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# Robust workforce planning

## Experiences and best practice

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# Abstract

**The Centre for Workforce Intelligence has developed a new approach to improve the process of health and social care workforce planning, which we call robust workforce planning (RWP). Rather than attempt to predict the future, RWP recognises the intrinsic uncertainty and complexity of factors influencing workforce demand and supply.**

Decisions made about workforce requirements need to work well across a range of futures in order to be robust against uncertainty. By analysing the key issues and uncertainties, we generate a set of plausible and highly challenging scenarios. Workforce demand and supply is then forecast for each scenario to understand how workforce numbers or skills might change over time. Prospective policies can be tested against these scenarios to see which one is the most effective.

An introduction to the RWP framework is presented in an earlier technical paper in this series, robust workforce planning framework: an introduction (CfWI, 2014a). This paper describes key learning points in applying the framework across a number of projects.

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# Key points

1. The CfWI has developed a robust workforce planning (RWP) framework to improve health and social care workforce planning.
2. The framework has been applied across a number of projects.
3. The approach has proved highly effective, and significant policy decisions have been made as a result.
4. Key learning points are provided on starting a workforce planning project, horizon scanning and scenario generation stages of the framework, and identifying key policy factors.

# 1. Introduction

**This technical report, by the Centre for Workforce Intelligence (CfWI), covers important areas in workforce management, planning, and intelligence, and reflects on the experiences from existing projects. This report provides an update to the robust workforce planning (RWP) framework introduced in an earlier Technical paper, robust workforce planning framework: an introduction, and should be read in conjunction with that paper.**

The framework has four stages:

- horizon scanning to elicit the uncertain driving forces
- scenario generation to produce challenging futures
- workforce modelling to forecast workforce demand and supply across these futures
- analysis to identify the most robust policies across these uncertain futures.

This paper focuses on the critical horizon scanning and scenario generation stages, as these demand considerable expertise gained by practice rather than the application of strict formal methods. It also introduces an approach to identifying key policy factors for modelling. Subsequent papers in this series will provide further information on the planning framework. In particular, the technical paper discussing the robust workforce planning medical model technical description (CfWI, 2014b), explains the system dynamics model developed for the Medical and Dental Student Intakes (MDSI) project, and *Technical paper, modelling: best practices in SD* (CfWI, 2014c) will provide an in-depth guide to best practices in developing system dynamics based workforce models, covering the development life-cycle.

The paper is divided into six sections. In Section 2 we discuss how the framework may be applied to a specific workforce issue and setting up a project. Section 3 looks at horizon scanning and the critical linkage with scenario generation. Section 4 considers the scenario process and the use of the Delphi method for quantifying the scenarios for modelling. Section 5 presents initial work on identifying policy factors. Section 6 concludes this paper with a summary of the key learning points.

## 2. Starting the project

**The first stage is to establish the workforce project where we will be using the framework. There are many textbooks available on project management, so this aspect will not be covered here. There are, however, several specific areas that need to be addressed if the project is to be a success.**

### 2.1 Problem and scope

The first step is to understand the problem we are trying to solve. This is the exam question, the focus of the workforce exercise. In workforce management it might be ensuring that workforce supply is sufficient to meet demand, or a more complex issue concerning the numbers and proportions of people across several workforce areas. Once the fundamental problem that policymakers need to resolve has been identified, the goals and objectives should follow logically.

The problem statement needs to be clear and precise, and not merely a symptom of an underlying problem. Any assumptions inherent in the problem should be stated. A useful approach is to break the problem down by asking the following questions:

- What is the problem we are trying to solve?
- Why is it important, why not a different problem? Is it the right one?
- What are the key uncertainties and worries?
- What are the key issues of concern?

Getting the right problem is critical, so it may be helpful to generate alternative views to create new insights. What are the givens where no further discussion is needed? How would a customer or a service user define the problem? What if the problem were made larger or smaller?

The project scope must also be established and this often requires considerable debate. A simple tool – a list of what topics are in or out of scope – can be highly effective in removing the confusion that often surrounds these discussions. Different people often have opposite views of what a project should address, and it is important to avoid requirements creeping in that do not belong or cannot be reasonably delivered. The scope definition needs to include:

- the boundary of the project
- the scale of the problem – whole of the workforce, staff groups, or specific roles and competences
- the geographical area – local, regional, national or global
- the time horizon – how far in the future
- the nature of the decisions that need to be made – short-term actions needed to correct current under- or oversupply, medium-term actions to make operational decisions, or long-term strategy setting.

## 2.2 Stakeholders

A major feature of the framework is the high degree of stakeholder involvement, which is critical in arriving at a shared view of future challenges and in agreeing political decisions. Stakeholders are involved from the start in confirming the scope and time frame for the investigation, and in all subsequent stages. It is often useful to map the different stakeholder groups by their power and interest in the project. This will help identify engagement and communications activities and how progress will be reported to stakeholders during the project.

Depending on the nature of the project, a stakeholder reference group may be needed. This should have clear terms of reference to define its role, for example:

- providing project assurance and specific expertise
- identifying sources of data and approving assumptions where data is missing or quality is low
- identifying participants for the horizon scanning and scenario workshops
- approving the high-level workforce model technical specification
- agreeing the policy levers to be tested against the scenarios
- signing off the project deliverables and providing feedback.

## 2.3 Start with the end in mind

The four stages of the framework are linked and each provides information that feeds into the next. Thus the horizon scanning stage identifies the key external drivers that feed into scenario generation. The scenarios uncover the intrinsically uncertain parameters that vary across plausible futures, and which impact the key question of concern. The workforce model takes these quantified parameters together with the parameters that decision makers have the power to control (policy levers) and known data and assumptions, and provides forecasts of workforce demand and supply.

The design of the workforce model requires knowledge of what policy levers are likely to be used, and which uncertain parameters will need to be quantified. So it is important to work backwards from the policy decisions that may need to be made, and think about what outputs are required from each of the stages to enable these decisions to be modelled and analysed. There may be some parameters that cannot be modelled, or limitations to the available data, which may lead to decisions being needed as to what is practically possible.

As a general rule, it is better to use the simplest approach and only add complexity once the findings have been thoroughly analysed, and only then if there is solid evidence that it will improve accuracy. Complex models are often less accurate than simpler ones, especially when dealing with uncertainty. Simple models are easier to understand, and are consequently less prone to mistakes.

## 3. Horizon scanning

**Horizon scanning is used to undertake a systematic exploration of the likely future developments, driving forces, and potential issues that could influence the workforce requirements over the period under investigation. These include technological, economic, environmental, political, social and ethical (TEEPSE) driving forces on an unfolding future.**

Driving forces can be classified as:

- **Constant** – these are structural factors that are unlikely to change over the time period, such as the need for food and water.
- **Predetermined** – change in these forces, for example demographics and population growth rates, is largely predictable and can be forecast with reasonable accuracy. Consequently, the future outcomes and probabilities are known. They may be slowly changing factors that are already in the pipeline, or the inevitable result of the current situation.
- **Uncertain** – these are fundamental uncertainties that might result in a range of plausible future outcomes, such as the economic outlook in Iraq or Afghanistan. Consequently, the probability of specific outcomes is not known.

The goal of the horizon scanning stage is to identify and classify these forces, and provide a synthesis of the findings that can be used in scenario generation.

### 3.1 Scope of the horizon scanning

The horizon scanning can be broad, across the whole of health and social care, or focused on a specific care area or profession. At the broad level are the big picture challenges (CfWI, 2013), sometimes called grand challenges, which require concerted, often multinational action, to resolve. These include demographic and social challenges such as the ageing population and ageing workforce, and uncertainty over the financial and economic outlook. Analysis of the big picture challenges will identify many of the key driving forces that act across the system. Focused horizon scanning will usually involve systematic and structured information gathering with key stakeholders and identified experts to elicit their thoughts.

### 3.2 Information gathering

Irrespective of the scope of the horizon scanning, information may be gathered in a number of ways, including focus groups, telephone interviews and one-to-one meetings. Focus groups are not recommended; it is important that participants speak for themselves and are not influenced by others, as may be the case if they are in the same room. Structured interviews may be held over the telephone or in person. These can be highly or loosely scripted, depending on the people involved and skill of the interviewer. Ideally, one-to-one interviews should be held which are recorded (given the participant's permission) so that the answers can be analysed at leisure. The questions should be designed to explore the future and then to move outside of the organisational context of the interviewee.

### 3.3 Who should be involved?

Participants in the horizon scanning interviews should be selected for a range of skills – their knowledge of the subject area or the nature of the problem, or people with ‘maverick’ views who challenge the status quo. It is the latter who are particularly important since the purpose of the horizon scanning is to explore future possibilities and uncertainty. These individuals may not necessarily be ‘experts’ in the conventional sense but perhaps bring in insights from other fields and disciplines.

### 3.4 What is required for the scenario stage

The starting point for the scenario workshop is to discuss the driving forces that impact the key issue of concern. The forces identified in the horizon scanning interviews need to be analysed and structured so they can be easily digested, for example around the TEEPSE framework.



## 4. Scenario generation

**Scenario thinking focuses on how the future might evolve. Scenarios are essential for workforce planning, since it is not possible to predict the future accurately. Scenarios are particularly useful since a range of plausible futures can be generated and demand and supply projections made. Workforce plans can then be assessed against the scenarios for robustness. A baseline scenario (where all trends continue as at present) may be included to illustrate what might happen if nothing changes.**

Scenarios are based around high-impact and high-uncertainty driving forces which shape the future. The method creates plausible stories about the future that capture what might happen in a memorable way. Scenarios are not accurate forecasts but ‘tools to aid thinking’. There is no probability associated with each scenario.

### 4.1 Scenario workshops

There are many ways to structure the scenario workshop, but the following have been found by the CFWI to work well in practice based on our experience.

- Workshop numbers are ideally between 15 and 25 people. Smaller numbers make it difficult to get a representative range of participants for the cross-fertilisation of ideas, and larger numbers are difficult to organise and manage.
- The workshop is conducted under the Chatham House Rule (Chatham House, 2013): ‘When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed’.
- The workshop requires at least one full day, and participants need to stay for the whole time, particularly towards the end of the day, as this is when the scenarios are formed. Experiences with workshops extending into two days are that it is often difficult to get busy professionals to give their full commitment over the entire period.
- The workshop needs to be guided by at least two people: a facilitator and a recorder to document the outputs. A camera should be used to record completed clusters and scenarios. Scenario explanations should be recorded to ensure that nothing is missed.

### 4.2 Key driving forces

As noted in the previous section, the starting point is to consider the key driving forces that may impact the focal issue of concern. These will have been identified by the horizon scanning, but workshop participants need to be given the time to review and understand them, and identify any that are missing. In a two-day workshop several hours can be set aside for this, but in a one-day workshop there is only limited time available. Assuming that the horizon scanning stage has identified the key forces, they can be written up on Post-it® notes and placed on a board grouped under the TEEPSE categories. This helps to identify areas where additional driving forces may be needed.

The driving forces are then presented and discussed as a group. Participants are asked to write up to five *additional* driving forces on Post-it® notes and explain them to the group. If these are new, they can be added to the set, but any duplicates are discarded. It is important that these are driving forces and not simply topics, such as ‘health expenditure’; they should point towards an outcome or direction, for example ‘change in health expenditure’. They should not indicate the direction of change unless it is inevitable. Participants should not focus on today’s or past changes and challenges, but on drivers of requirements for the future, possibly several decades ahead, depending on the scenario timescale.

### 4.3 Clustering the driving forces

Clustering is necessary to reduce the number of driving forces (there might be several hundred) into more manageable chunks, grouped around a higher-level factor. Participants often confuse the clusters with scenarios so it is important to explain that they are simply building blocks, effectively ‘mini-scenarios’.

The process of forming the clusters is to allow workshop participants to form their own groups (they can have a group of one) rather than prescribe group membership. The clusters need to describe the causal connections between driving forces, so it is useful to spend some time discussing cause and effect, and how these influences are mapped.

During the generation of the clusters it is important to check for overlap, as this will cause difficulties when they are ranked by impact and uncertainty of outcome. Clusters that strongly overlap should be combined. A cluster should contain no more than about ten to fifteen driving forces so that they remain focused on a clear theme.

The final stage of the cluster development is where two extreme outcomes are described. By extreme we do not necessarily mean opposite, nor do we consider likelihood. A useful way of thinking about this is that each of the driving forces in the cluster can go in different directions. They may increase or decrease, change more quickly or more slowly. If a driving force at the start of the cluster increases, then the effect on connected forces may cause them to move in particular directions, so this change ripples through the linkages, leading to a specific outcome. The two extreme cluster outcomes should be captured as bullet point lists on separate sheets of paper, and are not confined to the cluster but should include wider side effect and impacts, for example on the organisations and people involved.

Finally, when the two extreme outcomes have been mapped, the cluster needs to be named and a brief description created. As noted previously, clusters are not scenarios, so the name should be descriptive rather than creative or memorable. A short description (one or two lines of text) is important, as participants need to recall the clusters when they start to construct the scenarios.

### 4.4 Impact uncertainty matrix

The impact/uncertainty matrix is the most difficult part of the workshop. The purpose is to find the two clusters of most critical uncertainty and impact that will form the basis of the scenarios. Participants often find this process confusing, so it is important to spend time explaining what is going to happen.

The *impact* is on the key decision or focal issue of concern, so it is worthwhile reviewing this again. In most cases the impact is easy for people to understand, as it is about the changes to workforce numbers, requirements and/or proportions.

The *certainty* is around the direction and nature of the change, for example whether supply or demand or both are impacted, whether the change in numbers is up or down, or the nature of the shift in workforce proportions. We know the strength of the impact, so this is purely certainty around the *kind and direction* of impact on the focal issue. All clusters are plausible and could happen, so we exclude all discussion of probability. The following table shows example clusters organised by uncertainty and impact.

**Table 1: Impact uncertainty matrix**

This illustrates which clusters are the highest impact and lowest certainty – and therefore the most important for creating uncertain but challenging scenarios.

| Step 1       | Lower impact                                                                                                         | Higher impact                                                                                                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| More certain | <ul style="list-style-type: none"> <li>▪ Patient empowerment</li> <li>▪ Attractiveness of medical careers</li> </ul> | <ul style="list-style-type: none"> <li>▪ Global pandemic</li> </ul>                                                                                                |
| Less certain | <ul style="list-style-type: none"> <li>▪ Environmental change &amp; health of population</li> </ul>                  | <ul style="list-style-type: none"> <li>▪ Health of population</li> <li>▪ Economy &amp; Investment in research</li> <li>▪ Patient power and health needs</li> </ul> |

**Source:** The Centre for Workforce Intelligence

The cluster descriptions are as follows. Note that these are examples and should not be taken as definitive statements:

- The **Patient empowerment** cluster is about whether patients in the UK become more 'expert' in medical matters, driven by greater access to data such as online information, which has some impact on increasing demand for services. This is an expected feature of all scenarios, but the impact is seen as weak although the direction relatively certain (demand increases).
- The **Global pandemic** cluster concerns the spread of an infectious disease across Europe with consequent impact on the health of the population and medical workforce. Outcomes vary greatly around the spread and length of the pandemic, but it is assumed to have a major impact on both workforce supply and demand. The impact is seen as strong and the direction certain (supply decreases and demand increases).
- The **Attractiveness of medical careers** cluster assumes the continued popularity of the profession, which is largely irrespective of the state of the economy. This ensures a continued pipeline of applicants to medical education, supporting selection for the 'right' quality so there is little impact on workforce supply. The impact is seen as weak and the direction certain (supply maintained).

- The **Environmental change and health** cluster is about the impact of global warming on food and water supply and the spread of new diseases. This could cause a rise in illness, or an improving climate might improve health. The impact is seen as weak and the direction uncertain (it is not clear if demand would increase or decrease).
- The **Health of population** cluster is a combination of the increasing population – the in-the-pipeline demographic change – and the less certain compression or expansion of morbidity. The impact is strong and the direction uncertain (increasing or decreasing demand for health services).
- The **Economy and investment in research** cluster concerns the impact of economic factors on the government's willingness to invest in research and the stability of research funding. The impact is strong and the direction uncertain (supply and/or demand may increase or decrease).
- The **Patient power and health needs** cluster focuses on the relative influence of the patient population and whether the needs of the population or the profession prevail. The impact is strong and the direction uncertain (demand may increase or decrease).

The interpretation of cluster impact and uncertainty of outcome has to be carried out as a group exercise, and considerable skill is required on the part of the facilitator to keep the discussion on track and focused. There is no correct answer; different workshops are likely to arrive at different perspectives, as this will vary by participants and the key question of concern.

## 4.5 Delphi method

A unique feature is the use of a Delphi process to quantify key workforce variables. Experts make quantitative judgements, and share the reasoning behind them over several rounds to decrease uncertainty and refine the values. This is an empirical technique which can be conducted in a variety of ways, including a group Delphi workshop. We have chosen to use the 'standard' approach where participants are anonymous, supported by web-based software ([www.surveymonkey.com](http://www.surveymonkey.com)).

Ideally, participants in the horizon scanning and scenario generation exercises should be involved in the Delphi process, as they will be familiar with the aims of the project and the scenarios. But participants can be replaced and new ones invited if it is felt that their knowledge and expertise will add to the exercise. New outside views can be very helpful as a means to gaining new perspectives and stopping the process from taking the 'official line'.

There is no hard-and-fast answer as to the number of people taking part in the exercise. However, Delphi studies are rarely conducted with fewer than ten participants. The survey involves a great deal of time and effort in coordinating and collating responses, and maintaining a high level of communications to ensure that people do not drop out between rounds, so numbers exceeding fifty would require much support, and would not necessarily lead to better answers.

It is important that the greatest possible proportion of participants complete the survey, since if a large portion (say 50 per cent) of the subjects discontinues their responses during various stages of the Delphi process, the quality of information obtained could be discounted or at least critically questioned. This is the reason why the number of Delphi questions should be controlled. There is no

hard limit to the number of questions, but if the survey takes longer than an hour or so to complete, this risks reducing the uptake of each round.

## 5. Identifying policy factors

This section provides an introduction to policy analysis from the perspective of workforce planning. The framework developed by the CfWI allows policies to be tested against plausible but challenging scenarios to find out which is the most robust. Policies may be suggested as a 'what if' exercise, or derived from published proposals or legislation. Irrespective of their source, a necessary part of the process is to analyse prospective policies systematically. Further research is required and this will be addressed in a subsequent technical paper. However, the following may be useful as a starting point for the analysis.

### 5.1 Introduction

The policy analysis process may be required to investigate proposed policies or to develop new policy options. Some options will be easier to implement than others (for example, more politically acceptable) and policies may vary in how effective they are in achieving the desired outcomes.

Key questions to consider include the following.

- Who is involved?
- What policy options are available?
- Do new policies need to be developed?
- Which ones are the most effective?
- What are the trade-offs between policy options?

The following sections cover these areas in more detail.

### 5.2 Who is involved?

Any policy is likely to involve a number of stakeholders who have vested interests in the success or failure of the outcome. This includes those who are creating the policies, and the intended recipients of the policy outcomes. There are a number of questions to consider:

- Who are the main stakeholders (individuals or organisations) in the policy process?
- What are their priorities and (possibly hidden) agendas?
- What is their interest in the policy process? An influence/interest matrix can be helpful to identify stakeholders with high power and high interest.
- Which stakeholders have significant power to influence the policy, and who in turn influences them?
- At which stakeholders is the policy aimed? Do they have a say in the policymaking process?

- Do other stakeholders act for those at whom the policy is aimed? If so, do they have the authority and agreement to act?
- What are the overarching technological, economic, environmental, political, social and ethical (TEEPSE) drivers and trends that may influence the policy process and implementation?

### 5.3 Analysing existing policies

The starting point is to understand and define the policy. The historic context is important in understanding how the need for the policy has been arrived at, how the policy has been developed, and the evidence on which it is based. There may be issues and uncertainties which need to be surfaced, and may require further investigation. There may also be unstated factors driving the development of the policy, and desired outcomes that are not stated.

The following areas should be investigated in exploring the context around existing policies:

- What is the problem that the policy aims to resolve?
- What are the intended outcomes and impact?
- What are the urgent policy issues?
- What are the uncertainties and risks, political or otherwise?
- Who are the policymakers? What is their current thinking?
- What is the policymaking process or framework? What are the opportunities and timings for input into the formal process?
- What sort of evidence is needed to make decisions?
- What are the sources/strengths of resistance to the policy?

### 5.4 Developing new policies

If new policies are to be developed for testing and analysis, this must start with a clear statement of the problem. It is often helpful to conduct a root cause or causal chain analysis to understand how the problem has arisen and areas to be addressed. Potential policy solutions can then be proposed and evaluated so a selection can be made. The evaluation can be made against a set of criteria (for example, equity, efficiency and practicality). Thornley et al. (2011) give a useful list of criteria for policy design and assessment:

- **Targeting** – the focus of a policy must be carefully matched to its objectives.
- **Transparency** – the detailed substance and mechanism of policy should be known.
- **Coordination** – a policy is likely to be more effective if it builds on and leverages existing policies and markets.

- **Engagement** – up-front and ongoing engagement... is important for clarifying needs and building support.
- **Commitment** – the level of real or presumed commitment to a policy from Government, both in duration and resources, should be consistent with the need.
- **Implementation** – an institutional context and infrastructure that supports efficient delivery and modification is critical to success.

Policy design critically depends on knowing where the most effective interventions can be made in the system. This requires an analysis of the system the policy exists in, and which it is intended to influence. This is best done from a systems thinking perspective, which will ensure that we address the fundamental aspects that make up any system, and do not leave anything important out (Vester, 2012, pp.211-216).

Some parameters in the system will be controllable (so-called levers of change) and others will be outside the sphere of influence of the policymaker (exogenous factors). However, finding the best levers to control a system effectively can be difficult, as levers vary in their speed and impact. Some may even lead to counter-intuitive responses, as a result of feedbacks and delays in the system. If a policy is to be effective, the right levers need to be changed. Meadows (2009, p.145-265) gives a particularly useful list of places to intervene in a system in increasing order of effectiveness:

12. **numbers** – constants and parameters such as subsidies, taxes, and standards
11. **buffers** – sizes of stabilizing stocks relative to their flows
10. **stock and flow structures** – physical systems and their nodes of intersection
9. **delays** – lengths of time relative to the rates of system changes
8. **balancing feedback loops** – strength of the feedbacks relative to the impacts they are trying to correct
7. **reinforcing feedback loops** – strength of the gain of driving loops
6. **information flows** – structure of who does and does not have access to information
5. **rules** – for example, incentives, punishments and constraints
4. **self-organisation** – power to add, change, or evolve system structure
3. **goals** – purpose or function of the system
2. **paradigms** – mindset out of which the system (including its goals, structure, rules, delays and parameters) arises
1. **transcending paradigms** – moving beyond challenging fundamental assumptions into changing core values and priorities.



Further research is being conducted by the CfWI on the use of systems thinking to determine which factors in the system are most influential, and thus of interest as potential levers of change.

## 5.5 Policy evaluation

By policy evaluation we mean the future effectiveness of an individual policy. Scenarios are typically used to define plausible but challenging futures, and these can be used to test policies. Some policies may perform well in some futures and less well in others.

Measures of workforce policy effectiveness over time may include:

- the match between demand and supply
- overall workforce cost
- workforce characteristics such as age profile and participation rate.

Lempert et al. (2013) define the term ‘regret’ as the distance from optimality for any strategy in any future state of the world – the difference between that strategy’s performance in that future and the performance of the best strategy in that future. This focuses attention on the futures that matter, where policy choices can make the most difference.

Further work is needed on both qualitative and quantitative metrics for policy evaluation. This will be covered in a future technical paper.

## 6. Key learning points

The RWP framework has been refined and tested over a number of projects, including the Medical and Dental Student Intakes (MDSI) project. This project modelled the future demand and supply of doctors and dentists for the Health Education National Strategic Exchange (HENSE) review group (Department of Health, 2012). A number of scenarios and policies were investigated to inform the recommendations on future student intakes, and this directly led to the implementation of a 2 per cent reduction in trainee doctor numbers. The analysis also highlighted issues over data quality, so that no decision was made on dental school intakes.

Experiences gained from this and other recent projects have resulted in the following key learning points.

- **Start with the end in mind** – Having defined and agreed the key problem of concern, work backwards through the framework stages, starting with what policies may need to be analysed and thus what factors may need to be modelled, and then identify the critical uncertainties that will need to be addressed by the scenario generation process. This will help to ensure coherence between the stages.
- **Consistent stakeholder involvement** – Try to involve the same stakeholders who participate in the horizon scanning in the scenario stage. The understanding that they build up by being involved in successive stages will add greatly to the results. It will also help improve the quality of the Delphi quantification process outputs.
- **Experienced workshop facilitators** – The scenario generation workshop requires a minimum of two experienced facilitators and careful planning. It is worthwhile to produce a script and practise beforehand, as it is all too easy to overrun stages such as clustering, and find that there is insufficient time to generate and refine the scenarios. If the scenario stories are not well developed, this will create uncertainty for the participants in the Delphi process.
- **Formal policy analysis** – As noted previously, analysis of prospective policies is important to understand what factors may need to be modelled. Further work is needed to develop a formal framework for deriving the factors, but in the absence of this we have found that the checklists given in Section 5 are a useful starting point.

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