that elaborate implications of the scenarios for the policy or business strategy areas under consideration. One interesting issue is how far thinking through the alternative scenarios challenges the assumptions under which the organisation has been used to working? Then, for each scenario we need to examine what key issues arise for the organisation: for example, what are the 3–5 top priorities in terms of issues that demand further study, where there are challenges for received wisdom and routines, what practical issues may arise concerning who should take what action. Box 7.3, below, reproduces instructions used to orient a break-out group in one workshop to develop its ideas for actions.

Box 7.3: A Break-Out Group, Developing Action Implications from Its Scenario

We now move to examining the points for action that could be implied by, or deduced from, the scenario that has been developed by your group.

First task:

Brainstorming of main actions that are required to meet the challenges of this scenario (feel free to include actions that may have been provoked by the other scenario presentations).

- What actions could help avert or cope with the dangers and difficulties foreseen?
- What actions could increase the positive opportunities available in the event of these future developments?

It may be helpful to organise brainstorming around a series of broad classes of action—for example (this is merely a suggestive list) those connected with:

- Skills and training, professions and professional bodies
- Management and organisation
- Regulation and legal issues
- Funding and financing
- Public relations, marketing, lobbying, relationship with other bodies, etc.
- Technologies and infrastructures

(continued)

Box 7.3 (continued)

In the brainstorming stage, we do not try to assess the suggestions, the important goal is to collect a wide-ranging set of suggestions. So do not spend time critiquing each other's ideas, and if the flow of ideas is faster than one person can put onto a flip-chart, make use of post-its to jot down and add further ideas. (These are the "WHAT actions" points.)

Second task:

You should now have a good range of ideas; we suggest you transcribe these to a new flip-chart (or set of charts), grouping them in terms of the key actors that would be needed to implement the activity. (These are the "WHO acts" points.)

Now discuss the WHY, WHEN and HOW points. Which actions will have the biggest effects? Which ones are absolutely necessary and which ones are more debatable? Which actions have to be undertaken immediately, or require prior action to prepare the way for their introduction and successful implementation? What problems and difficulties might be confronted in trying to put the actions into place?

Third task:

Select those actions that you consider to be BOTH feasible (especially if they are relatively easy and inexpensive!) and to have high positive impacts. We propose that each group select 5–10 actions at this stage (please keep a record of other suggestions). Write a note on each action, saying what it is, and who should do what (and when).

Scenario Comparison

The next step is for the various scenarios, or sub-scenarios, to be presented to the entire workshop in a plenary session, and discussed. The rapporteurs who make the presentation should explain why this course of events and outcomes is a plausible one, and make a strong case for the need to take this seriously. They should offer the opportunity for other members of their group to add any points that they have missed, and to clear up any misunderstandings; they should take questions and provide answers to the other workshop members, about ambiguities or unclear rationales. This process may take from 5 to 20 min.

Having presented all (sub-)scenarios, these can now be compared more systematically. Are there inconsistencies? In the case of sub-scenarios, inconsistencies may involve the various elements not fitting together well (e.g. being reliant on different assumptions as to framework conditions and policies, or conflicting in terms of where resources need to be allocated). Where different scenarios are contrasted, there may be drivers or actor choices introduced across the narratives that suggest that earlier discussions about uncertainty of drivers have been overturned, or it may be that supposedly contrasting scenarios are beginning to look very similar (as was the case in the PHS scenario exercise mentioned above).

Some futurists are keen to assign probability rankings to different scenarios, and users sometimes request this. While it would be very appealing to decision makers to have a good assessment of the likelihood of different outcomes, and thus the risks being taken by gambling on one or other, this runs the risk of false precision. Decision makers may put more faith in one set of outcomes than is warranted. Arguably, no single scenario of the sort described here should have a probability estimate associated with it: the actual future course of events will diverge from, and perhaps be a composite of, all of the options considered. A simple profile may be an accurate description in terms of its limited parameters, but a full scenario is bound to feature some inaccurate details; and with a near-infinity of possible scenario variations, the probability of any particular account being fully realised declines toward zero.

It can be valuable, instead, to discuss collectively which elements of the scenarios seem more or less realistic. Often this discussion can provoke further elaboration of the details of a scenario, of the operations of drivers, and so on.

One approach that can facilitate this discussion is to request from participants, not estimates of the probability of different scenarios, but of other features. One line of enquiry is to estimate how far various normative goals might be realised in each scenario, for example—this can help later construction of a "success scenario". A different approach is to ask **how far** the future is liable to resemble each scenario, how many of the elements described are likely to emerge over the time period in question. This can be done by each participant allocating a set number of votes across each scenario, for example, or by use of a set of rating scales for each scenario. In the FISTERA project (Pascu et al. 2005) this latter technique was used, with participants keying in their judgements about each scenario into a groupware system that allowed for rapid calculation and display of results. Figure 7.8 reproduces the results of this exercise.

Several notable features emerged from this exercise. First, none of the scenarios was felt to be a complete representation of the future. Some mixture of elements was most likely. One of the scenarios (SCEN2 in the table—this was the scenario whose headline title was "Sustainable and Inclusive Information Society"), however, was seen by some participants as thoroughly unrealistic, and few expected many of its elements to be apparent. The other scenarios were seen by most participants as liable to be moderately or considerably featured. These results provoked discussion about possible developments, with SCEN2 seen as being too contingent upon a number of relatively unlikely events. We have experience of other workshops, too, where the "radical transformation" scenario was thought to be only reflected to a small extent in near-term futures: but as increasingly plausible as we move into the longer term. Thus it may be worth delving deeper into these issues in the workshop discussions.

In the "success scenario" approach, a step beyond contrasting sub-scenarios can be further characterising the overall success scenario by specifying concrete ideas about how to recognise that the success scenario (and its sub-scenarios) is becoming, or failing to become, a reality. Some preliminary ideas of the sorts of indicator that might be developed may be provided to kick off the work (for example, we

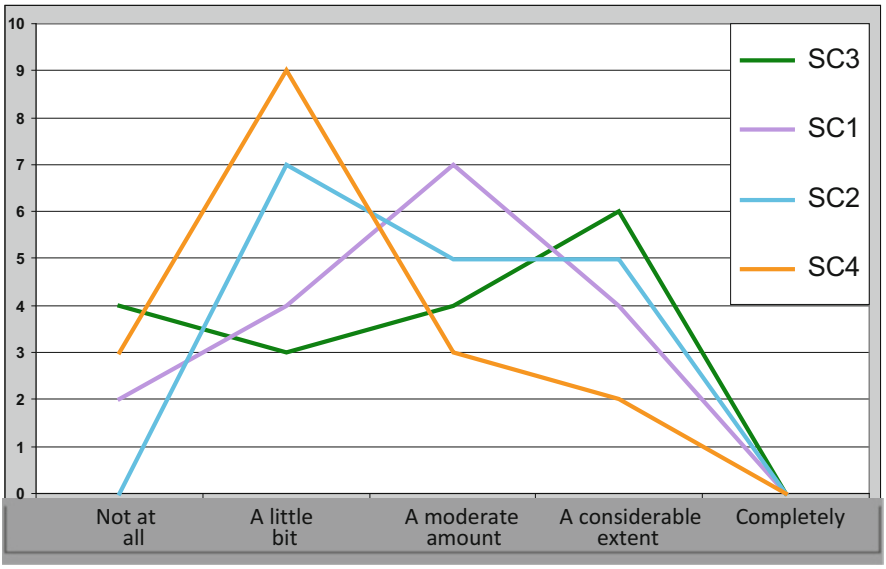


Fig. 7.8 How far the future was seen as being likely to reflect each Scenario, in the FISTERA workshop exercise. *Note:* The figures represent the numbers of respondents rating each scenario in terms of one of the categories on the horizontal axis. *Source:* Green et al. (2005)

might have diffusion levels of an innovation, measures of lives saved or expenses reduced, suggestions about spin-off firms or public attitudes…). The plenary session or subgroups are challenged to suggest plausible quantitative estimates of such indicators—to clarify points of agreement and disagreement, to provide tools for monitoring progress, and to suggest alternatives to the narrow set of indicators that are typically used to drive policies.

Prescriptive Activity

The final element of scenario workshops is usually a session designed to elaborate the implications of the preceding discussions for the actions of various stakeholders. This can be accomplished in various ways, but the underlying activities always involve generation of a series of proposed interventions, rendering these more concrete in terms of who should do what, when, with what objectives, and some process of assessment and/or prioritisation and selection among these.

In this step, it is very helpful to draw upon the expertise of people who have been involved in the policy-making or strategy formulation activities of key sponsoring/stakeholder organisations. They will be able to contribute their understanding of the language and rationales which can be used to "sell" specific policies, the timetables of decision-making systems, existing initiatives that might be used or complemented, and so on.

As discussed above, and illustrated in Box 7.3, one option is for the break-out groups to consider what actions are implied by their specific scenarios—to help

create, change or cope with the developments outlined. A slight variant on this, which has the virtue of introducing a different flavour to the activity, and getting people on their feet, is the "carousel method" (also known as the "samba"). Here, the team members have put a series of flip charts on the wall or on stands around the rooms being used, and the break-out groups (or new groupings of participants, if this makes sense) are encouraged to process around these (each starting at a separate point). They can see the points made by previous visitors to each poster, and comment on these and add new ideas of their own. The various posters may cover *specific themes*, such as research, training, public attitudes, international relations.... in which case the task is to specify what interventions should be made, and who would be responsible for these. Or the posters could cover *various stakeholders* and actors, such as government ministries, Universities, scientific associations, financiers... in which case the task is to specify what interventions they should make, when and with what objectives. It might be useful to assign flip charts to different types of policy instrument, too, though this might constrain creative thinking as to possible actions.

The resulting lists of actions can be transcribed onto a common poster or set of posters), a whiteboard, or a computer/projector system. If time is short, these can be briefly discussed and then voted upon (e.g. each participant allocating a number of votes across a set of actions). If there is more time, rather more sophisticated assessment of the interventions can be made. For example, there could be ratings of the actions (or a set of priority actions chosen through the voting procedure as mentioned above) in terms of the perceived benefits and the likely costs or difficulties associated with them. This can be a relatively simple assessment, or a more complicated one—for example, in a FISTERA "success scenario" workshop, the actions were rated in terms of the participants assessed each proposal in terms of feasibility captured by PREST headings—Political feasibility, Resources (i.e. economic feasibility), Ethical constraints and values (i.e. social feasibility), Sustainability (environmental feasibility) and Technological Feasibility. The various feasibility measures were combined and plotted against an "importance" measure in an approach familiar to strategy analysts. This let us see how the various actions were located in terms of feasibility and importance, and to home in on those that are "immediate" (high importance and feasibility), and those that are "intermediate" (important but less immediately feasible).

It is normal courtesy, of course, to conclude the workshop by thanking participants, and explaining how the organisers will feed back the workshop results to them and to the ForSTI process more generally. This can be a good moment for some words from the project sponsor, for engagement of participants into further activity—and for soliciting any thoughts about issues that have been neglected in the workshop and that demand fuller recognition in future work. On one occasion, the opportunity was taken by a charismatic sponsor to provoke a discussion in the concluding plenary of what the one key message to take away from the workshop would be, and what the single most necessary set of actions would be. Whether or

not this is appropriate will be determined by many factors—not least how tired people are!

7.7.2 The Post-workshop Phase

Finally, after the workshop, there will usually be **Post-workshop** activities, which we group here under the headings Consolidation and Communication.

Consolidation
At a minimum this requires preparing a report on the main activities of the workshop and their results, and circulating this to participants for corrections and comments. This can be an opportunity for people to (be asked to) suggest ideas for narratives, newspaper headlines, early warning signals, and other material that can add to the report. Clarifications can be gleaned about formulations that are found to be ambiguous when trying to write them up; it may be possible to get some sense of whether people approve one or other reformulation of statements that is made in the interests of clarity or precision. On occasion, there will be continuing discussion from a subset of participants, who may (for example) prepare a more impactful scenario narrative.

The sooner this feedback process is accomplished, the better. Memories are liable to fade, motivations to dissipate. The report, and consultation about what to report and how to report it, can help keep things fresh.

Communication
With the exception of work carried out to effect change within a particular organisation, there is usually an intention of reaching a wider audience, one going beyond the participants and immediate sponsors. Apart from presentations made face-to-face with sponsors and perhaps other organised stakeholders, the main form of such output will be a published report, outlining the results of the scenario workshop (e.g. in the form of elaborated scenarios, lists of key drivers and shapers, indicators, activities that need to be undertaken, etc.). It is also common to explain the context of the workshop and present dome of the background material. Historically this has mainly taken the form of a published document (and associated abstract, press releases, etc.), with add-ons such as dramatisations or illustrations of scenario elements being rather a luxury. With web publication and the scope for social media to enable other parties to input, this is liable to change—though the results may not always be easy to manage, unless a moderated forum of some sort is employed.

Material can, of course, be presented in many different ways—and different audiences may respond best to one or other approach. The systematic nature of the approach can be communicated by tables (for example comparing a set of scenarios in terms of key parameters), by timelines of events, even by use of graphs. Some

audiences will be more convinced by vignettes, looking for plausibility in narratives. Illustrations of activities in an imagined future context can be very telling (but often date rapidly, as clothing and other design elements can vary rapidly).

Other outcomes of a scenario exercise will take more the form of decisions about follow-up meetings, about topics where further research is required, about issues to raise with stakeholders, etc. It may feed into other scenario exercises in this, or other, ForSTI activities. Box 7.4 presents a further case study on the use of scenarios in ForSTI.

Box 7.4: Scenarios – Case Study

This case study concerns a study aimed at *Identifying Future Opportunities for EU-Russia STI Cooperation* (2009–2013). A scenario analysis was part of this study, which also included a two-stage Delphi study and a set of thematic workshops.

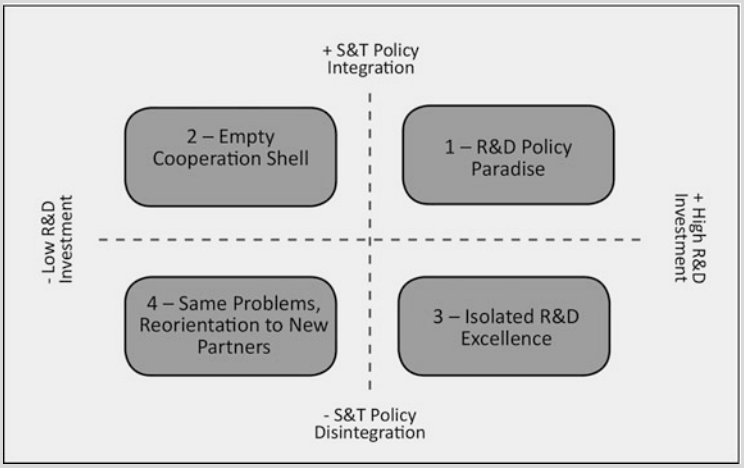
The starting point for scenario development was a "***creativity workshop***" held at the Institute for Prospective Technology Studies (IPTS) in Spain. It was devoted to discussion of critical variables and definition of the dimensions of the structural scenarios. A joint scenario grid was established and scenarios located in the grid. On this basis, small expert groups developed different scenarios and sketched out first scenario descriptions. The key dimensions considered within the scenario workshops were: R&D investment (low-high); S&T policy (integration-disintegration); key players (public-private); and performance (low-high).

The creativity workshop was followed by a series of **scenario workshops** with participation of policy makers from EU member states and associated countries and from Russia, along with experts and researchers in STI cooperation. The scenario workshops explored policy measures that would assist in STI cooperation—**these** "discursive spaces" enabled the exchange of information and of (converging and diverging) views on the structural arrangements for, and thematic orientation of, R&D and innovation cooperation. In turn, this facilitated the building of partnerships among the stakeholders—a process outcome of the work, along with the actual scenarios as products of the exercise.

Four scenarios describing potential EU-Russian S&T and innovation cooperation were selected for consideration by the participants—they outlined one optimistic, one pessimistic and two intermediate scenarios, and provide some narrative to describe these. Expert workshops with policy makers, representatives of funding organisations and researchers were then conducted to validate the scenarios and flesh them out in more detail, and the likelihood and desirability of the scenarios was assessed as part of the subsequent Delphi survey. The four scenarios are displayed below.

(continued)

Box 7.4 (continued)



Briefly, these scenarios were:

1. **R&D Policy Paradise** (assessed by participants of the Delphi study as rather unlikely but very desirable)
   (a) a decade of prosperous cooperation
   (b) Russia's successful and deepening participation in Horizon 2020
   (c) formation of a free-trade zone
   (d) Russia's joining the Organisation for Economic Co-operation and Development (OECD)
   (e) establishment of a joint EU-Russian research fund
2. **Empty Cooperation Shell** (rather likely but undesirable)
   (a) low and decreasing investment in R&D cooperation
   (b) lack of qualified personnel despite a strong interest in cooperation
   (c) draining of key human resources for public research centres by private Russian firms
   (d) discouragement of participation in R&D cooperation due to inadequate incentives
3. **Isolated R&D** Excellence (probable but very undesirable)
   (a) scientific isolation accompanying economic globalization
   (b) attempted creation by every macroregion (e.g., the EU and Russia) of the best "ivory towers" and centres of excellence to remain competitive in their specialties
   (c) R&D cooperation limited to specific areas
   (d) Russian focus on topics such as nuclear fission and defence, EU focus on different topics such as green energy and aging

(continued)

Box 7.4 (continued)

4. **Same** (i.e. Persisting) **Problems, Reorientation toward New Partners** (probable but undesirable)
   (a) because of limited EU enthusiasm to promote joint research projects, a shift in R&D cooperation by Russia toward the Eurasian Union
   (b) by 2020, continued third-country status for Russia in Horizon 2020
   (c) uncertainty persists in R&D governance issues, including Russian intellectual property rights policies, visa procedures, and convergence of standards (e.g., Bologna Process)
   (d) little improvement in quality or scale of cooperation.

The Delphi survey revealed wide agreement on the relevance of such broad topics as energy, transport, health and nanotechnologies, for STI cooperation between the EU and Russia, and the study ultimately resulted in a joint research call.

For more information on the project see Haegeman et al. (2015) and Sokolov et al. (2014).

7.8 Conclusions

We have reviewed a range of scenario methods, and focused particularly on the practicalities of Scenario Workshops, illustrating these with material drawn from a number of exercises. These workshops are intended to contribute to decision processes, and in conclusion we should note that there are several elements to this:

- The activity brings a wider span of knowledge into the process. Participants share relevant thinking in new ways (they are discouraged from delivering their conventional speeches, for example, and asked to relate their expertise to the points that others are bringing to bear). As in ForSTI more widely, the benefits of this can be viewed technocratically (as increasing efficiency by accessing more knowledge), or democratically (as enabling wider participation through deliberative means).
- The scenarios should provide insight into how the focal topic is influenced by various driving forces and their interactions, what some of the major uncertainties may be, and what sorts of contingency may need to be addressed. Often the activity will provide new insights and bring together material that has previously been compartmentalised. The participants will improve their understanding of each others' points of view, and how different stakeholders might respond to various contingencies.
- The workshop is likely to arrive at suggestions of possible actions, and some assessment and prioritisation of these; results developed from such a process

can be more valuable to decision-makers than the established opinions of a few (possibly self-serving) individuals. Of course, such lists are not translated automatically into policy actions—the decision makers have their own judgement to exercise and choices to make, though there is now a reference point at which the decisions can be compared.

- These inputs may serve to provide sponsors with huge amounts of intelligence which they previously lacked. Or they may serve to confirm what the policy expert already believed, but legitimise this by validating the views by reference to a wider set of experts and stakeholders.

As in many other ForSTI activities, client involvement often proves vital in the design, conduct, and eventual use of the scenario workshops. Without such involvement, the exercises would not have been adequately tailored to the decision-making needs of the sponsors. Client participation in the activities helps ensure that there were "champions" for the scenario work within the sponsoring organisation, who could take the messages of the study further. This could be seen as a matter of disseminating the products of the exercise further. Equally, it can be viewed as a matter of extending the process of the exercise. Design to allow both of these dimensions to be maximised is needed to make sure that scenarios effectively contribute to decision making.