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Scenario Analysis for Managers

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SCENARIO ANALYSIS FOR MANAGERS

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1 INTRODUCTION TO SCENARIO ANALYSIS

1.1 PURPOSE OF THE BOOK

All managers and students of business have, at some point in time, been involved with scenario analysis. With scenarios, managers attempt to anticipate events in the future and to evaluate the worth of their strategic intentions. If you are reading this book, scenario analysis is likely to be something that you would like to know more about. Even though scenarios are frequently mentioned, it is rare that students in universities take a scenario analysis class. Instead, scenarios would have been mentioned by instructors in management and strategy classes. In management meetings, what is meant by scenarios can be extremely diverse in terms of scope and scale. Scenario analysis is one of these topics that everyone knows about, but typically knows quite little!

This describes fairly well my own experience with scenario analysis. It was frequently mentioned in decision making and strategy classes when I studied for my MBA, but we rarely performed a scenario analysis, and when we did, it was deceptively simple. In management meetings throughout my career, I have often been part of discussions about what would happen ‘in that scenario’.

This changed when a few years ago I was asked to lead the elaboration of a scenario analysis as part of a large scale European applied research project. It is during this project that I finally decided that I could not continue to just ‘talk’ about scenarios. There had to be more to scenario analysis than just hearsay! I was expecting to find some clear processes that I could follow and examples of scenarios that I could use to make sense of how to do a better job. Instead of a short story about the future, or a comparison of optimistic and pessimistic sales figures for a company, I wanted to see practical examples like the one shown overleaf in figure 1.1.

I was not immediately successful. I had limited time and nearly no budget, so I visited websites, bought books, and read research papers. I saw very few diagrams like the one in figure 1.1 to give me an idea of what the ‘final product’ would look like. The more I read, the more mysteriously unreachable and complex scenario analysis was becoming. It took a lot more reading, attending scenario analysis conferences, etc. before I started to build a more tangible understanding and practical sense of scenario analysis. In their book presenting the famous Oxford Scenario Planning Approach (OSPA), Ramirez and Wilkinson (2016) state that there is no barrier to entry to perform a scenario analysis. As explained above, this is right, i.e. all of us have been involved with scenario analysis without knowing much about it. This does not mean that it is easy to learn more than intuitive steps about scenario analysis though, and for this reason, I believe that there is a barrier to improving one's practice of scenario analysis.

The purpose of this book is to be remove this barrier to learning. It is a simple yet serious text through which students and managers that are new to scenario analysis can quickly learn about it. My aim is to allow readers of this book to confidently have a go at scenario analysis within a few hours by giving them a robust starting point. In contrast with authoritative sources on scenario analysis that define it as a team exercise, this book is written with individuals in mind. It is undeniable that much of the power of scenario analysis is derived from team processes, but it is important that all group members start with a good grasp of scenario analysis as a technique at an individual level.

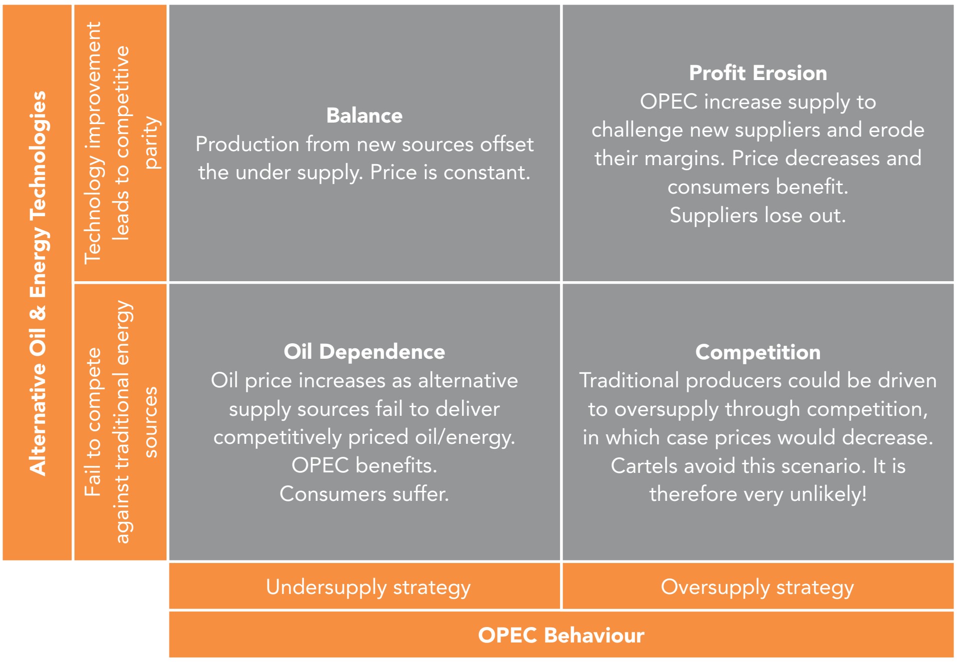

Figure 1.1. Example of a scenario analysis prepared to assess likely future oil price movements by contrasting the behaviour of OPEC countries with the development of alternatives sources of oil (e.g. shale oil) and energy (e.g. renewable energy).

1.2 THE ANATOMY OF SCENARIOS

Before we start looking at process, i.e. the method through which figure 1.1 was prepared, it is useful to understand the anatomy of the end product, the scenarios. To begin with, a point about spelling: one scenario, two scenarios. You may run into people arguing that the plural of scenario should be *scenarii (*or another exotic plural spelling). Only 'scenarios' is correct and the *scenarii* spelling is what linguists call hypercorrection, the creation of usual language forms by applying an erroneously perceived grammatical rule. So, do not let others sway you away from writing 'scenarios'.

A simple way to think about scenarios is that they are stories about the future. Figure 1.1 shows four such stories. Depending on how much you know about the oil sector and about economics, these stories will be more or less easy to understand. For somebody who knows nothing about the oil sector, these stories may be a bit cryptic. To an expert in oil economics, these stories will appear to be overly simplified, if not trivial. This difference in perception can be explained by the fact that scenarios are always based on underlying theoretical models and frameworks, i.e. theoretical explanations of how things work. These models are not explicitly shown in figure 1.1, but they were used to prepare it and they would be used to tell the stories. First is technology roadmapping, a technique which looks at the typical patterns of development of technologies such as the extraction of shale oil and the production of electricity or other 'fuels' (e.g. hydrogen) from renewable energy sources. By comparing these new technologies to others from the past, different possibilities about the technologies' future competitiveness are considered. The second model is the classical economics model of price determination as the equilibrium between supply and demand.

In order to use the models to create the stories, we need to feed them information. This information is structured around scenario variables. These variables are external strategic factors, i.e. things that affect our future or the future of a business, but things that as decision makers we cannot change. There is a debate amongst scenario analysis experts regarding whether or not internal factors, i.e. things that we manage and therefore can change, should be used as variable. We will return to this discussion in the next chapter, but for now will proceed with the principle that scenario variables are always external. The first variable in figure 1.1 is the behaviour of OPEC (Organisation of the Petroleum Exporting Countries) countries. OPEC countries are a cartel arrangement, which means that members of this cartel communicate with each other to control market price. They can do so because they control the majority of oil supply and can, pretty much at will, 'open or close' the tap of oil supply. If they 'open the tap' they supply more oil than is required, which sends market prices down, giving them less money for their output. Not a desirable outcome. If they 'close the tap', demand will outstrip supply and the price of oil will increase, bringing them more revenues for less production effort. Several large-scale military conflicts (such as those associated with the oil shocks of the 1970s) have actually been started when this has happened, as many Western economies suffered dramatically from sharp increases in oil prices. It is because of this dependence on oil supply that Western countries have started to look for alternative energy fuels, the second scenario variable in figure 1.1.

One alternative is to extract shale oil, oil which is found in rocks. The process of extraction is expensive, complex, and environmentally controversial. It consists in compressing the rock ('fracking') to the point where the oil is pushed out of it. This technology has been known for decades but has never been used commercially because it was too expensive. However, as OPEC countries have limited supply in the last decade, oil prices eventually reached levels at which it became economical to extract shale oil. As soon as it happened, OPEC countries 'closed the tap' in order to lower market prices and to make this new form of competition not economically viable.

In figure 1.1, scenario variables are summarised into 2 states each. OPEC countries can 'increase' or 'decrease supply' and alternative energy sources can 'reach' or 'fail to reach' competitive parity. These (variables, states, models) are all the components that you need to perform a scenario analysis. You need to identify scenario variables (external strategic factors), summarise them into possible states (plausible future states of the variable), and use the models to transform the combination of states into a story. This is illustrated in figure 1.2.

Now that you know the ingredients, a good exercise is to go back and have a look at figure 1.1. The stories are very short: based on your knowledge of the different ingredients, how would you tell the stories in your own words? A good scenario analysis should result in stories that are evocative, easy to understand, and easy to tell.

1.3 SCENARIO ANALYSIS VS. SCENARIO PLANNING

The focus of this book is scenario analysis rather than scenario planning. The meaning of 'scenario planning*'* is a widely debated issue in the research literature. A pragmatic definition is that scenario planning describes the *use* of scenarios in order to prepare or improve plans, typically in a strategic management context. Scenario analysis focuses instead on the preliminary *process of developing scenarios*, such as the four scenarios shown in figure 1.1. This book focuses on process, i.e. on 'recipes', or 'step by step' instructions for preparing scenarios. In other words, whereas scenario analysis is about the skillset and capacity to anticipate the future, scenario planning is about applying the knowledge gained from scenarios. The rest of this book focuses on scenario analysis and scenario planning will be discussed briefly in Chapter 7.

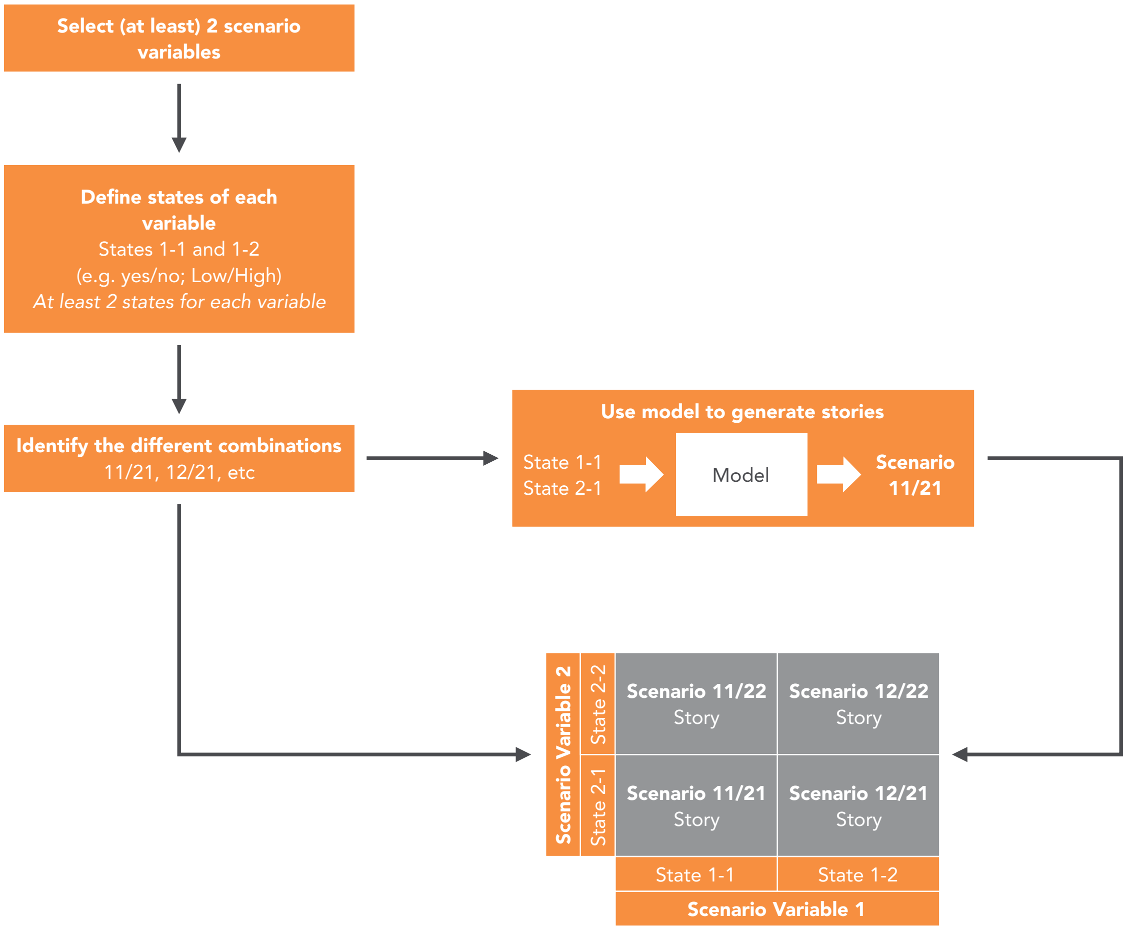

Figure 1.2. Generic Anatomy of a Scenario Analysis.

In the previous section, we discussed how we are drawn to "scenarios" when we need to make decisions. When we consider changing jobs, moving houses, or choosing a university, we try to anticipate what is going to happen. For example, if I am concerned that interest rates will increase in the future, I may decide to buy an affordable house so that I can afford mortgage repayments when interest charges go up. It is worth spending a bit of time reflecting on this aspect of scenarios. On one hand, scenarios are often linked to the concept of foresight, i.e. the idea that we make better decisions because we can 'foresee' the future. It is easy to see why this is a skill that business managers would like to master! On the other hand, Ted Fuller (2015) likes to describe scenario thinking as an element of anticipatory systems. His research uses work done across disciplines to describe natural anticipation systems, as for example in biology. There is a subtle distinction between foresight and anticipation. The first describes a skillset, a special talent, which only consultants and top managers are trusted to possess, yet we know that it is not possible to predict the future (cf. Chapter 2). The second describes something that we all naturally do, i.e. we possess behavioural and cognitive skills that are used to deal with the future. Thus, to a large extent, this book is about formalising thought processes that we normally engage in. Some of us are better at anticipation and foresight than others though, and most of us will be keen to improve our ability to anticipate. If we want to do that, it is a good idea to start learning more about scenario analysis.

2 HOW COULD WE GET IT SO WRONG?

2.1 CASE STUDY: THE OFFSHORE VALUATION

In September 2017, Andrew Mack posted an article on the social media site Linked In entitled: "How did we get so wrong?" (https://www.linkedin.com/pulse/offshore-wind-how-did-we-get-so-wrong-andrew-mack/). Back in 2010, Andrew Mack was the lead consultant on a project about determining the value of offshore renewable energy sources in the UK by looking at the impact it could have on the UK energy sector by 2050. His report, The Offshore Valuation, considered three different scenarios of scale of investment in offshore renewable energy. The problem with renewable energy sources is intermittence, i.e. offshore wind farms only produce wind in windy weather. This means that to supply electricity with wind farms, you should build more capacity than you need. For example, consider a country with a Southern and a Northern windfarm. Each has to be sized to supply power to the whole country if we assume that only one region is windy at a given point in time. *The Offshore Valuation* report examined three scenarios of the extent to which aggregate supply could exceed UK demand, and assumed that the excess supply (in the case where all regions are windy) would be exported to Europe. The report discusses all types of value creation (such as CO_2 reduction, job creation, etc.) and it also had to look at the cost of electricity produced. This is called the Levelised Cost Of Electricity (LCOE) and is measured in £/MWh. The LCOE is an average of all the lifecycle costs of electricity production (building the facility, operations and maintenance costs, decommissioning the facility).

Andrew Mack was not the only individual interested in what the cost of producing electricity from renewable energy sources would be in the future. To this day, the offshore wind energy sector has been heavily subsidised, and this has been the main source of criticism against the sector. Investors will not willingly support this sector if they believe that it will never be commercially viable. This means that the forecasted value of offshore wind electricity production is a key indicator of investment worthiness, and an indicator that all parties have been watching attentively. A few years after the publication of *The Offshore Valuation* report, the Crow Estate, the owner of the UK seabed, commissioned a large consulting study that led to the publication in 2012 of the *Offshore Wind Cost Reduction Pathway* study. This report considered 4 scenarios based on how quickly the technology of wind farms, supply chain, and the sector's financing would improve. It forecasted LCOE of 89-140 £/MWh by 2020, depending on the scenario, or "pathway". These figures were consistent with Andrew Mack's initial forecast of 80 £/MWh by 2025. His LinkedIn article was written when he discovered that *in 2017* wind farms developers had just proposed a project with a planned LCOE of *57.50* £/MWh. You can see why he titled his post *how could we get it so wrong.*

2.2 CASE STUDY: ALTERNATIVE PATHWAYS TO COST REDUCTION

On a morning of May 2015, I was preparing myself to deliver a presentation entitled *Alternatives Pathways to Cost Reduction* at the *All Energy Conference* in Glasgow. My idea was simple. The Crown Estate had performed its scenario analysis in 2012 to estimate the LCOE for offshore wind based on technology, supply chain, and finance improvements. My paper was about other ways of reducing costs: reducing the cost of low social acceptance, reducing the transaction cost of wind farm projects, and improving asset utilisation. I wrote the paper because I felt that the numbers that I saw in reports did not stack up. My basic intuitive hunch was that it did not make sense that a source of energy for which the fuel (wind) is free would be more expensive than one for which we have to buy the fuel (e.g. oil or gas). I build an Excel model including the wind history over a year for Kent, performance and reliability data from the turbine manufacturer's specifications, and cost data about construction, operations, and maintenance. My presentation included three scenarios:

1. the current utilisation rate of wind farms in Kent (30%), which resulted in a LCOE of 140 £/MWh (the actual real-life performance of Kent wind farms at that time).
2. a 100% wind, 100% utilisation scenario as a benchmark, leading to a 40 £/MWh LCOE.
3. 100% utilisation subject to the actual wind levels in Kent over a year, giving a 100 £/MWh.

On that morning, before walking onto the stage, I asked myself why was I doing this? I am not an expert on renewable energy. Given my teaching and other work commitments, I had in total about 72 hours available to prepare my presentation. I am not normally queasy about presenting in public but on that morning I asked myself why experts who have worked full time in the sector for the last 10 years and have all read reports that cost millions of pounds to write would find my 72 hours Excel bricolage interesting? Would they think of me as a weird academic that lectures on things that he does not know much about? My observations were that existing wind farms performed at 140 £/MWh, the Crown Estate report estimated a £40 reduction for technology and supply chain, and I thought that the 140 £/MWh included 40 £/MWh for not producing when it is windy (the difference between scenario 1 and 3 above). So, my estimated LCOE of a wind farm with a mature technology is 140-40-40 = 60 £/MWh. *How could I get it so right?*

2.3 CASE STUDY: SCENARIO ANALYSIS AT ROYAL DUTCH/SHELL

Getting it right is what scenario analysts crave. Nobody wants to be told that their scenario was unrealistic or poor, and there are plenty of research papers that openly criticise the "misuse" of scenarios. I have to give credit to Andrew Mack for his LinkedIn post. It is thanks to this post that we can better reflect about the challenge of "getting it right" or of 'predicting the future'. Before we proceed on this subject, it is important to stress than no matter how alluring the idea of being able to predict the future accurately is, you should not get your expectations too high. In the words of Michael Jefferson: "*those who claim to foretell the future lie; even if they foretell the truth*" (p. 187, 2012). This applies to my "how could I get it so right?" tongue in cheek question in the previous paragraph!

With this disclaimer in mind, in the field of scenario analysis, it is impossible to discuss "getting it right" without discussing the work of Pierre Wack at Shell. Pierre Wack was an employee of the French subsidiary of Royal Dutch/Shell in the 1970s. He was involved with scenario analysis but became critical of what he calls 'first-generation' scenarios, scenarios that quantify the values of key business variables (such as oil price) as a function of known uncertain variables (Wack, 1985). My scenario analysis in the previous section estimating the cost of offshore wind electricity at 60 £/MWh is a good example of a first-generation scenario. It is predicting the cost of electricity on the basis of (1) wind levels and (2) the utilisation rates of wind farms. It is likely that you have seen before scenarios with labels such as 'pessimistic', 'most likely', and 'optimistic'. These are also first-generation scenarios.

With his team, Pierre Wack realised that a shortcoming of first-generation scenarios is that they encourage a business-as-usual approach to thinking about the future. This is a key issue if an industry is about to experience major changes. In the words of Pierre Wack, it is an issue to be 'wrong when it hurts most'. They also realised that the scope of first-generation scenarios was to understand how things worked. This can be illustrated again with the previous scenario analysis: it is useful to explain why a wind farm could operate at more than 60 £/MWh: when there is no wind, or when it is windy and it is not utilised (for example because there is no demand at that point in time). Wack and his team developed a number of scenarios that challenged the 'business as usual' mentality of managers at Royal Dutch Shell (Wack's 1985 "Scenarios: uncharted waters ahead" article in the *Harvard Business Review* provides a full account of the story). Wack called these second-generation scenarios 'decision scenarios' as their emphasis is on creating new managerial insights that can be used to make decisions. Wack and his team predicted very accurately that the oil industry would become a supplier's market (rather than a buyer's market) and that this would generate oil shocks. Royal Dutch/Shell was better prepared than its competitors to face these changes as they had been anticipated and as contingency plans had been drawn. Most of what goes on in the oil industry today can easily be understood and explained by looking at the work done at Royal Dutch/Shell back in the 1970s. This exemplary tale of corporate foresight put scenario planning in the limelight, and to this day, Wack's work remains the gold standard of 'getting it right'. For this reason, we will return to Wack and his team in many parts of this book.

2.4 SCENARIO AND CURIOSITY

One of the important contributions of Pierre Wack was to define the need for anticipation to avoid being 'hurt when wrong'. If you compare the scenario work described in the two opening case studies in this chapter, it is easy to see that the stakes between Andrew Mack and myself are very different. If Andrew Mack is really wrong, it is likely that his professional reputation, and therefore his business, are at risk. As I am not an expert in renewable energy and have no commercial stake at all in this sector, it does not really matter if I am wrong (aside from a slight ego bruising!). However, Andrew Mack and myself have something in common: we are both curious about the future of offshore wind farms. Curiosity is "the intrinsic desire to know, to see, or to experience that motivates information seeking behaviour" (Litman, 2007).

However, the nature of our curiosity is different because we have different reasons for being curious and different stakes if we manage (or fail) to satisfy this curiosity. This difference can be explained with the I/D model of curiosity (Litman and Jimmerson, 2004). Litman and Jimmerson (2004) define I-type curiosity as discovering the opportunity to learn something *I*nteresting. The process of seeking information is positive and is induced by the desire to learn something of interest. For example, my simple scenario analysis was triggered by the question: how can a source of energy with free fuel end up being more expensive than one where fuel has to be bought? This is an interesting question.

In contrast, D-type curiosity is activated when someone is *D*eprived of information. Instead of *wanting* to know, they *need* to know. Consider a utility company investing £20 billion in wind farms in the next 10 years. They *need* to know that this investment is better than continuing to invest in traditional fossil fuels generation technologies. I and D types curiosity can be respectively compared to eating something because you wanted to (you were not hungry, but it looked appetising) and eating something because you needed to (you were very hungry, it did not really matter what you ate).

The fact that we can approach scenario analysis from these two opposite perspectives is important as it creates the greatest learning hurdle to becoming a skilled scenario analysist. If you are reading this book to know more about scenario analysis, you are like me, interested in I-type scenarios. You are likely to engage with the approach because you are trying to find a way to discover something interesting. If you do not, or discover the wrong thing, it does not really matter. In contrast, a manager asked to make a decision under uncertainty is likely to be much more stressed about using scenario analysis. The challenge is that when you learn about scenario analysis your mindset will be I-type curiosity. But once you use scenario for an assessment or to make a decision at work, you are dealing with D-type curiosity. If you decide to read more articles or books about scenario analysis, you should be able, within a few pages, to quickly identify if the authors are talking about I-type or D-type scenario analysis. Figure 2.1 proposes a typology of the different types of scenarios that you can produce.

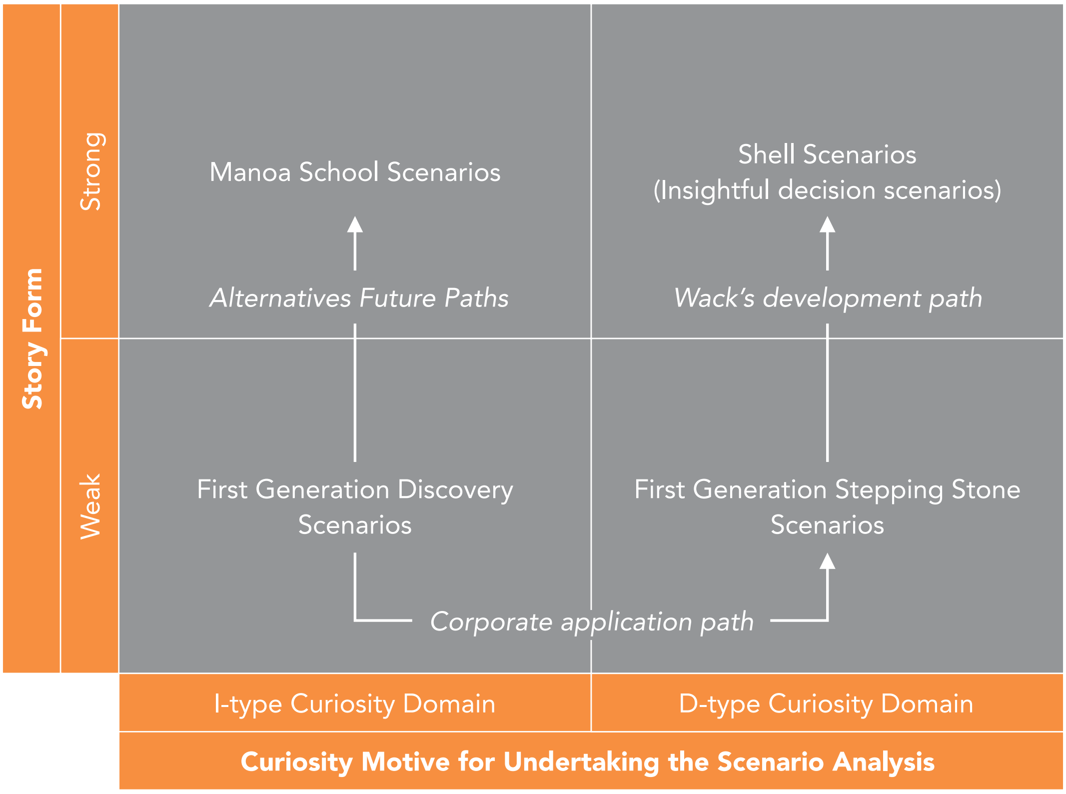

Figure 2.1. A Typology of Different Types of Scenario Analysis

Figure 2.1 defines 4 different types of scenarios by combining the curiosity motives that drive the scenario analysis with the level of details embedded in the scenarios, called in figure 2.1 the 'story form'. The scenario described in section 2.2 in this chapter is an example of the bottom-left quadrant, first-generation discovery scenarios. It was initiated to satisfy my curiosity about understanding offshore wind electricity cost and the story is as follows: *if a wind farm in Kent continues to experience the average wind conditions of the last 10 years, if reliability of turbines is 98%, and if all electricity produced can be injected into the national grid, the LOCE of that wind farm will be 100 £/MWh. If turbines are replaced with more modern ones, this can be lowered to 60 £/MWh.* It is a simple story, focusing on quantification, and devoid of rich details. There is no more to it than what is said in that one sentence. Wack explains that his richer, insightful, second-generation decision scenarios use first-generation to begin with ("*it is almost impossible to jump directly to proper decision scenarios*", 1985, p. 77). This is why once applied to corporate settings, first generation scenarios become the stepping stone scenarios of the bottom-right quadrant in figure 2.1, which are then developed into the rich, imaginative stories of the "Shell scenarios" in the top-right quadrant.

There is another type of rich scenarios that occupies the top-left quadrant in figure 2.1, the Manoa School scenarios. The focus of these is not to inform strategic decision making for a corporation but instead to invite stakeholders to reflect on what the future could possibly be. The Manoa School is described in more details in Chapters 5 and 7.

It is important to stress that the two types of scenarios at the top of figure 2.1 do not connect. This is because Shell scenarios are about addressing information deprivation about external variables affecting organisational life, but these organisations are not 'future-makers', i.e. they cannot by themselves change these external factors. Therefore, scenario analysts work in a stressful decision domain. In contrast, the Manoa alternative futures school is used to move organisations and communities towards a desired future, i.e. they can collectively act today to evolve towards a future that they agree is more desirable. This is done by arousing their curiosity about the future of society and aligning actions with what participants in the workshop *like*.

3 SCENARIO ANALYSIS IN CONTEXT

3.1 A CONTEXT MODEL OF SCENARIO ANALYSIS

3.1.1 ART OR PROCESS?

Scenario analysis is commonly described as an art (Van den Heijden, 2005; Godet, 2000). If it is an art, akin to creating a piece of music, it seems paradoxical to describe scenario analysis as a process! This paradox rests on the perception that processes are pre-planned and instrumental whereas artistry is intuitive and improvised. This antinomy is perceptual though as we like to think of processes and artistry in opposition, when the reality is that there is always a process, simply defined as a method of doing something, behind human actions. It may not be explicit and may be embedded in social and cultural practices, but even writing music or painting modern art follows some sort of process.

One of the key ideas behind this book is that when you are learning about scenario analysis, it is better to think of it as a process than an art. This is because art performance is typically mysterious and often unattainable for novices. If I fail to learn, it is not unusual that failure would be rationalised by stating that "I do not have any talent", i.e. art is just not for me. At the very early stage of learning, there is a need to provide as much explicit information as possible. Once you have acquired experience at performing scenario work, it is then that new insights will appear and that you will be able to develop 'artistic' improvements.

The purpose of this chapter is to describe the context in which you are likely to perform your first scenario analysis, based on the context model presented below. Each contextual variable will be described in detail so that you have a robust understanding of what best practices are. It is challenging though to aim for best practice at first attempt, so throughout this chapter, each contextual variable will be summarised with recommendations for designing your first scenario analysis attempt.

3.1.2 SCENARIO ANALYSIS CONTEXT MODEL

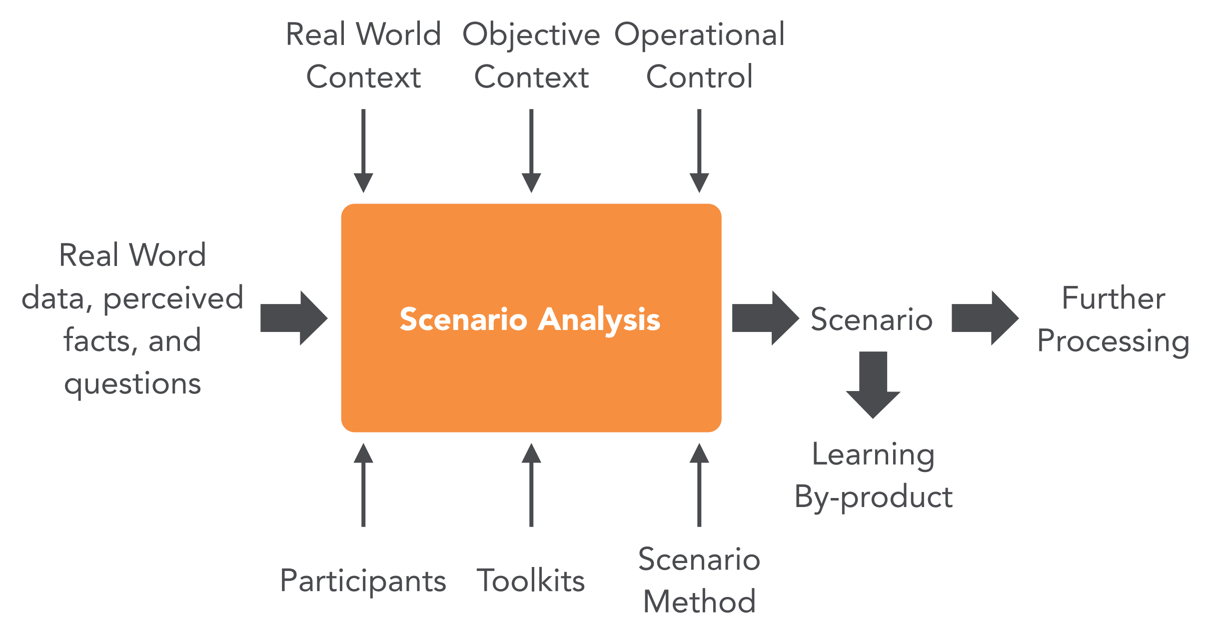

Figure 3.1. A high-level process map of scenario analysis (from Leseure, 2019).

Figure 3.1 shows a high-level process model of scenario analysis. Scenario analysis is conceptualised as a transformation process using factual inputs and questions about the future to produce one or multiple scenarios.

3.2 PROCESS OUTPUTS

The outputs of the process are the scenarios themselves, i.e. stories of the future. As an output, scenarios are best described as intermediate products, i.e. they are rarely an end in themselves. Typically, the scenarios will become the input of another process, e.g. strategic planning. This is discussed in more detail in chapter 7.

Figure 3.1 also shows that as they perform a scenario analysis, participants will learn a number of things, and what is learned is a 'by product' of the process. Even if the stories of the future turn out to be wrong, participants will have learned something useful in the process of going through the scenario analysis.

Take for example the vision of the future of many British entrepreneurs in the 1960s who concluded that large cars would become unaffordable and impractical due to rising oil prices, population growth, and road congestion. They all invested in micro-cars concepts and spend precious funds and resources making cars as small and light as possible. As almost none of us drive micro cars today, we know, with the benefit of hindsight, that the scenarios that underpinned their investments were flawed. Yet these scenarios led them to learn about economic, urban, and environmental conditions that called for smaller, lighter, and more fuel-efficient cars as well as electric cars. These conditions are key concerns today and the lessons that they learned were useful and valid. This 'planning as learning' (de Geus, 1988) is key to understanding the power of scenario analysis: sometimes, the learning by-product is more valuable, in the long term, than the medium-term set of actions that follows a scenario analysis.

Many scenario planning experts prefer to present the output of their work as more than a set of stories and also use a graphical summary approach. This shows all the stories together and contrasts them for maximum effect. A possibility is to use tables listing the different scenarios but very often a diagram showing 4 scenarios is preferred. This is the approach that was illustrated in figure 1.1.

Ramirez and Wilkinson (2014) recommend being careful when presenting outputs as a 2x2 matrix (like figure 1.1) and stress the need to make a distinction between using a scenario grid or a scenario frame. A grid means that the scenarios are discrete, mutually exclusive possibilities. Each scenario happens because one the scenario variable is in a specific binary state (i.e. 0 or 1). Scenario frames are based on continuous spaces where both scenarios variables can take a multitude of values, and thus, in the centre of the space, all scenarios are possible.

Your first scenario analysis: When designing your first scenario analysis, you need to decide what your desired outputs are. As it can be challenging to do a scenario analysis on a topic that you have a vested interest in, it is a good idea to select a subject that you find interesting and that you regard neutrally. Although it is tempting to try to predict the 'best' or 'most insightful' future, use the multiple stories approach described in Chapter 1. This is the one most likely to bring on learning opportunities so that you can experience first-hand the benefits of scenario analysis.

3.3 PROCESS INPUTS

It is not easy to anticipate what is going to happen in the future and although there is room in the process for personal intuition and opinion, it is best to think of scenario analysis as a process which demands rich and detailed inputs. If you are ever asked to participate in a scenario analysis about a subject that you do not know much about, the best thing to do is to start reading and to do as much research as possible.

These inputs are questions about the future and facts from the present and the past. There is a balanced relationship between historical facts and prospective analysis. A lot of ideas about what could happen in the future are based on things that have happened in the past and that could happen again. Sometimes the parallel between two situations is obvious whereas at other times there is only a partial match in circumstances. This interest in knowledge of the past is why participants are often experts in a domain. Experts do not have to do read and to do research as they can rely on their experience to bring insights to a scenario workshop. However, only using experience as an input could become a problem if it creates an 'experience bias' that would prevent participants predicting new events or patterns. This bias is very much the issue that was described by Pierre Wack (cf. Chapter 2) in his experience at Royal Dutch Shell. Managers prepared scenarios that were simple extrapolations of the past, i.e. scenarios were based on the idea of 'business as usual'. His contribution to scenario analysis was to remove this bias and to lead his team towards more insightful scenarios.

Gavetti and Levinthal (2000) show that when searching for solutions to complex problems there is an optimal trade-off between experiential searches and cognitive searches. In contrast to using knowledge about the past, cognitive searches are forward looking and rely on cognitive skills such as imagination and the application of models. This optimal trade-off applies to scenario analysis and the best way to think of the inputs is that there should be the right balance between knowledge from the past with fresh, new, and innovative ideas and questions.

Another legacy from Pierre Wack is the concept of *pre-determined elements*. Key inputs to scenario analysis include events that have already taken place but whose consequences have not unfolded yet. The consequences of these events must be irreversible, i.e. not manageable by the scenario team. The example used by Pierre Wack was a story (*Flooding in the ganges; Wack, 1985*) of inhabitants of a valley exposed to frequent flooding. In order to forecast when a flood will happen, it is best to use inputs from a wider system than the valley itself. In his story, Pierre Wack describes the mountains where the water comes from and a half-way city. If floods are observed in this city, then it means that the valley will flood 4 days from now. This story illustrates two important principles:

1. It is better to look for inputs in the full system than only in the local vicinity of the problem at hand. Wack called this wider system the *macroscope* (i.e. the opposite of a microscope).
2. Analysts should look for all relevant pre-determined elements. This, according to Wack, means that planning becomes based on more certainty by opposite to only guesses about uncertainty.

George Burt provides a useful example of the importance of pre-determined elements in an article where he presents his consultancy work with a whisky producer (Burt, 2006). Managers planned as if they were still in control of production and distribution. The pre-determined element was the realisation that control over demand management and logistical management for whisky had already shifted to distributors and supermarkets and that this trend would continue. Once this significant change in the industry-wide way of working was understood, the scenario analysis could proceed on a more realistic basis.

Your first scenario analysis: List key questions about the future and identify all pre-determined elements.

3.4 PROCESS RESOURCES

A number of resources are required to perform a scenario analysis: participants, methods, and tool kits.

3.4.1 PARTICIPANTS

We have already discussed how experts are useful participants because of the inputs that they bring but that using only experts could create a bias. Deciding who to use in a scenario analysis is in fact a delicate matter. There are a lot of research papers that are written specifically on the topic of selecting participants (e.g. Hodgkinson and Healey, 2008; Franco et al., 2013).

All authors, even those such as Wright and Cairns (2011) who are strong advocates that scenario analysis should be a democratic process, explain that participants should be carefully screened and selected. This is a sensible recommendation, as it is easy to see how individuals in conflict or with opposite viewpoints/approaches may impeach a democratic discussion. Yet, the very idea of screening participants does not sound very democratic. This design dilemma is described by Hodgkinson and Healey (2008) when they explain that a scenario team requires informational diversity, i.e. participants with different background, but that in doing so, one incurs the risk of social categorisation processes. In these processes, similar individuals will form groups, or 'cliques', which are likely to result in reinforcing cognitive biases within each group and in conflicts between subgroups. The opposite design decision, to use a group of homogenous participants is hardly a solution, as group biases lead to groupthink. Groupthink, which was first described by Janis (1971; 1972), describes a set of specific group dynamics where all participants convince themselves that their analysis is right and cannot exert the requisite level of critical thinking. President Kennedy's decision to invade Cuba in what is known as the Bay of Pigs fiasco is an example of group think. Kennedy is famously quoted for saying after the invasion: “how could we have been so stupid?”. Kennedy was not stupid though and neither were his advisors. In fact, Janis (1971) states that the team that made the decision included the brightest intellectual talent in America at that time. They made a poor decision because they were victims of groupthink.

If it were not difficult enough to design a team to avoid the opposite extremes of conflict and groupthink, another issue with selecting participants is engagement. Participants in a scenario analysis should be ready to participate fully in the exercise and ‘get their hands dirty’. Remember that scenario analysis aims to challenge thinking. This has an impact on the number of participants. A small team with a handful of individuals will be easier to manage than large groups. When many participants are involved (more than 10 and up to hundreds), physical workshops become impossible and scenario analysis is performed as a Delphi analysis. Delphi analysis is a process where a facilitator writes to participants to ask for their views, compiles a summary of the collective views, and sends this back for feedback. The process goes on until all parties have reached an agreement. There also are specific scenario approaches, such as the branching scenario (Cairns et al., 2016) and the scenario improvisation method (Cairns et al., 2017) that are specifically designed to deal with large teams of individuals with limited time to engage with scenario analysis.

Finally, the final issue with selecting participants is whether or not you will be using an external facilitator. This is the recommendation of Wright and Cairns (2011) and they explain that the facilitator should not have a stake in the foresight question itself, i.e. he or she does not need to be an expert in the subject. The role of the facilitator is only to orchestrate the process of performing the analysis and of making sure that all participants contribute equally. Like all of the issues discussed in the section, this is a debated position. Some facilitators are experts and get involved in the analysis itself.

Your first scenario analysis: Start by practicing the techniques described in this book (especially chapter 4) by yourself. If you want to use scenario analysis as a management tool, once you are confident with the approach, plan for your first scenario workshop with a small group of no more than 4 individuals. Use common sense to select individuals so that the right dynamics can happen and to avoid conflict or groupthink. Do not invite your least preferred co-worker! You will be the facilitator and use the process described in chapter 4 to drive the workshop forward.

3.4.2 METHODS

The field of scenario analysis is very rich in terms of the diversity of methods which are championed by different authors. There are so many approaches that it can be very confusing for a novice to understand the similarities and the differences between them and to select one for use. It is impossible to describe all the schools of scenario analysis in detail in a short book like this one, so instead, a family tree showing the main schools is shown in figure 3.2. More details about famous schools of scenario analysis can be found in chapter 5.

The ancestor of scenario analysis are basic forecasts of key variables (such as sales of a product or cost of a raw material) that are intuitively prepared by individuals or groups when they recognise the need to anticipate change. This need can be addressed with forecasting techniques (see chapter 7 for more information about forecasting). Forecasting works well when using time series information to estimate future changes in a variable. Scenarios in this branch of the tree (figure 3.2) are based on business as usual, linear change assumptions.

In most cases, planners quickly realised that they could better anticipate changes in uncertain variables by using models and taking into account pre-determined elements. Examples of models are: classical economics supply and demand price determination, learning curves, economies of scale. These models are not always based on linear laws and can accommodate many variables. By changing assumptions made about the value of these variables, 'what-if' sensitivity analyses can be performed, and they result in 'traditional scenario analyses' in figure 3.2. The LCOE for offshore wind estimate of 60 £/MWh discussed in chapter 2 is an example of a 'model-based scenario". The case study presented after figure 3.2 describes an example of a 'traditional scenario'. All of these scenarios form together the 'single scenario' family, where a unique prediction of what is going to happen is underpinned by a more or less complex model and set of assumptions. It is by varying these assumptions in sensitivity analysis that analysts can derive different 'versions' of the scenarios, although the story remains essentially the same.

Figure 2.3 shows that another large family, multiple scenarios, also exists. These approaches focus on discovering key events or 'singularities'. In mathematics, a singularity means a point in a space where a mathematical construct changes behaviour, sometimes radically. Even though traditional scenarios may include complex combinations of variables and non-linearity, they expect these complex models to apply uniformly. A commonly discussed singularity today is the technology singularity, i.e. the point at which artificial intelligence will create a chain reaction of technological growth which could endanger human civilisation, as depicted in the Hollywood movie "Singularity". In the seminal scenario analysis of Pierre Wack at Shell, imagining the possibility of an oil conflict was a singularity. So was the possibility that oil extracting countries would form anti-competition cartels. The "multiple future scenarios" is a school where analysists look for the existence of singular events linked to the scenario variables. When a singularity is viewed as possible, it creates new pairs of alternative futures.

Because these singular futures are a departure from what we are used to, they are difficult to envision, and many scenario participants will dismiss them as 'science fiction', 'scaremongering', or 'utopia'. The 'learning scenario' approach is a set of scenario methods concerned with avoiding the generation of sensational yet implausible scenarios. This set of methods puts a strong emphasis on learning and the idea of planning as learning. A first set of multiple futures are described and are then extensively discussed and refined. This leads to a second generation of scenarios, which incorporate what was learned. This iterative process goes on until participants are happy that they have explored all the ins and outs of the multiple futures and that all are realistic possibilities. The branching scenario and scenario improvisation methods of Cairns et al. (2016, 2017) are good examples of learning scenarios.

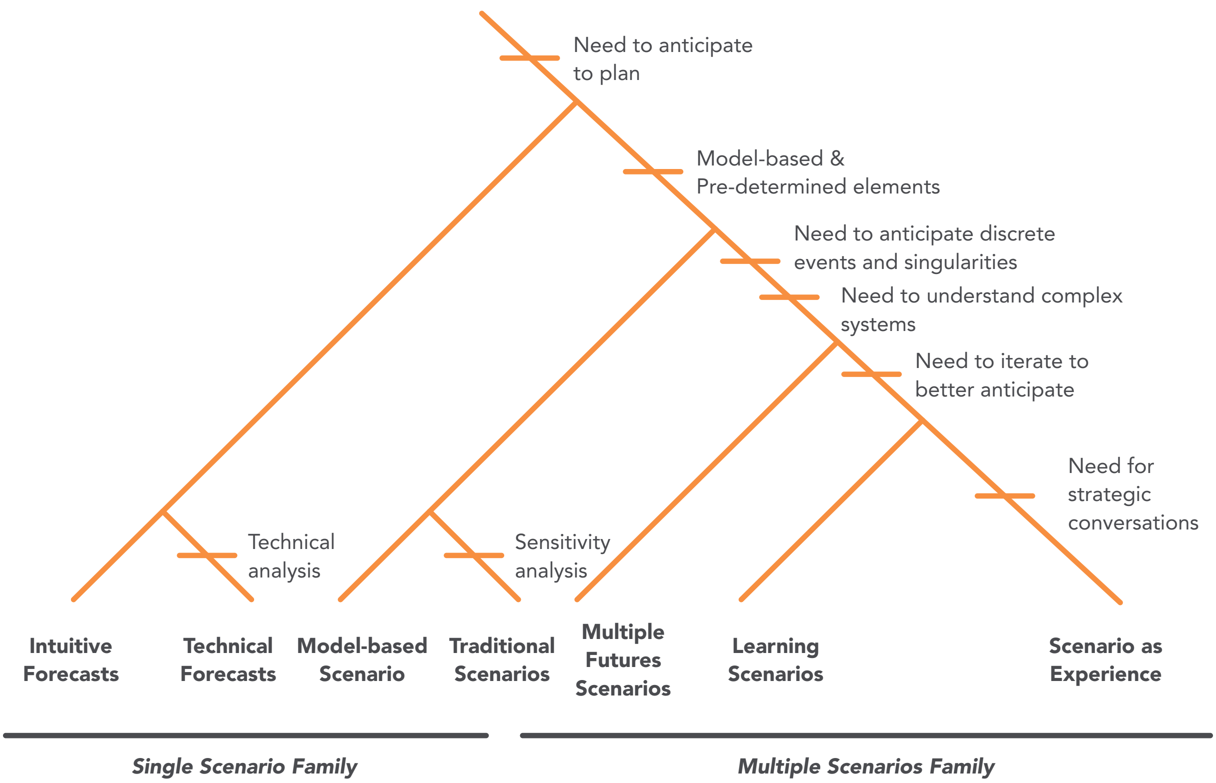

Figure 2.3. A Family Tree of Scenario Analysis

Figure 2.3 also shows a slight variation of the learning scenario approach, the "scenario as experience" approach. In this approach, the concern is not only to learn when performing the scenario analysis but to make sure that all participants learn collectively. By sharing a learning experience together, they will also share a strong consensus around the subsequent actions to be implemented. This means that the participants need to engage in intense strategic conversations until they reach what is often called the 'aha' moment, when all agree that the scenario analysis is completed and that they have identified a clear direction for action. Most modern schools of scenario analysis such as the intuitive logics approach of Wright and Cairns (2011), the French *Prospective* approach (Godet, 2000) and the OSPA (Ramirez and Wilkonson, 2014) are members of this family.

Case study: Offshore Renewable Energy Scenarios for Brittany

In 2014, experts from Brittany were asked to prepare a scenario analysis for the Channel-MOR project (Channel-MOR, 2014) about the amount of offshore renewable energy that the Brittany region will produce. In order to build their scenario, they used the following variables:

1. likely improvement of traditional wind turbine technology,
2. whether or not technologies such as floating wind turbines, tidal energy, and wave energy will become viable,
3. whether or not more funds will be become available to finance R&D and infrastructure projects,
4. whether or not energy producers will secure feed-in tariffs,
5. social acceptance of infrastructure projects,
6. the complexity and evolution of consenting and planning processes,
7. managing environmental issues and the emergence of new technologies to mitigate these, and
8. the evolution of the design of France's electricity network.

In a traditional scenario analysis, analysts explore not only the different states of these variables but also their interconnections. For example, the viability of floating wind turbine technologies will have a limited impact if social acceptance of offshore wind turbines is low. In the traditional scenario approach, analysts summarise uncertainty by using optimistic or pessimistic sets of assumptions. The full details can be found in the Channel-MOR report (2014). The table below shows the scenarios and their impact:

	Conservative Scenario	*Optimistic Scenario*
Power generation	Only 2 operational windfarms by 2018-2020 Demonstrator sites for floating wind and tidal	The improved efficiency of turbines leads to a significant increase of wind farms up to 2030. Up to 3 floating wind projects, 1 tidal, and 1 wave project
% of regional consumption produced by local renewable energy sources	20%	50%
Job creation	7,500	15,000
% of renewable energy in regional energy mix by 2030	15%	35%

Your first scenario analysis: It is best to start with the 'learning scenario' approach and its predecessors in figure 2.3. If you are more interested in using scenarios to unite a team toward a strategic action, i.e. the "scenario as experience" approach, you will need to read books describing more advanced methods, such the OSPA approach (Ramirez and Wilkinson, 2014) and the intuitive logics approach (Wright and Cairns, 2011). Managing a collective learning experience adds a layer of complexity to the process.

3.4.3 TOOL KITS

Tool kits are variations within each approach to scenario analysis, i.e. additional process specifications or techniques used to implement a specific approach. For example, the intuitive logics approach is often complemented by the following tool kits:

- The critical scenario toolkit: An approach where participants are invited to consider critical theories to challenge an initial set of futures which was developed to improve the elaboration of international business futures (Cairns et al., 2010).

- Inconsistent scenarios: As analysts often focus on a set of consistent variables that result in plausible futures, they often eliminate variables that are seen as inconsistent as they clash with commonly expected trends. This means that potentially important singularities are often ruled out. Postma and Liebl (2005) suggest keeping these inconsistent variables and developing 'inconsistent scenarios' in order to let participants discuss whether or not such a future state could actually occur.

Your first scenario analysis: It is important to keep your first scenario analysis quite straightforward in terms of process. For this reason, it is best to stay away from advanced "add-on" tool kits, unless your scenario problem really requires such a specific approach.

3.5 PROCESS CONTROLS

Process controls are shown at the top of figure 3.1. They are either constraints to the process, i.e. external factors that cannot be changed, or controls, i.e. factors set by the scenario analyst. They include the real-world context, the objective context, and operational control.

3.5.1 REAL WORLD CONTEXT

The real-world context describes the conditions that characterise the real-life challenges that the scenario analysis is trying to address. This includes the conditions (e.g. degree of uncertainty) that the scenario analysis will be facing, the actors, and stakeholders.

The conditions that create the motivation for undertaking a scenario analysis are best described with the TUNA acronym as defined by the OSPA (Ramirez and Wilkinson, 2014). It stands for turbulence, uncertainty, novelty, and ambiguity. Turbulence generally defines a state of conflict or confusion, i.e. something chaotic. It is similar to the concept of a singularity discussed in the previous section, i.e. a singularity is likely to create turbulent conditions. Turbulence is an issue for planners as their plans may not be robust enough to handle what happens next. Uncertainty refers to the inability to predict what will happen next, even though no singular event is expected. Uncertainty is often measured with volatility, i.e. the range of different values that a value can take. The worst uncertainty conditions are called "deep uncertainty" (Knight, 1921), a decisional context where probabilities of future events are unknown, the uncertainty is uncontrollable, and predictions based on past data are unreliable. Novelty captures the extent to which scenario analysts deal with something which is new to them. If this is the case, they are likely to struggle to appreciate how things work and may not find the right models to build predictions with. They may also miss underlying pre-determined elements. Finally, ambiguity describes the challenge that analysts will face when deciding if a factor/trend is a good thing or not.

The real-world context is also defined by the actors and the stakeholders. These are not the participants discussed previously but individuals whose actions will affect the future (actors) or influence the future (stakeholders). For example, when considering the future of electrical cars, actors are car buyers (as their purchasing behaviours will have a direct impact on future designs) and stakeholders are policy makers (for example, laws passed to tax traditional petrol engines for their emissions will have an indirect impact on the future of electrical cars).

> Your first scenario analysis: Although you want to make your first scenario analysis as simple as possible to learn from it, the real-world context is what you cannot compromise on. You should select a question/challenge that scores high in terms of TUNA conditions. You are unlikely to learn much from a scenario analysis with little underlying uncertainty.

3.5.2 OBJECTIVE CONTEXT

It is important to distinguish the objective context from the real-world context. The objective context explains the reasons for undertaking the scenario analysis in the first place. In chapter 1, we have explained that the over-arching motive for doing a scenario analysis is to anticipate the future. It is important that the objectives for undertaking the scenario analysis are clearly stated and agreed by all as it defines what the outputs should be and when the analysis can stop, i.e. when the desired objectives have been attained. When performing a scenario analysis as a team, it is important to make sure that all participants agree with what the objectives are, as otherwise conflict would ensue.

> Your first scenario analysis: Select objectives such as enhancing understanding, challenge conventional thinking to focus the scenario on "what will happen next" rather than the more complex "what should we do next" types of scenarios.

3.5.3 OPERATIONAL CONTROL

Operational control means process control, that is the different steps that you can take to make sure that the process works fine and results in an output that matches your objectives. This includes risk management. Lewis (2003) explains that operational control can be performed *ex ante* (preparing for the process), in-process (during execution) or *ex post* (after the process is completed).

Leseure (2019) describes how Lewis' framework translates to the case of scenario analysis. *Ex ante* means all the preparation steps that are performed before a scenario analysis, including research, the selection of participants, and planning for the work. In-process control means responding flexibly to challenges experienced when performing the analysis and includes changing the approach (e.g. exploring as new direction as in the scenario improvisation method, Cairns et al., 2017), using facilitation to keep the project 'on track' and avoid conflict, or using an iterative approach such as the OSPA. Finally, *ex post* control means fixing an issue or recovering from a failure. It implies that you revisit the data and work performed during a scenario workshop and edit it so that you are happy with the end result. Leseure (2019) provides an example where new analytical techniques are used in order to make sense of issues experienced during the scenario analysis. This can be compared to post-production when making a movie: no more acting and filming will take place, and the editor has to work with the available material to produce the best possible output.

> Your first scenario analysis: As with any business affair, it is better to plan things right from the outset of a project. You should use this book and the checklist shown in chapter 4 to make sure that you are adequately prepared to start a scenario analysis. It is unlikely that you will be an expert facilitator from day 1, so if the problems you face are challenging, consider using an iterative approach (e.g. planning 2 or 3 team meetings) to give yourself time to reflect and improve between meetings. Finally, do not be afraid to use ex post control and refine the scenarios by yourself. It is at this stage that you are likely to have the time and space to reflect on performance and learn about scenario analysis.

4 SCENARIO PROCESS

4.1 PURPOSE OF PROCESS MODEL

The purpose of this section is to present a simple process model so that you can have your first attempt at a scenario analysis. It is based on the anatomy of a scenario analysis presented in Chapter 1 and shown in figure 1.2. This process model is inspired from basic process model specifications, such as the Royal Dutch Shell approach (Wack, 1985) and does not aim to be a 'best-in-class' model. A more detailed description of more advanced scenario analysis process models can be found in chapter 5.

4.2 HIGH-LEVEL PROCESS MODEL

Figure 4.1 below shows a high-level process model. As you will use this model for your first attempt at scenario analysis, the expectation is that you would use it as a straightforward stepwise model by going through each of the steps. You may encounter issues though and you should not hesitate to go back to a previous step if you need to, as shown in figure 4.1 with the feedback loops.

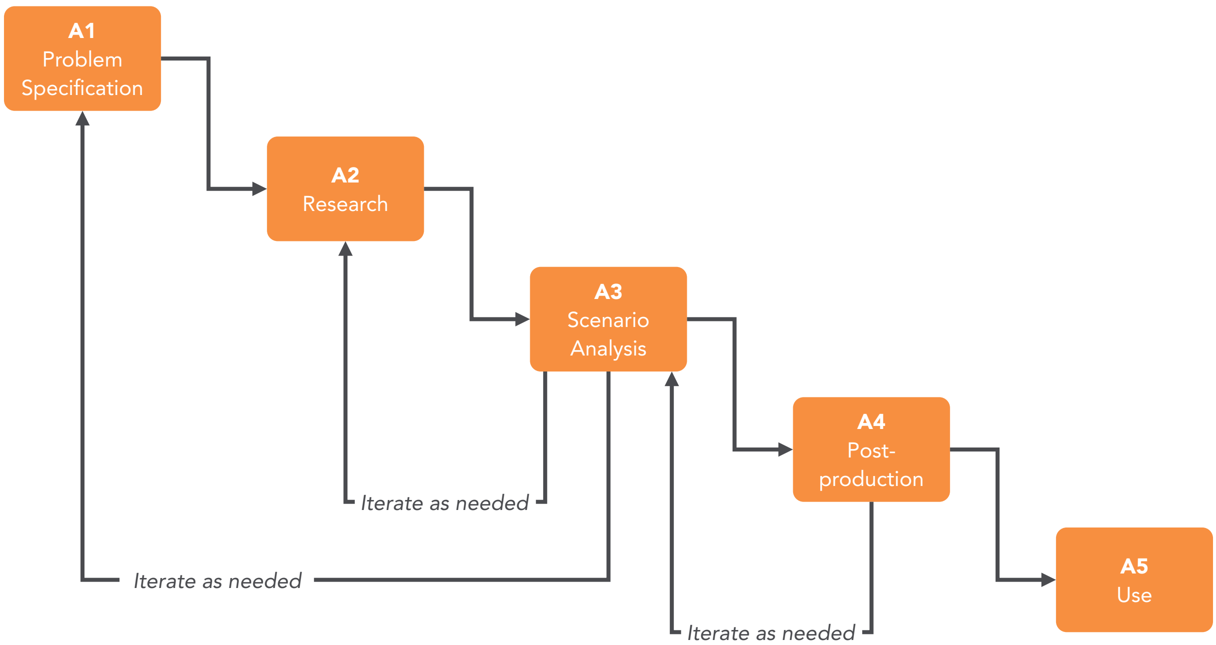

Figure 4.1. Scenario Analysis Process Model

Each of the steps is discussed in more details in the following sections. The process starts with performing research to get all the required data and information. Once research is finished, you can proceed onto the scenario analysis itself. You may decide to involve some participants and run a scenario workshop in step A3. In that case, as things may get complicated, step A4, post-production, is designed to give you back control of the process. For example, you can eliminate inputs from participants that you think were biased and revise the stories accordingly. If things really go wrong, you may decide to redo the workshops (rather than fix its output) and there, may decide to iterate all the way back to the problem definition. It may also include adding information that has become available and updating your scenarios as required. The last step, the use of the scenarios, is discussed in chapter 7. The focus of this chapter is step A3, the scenario analysis itself, and the steps that precede it.

4.3 A CASE STUDY

In June 2016, a UK referendum led to Brexit, the decision by the United Kingdom to leave the European Union. There were a multitude of arguments used for and against Brexit before the referendum. As facts about the implications of Brexit started to appear, plenty of questions about the future emerged. One of these questions is about the future of low-cost airlines. The right of low-cost airlines to fly between European cities is set by current European 'open sky' regulations and when the UK will leave the European Union, this means that the right of UK airlines to fly to Europe and the right of European airlines to fly to the UK will be affected.

Traditional airlines, such as British Airways or Air France, will retain their right to fly to and from the UK because these rights are derived from historic bilateral agreements that were signed prior to the European Union regulations. These agreements were signed directly by both governments and this is why traditional airlines are often called 'flag carriers', i.e. they derive their rights to fly to specific destinations from their historical government affiliations.

This case study will be used as an example throughout this chapter. More information about this case study can be found in this link: https://www.economist.com/business/2017/07/06/why-brexit-could-entail-a-hard-landing-for-low-cost-carriers.

4.4 PROBLEM DEFINITION & RESEARCH

Figure 4.2 provides a detailed view of the different steps required to initiate the process. It starts with an initial scenario question, which for the case study, would be:

What will be the impact of Brexit on low-cost airlines?

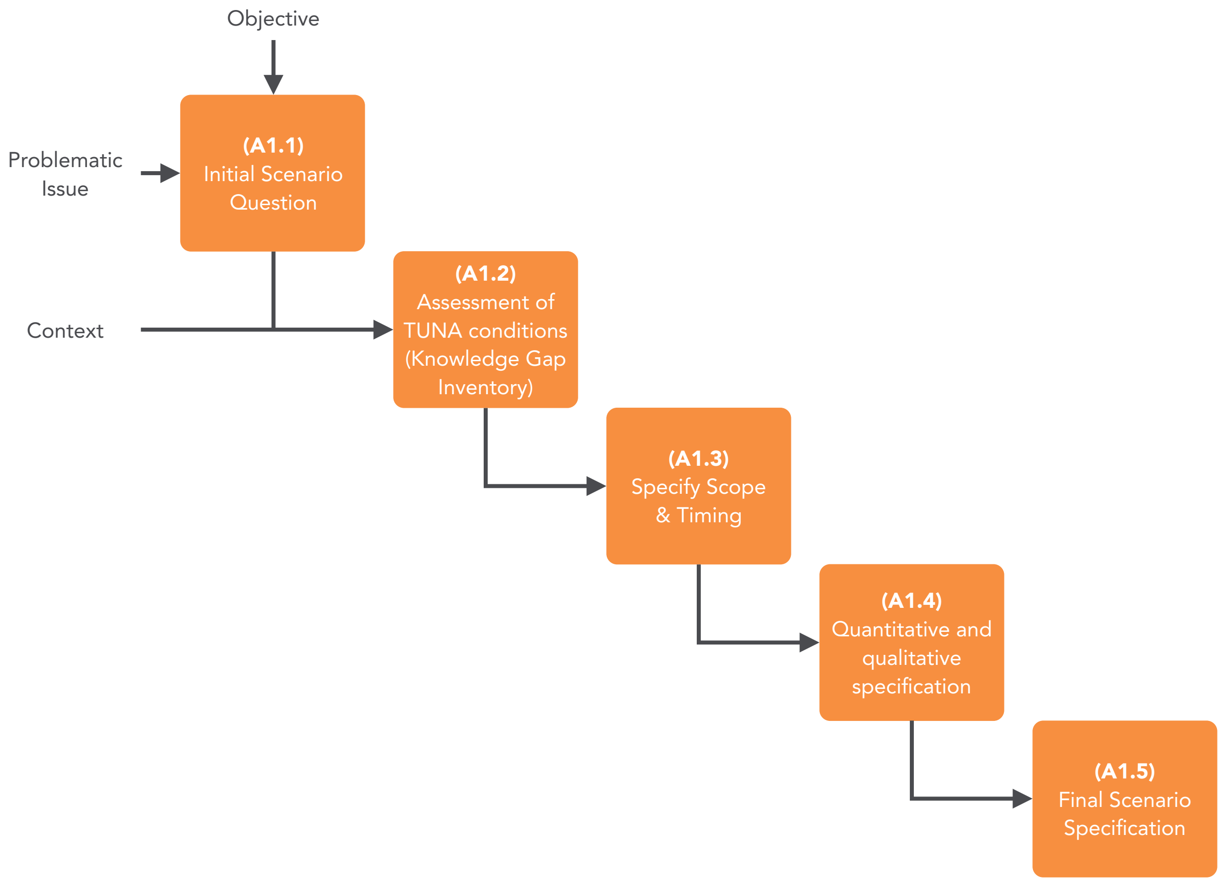

Figure 4.2. Scenario Specification

Figure 4.2 shows that when drafting this question, we need to be clear about why we think that the question is important and why we are interested in it. It is a good idea to write all of this down:

Low-Cost Airline Scenario Top Specification

Background: Low-cost airlines have become the largest airlines in Europe and have brought low-cost travel to a range of stakeholders. Some stakeholders are very dependent on using these travel links.

Broad question: What will be the impact of Brexit on low-cost airlines?

Scoped Objective: To understand how Brexit will affect my options to use low-cost air travel between the UK and continental Europe.

Next, we should document the TUNA conditions as shown in table 4.1. This can be described as a 'knowledge gap inventory' describing what we do not know (either partially or fully). Note that the assessment made in table 4.1 is subordinate to the objective. This is why my future needs for air travel is entered as something uncertain. If an airline executive were doing the same scenario analysis, a lot of past demand data would be known and could be used to extrapolate future demand. Note that table 4.1 does not include what I know, as for example my past consumption of low-cost air travel. It can be easily be extended to show this information if required. Once the assessment of the TUNA conditions is performed, it becomes possible to look at questions of scope, timing, and whether or not quantitative data will be needed.

Table 4.1 can be used to provide a time window to scope the scenario analysis. The purpose is to produce scenarios after the UK leaves the European Union. Depending on the deal agreed by all parties, it is possible that a turbulent period of 12-24 months will ensue, depending on the good will of all parties to renegotiate freedoms of the sky. The scenario should include this period but also at least a subsequent 2 years period for the industry to reach a 'post-Brexit' steady state.

An additional decision, based on table 4.1, is whether the scenario will be presented as a grid of discrete possible futures or as a set of continuous frames. When turbulent conditions are involved and bring mutually exclusive outcomes (e.g. hard vs. soft Brexit) a scenario representation as a grid will work better. It is only in the case of non-turbulent uncertainty that frames will work (e.g. different grades of soft Brexit).

Finally, the last specification is to decide whether the scenario analysis will be fully qualitative, as in the fashion of the intuitive logics school, or if some quantitative trend analysis or some probability work will be included. It is important to differentiate the use of quantitative data (as for example a third-party forecast) from performing numerical analysis as part of the scenario analysis itself: the former is about evidence informing the intuitive analysis whereas the latter is about using a quantitative scenario method. In this chapter we will use a qualitative approach. The final specification for the example case study is shown after table 4.1.

TUNA	Question	Answer
Turbulence	Is the scenario likely to involve singularities and turbulent conditions?	As the nature of the Brexit agreement is unknown, it is possible that following Brexit, a period of chaotic air travel could occur, with each country imposing different conditions on airlines.
Uncertainty	Does the scenario involve uncertain and unknown variables?	Uncertain conditions are: • Impact of Brexit on migration • Impact of Brexit on business travel • Impact of Brexit on non-business travel • Threshold fill rates allowing airlines to offer low costs • The extent to which my travel patterns are part of a mass or niche target market • The extent to which my travel frequency will change (e.g. health of relatives)
Novelty	Does the scenario involve new variables/phenomena?	Not applicable
Ambiguity	Does the scenario involve ambiguous conditions?	The position of individual states regarding extending bilateral air travel agreements beyond flag carriers are ambiguous, as there is no willingness to make public statements.

Table 4.1. Assessment of TUNA conditions for the low-cost airline case

Low-Cost Airline Scenario Final Top Specification

Background: Low-cost airlines have become the largest airlines in Europe and have brought low-cost travel to a range of stakeholders. Some stakeholders are very dependent on using these travel links.

Broad question: What will be the impact of Brexit on low-cost airlines?

Objective: To understand how Brexit will affect my options to use low-cost air travel between the UK and continental Europe.

Time Scope: October 2019 to March 2023, divided in two periods: aftermath of Brexit up to October 2021, post-turbulence period thereafter.

TUNA conditions: Significant turbulence, uncertainty, and ambiguity combined. Scenario representation: As a set of futures on a qualitative, discrete grid.

4.5 RESEARCH

It seems trivial to state that researching a scenario issue needs to be done. Focusing on the right issues can be challenging though: in her research about the way in which IT systems and expert systems can support human foresight, Joseph (2018) shows that analysts find the research stage to be one of the most challenging stages of the process. Figure 4.2 shows a high-level view of the research process.

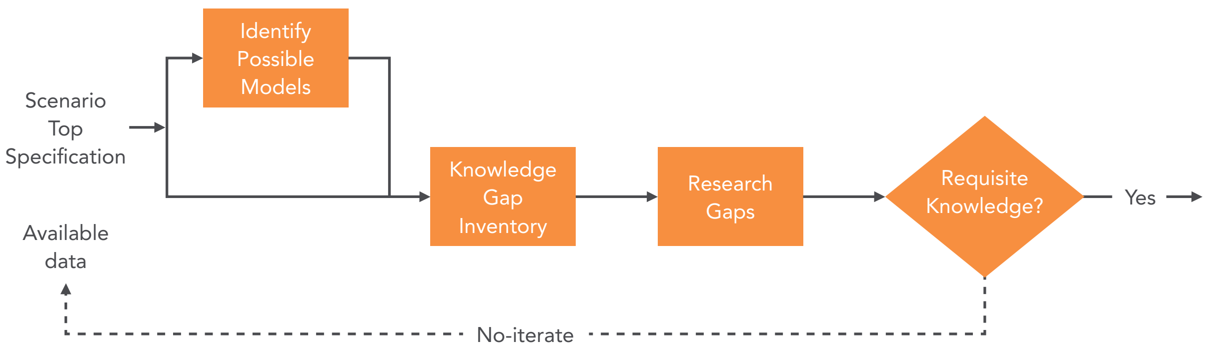

Figure 4.2. The research process

The process starts with the scenario top specification and more particularly with table 4.1. At this stage, the analysis should query:

- What is known about the underlying issues? What data is available and what models and frameworks can be used for the analysis?
- Can any historical data/method be used to critically inform the analysis (Bradfield et al., 2016)?
- What is not known about the underlying issues? What data is missing and what models/skills are lacking to start the analysis?

Different individuals will answer these questions differently and the research stage is therefore the most idiosyncratic stage of scenario analysis, as the need to do research greatly depends on your existing knowledge of an industry.

To illustrate the case study about low cost airlines here is my knowledge inventory, i.e. a statement of data and models that I am familiar with: the history of the airline industry, the debate that led to airline deregulation and the nine freedoms of the sky, the business model of low cost airlines versus traditional airlines, including an appreciation of the importance of managing fill rates through revenue management, an intuitive understanding of prices and volumes, and an understanding of classical economics demand and supply price determination. On the Brexit side, I am familiar with the different political possibilities of outcome (no deal, hard Brexit, several versions of soft Brexit, and the possibility of reversing the process).

As a practical exercise, it is good to stop reading at this point in time and to ask yourself: is there anything that I need to know about Brexit and the airline industry that is not mentioned above?

For example, I could question my 'intuitive understanding of prices and volumes'. Before moving to the next step, it may be a good idea to research actual data about different routes, such as flight frequencies, prices, and target markets. The latest will have to be inferred from publicly available data. For example, when considering EasyJet seasonal routes from the UK to La Rochelle (summer) and Grenoble (winter), it is easy to deduce that these flights primarily serve a holiday-time target market. The Ryanair routes which are available all year, e.g. London to Poitiers, in contrast, target individuals such as business travellers and expatriates. According to The Economist (2017), the proportion of passengers travelling to visit friends and relatives grew from 5% in the early 1990s to about 33% today.

Before undertaking the scenario analysis, it may also be useful to know about the economic growth of the airline industry as a whole. After some research, one is likely to find the 20 year passenger forecast prepared by the International Air Transport Association (IATA). Interestingly, this commercially available forecast is based on different scenarios: (1) a continuation of current policies, (2) a closing borders scenario, and (3) a liberal policies scenario. Reading about these scenarios and the underlying variables is clearly very useful before undertaking our own scenario analysis. Another interesting fact to consider before starting our scenario analysis is that IATA forecasts that air travel is likely to double in the next 20 years.

4.6 SCENARIO ANALYSIS

4.6.1 SCENARIO ANALYSIS PROCESS

Figure 4.3 shows a process model for the core of the process, the actual scenario analysis. The first step is to generate a long list of all factors that should be considered. This is informed by the previous steps of the process and could include lists individually prepared by different participants prior to a workshop. These factors are what we called “scenario variables” in Chapter 1. They capture ongoing trends, shifts, and changes. Their future states remain uncertain. At this stage, the focus should be to generate a list as exhaustive as possible, and this should be thought of as a brainstorming, mind mapping stage. Mistakes and redundancies are allowed. This step is similar to performing a PESTLE analysis, i.e. we are looking for political, economic, social, technological, legal, and environmental variables. The PESTLE acronym should be used as a search trigger but not as an exhaustive requirement. This means that you should ask yourself: are there legal aspects that I should consider? If there are none, this is fine.

The second step is to review this list for variables which are not uncertain, i.e. we know fairly well what is going to happen and have no reason to question existing forecasts. This includes pre-determined elements. This is for example the case of the prediction by IATA that airline travel will double in the next 20 years. We should perform our scenario with the understanding that generally, airline travel is expected to grow substantially.

The third step is to perform a structural analysis of the scenario variables. This is the heart of scenario analysis and the purpose of this step is to analyse and document the relationship between the different variables considered so far. This can be performed in an intuitive fashion or through the application of mathematical and logical approaches. In this chapter, we will use a simple graphical approach to perform this step. All the variables are organised in a belief network which shows the perceived relationships between these variables. More advanced approaches are discussed briefly in Chapter 5. A popular technique used in advanced schools of scenario analysis is called “cross-impact” analysis. Cross-impact is a systematic quantitative analysis that one variable has on the state of all the other variables. The belief network approach that is described in this chapter includes cross-impact analysis, but only in an intuitive fashion. The structural analysis step is concluded by selecting the key variables that will be used for the rest of the process.

The fourth step is to select a scenario representation method. If we selected two variables in step 3, and if these two variables are assumed to present 2 discrete states each, then the scenario representation method can be the classical 2x2 scenario grid.

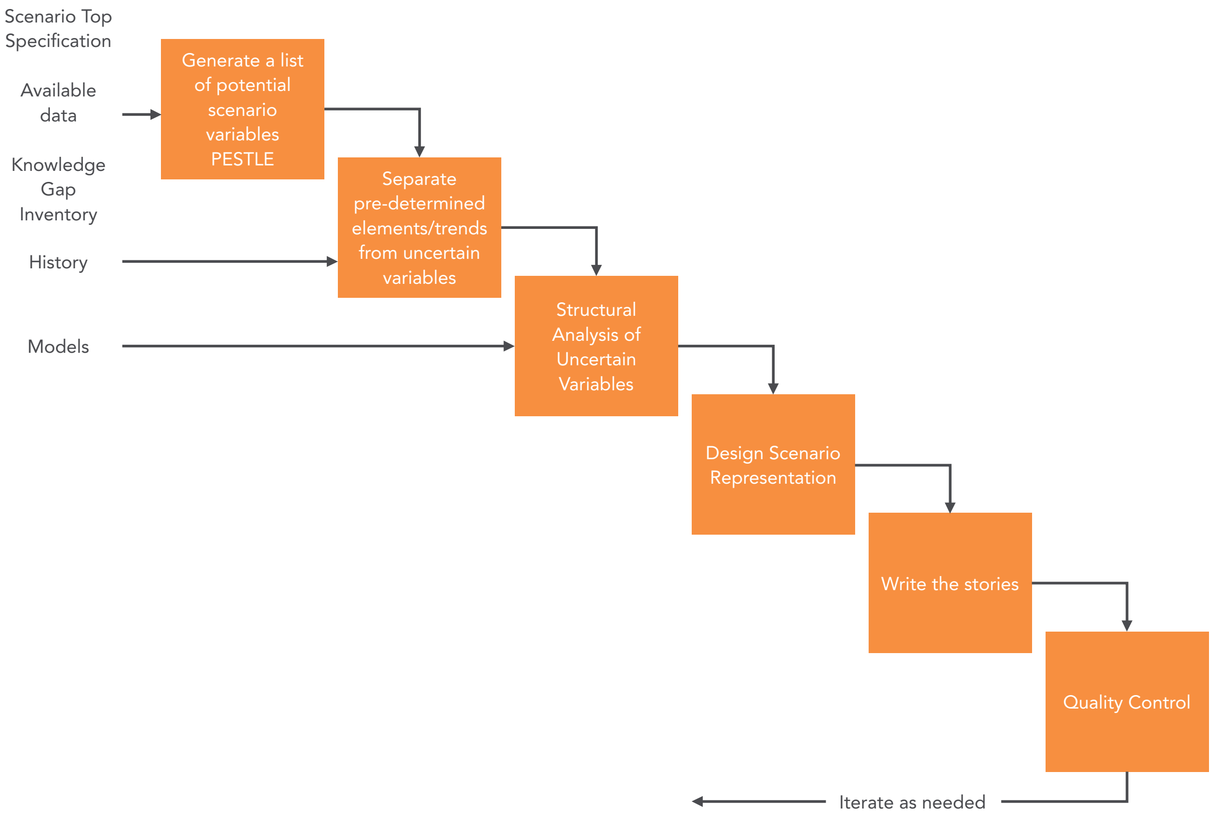

Figure 4.3. Scenario Analysis Process

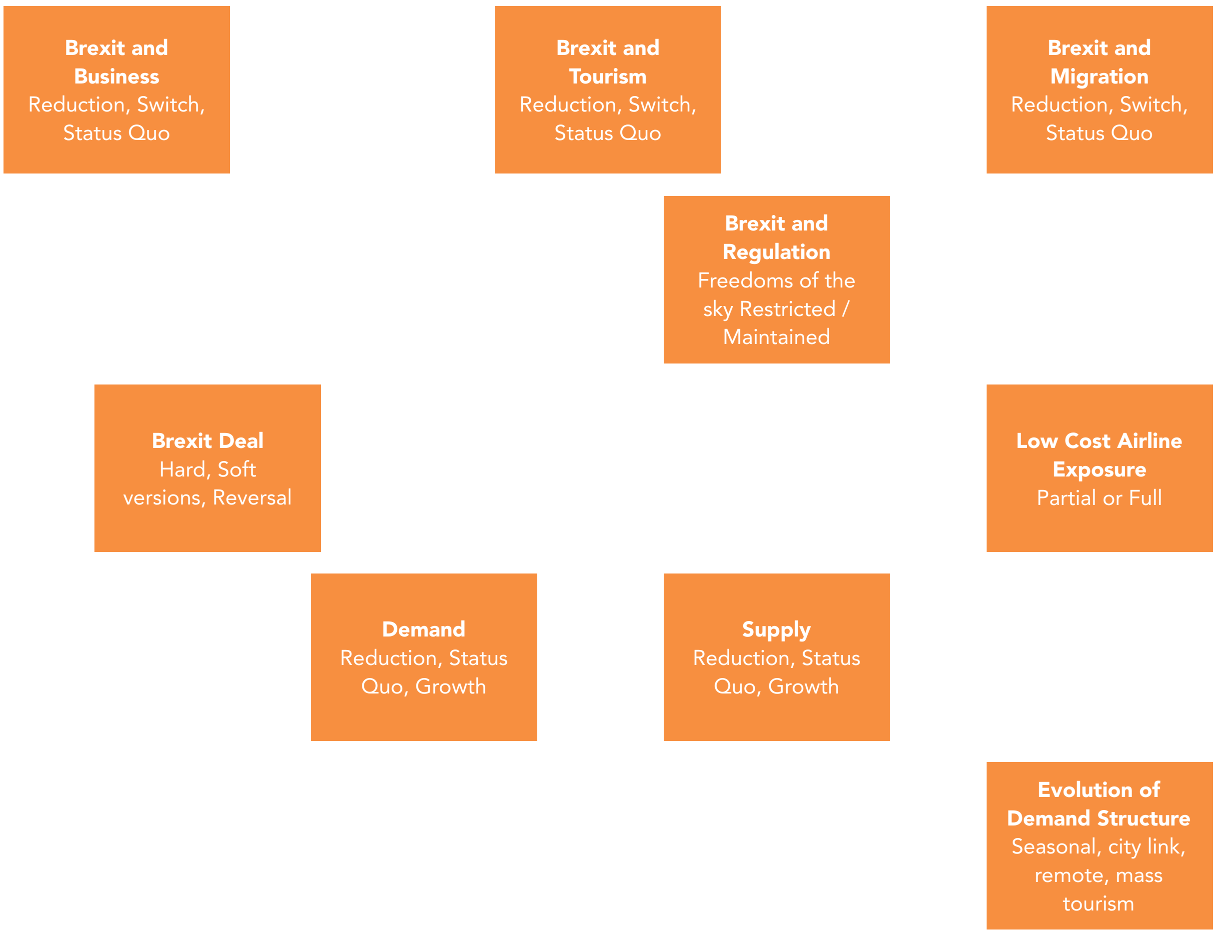

Figure 4.4a. Unstructured List of Scenario Variables

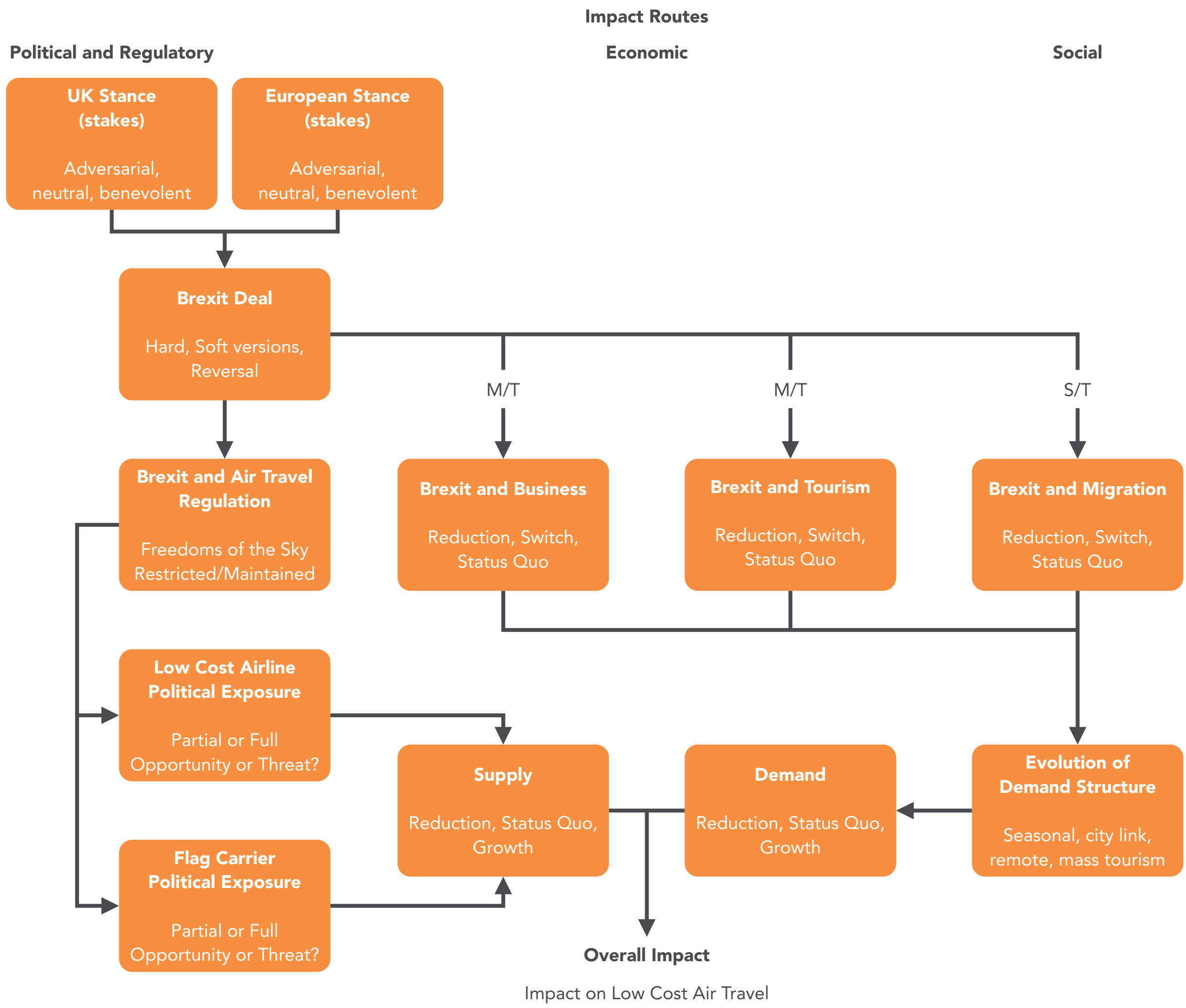

Figure 4.4b. The Structural Analysis Step

The following step is to write the stories associated with each of the scenarios. This is where we should rely on story telling skills. The challenge is to make the stories as detailed as possible but to be as concise and evocative as possible. Once the stories of different possible futures are written, the final step is that of quality control. If the scenarios are disappointing, vague, implausible, etc. the previous steps should be iterated until you are pleased with the final product.

4.6.2 ILLUSTRATION

The process in figure 4.3 can be illustrated as follows. The list of potential variables is listed in table 4.1. The next step is to isolate all pre-determined elements and internal variables. In table 4.1, we were preparing a knowledge inventory, that is all things that we need to know in order to understand and solve the problem. For the scenario analysis itself, we need to focus now exclusively on external uncertain variables, as these are the variables that will have an impact and shape the possible futures.

We know from the research done that the general forecast is that airline travel will increase, but we also know that according to IATA, this growth is driven by regulatory arrangements in relation to the freedoms of the sky. This defines the context in which our scenario analysis is performed and these pre-determined elements also point us to political and regulatory variables as key for the analysis. Figure 4.4a represents a first attempt at defining the external variables that should be used for analysis, in the same way that one would put ideas down on Post Its.

Figure 4.4b, the heart of the process, provides an illustration of the structural analysis of these variables. Do note that new variables have appeared between figure 4.4a and 4.4b as during the process of structuring, new ideas will always emerge. The question that drives the analysis is: how do these different variables relate to one another? The type of relationships that can be considered are:

- **Similarity**: if variables are similar, they should be **classified** or **clustered** together. In figure 4.4b variables have been clustered according to the impact route: political, economic, etc. Similar variables are represented in proximity of one another.
- **Causality**: this captures if one variable causes a change in another variable. For example, the manner in which UK and European politicians will negotiate the Brexit deal is the root cause of the final outcome of the deal. For example, if both behave in very adversarial fashions, it is reasonable to expect that the result would be a no-deal, i.e. a hard Brexit. In turn, this would cause the immediate cancellation of all existing freedoms of the skies, etc.
- **Temporality**: different variables will be important at different points in time. For example, because the Brexit referendum has been associated with issues of immigration, it is likely that the Brexit deal will have a short-term, nearly immediate, impact on migration. In contrast, the impact on UK-European business and tourism travel is likely to take more time to unravel.
- **Parallelism**: A parallel relation is one where two parties respond to changes independently. For example, in figure 4.4b, should UK-Europe freedoms of the sky become separated, low cost airlines would have to adjust. For example, an EasyJet flight from London to Milan would not be allowed as EasyJet would lose its access to European skies as a UK-based company. British Airways, however, would be in a unique position to take advantage of this by using its (pre-deregulation) legacy rights to fly this route. This means that to understand how airlines will react to a change in regulations requires considering the competitive cat-and-mouse game that would ensue and considering who is in a better position to win. The flip-side of the coin of losing the London-Milan route is that EasyJet may decide to intensify its internal flights, e.g. from London to Glasgow, and take customers away from British Airways on that route.

Figure 4.4b can be summarised as follows. The Brexit negotiations create a unique and singular political and regulatory uncertainty that will have an impact on the low-cost airline sector operating to and from the UK through two main impact paths. The first impact pathway is the change in the ability to supply low cost flights caused by a change of the freedoms of the sky. The second impact pathway is a longer-term impact of Brexit on the demand for low cost flights.

Conveniently, the analysis in figure 4.4b results in two structural pathways, which means that we can easily continue the illustration of this case study and propose a scenario analysis based on a 2x2 grid presenting 4 futures as shown in figure 4.5. Once figure 4.5 has been prepared, it is now straightforward to answer the opening questions. Airline business is crucially driven by the process of airline deregulation, and especially low-cost airline business. Brexit directly threatens this principle, and it is very likely that individual passengers should brace themselves for less choice, less frequent flights, and higher prices for flights travelling to and from the UK, unless all parties are willing to re-create the multi-lateral agreements that Brexit is removing.

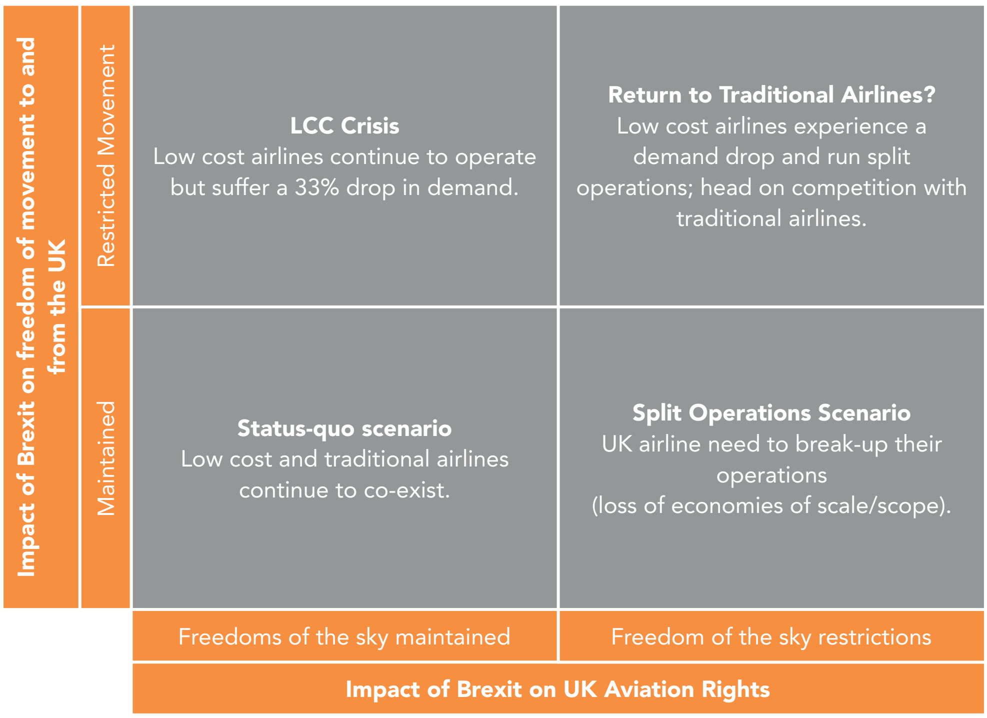

Figure 4.5. Scenario Analysis for Low Cost Airlines

4.6.3 COMMENTS ON ILLUSTRATIVE CASE

The low-cost airline case study was selected for its relative simplicity. It is clearly convenient that only two key pathways emerged in figure 4.4b! In more complex cases, where more variables are at play, the analyst will have to make the decision to either select the two most impactful/uncertain variables (see Chapter 5) or to present more possible futures. In any case, the purpose of the structural analysis is always to reduce the complexity of the problem. For example, figure 4.4a displays 9 scenario variables. For the sake of simplicity, assume that each variable can only take two states (yes/no, low/high) as assumed in chapter 1. If we consider that these variables are independent, then we could define $2^9 = 512$ different possible futures! This is clearly pointless as figure 4.4b shows that our variables are clearly causally related, and that the 4 futures of figure 4.5 are enough to capture what could reasonably happen.

There are other variables that could have been considered: the impact of Brexit on UK disposable income, the future cost of fuel, the availability of new technologies (such as electric planes). Clearly, the last one is not directly related to Brexit and can be eliminated as it is only relevant for longer term forecasts of the global airline industry. The first variable (UK income), although not considered, could easily be inserted in figure 4.4b as a driving force belonging to the demand impact pathway. Similarly, the cost of fuel is driven by the US dollar/pound exchange as aviation fuel is traded in dollars. A new impact pathway could be added to figure 4.4b on the supply side (Brexit has an impact on the value of the pound, this has an impact on the cost of fuel, this has an impact on the supply of low-cost flights). A good structural analysis of scenario variables should exhibit stability: new variables are easily attached onto the existing structure. If a new variable means that a structural diagram/belief network should be completely redrawn, it suggests that the initial analysis was not that robust.

4.7 DID IT WORK?

Once you have tried to use the simple process described in this chapter, you will be left with the question: did it work? But as scenario analysis is about foresight, how would you know? One option is to wait for 5 or 10 years (or whatever the horizon of your scenario analysis was) and to see if reality matches one of your stories. In many business situations, this wait and see approach is not an option! This is where feedback from others or performing this exercise as a group is invaluable in terms of providing feedback.

More information about assessing if a scenario process was successful is discussed in chapter 6. If you are not satisfied with the results, you should re-iterate the process or initiate a post-production stage.

5 KEY SCHOOLS OF SCENARIO ANALYSIS

5.1 THE INTUITIVE LOGICS SCHOOL

The intuitive logics school is one of the most famous schools of scenario planning and forms a *de facto* reference point when comparing different approaches to perform scenario analysis. It claims to be similar to the original approach used by Shell, but it is important to note that most schools of scenario analysis make this claim. Over the years, Shell has employed many individuals in its scenario planning department. Many met and worked with Pierre Wack. The end result is that all scenario experts have been influenced by the Shell approach in some ways, and thus, all are making a valid claim.

It is commonly agreed that the *intuitive logics* label is somewhat of a misnomer. The fact that it is called intuitive logics does not mean that it is not a rational approach and that it relies solely on imagination and intuition. It is in fact a very rational method. To understand the origin of the name, it is important to put it in its historical context. Prior to the development of the approach used at Shell, most planning was based on quantitative forecasts and required extensive mathematical analysis. It is to highlight the contrast with almost entirely mathematical approaches that the intuitive label was used. To illustrate this fact, let us return to the low-cost airline of Chapter 4. We showed that Brexit will have some impact on the demand for low cost airlines and that this impact will apply to three distinct segments: business, tourism, and personal (migrant workers) travel. A formal technical analysis would require researching the exact market shares of these three segments and to study the factors that drive demand for each segment. Estimates of percentage demand decrease could then be prepared. These estimates would then be combined with estimates of price elasticities of demand for each segment (more mathematical work) to assess the combined effects of supply –driven increase in price and downward shifts in demand. In chapter 4, we used an intuitive understanding of these steps to prepare the different scenarios. Essentially, the idea of the intuitive logics approach is that there is no need for advanced mathematics and data analytics if we can grasp the key, high impact, drivers of change in an industry. The intuitive logics approach is designed to be a team process and discourages the idea of performing a scenario analysis by yourself. The accuracy and rigour that is lost by not using data analytics is compensated by the diversity of thinking and experience that is brought by a carefully selected team of participants.

In terms of process, the intuitive logics approach is actually very similar to the one described in Chapter 4. The steps suggested by Wright and Cairns (2011) are described below and are contrasted with what was said in Chapter 4.

Stage 1: Setting the scenario agenda

This stage is similar to the scenario specification step described in chapter 4. The main difference is that the intuitive logics approach is designed with a client (e.g. a business organisation) in mind and an expert facilitator is used. The first stages are usually based on the facilitator interviewing each participant and keeping detailed transcripts of answers. The questions asked during the interviews are less analytical than the approach shown in Chapter 4. Instead, the facilitator asks participants to describe possible futures, what events or forces could create them, and what could stop them from happening.

Stage 2: Determining the driving forces

In Chapter 4 the second step was to perform a knowledge inventory of both internal and external factors. The intuitive logics approach is based on the principle that all participants are subject matter experts (for example, Shell managers are knowledgeable about the internal factors associated with running an oil company) and therefore the second step focuses on the identification of driving forces by relying on a PESTLE frame of reference. This is done individually and then as a group. The outcome is an unstructured list of driving forces, similar to that shown in figure 4.4a.

Stage 3: Clustering the driving forces

Wright and Cairns (2011) call this stage clustering but their approach starts by describing the causal and chronological relationships between variables. This is typically done as a facilitated group-based Post-It exercise, similarly to oval mapping techniques. The goal is to reduce the number of driving forces that will be considered. It is identical to the step of structural analysis described in chapter 4, and the output of this stage is a diagram, or set of diagrams, similar to figure 4.4b. The difference is that the different 'clusters' are unconnected whereas the approach in chapter 4 assumes that all driving forces stand in some form of logical relationship with one another.

Stage 4: Defining the cluster outcomes

For each cluster, the participants are asked to write what is the range of possible outcomes and the impact of these outcomes on the future on large sheets of paper. The focus is on identifying possible extreme outcomes. These outcomes were summarised in figure 4.4b for each scenario variable, and figure 5.1 shows an example of how the "evolution of demand structure" driving force would be documented with the intuitive logics approach:

Evolution of Demand Structure – Hard Brexit
Demand could collapse immediately if no arrangements are agreed by civil aviation authorities. Migration from Europe to the UK stops. Europeans residing in the UK observe the consequences of a hard Brexit and assess their options/status. Unattached young professionals that make up the bulk of low cost "ultra-mobile" customers may decide to leave the UK. Demand from migrant workers/family purposes could cause a total decrease in demand of up to 33%. Tourists adopt a careful "wait and see" approach that results in a drop in demand for a few years. If low cost travel options/affordability is affected, a vicious circle of demand decrease/price increase is initiated. Business travel is more price inelastic and is likely to be maintained in the short term, even in the event of price increases. A reshuffling of trade deals and trade partners lead to a decreased demand in business travel in the long term.
Evolution of Demand Structure – Soft Brexit (freedom of movement) or Reversal
An agreement is signed and maintains freedom of movement, imposes immigration restriction similar to those negotiated by the UK pre-Brexit, or Brexit is cancelled. Demand is maintained for all segments and the industry returns to its anticipated growth stage for at least the next 10 years.

Figure 5.1. Example of an "Extreme outcomes" record

Stage 5: Impact/uncertainty matrix

The purpose of this stage is to select the two key driving forces that will be used to build the scenario stories from the list of clustered forces identified in stage 2. This is done by mapping the driving forces onto an impact/uncertainty matrix. The horizontal axis of the matrix is the possible impact (low or high) that a driving force will have. The vertical axis is about the degree to which we are confident that a driving force will have an impact. The driving forces that are selected are those that are expected to have a high impact, and this, with a high degree of uncertainty. Figure 5.2 shows an example based on the low-cost airline case study.

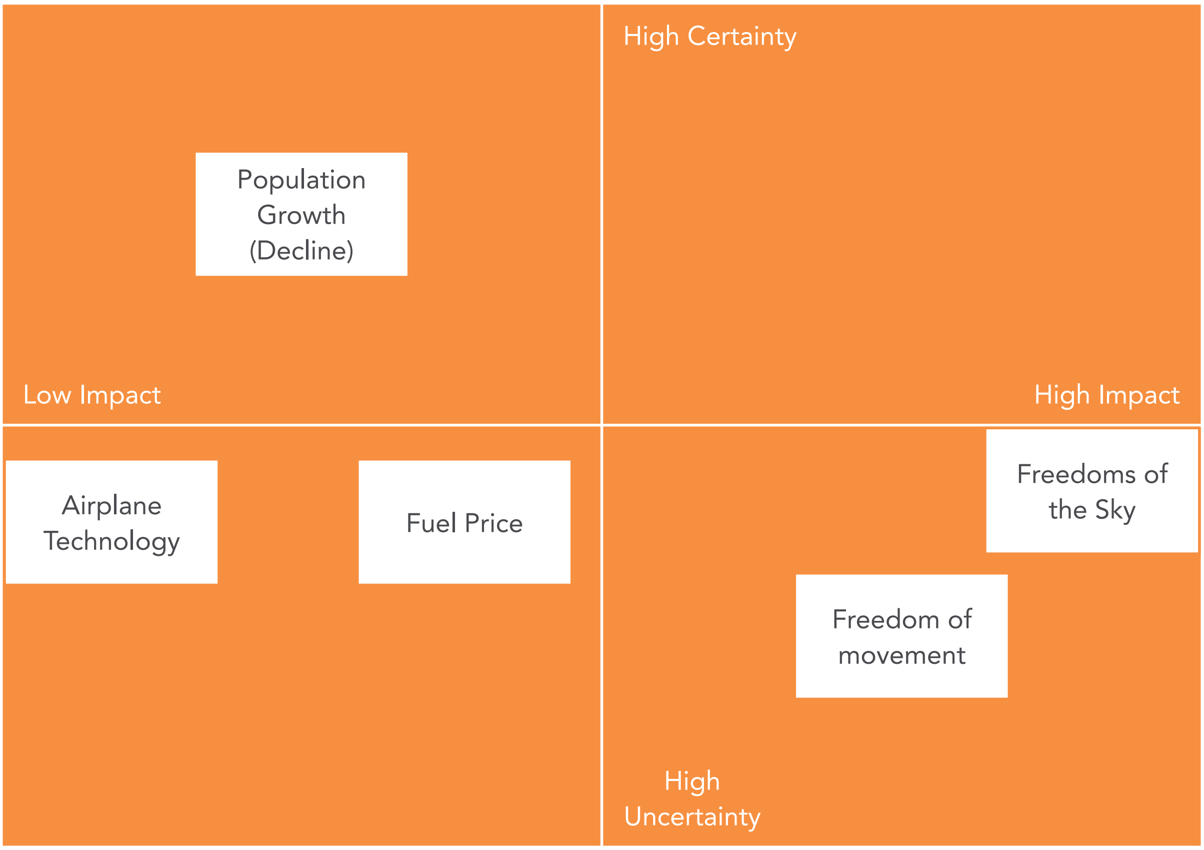

Figure 5.2. Example of an impact/uncertainty matrix

Wright and Cairns (2011) recommend that the driving forces should first be positioned on the horizontal axis to focus only on their relative impact. Once this is done, the certainty/uncertainty of this impact is assessed and driving forces are moved vertically either up or down. In figure 5.2, some low impact factors have been added for the sake of illustration. It shows that a change in fuel prices would have a moderate impact on low cost airlines (who monitor and hedge their exposure) but this impact is rather uncertain (one cannot rule out a forthcoming oil shock, further volatility of the pound relative to the US dollar, or a combination of both). Fuel price is however judged to have less impact than a change in the freedoms of the sky, as these are the foundations of low-cost airline business models. The fact that a change in the freedoms of the sky would have an impact is fairly certain, but there are a range of bilateral or multi-lateral air travel agreements that could be signed, creating some moderate uncertainty about the fact that the impact could be as high as expected. Freedom of movement restrictions is viewed as having slightly less impact, but a more uncertain one. Figure 5.2 would be used to conclude that the stories of the possible future should be around the variables in the bottom right corner, i.e. freedoms of the sky and freedom of movement.

Stage 6: Framing the scenarios

At this stage, the group is expected to discuss whether or not they are happy to build the scenarios around the two (or more) driving forces that came out of stage 5. This can be an unstructured conversation or a more formal process where new driving forces are considered.

Stage 7: Scoping the scenarios

All the Post-Its and sheets prepared in the previous stage are re-organised and positioned around the different emerging scenarios. For example, the notes about the evolution of the demand structure in the case of a hard Brexit in figure 5.1 would be associated with scenarios based on changing freedoms of the sky and/or freedom of movement. Allocating facts and ideas to each scenario, and adding new ones, is discussed by the group. The purpose is to define the boundaries of each scenario in order to make sure that the extreme outcomes being considered remain plausible.

Stage 8: Developing the scenarios

Using all the information and specifications from stage 7, the team write the stories for each scenario. Wright and Cairns (2011) also recommend adopting a timeline approach that shows how the story of each future unfolds. This can be done graphically.

5.2 INTUITIVE LOGICS "AUGMENTED APPROACHES"

The intuitive logics is also famous for its variants or additions to the basic approach. In their book *Scenario Thinking*, Wright and Cairns (2011) dedicate a full chapter to extensions of the basic method, which includes:

- Working more extensively on the extreme outcomes before clustering the driving forces.
- Use a stage of stakeholder analysis to better understand who the different actors are and how their collective actions and reactions contribute to shaping the future.
- The *Critical Scenario Method* where stage 8 (the development of the scenarios) is followed by an additional stage 9 where participants are asked to purposefully adopt a critical perspective, usually informed by theory (e.g. Cairns et al., 2010).

- The *Scenario Improvisation* method (Cairns et al., 2016) is a variation of the basic method adapted for workshops performed with a more diverse set of participants with limited time availability. The approach is a more iterative one. An initial scenario is performed by a facilitating team. This scenario is presented to the participants and the discussion that ensues is used to refine the scenarios. This process of presentation, discussion and refinement continues until all parties are happy with the scenarios. The facilitating team can also introduce new, improvised scenarios, based on themes emerging from the workshops.
- The *Branching Scenario* approach (Cairns et al., 2017) is similar to the scenario improvisation approach in that it is based on an iterative process that includes off-workshop work, workshops, and Delphi-stages where participants are consulted individually. Its unique feature is to use branching scenarios to highlight versions of the future that participants may be inclined to avoid. In their example, Cairns et al. (2017) describe how regional politicians refused to consider the possibility of altering their region's futures as they felt that national-level, not regional policies, would shape these. This was addressed by including a set of scenarios where national powers were devolved locally as an alternative to the scenarios based on national policies.

5.3 THE OXFORD SCENARIO PLANNING APPROACH

The Oxford Scenario Planning Approach (OSPA, Ramirez and Wilkinson, 2016) is also derived from the original Shell approach but it possesses a number of unique characteristics. Ramirez and Wilkinson (2016) explain that the essence of OSPA is to allow participants to reperceive their own and others' self-interest and options in relation to the problem at hand. It is based on a flexible but structured learning-oriented approach. The distinguishing feature of the OSPA is that it is designed more as a cycle than as a stepwise process model, as shown in figure 5.3. The process can be described as follows. Participants start with an initial scenario analysis and define a first set of strategic frames, a stage equivalent to stage 6 (framing the scenarios) of the intuitive logics approach. Participants are then encouraged to critically review the framing of the scenario in order to discover missing variables, issues, etc. This is called "reperceiving" and it leads to redoing the initial steps of the scenario analysis. As the analysis is redone, new frames are discovered: this is reframing. The new frames may lead to new questions that lead to more reperceiving, and etc. The cycles of reperceiving and reframing are repeated until the participants are satisfied with the scenarios.

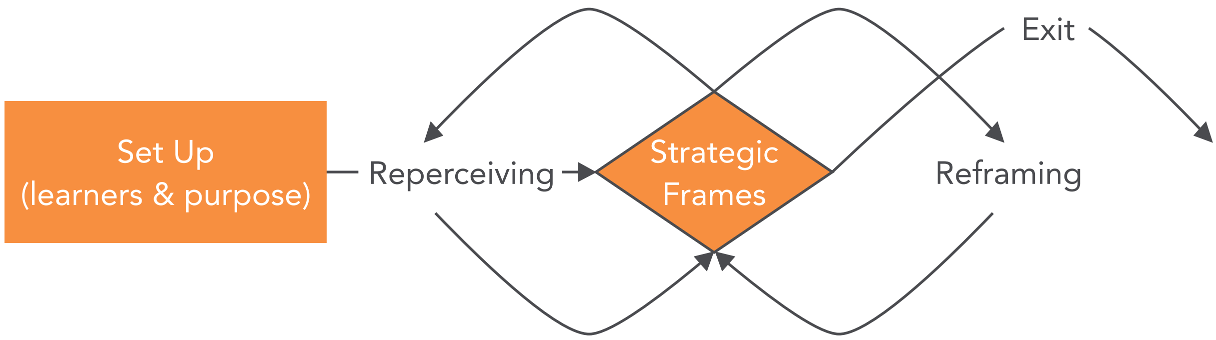

Figure 5.3. The Oxford Scenario Planning Approach

The OSPA uses a default intuitive logics approach but it can be adjusted to become a deductive, inductive, abductive, normative, incremental, alternative futures, critical scenarios or perspective-based method. These different approaches are deployed as needed during the cycles of reperceiving and reframing. The OSPA is also based on the TUNA conditions framework which was discussed in Chapter 3.

5.4 LA PROSPECTIVE

La Prospective is a French school of scenario analysis that describes itself as being a more "latin" concept (Godet, 1985) initially created by the French philosopher Gaston Berger in the 1950s. *La Prospective* is defined as being neither about forecasting nor about futurology. It is defined as a method of building a view of possible futures. Possibility is defined as the consequence of historical determinism and of the interplay of actors. Scenarios are defined as logically coherent configurations of hypotheses. Whereas most of the previous methods described in this book did not use probabilities, *La Prospective* estimates the probabilities of the occurrence of the scenarios.

The purpose of *La Prospective* is to create a strategic culture based on the following three 'golden' rules (Godet, 1985):

- Cultivating the ability to anticipate ("prospective" will)
- Cultivating the will to act strategically by planning flexibly
- Appropriation, i.e. the collective mobilisation of all actors

The scenario method of *La Prospective* is summarised in figure 5.4. Whereas most of the focus of this book has been on scenario analysis, i.e. the different methods used to anticipate the future, *La Prospective* is a fully integrated approach, linking anticipation to action. As such it displays a more systematic and careful definition of the different concepts and steps: actors, their intentions, the role of historical determinism. More information can be found on the website of *La Prospective*: http://en.laprospective.fr/

The first step in figure 5.4 is about structural analysis. It is based on a formal approach based on matrix algebra and is named MICMAC, a French expression used to indicate that what analysts do is to reveal order and structure in what appears to be a mess. MICMAC starts with a thorough census on all internal and external variables that are relevant, e.g. a list of 80 variables. A matrix is then built to represent the impact that each variable has on all the other variables. A distinction is made between a direct impact between two variables, or the fact that these two variables can stand in an indirect relation. This distinction is important as one of the key features of MICMAC is to able to reveal a hidden variable, i.e. a variable that participants are likely to overlook but that is pivotal in terms of understanding how a system behaves. The result of the MICMAC mathematical procedure is to classify variables in 4 groups:

- Autonomous variables which are not dependent on others and that do not drive system change
- Dependent variables (i.e. driven by others) that do not drive system change
- Independent variables that drive system change
- Pivotal variables that are driven by others and create system change

The second unique feature of *La Prospective* is the estimation of probabilities, also called the SMIC method. This is a stage of surveying experts, usually through a Delphi process.

Experts are asked to consider different hypotheses and to estimate a probability of occurrence for each hypothesis. They are also asked the probability of occurrence of that hypothesis if another hypothesis occurs or does not occur. This results in a cross-impact matrix. Matrix algebra is then used to compute the probability of occurrences of the different scenarios based on the data contained on the cross-impact matrix. It is worth noting that in practice, MICMAC and SMIC are performed with specialist software. This means that no knowledge of matrix algebra is required.

5.5 THE MANOA SCHOOL

This scenario method is based on the approach developed at the Hawaii Research Centre for Future Studies and the Political Science Department of the University of Hawaii at Manoa. Jim Dator (2009) explains that this approach uses as many theories and visions of the future as possible to build rich alternative descriptions of the future. In his experience, these alternative futures often fall into 4 generic types:

- A "continued growth" view of the future that assumes that countries and societies can continue to grow by continuing existing practices.
- A "collapse" future where serious social or environmental change takes place, halting growth and growth prospects.
- A "discipline" future where society understands key social and environmental issues and manages to discipline itself with adequate value systems.
- A "transformation" future where society transcend social, economic, and environmental problems through technological progress.

In the Manoa School, participants are invited to enter a room which has been decorated with images and artefacts about one of these futures. They are read a description of the future and asked to answer a number of questions about what their life, their concerns, daily activities, and needs would be. The Manoa alternative futures school method is used to move organisations and communities towards a desired future, i.e. they can collectively act today to evolve towards a future that they agree is more desirable.

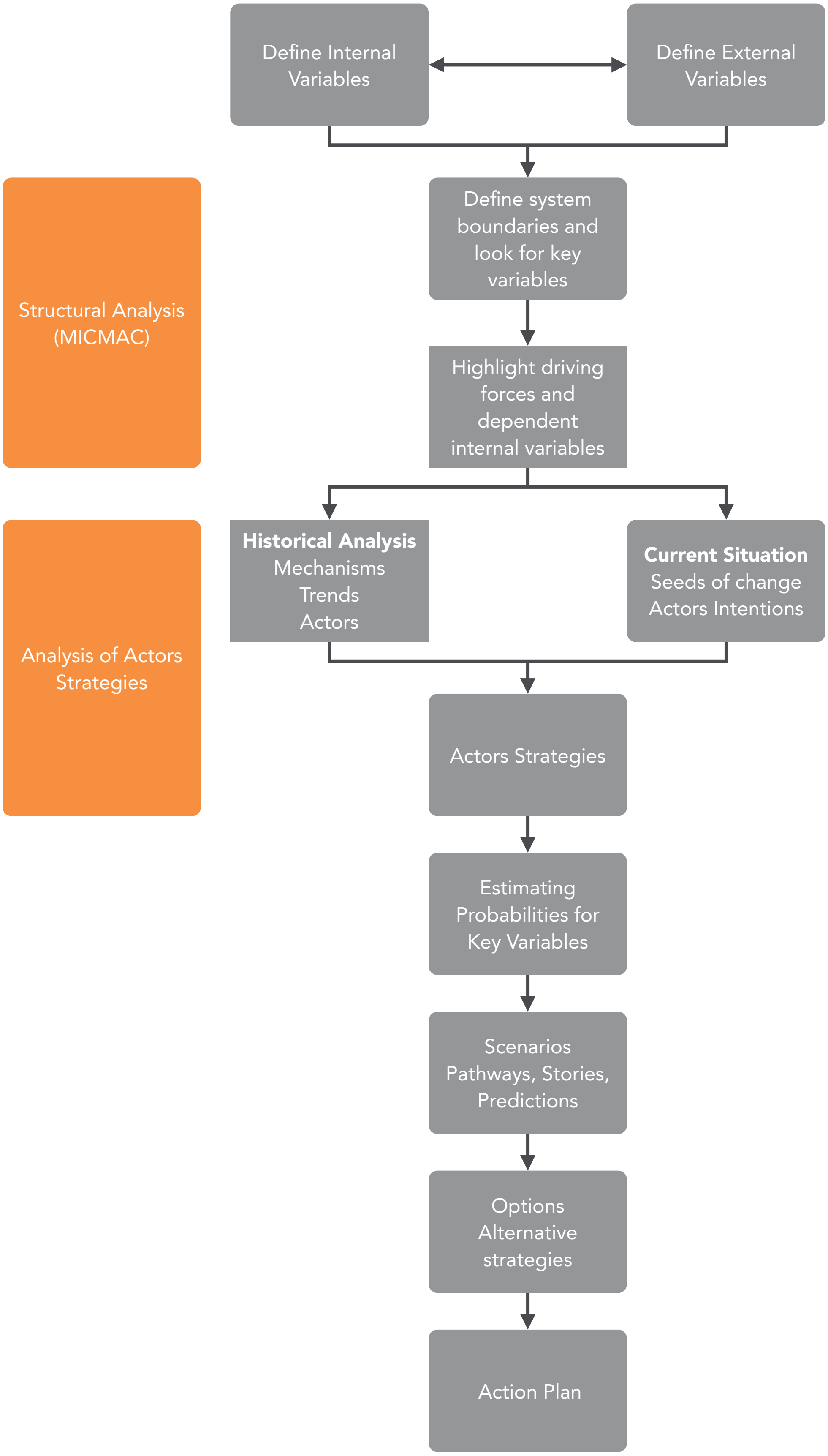

Figure 5.4. La Prospective Approach to Scenario Planning

6 SCENARIO SUCCESS AND FAILURE

6.1 THE AMBIGUITY OF SCENARIO SUCCESS

For most users of scenario analysis, it is necessary to assess if the work done was successful at the time of the analysis, but defining success is highly ambiguous. Figure 6.1 uses a simplified account of Leseure (2019) to show that the success of the scenario analysis can be defined in four different and independent ways:

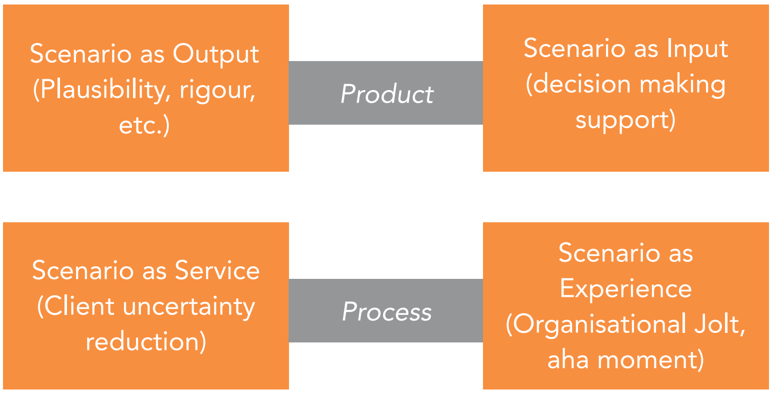

Figure 6.1. Four Independent Dimensions of Scenario Success

Figure 6.1 first introduces a product/process distinction and then proposes four different ways of describing scenario success. A scenario analysis can be said to be successful if:

- Its products (the scenarios) are 'accurate' or 'right'. The notions typically associated with this success criterion are rigour (Godet, 2000) and plausibility (Ramirez and Selin, 2014). Bradfield *et al.* (2005) add the following baseline criteria: probability (of the scenario), coherence, internal consistency, logical underpinnings, verifiability in retrospect.
- Its products (the scenarios) will make a constructive and useful contribution to a further process of decision making.
- The process of the scenario analysis is useful to the client and address pre-agreed contractual objectives.
- Participants will experience an enlightening moment as part of the scenario analysis, i.e. they will collectively go through an experience. This experience is described as an 'organisational jolt' (Wright and Cairns, 2011), the ability to reframe and re-perceive leading to an 'aha' moment (Ramirez and Wilksinson, 2016), or as appropriation (i.e. collective mobilisation translating anticipation efforts into action; Godet, 2000), or the making-meaning feature of storytelling (Bowman *et al.*, 2013).

One of the challenges with assessing when a scenario analysis is successful is that different individuals can use different definitions.

6.2 ASSESSING THE PRODUCT QUALITY OF SCENARIOS

If you want to assess how good the outputs of a scenario analysis are, the principle is to review the scenarios against a checklist, such as the detailed list from Mitzner and Reger (2005, p. 234), as shown below:

- *Clarity (scenarios should be understandably formulated for the reader)*
  - Clearness (avoid misunderstandings)
  - Cohesion with the object of investigation
  - Suitability
  - Transparency

- *Thoroughness of the Content*
  - Flawlessness (no invalid assumptions)
  - Plausibility
  - Completeness
  - Finding of cohesions
  - Description of development paths
  - Information content (precision, universality, utility)

- *Relevance*
  - Function of decision
  - Function of orientation
  - Relevance in different planning processes (target building, identification and analysis of problems, forecast, assessment and decision)

- *Constitution and Relationship of Scenarios among Themselves*
  - Dissimilarity
  - Covering all future situations
  - Homogeneous forms and statements
  - Stability

6.3 HOW AND WHY DOES GROUP SCENARIO ANALYSIS FAIL?

In the more general context of assessing the success of a scenario analysis by looking at the quality of the process, there are four different possible root causes of failures.

The first is the use of scenario analysis as a conduit for political discussions. Participants will actively promote their agendas, but nobody is genuinely interested in what other parties have to say. Bowman et al. (2013) present a case study of a scenario intervention that failed because of '*political manoeuvring*'.

The next mode of failure is '*go with the flow scenarios*', i.e. the result of general indifference by participants and of a lack of debate, typically leading to accepting any scenarios that are proposed. Leseure (2019) provides an example of a scenario that was a 'go with flow' failure and was eventually recovered.

'*Constrained scenarios*' are characterised by several participants having an irrational want for a specific outcome; their physiological state (high arousal) prevents constructive participation and constraints the ability to have a healthy debate.

Finally, '*conflicts battlefields*' described situations where participants are in a state of irrational want which leads to too much debate; this results in open conflict and a heightened state of over-stimulation. Hodgkinson and Wright (2002) provide a detailed case of a failed scenario analysis that exemplifies the stressed and conflict-ridden environment of the '*conflict battlefield*' mode of failure.

7 USING SCENARIOS

7.1 FRAMING THE BOUNDARIES OF SCENARIO ANALYSIS

We have mentioned throughout this book that there are many reasons for using scenario analysis. In Chapter 3, we saw that scenarios are often intermediate products, i.e. they are the input to another step such as planning. Figure 7.1 clarifies this by distinguishing scenarios, forecasts, simulations, strategies, and real options, and by linking these concepts together. It is illustrated by an example of planning for the impact of Brexit on UK businesses.

A first important distinction is that between forecasts and scenarios. Forecasts are quantitative predictions, for example a 10% depreciation of the Pound Sterling relatively to the Euro in the next year. If the rate today is 1.13€ per £, the exchange rate in 1 year will be 1.13 x (1-0.1) = 1.017 €/£. This value is a forecast and many quantitative techniques exist to prepare forecasts, as for example time series analysis. A key concern when forecasting is accuracy as a business person will make an actual decision based on the forecast, as for example the speculative decision to purchase euros today and sell them in one year for a profit. Forecasts are useful inputs when performing a scenario analysis, especially when they are combined with sensitivity analysis: what happens to the exchange rate if the UK inflation changes by +/- 5% from current average values? Forecasts can also be used to build simulations: what happens if we simulate randomly changing inflation rate, trade and capital flows?

Scenarios are typically complex stories of the future. For example, in figure 7.1, the underlying 'story challenge' is to understand the different types of Brexit. Brexit could mean a complete breakdown of trade relations with Europe ("hard Brexit") versus a negotiated agreement where some trade links are maintained ("soft Brexit"). Although the value and future volatility of the Pound Sterling will be part of these stories, there are many more dimensions to these stories: custom duties, labour mobility, capital flows, etc.

Figure 7.1 shows that, in contrast with forecasting where a few independent variables are used to predict a single variable, the elaboration of scenarios will involve a large amount of data, information, and knowledge. This means that whereas forecasts typically demand mathematical skills, the problem faced by scenario analysts is different. The key challenge is to bring together facts, theories, ideas, intuitions, etc. which are often contradictory. Sense making (Weick, 1995), the ability to sort out relevant facts from noise, and a cool head are the skills required.

Although we may be preparing scenarios just because we are curious about the future, in the majority of cases, we will be using the scenarios to make a decision. When managers combine strategic management with scenario analysis, this becomes the domain of **scenario planning**. In the example of figure 7.1, the decision is whether or not to open a financial services branch in London. As London has for long been recognised as the financial capital of the world, this would normally be a simple decision. However, in 2018, London lost the top place to New York in the Global Financial Index 25 ranking. This means that investing in the branch today can be associated with a variety of outcomes, from a loss if access to customers is compromised (hard Brexit) to a profitable venture (first mover advantage in the case of the recovery of London as financial capital).

If my scenario analysis suggests that a hard Brexit type is almost certain, I will cancel the investment today. It is only if I believe that the future will be based on some variation of a soft Brexit scenario that I would continue. This does not mean however that my decision is riskless, as a hard Brexit could still occur!

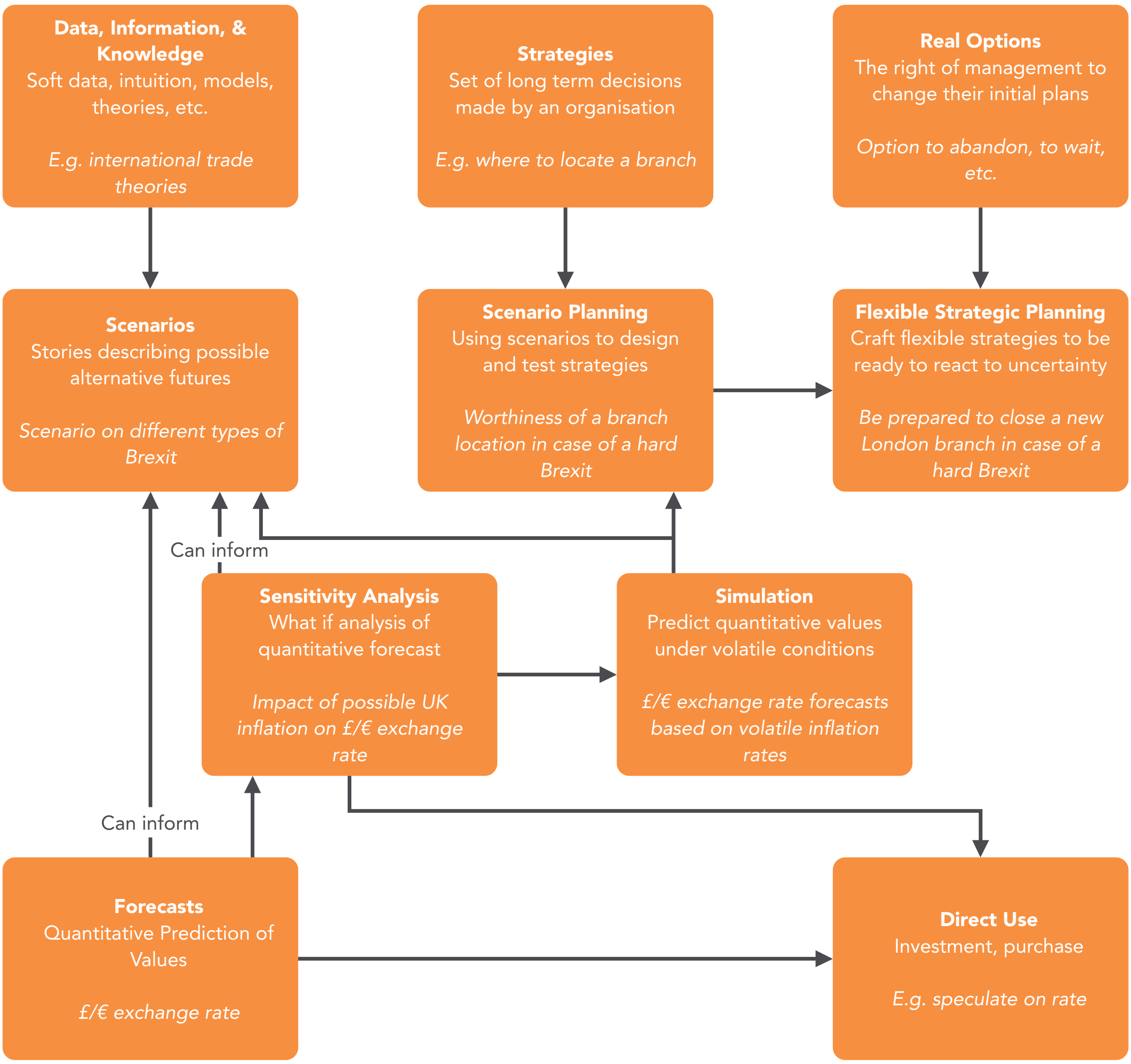

Figure 7.1. Mapping Key Concepts and their Relations

If I choose to proceed and want to manage this risk, this is where the field of **real options thinking** comes in. Real options are rights, but not obligations, for managers to take some actions relative to real assets. In the case of figure 7.1, if my scenarios suggest that a political decision on Brexit is imminent, I may consider the option to wait. If the decision is expected to be made at a much later date, e.g. in a couple of years, I could value the option to abandon, i.e. plan for an exit strategy in case of a hard Brexit. When real options thinking is used to help managers make a decision, this becomes the domain of **flexible strategic planning**.

7.2 SCENARIO PLANNING

To appreciate how scenario planning works, it is useful to look at an example of a typical strategic decision under uncertainty. A textile firm with a manufacturing facility in the UK is struggling to remain competitive due to high labour and operations costs. It is considering several relocation alternatives which are shown in figure 7.2.

The first two options are relatively small capacity investment projects in Morocco and Turkey respectively. Another option is to acquire an existing firm in Latvia, which would come with 3 times the capacity of the other projects. Finally, the last option is to form a joint venture with a Chinese firm, with an even higher initial investment capacity. Figure 7.2 show that there is some flexibility in the future when considering further investment in the next two years, and there are 32 possible investment sequences (for example, decision sequence 5-13-18 would be the initial decision to invest in Latvia, not to invest in year 2, and to build a new factory in Turkey in year 3).

Traditional strategic decision making would only look at the financial worth of decisions 2, 3, 4, and 5. These would be based on forecasts of future cash flows, and a Net Present Value (NPV) figure would be computed for each project. The project with the highest NPV would be selected.

This traditional approach to investment decision making has been criticised as it does not take into account the flexibility that is embedded within each decision. This is where real options valuations comes in: financial experts will add to the original NPVs the values of possible options. This means that a value is now attached to a decision sequence rather than only the initial step. For example, a strategic NPV could be computed for sequence 4-12-15, which is an investment in China in year 1, which is abandoned in year 2, and replaced with a small facility in Morocco in year 3. The textile firm would end up with very little capacity in year 3 and much money would be lost in the abandonment of its initial move. With real options valuations, the decision sequence with the highest strategic NPV will be selected. This is typically the sequence which is the most flexible.

All the financial computations that would be done with these two approaches are based on numerous assumptions. So far, scenario analysis was not used. A scenario analyst would look like at figure 7.2 differently and ask the question: could anything happen to invalidate my assumptions? This is the starting point of scenario planning. The 32 decision sequences are the different possible plans, and scenario analysis will help us to determine how good these plans are under different futures. To keep the illustration simple, we will use simple scenarios: (f1) the cost of labour increases significantly in China, (f2) political upheaval in Morocco, and (f3) Turkey joins the EU. It is important to note that none of these futures align with the initial assumptions that were used to estimate the financial worth of each plan.

Decision sequence 4-12-15 was described above as not being desirable because the investment in China was abandoned. In future 1, it becomes a more robust plan as it would provide the opportunity to produce a large quantity abroad at a low cost and to move to a different location if the cost of labour were to increase. Making this assessment is why scenario planning is famous and recognised as a key strategic planning technique. The assessment of which plan is best given possible futures can be intuitive, but it can also be based on using robustness analysis (Rosenhead, 2001). To apply robustness analysis to figure 7.2, planners will have to consider each decision sequence under each possible future, and to rate the sequences as being desirable, acceptable, undesirable, or catastrophic investment plans. For each pairwise association of investment sequence and future, a decision robustness ratio is computed by dividing the total number of positive end configurations by the total number of end configurations. In the case of figure 7.2, this would lead to a table of robustness scores as shown in table 7.1. It shows that the decision to initially invest in Morocco has a robustness score of 100% in future 1, but that it performs very poorly under future 2. Decision 5, the investment in Latvia, is the more robust decision across all possible futures, whereas decision 4 (China) does not appear to be very robust. More technical explanations based on a similar example can be found in Driouchi et al. (2009).

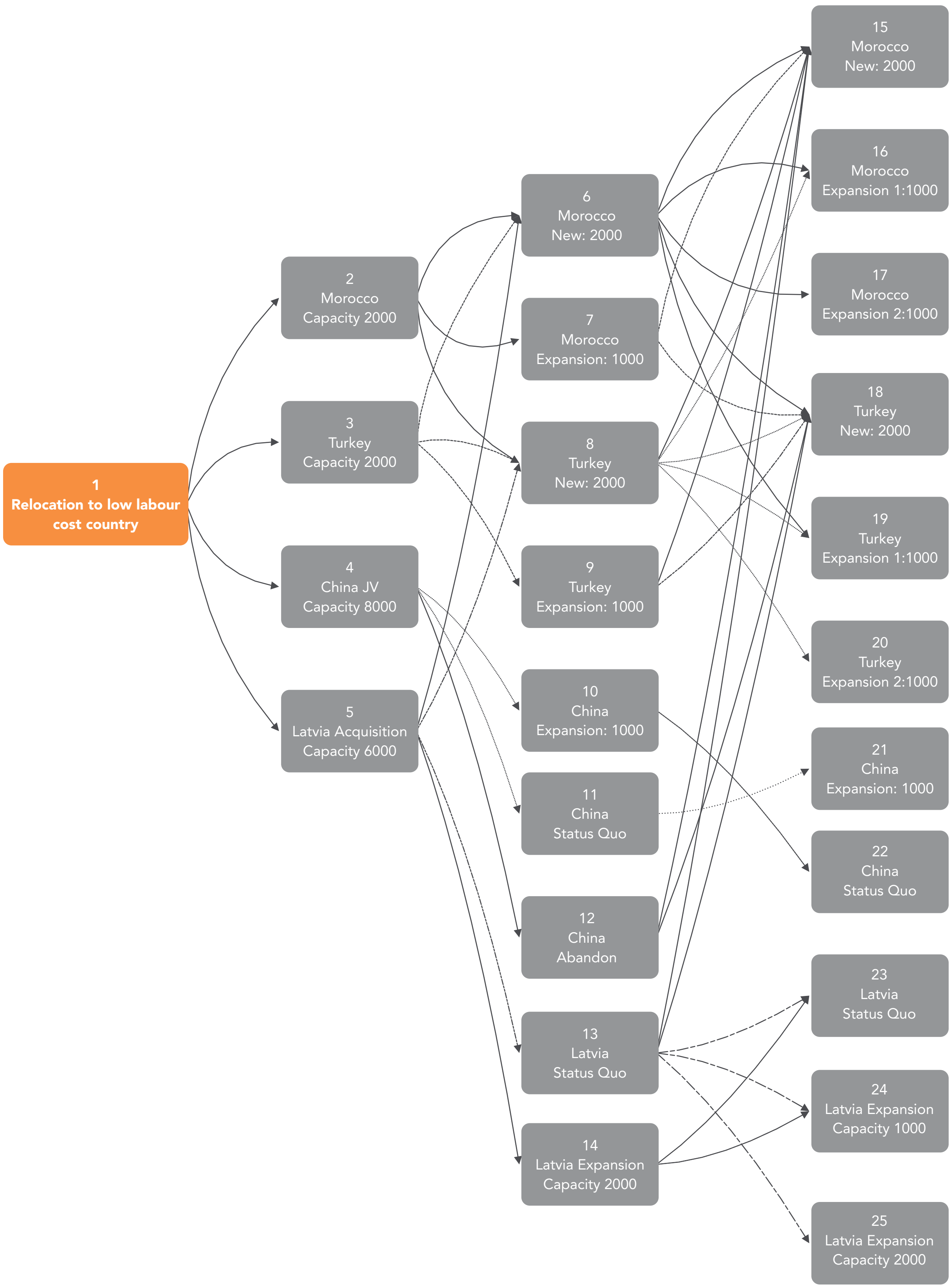

Figure 7.2. Options Available to Textile Producer

Decision	F1	F2	F3	Average
2	1	0	6/9	0.56
3	1	0	1/11	0.36
4	0	3/5	0	0.2
5	4/10	9/10	8/10	0.7

Table 7.1. Robustness Analysis Example

7.3 PERFORMANCE ASPECTS

An important side of using scenario analysis is the ability to communicate the stories to third parties who were not part of the construction of the scenarios. This is called scenario performance, and it is generally accepted that presenting the scenarios effectively is a skillset in its own right. Typically, at this stage of the process, the objective is to disseminate the ideas that were discovered during the scenario analysis and imprint a collective meaning on the audience. This feature of scenario planning is often compared to storytelling. This means that ideally, scenarios should be presented like stories that contain specific attributes such as novelty, a surprising outcome, and a compelling set of logical connections. Through these storytelling features, the person presenting will be able to change the mindset of the audience from an existing set of beliefs towards a newer, shared vision of the future.

Bowman et al. (2013) provide an interesting account of two subsequent scenario planning exercises for a local government agency in Scotland from a storytelling perspective. The first set of scenarios were prepared by a small of group of experts in a similar fashion to the intuitive logics approach. This resulted in particularly insightful scenarios, and a professional storyteller was hired to present these scenarios to the employees of the agency. The scenarios became part of the organisation's shared knowledge and were frequently referred to by employees when making decisions. Based on this success, the agency started a second phase of scenario analysis. The approach was different and involved many more participants. It was performed more like a Delphi study. Storytellers were not hired and Bowman et al. (2013) suspect that the relatively non-engaging presentation of the scenarios to the rest of the organisation is why the second round of scenario planning was judged unsuccessful.

We have previously stressed how the work of Pierre Wack at Shell was influential in making scenario planning famous. Historical accounts of Pierre Wack's work (e.g., Chermack, 2018) point out that the written scenario presentation formats of Pierre Wack were basic and unsophisticated. There is very little evidence of Pierre Wack ever using the scenario frames/grids discussed in this book for example. Instead, Pierre Wack was famous for his ability to engage the audience through highly entertaining stories and persuasive accounts of each scenario.

7.4 SHAPING OPINION AND CHANGING MINDSET: BEYOND CORPORATE SCENARIO ANALYSIS

There has been an increasing use of scenario planning to inform and influence large scale societal decisions. For example, MacKay and Stoyanova (2017) provide a detailed account of the different scenario analyses used by the UK and Scottish governments in the run up to the Scottish independence referendum in 2014.

The practice of shaping opinions beyond the scale of corporate scenarios can be illustrated with the following set of Brexit scenarios:

1. Through the adoption of free trading standards and targeted free trade agreements, the UK could be better off. The monies not spent on European membership can be spent on improving quality of life and quality of infrastructure in the UK. Shortly after Brexit, the UK will experience healthy economic growth.
2. It is likely that trade will be negatively affected by Brexit and that the UK economy will suffer. However, the rationale for Brexit is regaining sovereignty rather than improving the economy. Brexit is likely to be followed by an economic recession comparable to the credit crunch. The UK is a large enough economy and as such it will eventually recover, although growth prospects will remain modest. The UK will become known as a large independent island economy, setting new standards for reasonable (sustainable) growth targets.
3. The disruptive impacts of Brexit are so numerous and widespread that the UK economy will collapse. Border travel and freight will decline. High inflation will lead to personal and corporate bankruptcy. Increased demand on public services cannot be satisfied for both budgetary and staffing reasons. It will take decades to recover from Brexit and reversing the decision will be the only way to do so.
4. In a world torn between small-scale populist and large-scale globalist values, Brexit is the first case of a large economy openly seeking to benefit from sovereignty and global connections at the same time. In order to remove the trade-off between sovereign control and participation in free trade, the UK will have to rely on securing advantageous deals or exceptions to rules. As trade partners gradually realise that they are dealing with a partner unwilling to accept economic trade-offs, the reputation of the UK will eventually become that of a neo-mercantile, selfish trade partner. This eventually results in economic isolation.

It is easy to imagine how different political parties will align themselves behind these different scenarios, look for evidence supporting them, and campaign by finding spokespersons that can tell one of these stories in convincing ways. This support eventually translates into votes and/or decisions aligned with the more compelling view. This practice, that of shaping opinions through the performance aspect of scenario analysis, is both a positive and negative aspect of scenario planning.

The positive account is described by Kornberger and Clegg (2011) with their detailed account of how Sydney developed a sustainability strategy through 'performative practice'. It is by adopting a specific language and performance approach that Sydney's population was engaged and became more knowledgeable. The population became mobilised around some ideas that became legitimised by silencing dissenting voices. Kornberger and Clegg (2011) argue that the performance aspects of strategy should be viewed as an aesthetic performance, i.e. one that could be compared to acting.

The capability to influence through performance is clearly a desirable feature, provided that a consensus is reached towards a sound strategy. In the case of the 4 Brexit scenarios listed above, 3 years after the referendum, there is no still no consensus nor commonly accepted view of which scenario is more likely to happen. In such a case, it may well be that the performance aspect of scenario analysis will prevail over the quality of the analysis that went into supporting or refuting the scenarios. In their review of the Scottish referendum scenarios, MacKay and Stoyanova (2017) argue that how participants and structural social systems interact define and constrain the range of possible futures that will be considered. The current social debates about Brexit are a competition between scenarios 1, 2, and 3. There has been no discussion and no consideration of the possible negative reputation effect of Brexit as described ins scenario 4, and it could be argued that this is because current participants and structures (political parties, international trade institutions/rules) are not making the consideration of this scenario possible.

Finally, it is important to note that changing mindsets is the domain of excellence of the Manoa school of scenario planning (cf. Chapter 5). It is unique in that it moderates, through its approach, the risk of 'performance taking over analysis'. In the Manoa school, stakeholders would be invited to consider the four scenarios listed above and would have to first discuss which is the future that they want to live in. Once a consensus is reached, the question is how can this collective vision of the future be achieved?

8 INDIVIDUAL FORESIGHT

8.1 COLLECTIVE OR INDIVIDUAL FORESIGHT?

This book is a practical introduction to scenario analysis for managers. Much of its content goes against the commonly-agreed approach to defining scenario analysis as a collective, democratic process used for strategic decision making in the workplace. Instead, foresight and the willingness to anticipate the future are presented as individual traits, which can then be deployed, when needed, in team settings.

Thus, although performing scenario analysis as a team is a good idea, this book argues that it is equally important that managers develop their individual foresight skills to make better decisions. Critics will argue that an individual working alone will never be able to prepare more plausible scenarios than a group of professionals together.

We have already discussed the ill-fated strategic plan of the UK micro-car concept in Chapter 3. Another example of failed foresight is the 1983 book *The World Car: The Future of the Automobile Industry* by Stuart Sinclair. This book built upon the theory of globalisation put forward by Theodore Levitt about the globalisation of markets in a 1974 issue of the *Harvard Business Review*. Stuart Sinclair argued that the market for cars was becoming more global and that consumer tastes in car would converge. This meant that the first car company to manufacture a 'global car', i.e. one that would satisfy the needs of customers in different continents, would benefit from such large economies of scale that they would automatically gain leading market shares. The book was read by many car companies executives and was influential for many years in trying to make car businesses more global. These ideas were especially instrumental at the Ford Motor Company and led to its very poor performance in the second half of the 1990s. As Ford was seeking to transform its business into a truly global multinational serving a homogenous market, it failed to realise that the world car did not exist and that markets were instead becoming more fragmented (Donnelly and Morris, 2003). In other words, the world car and Stuart Sinclair's vision of the future of the automobile industry never became true.

Based on these two examples, should we conclude that individual foresight can never perform as well as collective foresight? There are many theoretical reasons why this may not be the case. In Chapter 3, we already discussed the issue of groupthink, i.e. group members agreeing to a conclusion to fit in a group when they would otherwise disagree with it. There are also many theoretical accounts explaining that democratic decision-making does not always work and that it is often ambiguous, if not impossible, to agree on how democratic decision-making processes should be governed (Weick, 1979, Dator, 2017). In other words, theory suggests that collective scenario analysis should be more complex than individual scenario analysis, as it combines a foresight challenge with a group decision making challenge. The research literature supports that very participative, large scale scenario analysis interventions are prone to failure.

It is important to note there are examples of individuals that have developed, single-handedly, accurate visions of the future. Take for example the work of Canadian philosopher Marshall McLuhan, who predicted the internet and World-Wide-Web 30 years before it was invented. Another example is *The Revolt of the Masses*, a book published in 1936 by Spanish philosopher José Ortega Y Gasset. The book was famous for predicting the rise of the Nazi party in Germany and the possibility of a large-scale military conflict. The book also discusses the fact non-democratic systems were replaced with hyper-democratic systems that match the populist movements observed everywhere today.

8.2 WILLINGNESS TO ANTICIPATE

For a manager, the ability to anticipate the future is a key skill, both at a personal level and in terms of managerial decision making. It is important to be able to share a vision of the future with peers. Individual foresight and the ability to anticipate the future are therefore skills that managers should cultivate, and for this reason, I argue that they should never hesitate to undertake a scenario analysis on their own by using the method described in this book. This will typically be the starting point of a larger process, involving more participants, which will probably require the use of the collective approaches to scenario planning described in Chapter 5.

Through the constant application of the principles of division of labour, it is not unusual that as individuals we do not concern ourselves with issues that we view as beyond our scope or reach: it is somebody else's problem, we will often say. A side effect of this thought pattern is to dismiss anticipation as a personal responsibility and to perceive it as the prerogative of top managers and entrepreneurs. Doing so is a counter-productive habit and it is important that all individuals learn to cultivate their willingness and skills to anticipate the future.

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