

# **Engaged decision making: How to transform team knowledge into high quality decisions**

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## Preface part I. Are more heads better than one?

The idea that decisions can be made in a better way will not come as a surprise to many. In fact, plenty of people would agree that decisions - in particular those made by others - leave a lot of room for improvement. Some might even remember occasions on which their own decisions could have been better, in hindsight. In the last four decades, research has shown that people are prone to use quick 'rules of thumb' to make decisions in both everyday life and the work environment, possibly resulting in biased decisions. Decision and behavioural scientists have spent a significant amount of time developing and testing strategies to help people make unbiased decisions. Unfortunately, there are situations in which even unbiased decisions do not achieve the expected results due to factors outside the individual decision maker's control. Specifically, in situations where stakes are high and information is limited, the actions of other parties can affect both the implementation and intended impact of a decision. This is why making decisions in such complex situations often calls for bringing together those with a stake in the outcome of the decision to work as a team and agree on what to do. An effective team takes advantage of its members' diverse experience and knowledge to facilitate the generation of novel ideas and multiple alternatives, and increase members' commitment to the final decision.

However, making a decision as a team does not always guarantee better results. Not only do teams suffer from some of the same biases as individuals, but team decision making can also introduce new challenges. A considerable number of research studies suggest that teams find it difficult to manage conflict or surface relevant information that team members possess. This is particularly noticeable for complex situations, where members are likely to have strong views about how to formulate the decision and which alternative should be chosen. If team discussions are ineffective, dysfunctional team dynamics can arise and lead to errors in judgement or pressures to conform to a premature solution and, ultimately, a decision that nobody supports.

Part I starts with a focus on individual decision making, and explains why the personal or work decisions we often make are sometimes suboptimal. We then move on to discuss team decision making, and consider the reasons why making a decision as a team can be fraught with difficulties. Finally, this part ends with a discussion of the potential role that decision support interventions can play in improving team decisions.

## Chapter 1. Decision making traps

Mount Everest is the earth's highest peak above sea level; at an altitude of 8849m, ascending to the summit presents a formidable physical and logistical challenge. In preparation for the low levels of oxygen at such a high altitude, climbers have to spend at least six weeks acclimatising their bodies. They follow a gradual climbing routine that takes them through four established camps along the path to the summit, starting with Base Camp at 5364 m. The final climb starts at Camp IV at 8000 m, leaving before the sun rises and reaching the summit after nine hours if all goes well - climbers must then return quickly before the sun sets. Without supplemental oxygen, most people would not be able to complete the climb, which creates an additional logistical and physical challenge for the climbers.

Rob Hall and Scott Fisher were two of the world's most experienced high-altitude mountaineers who had their own businesses (Adventures Consultants and Mountain Madness respectively) that specialised in Mount Everest climbing. On May 10, 1996, each led a commercial expedition team that included eight paying clients accompanied by several guides and helpers. Although many members of both expedition teams reached the summit, they were caught in a storm during their descent. Five individuals, including Hall and Fisher, died during the storm. The others barely escaped with their lives after many hours wandering in the dark at sub-zero temperatures. According to survivors and climbing experts (Boukreev & DeWalt, 1998; Krakauer, 2009; Weathers & Michaud, 2015), Hall and Fisher made a number of poor decisions during the ascent. One of the most critical ones was violating their own 'two o'clock rule': if a climber cannot reach the summit by two o'clock in the afternoon, they should turn around and go back to Camp IV, no matter how close they are. Unfortunately, many of the expedition team members, including Hall and Fisher, ignored the two o'clock rule and did not reach the summit until later in the afternoon. As a result, the expedition teams found themselves climbing down in darkness during the storm, with five people not able to get back to safety and dying high on the mountain.

The Mount Everest tragedy demonstrates a number of decision-making traps caused by cognitive biases that impaired the mountaineers' decision making (Roberto, 2002). In this chapter, we examine some of these systematic biases. We will also discuss a range of strategies developed by decision and behavioural scientists to counter cognitive biases, and the extent to which they are effective across different types of decision situations.

### 1.1 Cognitive biases

A long-established stream of research in psychology has identified a number of cognitive traps that afflict most of us when making judgements (Hammond et al., 2006; Kahneman, 2003; Plous, 1993). These traps are the result of the mental strategies (heuristics or rules of thumb) we use to simplify complex decisions and prediction tasks. In his book, *Thinking Fast and Slow* (2011), Nobel Prize winner Daniel Kahneman argues that our mental strategies are drawn from a cognitive structure known as System 1, which is based on well-learned, partially unconscious, parallel processing of information. When using System 1 during problem solving or decision making, an answer suddenly springs to mind: an intuitive hunch that does not come from a defined or recallable process. Kahneman also identifies a more developed cognitive structure, known as System 2, that directs our attention to activities that require more difficult information processing. This structure uses serial processes which can produce more sound lines of argumentation and arrive at appropriate conclusions. For example, when buying a house, most

people would spend considerable effort comparing mortgage packages, going over each one carefully to make sure they do not miss important details. Hence, in this situation, the majority of us would use System 2 rather than System 1. When potential mistakes are not costly and we have the opportunity to learn from them -which for many of us means most circumstances- using System 1 serves us well: it saves us a lot of time and we can still make good decisions. This system is typically used in repeated decisions without major consequences. For other situations, especially those that involve high stakes and are unique or complex, System 2 is required. Unfortunately, we do not always recognise that a situation cannot be handled by System 1 and as a result fail to engage System 2. Additionally, in some instances even System 2 might not be up to the task because it has a limited capacity, meaning it may not be able to tackle very complex decision making situations. As a consequence, we make mistakes leading to errors in judgement that can go unrecognised. Psychologists call these systematic mistakes ‘cognitive biases’ (Bazerman, 2006; Kahneman et al., 1982); we can think of them as hidden decision traps that we fall into with some regularity. A substantial amount of evidence shows that these biases affect experts and novices from a wide variety of backgrounds, in laboratory as well as field research.

There are a considerable number of cognitive biases that have been studied in a variety of disciplines including psychology, economics and decisions sciences. Our main interest here is team decision making, and thus below we discuss only a selected sample of biases that are most relevant to teams<sup>1</sup>.

### *1.1.1 Overconfidence*

Research studies of decision making highlight that people have a natural tendency to be overconfident about their judgements. For example, according to a YouGov survey, a surprising 12% of British men believed they could win a point in a game of tennis against 23-time grand slam winner Serena Williams. Furthermore, a survey by the American Automobile Association reports that 80% of American men consider their driving skills better than average despite the fact that more than 90% of car crashes are the result of human error. Perhaps most worryingly, research also shows that doctors, while being completely certain of their clinical diagnoses, in fact are wrong 40% of the time (Podbregar et al., 2001). These are all examples of an *overconfidence bias*: the tendency for people to hold an exaggerated belief in what they can do, control or know.

Overconfidence is particularly noticeable when there is a need to provide estimates of quantities (e.g. sales, costs, delays). Authors Edward Russo and Paul Shoemaker asked more than 2,000 managers in different industries to estimate industry-specific quantities in the form of ranges they were 90% confident of containing the true quantity values. They found that fewer than one percent of the quantity values fell within the estimated ranges. However, if managers are asked job-specific estimates, they do perform better, but overconfidence remains high (about 30% of ranges do not capture the true quantity values). The evidence produced by Russo and Schoemaker is confirmed by a body of similar results from different professions, levels or expertise, ages, and nationalities (Lichtenstein et al., 1977; Wright & Phillips, 1980).

In terms of consequences, overconfidence is perhaps the most significant of the cognitive biases. In the Everest tragedy, the evidence suggests that Fisher and Hall displayed clear signs of overconfidence. Unsurprisingly, they had many reasons to be confident. Both had climbed many of the world’s most difficult peaks and had become accustomed to overcoming adverse

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<sup>1</sup> For more extensive treatments the interested reader can consult the relevant literature (Arkes, 1991; Gilovich, Griffith and Kahneman, 2002; Kahneman, 2011; Kahneman, Slovic and Tversky, 1982). Tversky and Kahneman, 1974).

climbing conditions. They also knew that about four hundred individuals had successfully reached the summit in the previous five years, and that most of them were not nearly as skilled and experienced as they were (Roberto, 2002).

Displaying overconfidence is not always bad. Indeed, when persistence in the face of adversity needs to be encouraged, showing a small dose of overconfidence may be a good thing. Overconfident people are by nature stubbornly optimistic, but unwarranted optimism can be costly. A series of studies show that about half of inventors continue developing their projects even after being told that their chances of success were unequivocally almost zero (Åstebro, 2003). Furthermore, on average these optimistic individuals doubled their initial losses before giving up. Overconfident people are also very persuasive, and this can potentially mislead others. In his memoir, *The Wolf of Wall Street* (Belfort, 2011), former stockbroker Jordan Ross Belfort insists that people who display overconfidence are better able to influence others and gain their trust. Research by Cameron Anderson and colleagues has corroborated this effect; they show that people are considered more competent and attain greater status through the *illusion* that they are competent (Anderson et al., 2012; Kennedy et al., 2013). Even more shocking, another study suggests that when reliable information about individuals is unavailable or costly to obtain, overconfident individuals still wield influence regardless of their performance! (Sah et al., 2013).

#### *1.1.2 Availability bias*

Participants in a study heard a list of 19 names of famous women and 20 names of non-famous men (and inversely with 19 famous men and 20 non-famous women). They were then asked to estimate whether there were more males or females in the list. The results show that 80% of participants judged the famous gender to be more frequent (Tversky & Kahneman, 1973). These results are an example of an *availability bias*, which is the tendency to place too much emphasis on the information and evidence that is most readily available when judging frequencies and probabilities. In this case, being famous was more memorable (and thus available) to participants.

The ease with which instances or associations are brought to mind is pervasive when making judgments about unknown events. When assessing the chances that a particular couple will get divorced, we may try to recall similar couples which this question brings to mind. If divorces are more prevalent among the instances recalled, we will judge divorce as probable for this couple. Alternatively, we can try to imagine circumstances that will lead a couple to get divorced. If these circumstances are easily imagined, then divorce will also appear probable.

Availability can be a reliable heuristic if the recalled events have frequently occurred in the past. Frequently occurring events are usually easier to recall, so judging them as more probable should be reliable. However, rare or unusual events are also easier to bring to mind, and this can lead to biased probability estimates. In the case of the Everest tragedy, Rob Hall is likely to have underestimated the probability of a bad storm because he had enjoyed several previous seasons of good weather on summit day (Roberto, 2002).

#### *1.1.3 Sunk-cost bias*

The tendency for people to escalate commitment to a failing course of action is known as the *sunk-cost bias* (Staw, 1976, 1981). In a seminal study conducted by researcher Barry Staw, people who choose a course of action that produces negative consequences invest more than people who do not make that choice. Staw argues that people keep on investing in a failing course of action because of the need to justify their previous choice, particularly if they are

responsible for losses. Over the years, researchers have identified many other factors that cause escalation behaviour, including economic (e.g. withdrawal costs higher than persistence costs; long delays between expenditures and benefits), social (e.g. 'face-saving'; perceived social rewards of persistent behaviour) and organisational (e.g. institutional inertia; mission and values) factors (Staw & Ross, 1989).

The sunk-cost bias affects decisions in many business and policy settings (Biyalogorsky et al., 2006; Cheng et al., 2003; Keil et al., 2000; Ross & Staw, 1986, 1993; Staw & Ross, 1978; Staw & Hoang, 1995). In the Everest case, the climbers had spent \$65,000 plus many months of training and preparing, thus the sunk costs were substantial. This may explain why they violated the turnaround-time rule, and kept climbing even in the face of evidence that things could turn out badly (Roberto, 2002).

#### *1.1.4 Confirmation bias*

Researchers have accumulated a significant amount of evidence on what is known as *confirmation bias*, that is, people's built-intendency to favour information that supports their current beliefs or preferred choices and dismiss evidence that challenges them (Klayman, 1995; Klayman & Ha, 1987). Indeed, research shows that we are more than twice as likely to favour confirming than disconfirming information (Hart et al., 2009). For instance, Anti-Vaccine campaigners are typically most interested in health information that is consistent with their beliefs than that which is not. Another easy-to-identify example is when a consumer buys a particular brand of phone and attempts to justify their decision after purchasing. A study conducted by scholars Mathew Hayward and Donald Hambrick shows that CEOs overpay acquisition premiums by 4.8% for every time a favourable article about them appeared in the media (Hayward & Hambrick, 1997). It appears that people see only what they want to see, and this can lead to biased decisions.

In the Everest case, it is worth noting that more than 300 people have died trying to climb Everest since the first summit attempt in 1922, and countless others have experienced serious injuries. Storms on Everest are not unusual, and are in fact the norm rather than the exception. For example, there were three consecutive seasons in the mid-1980s where no one climbed the mountain due to ferocious weather conditions. This represents important information that Rob Hall ignored when he chose to break the two o'clock turnaround rule. The information that he focused on were his own beliefs about the situation he was in; he strongly believed he could take his team to the summit and back despite breaking his own rules. The fact that in the past he had taken 39 clients to the summit and back safely, had always enjoyed good weather on summit day, and had never been caught in a storm high on the mountain may have contributed to Hall's biases.

#### *1.1.5 Anchoring, representativeness and narrow framing biases*

There are many other biases that researchers have identified. For example, the *anchoring bias* (Kahneman et al., 1982; Tversky & Kahneman, 1974) refers to the notion that people often allow an initial reference point to distort their estimates. Typically, when we are asked to estimate the value of a quantity (e.g. what next year's sales will be, how long a project will last), we begin at an initial value (a reference point) and then adjust it to obtain the final estimate. Unfortunately, the adjustment is often insufficient. In one study (Northcraft & Neale, 1987), participants received a 10-page booklet describing a house for sale. They then visited the house and neighbourhood for a maximum of 20 minutes. All participants received identical booklets, with the exception of one piece of information: the listing price. They were then asked to value the property using a range of indicators, such as selling price and lowest acceptable



offer. Low listing prices consistently led to low estimated property values, while high listing prices yielded high estimates. Both amateurs as well as professional real estate agents gave significantly biased estimates.

Also, people often judge the chances that a person or object belongs to a particular category (e.g. how likely is it that this person is a consultant?) by how representative the person or object is of that category. Similarly, the probability that events originate from a particular process (e.g. how likely is it that the peaks and troughs in the sales graph are random?) is judged by how representative the events are of that process. In both cases, our assessments can lead to a *representative bias* (Kahneman et al., 1982; Tversky & Kahneman, 1974) if we ignore relevant statistical information or have misperceptions about the nature of random processes. An example concerns decisions on commercialising inventions (Shane et al., 2015). In many universities, technology licensing officers have a central role in deciding which of a range of inventions should be supported and become a university spinoff. Previous studies show that licensing officers think that spinoff company founders are typically male immigrants with industry experience who are easy to work with. A total of 352 licensing officers participated in a study, conducted online, in which they received information on inventions which were adapted from actual university invention descriptions. If licensing officers use the representativeness heuristic in making their decisions, they would be more likely to favour cases that look like the standard example and disfavour cases that look dissimilar. Invention descriptions were paired with inventor profiles that were carefully manipulated: the inventor was male or female, had an American or a Chinese name, did or did not have industry experience and was more or less easy to work with. Decisions on whether or not to recommend the inventor to start a company were influenced by gender, industry experience and how easy it was to work with the person. This indeed shows that the more an inventor looks like the typical inventor, the more likely the person is to get positive advice. This may be defensible for a factor such as industry experience, as it may relate to potential success of a spinoff (although the author's advice is to pair inventors without experience with those who have experience). It is, however, surprising that gender should influence the decision on who (not) to advise to start a company.

Finally, people tend to hold a narrow view of the decision at hand and assume knowledge is complete, which makes them overlook important objectives, options, and outcomes (Larrick, 2009; Russo & Schoemaker, 1989). For example, in 1995, the top management team at Seagate, the world's largest producer of disk drives at the time, got together to develop a comprehensive list of objectives that encapsulated the company's mission. It turned out that the set each member came up with was only a subset of the collective list of objectives. Perhaps more surprisingly is that, on average, only 36% of the specific objectives they later recognized as relevant were initially listed by team members. This illustrates that the information that comes to mind, (i.e. the frames that people use) often seems complete and coherent, reducing the desire for further research (Bond et al., 2008).

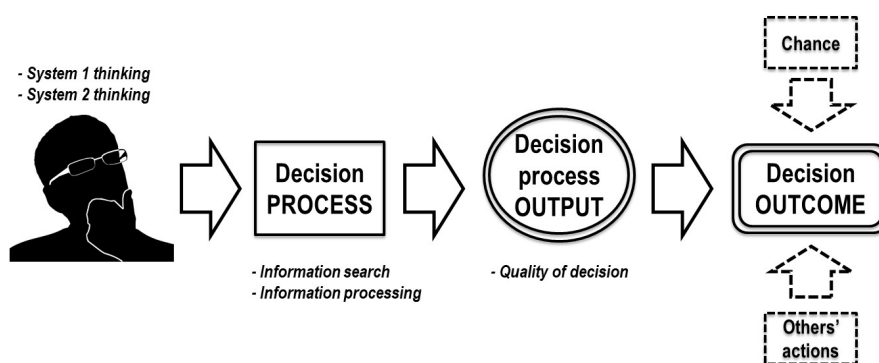
Frames are structured ways of thinking that simplify and guide our understanding of reality. A frame forces us to view the world in a particular and limited perspective, and they strongly influence our perceptions of what we see or expect to see. Using a frame is like looking through binoculars: part of the landscape comes into focus, but there is far more that you do not see. Our frames are thus selective and narrow, and affected by expertise and experience. The seminal study by DeWitt Dearborn and Herbert Simon provides further illustration of the use of frames that are consistent with experience and functional background (Dearborn & Simon, 1958; Russo & Schoemaker, 2002). Dearborn and Simon asked managers with different functional

backgrounds to read a case about an organisation facing a particular situation. When requested to identify the most important problem in the case, the majority of managers highlighted issues consistent with their backgrounds: sales managers mentioned sales issues, production managers mentioned production issues, and so on. Clearly, functional expertise and experience influence which aspects of a situation are thought to be relevant. Follow-up research modified this picture somewhat, but the overall conclusion is that the department in which a manager works influences their opinion (Beyer et al., 1997; Chattopadhyay et al., 1999; Walsh, 1988).

The frames we use pertaining to a situation are also influenced by how we perceive the context. To illustrate, consider two ways of defining a project brief in the construction industry [cf. 46]. Typically, contractors see a project brief as a kind of insurance against changes in project specifications made by clients, and as a means to prevent costly surprises during the project. On the other hand, clients may frame a project brief as a generic and fluid document that can be updated while the project progresses. It's easy to see how these different motivations and perceived contexts lead to different understandings of a project brief, which in turn may cause difficulties in the interaction between contractors and clients. The problem is not that the frames they use are wrong per se, but that each frame is only a partial picture of reality; some characteristics take centre stage and others are in the wings.

A *narrow frame bias* is caused by associative memory processes that lead people to start with a set of assumptions, and then collect evidence in a way that is consistent with the initial view. The information that comes to mind seems complete and coherent, reducing the need for further search. The way a decision problem is framed can have dramatic effects. For example, framing a decision outcome in terms of gains or losses can cause people to reverse their preferences (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981).

To summarise, and as shown in Figure 1, research shows that individuals draw on mental strategies to simplify complex decisions and prediction tasks. Although usually effective, these strategies can lead to systematic biases that may go unrecognised and affect the quality of decisions. In addition, irrespective of whether a decision is biased or not, the outcome of a decision can also be affected by things that are outside our control, like chance or the actions of others.



**Figure 1.1 Individual decision making**  
(Image of person thinking by OpenClipArt-Vectors by Pixabay)

## 1.2 Team decision making

The examples and studies described so far concerned decisions made by individuals. While these clearly may have consequences for others, as was clear from the Mount Everest case,

decisions in organisations are often discussed in teams. In this book, we will define a team as three or more individuals who are brought together to make a decision, or provide a recommendation, about a situation that needs to be addressed. Team members socially interact face-to-face or virtually, may have a stake in the situation of concern, and may be drawn from one or more organisations. The use of teams for decision making has many advantages. They offer greater thinking capacity, expertise, knowledge, and information. They also bring multiple perspectives (or frames) about the situation to team discussions. And team members are more likely to support the decision or recommendation because of their participation in the decision making process.

From our discussion of cognitive biases in the previous section, a key issue is whether teams fall in the same decision traps as individuals. Unfortunately, the empirical evidence suggests that individual errors are often amplified at the team level (Sunstein & Hastie, 2015). Indeed, teams have been found to suffer from augmented representative biases (Stasser & Dietz-Uhler, 2001), show more unrealistic overconfidence (Snizek & Henry, 1989), be more vulnerable to framing effects (Kerr et al., 1996), and be even more susceptible to sunk-cost bias (Whyte, 1993), to name a few. Not all teams amplify the errors made by individuals. Indeed, there is some evidence that, compared to individuals, teams are less subject to certain biases such as availability and anchoring (see Sunstein and Hastie 215). However, the central point is that individual biases are not automatically corrected when they work as a team, and they often get worse.

Furthermore, a considerable amount of research studies suggest that teams do not always achieve their potential. due to ‘losses’ in the decision making process (Steiner, 1972). Well documented process losses include team members working harder to make up for others who ‘free-ride’ knowing that the team (and not individual team members) are accountable for the team decision (Ingham et al., 1974; Jackson & Harkins, 1985; Williams et al., 1981); or team members pressuring others to conform to an early consensus on a particular solution (Festinger et al., 1950; Janis, 1982; Taras, 1991). In the next chapter, we discuss the impact of motivational factors as a potential source of process losses in team decision making.

## Chapter 2. Motivated team decision making

The use of teams for decision making pervades contemporary organisational practice. Within and across organisations, teams are formed to tackle situations that require a decision to be made, whether it is simple or complex, routine or one-off, short or long-term. They do this by using the diversity of perspectives, knowledge, information, and expertise within the team to develop an understanding of, and responses to, a situation that no team member could have produced alone (Fraidin, 2004; Hill, 1982). Indeed, team decisions can produce remarkable results: for example when a team of NASA engineers found a way to bring the crew of the damaged Apollo 13 spacecraft back to earth (Kranz, 2001), or when a global team comprised of representatives of multiple organisations worked together to rescue all thirty three miners trapped in the San Jose copper mine in Chile (Franklin, 2011).

Unfortunately, considerable research shows that team decision making often fails to deliver on its promises (e.g. J Richard Hackman, 2002; Kerr & Murthy, 2004; Nutt, 2002). Scholars have found that teams suffer process losses (Steiner, 1972) and fall into the same decision traps individuals do (see Chapter 1) - sometimes even more so (e.g. Argote et al., 1990; Smith et al., 1998; Whyte, 1993). Others have reported that teams sometimes underestimate their vulnerability and fallibility (Janis, 1982; Janis & Mann, 1977), are unable to share and integrate critical information effectively (Schulz-Hardt et al., 2000; Stasser & Titus, 1985), or struggle to manage conflict (Amason, 1996; C. K. W. De Dreu & L. R. Weingart, 2003). Notable examples of failed team decision making include the launch of the Challenger space shuttle (Aldag & Fuller, 1993; Esser & Lindoerfer, 1989), the Bay of Pigs invasion (Rasenberger, 2012; Schlesinger, 2002), and the disposal of the Brent Spar oil storage and tanker (Grint, 2005; Jordan, 2001). These, and related analyses of team decision making, share the notion that teams act as ‘information processors’ (Hinsz et al., 1997; Levine & Moreland, 1998; Tindale & Kameda, 2000); they process and integrate relevant information to reach a collective agreement on what to do about the situation of interest. We use the term ‘information’ here to refer to all relevant knowledge, data, facts, goals and interests pertaining to the situation, including taken-for-granted assumptions and frames (see Chapter 1) which team members may bring to the table.

In this chapter we discuss two critical factors that affect the ability of teams to share and integrate information effectively. To this end, we will draw on the Motivated Information Processing in Groups (MIP-G) theory developed by social psychology scholar Carsten de Dreu and colleagues (De Dreu et al., 2008; Nijstad & De Dreu, 2012). The MIP-G theory sheds light on the role of different motivations in teams, and extends the notion of teams from information processors to teams as *motivated* information processors. Broadly, the theory posits that both cognitive and social motives drive the sharing and integration of information within teams. *Cognitive motivation* (also known as ‘epistemic’ motivation) refers to “the willingness to expend effort to achieve a thorough, rich and accurate understanding of the world, including the group task or decision problem at hand” [27, p.23]. *Social motivation*, on the other hand, is defined as “the individual preference for outcome distributions between oneself and other group members” [27, p.23]. Furthermore, social motivation can be prosself (i.e. the individual is concerned with own outcomes) or prosocial (i.e. the individual is concerned with joint outcomes and fairness). Cognitive motivation affects the depth of information processing, whereas social motivation biases the type of information that is processed. Cognitive and social motivation capture the influence of a host of cognitive style variables such as the need for cognition (Cacioppo & Petty, 1982), need for closure (Kruglanski & Webster, 1996), and personality traits such as openness to experience and agreeableness (Costa Jr & McCrae, 2000). They also

capture the influence of situational factors such as time pressure, accountability, and incentive schemes. Increasingly, research shows that cognitive and social motivation interact to influence the nature of information exchange and integration within teams, which in turn determine the extent to which teams are able to fulfil their synergistic potential (e.g. De Dreu et al., 2008; Nijstad & De Dreu, 2012; Resick et al., 2014; Steinel et al., 2010; Toma & Butera, 2015; Van Ginkel & Van Knippenberg, 2008).

## 2.1 Cognitive motivation and information processing

Developing appropriate responses to a situation of concern often requires bringing together a team of people with different expertise, experience and views pertaining to the situation. For example, up until 2005, teenage pregnancy rates in the UK had remained similar to those in the 1970s, while most of Western Europe had halved them. The severity of the problem led the UK government to advocate 'joined up working' policies to break the long-term, reinforced cycles of social exclusion such as those resulting from teenage pregnancy. One of these policies was a requirement that all local authorities in England create a Teenage Pregnancy Strategy Group (TPSG) to make decisions about how to tackle the problem. These teams involved representatives from local authorities, the National Health Service, the education authorities, faith groups, and other stakeholders such as the voluntary sector, which included young parents' representatives (cf. Franco & Lord, 2011). The expected benefit of bringing people from different organisations together as a team was that the differences in team members' views and knowledge about the problem would become a valuable asset, enabling them to develop a shared understanding of the problem before they reach agreement on how to act. In this way, a team like the TPSG would be able to make progress which could have not been possible by any team member working alone.

When team members get together to address a situation, they are likely to possess different types of information pertaining to that situation. Initially, team members will bring their own implicit frames of the situation to the discussion, each highlighting different parts of the situation as important. For example, when the TPSG had to decide which projects to fund to alleviate the problems associated with teenage pregnancy, team members had different views, data, and assumptions about candidate projects and their potential impacts. Sharing the multiple frames that team members hold is critical to gaining a better understanding of a situation of concern. However, this is often difficult as people are often blind to their own and others' frames (Cannon-Bowers et al., 1993; Russo & Schoemaker, 1989).

Beyond individual frames, team members will also bring other types of information such as knowledge, data, facts, and assumptions pertaining to the situation. For many situations, the distribution of information within the team will be asymmetric. This suggests, at least in principle, the potential for synergetic benefits from sharing and integrating the information that team members possess. Yet in practice, such benefits are not always realised. Extensive research has shown that teams are prone to discuss information held by all members (shared information) much more than unique information (unshared) that is often critical to address the situation. Team members, deeply engaged in the discussion, often fail to recognise the salience of unshared information for the issues under consideration, and thus this information never surfaces, remaining hidden.

This phenomenon is best illustrated by studies of hidden profile tasks (Lu et al., 2012). In the original study, developed by Garold Stasser and William Titus (Stasser & Titus, 1985), a team

has to choose among two candidates (A and B) for a job position. Table 2.1 shows the design of the study. In the columns are committee members X, Y and Z. The rows indicate which information on two candidates is known to a member: a<sub>1</sub> to a<sub>7</sub> refers to information items on candidate A; b<sub>1</sub> to b<sub>4</sub> refers to information items on candidate B. All information items are positive. The upper panel refers to a situation in which all information is shared: all items are known to X, Y and Z. In the lower panel some information items are shared and others are unshared. The full information set about the candidates would clearly identify A as the best candidate for the job. Indeed, if information is divided as in the upper panel of Table 2.1, almost all groups identify the best candidate in a matter of minutes.

	member X	member Y	member Z
<i>All information shared</i>			
Pro-A Pro-B	a <sub>1</sub> a <sub>2</sub> a <sub>3</sub> a <sub>4</sub> a <sub>5</sub> a <sub>6</sub> a <sub>7</sub> b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>	a <sub>1</sub> a <sub>2</sub> a <sub>3</sub> a <sub>4</sub> a <sub>5</sub> a <sub>6</sub> a <sub>7</sub> b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>	a <sub>1</sub> a <sub>2</sub> a <sub>3</sub> a <sub>4</sub> a <sub>5</sub> a <sub>6</sub> a <sub>7</sub> b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>
<i>Biased distribution</i>			
Pro-A • shared • unshared Pro-B (all shared)	a <sub>1</sub> a <sub>2</sub> a <sub>3</sub> b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>	a <sub>1</sub> a <sub>2</sub> a <sub>3</sub> b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>	a <sub>1</sub> a <sub>6</sub> a <sub>7</sub> b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>

Table 2.1 Hidden profile task (see also Stasser et al., 1989)

However, the lower panel shows a different situation. Here, prior to discussion, some information about the candidates is known to all team members (shared information) and other information is unique to team members (unshared information). The combination of shared and unshared information held by any one member would identify B as the best candidate (as there are only three positive items on A compared to four positive items on B). Thus, the optimal choice is hidden to the team as a whole and can only be discovered by disseminating and processing the unshared information among team members. However, it turns out that teams have a natural tendency to focus on shared information. In fact, only about twenty percent of teams had members ask whether there is any additional information not yet known to others. Hidden profile studies not only highlight the tendency of team members to talk primarily about shared information and ignore unshared information, they also indicate that whether or not team members actively and systematically process the exchanged information is, at least, as important (Greitemeyer & Schulz-Hardt, 2003; Winquist & Larson Jr, 1998).

Different explanations for why teams fall into the trap of hidden profiles have been offered (Faulmüller et al., 2010; Faulmüller et al., 2012; Greitemeyer & Schulz-Hardt, 2003; Stasser, 1992; Stasser & Titus, 1987). Here, we argue that teams find it difficult to uncover hidden profiles because team members may have low levels of cognitive motivation. When team members' cognitive motivation is low, they will be less willing to search or generate new information pertaining to the situation, and less willing to actively and systematically process the information that is exchanged. Consequently, in a team with low levels of cognitive motivation, team members are more likely to be blind to their own and others' frames, unwilling to develop an appropriate frame that fits the situation at hand, and only focus on discussing information they recognise and share in common. Note that this phenomenon does not depend on the social motivation of team members.

If teams cannot always deal effectively with simple decision situations such as the hidden profile task, what can we expect for more complex situations? On the one hand, the need to draw on a wide range of stakeholders who have different views and perspectives of a complex situation should make the possibility of processing information in depth more likely. On the other hand, the pressures under which stakeholders tend to work may lower cognitive motivation within the team and thus hinder the depth of information processing [138]. If situation-relevant frames, knowledge, assumptions or data fail to surface during team discussions, it will affect the decision outcome. By not discussing all pertinent information, the team is likely to adopt a narrow frame, lose sight of important objectives, overlook plausible responses to the situation, and fail to appreciate the full consequences of different options.

Research showing that higher levels of cognitive motivation promote high-quality decisions implicitly assume that team members also share a motivation to develop shared goals and a joint decision by consensus, and have little or no incentives to achieve personal gains at the expense of others (cf. De Dreu et al., 2008). However, social psychology scholar Carsten de Dreu and colleagues have argued, and shown empirically, that the positive effects of high cognitive motivation on team decision making are limited to situations in which team members have a prosocial rather than proself motivation, which is not always the case in practice. Though team members need one another to develop effective ways to tackle a situation of mutual concern, they may not want the collective effort to be successful at the cost of losing sight of their personal or constituency interests. We turn to this issue in the next section.

## 2.2 Social motivation and information processing

Teams wishing to tackle a situation of concern may experience difficulties when discussing aspects of the situation where team members have competing interests. Here we use the term ‘competing interests’ to refer to the goals and objectives that team members wish to achieve regarding the situation of concern. Although the need for cooperation is central to team decision making, often team members have other competing incentives (Davis et al., 1976). This was most evident in the TPSG case, where team members were all competing for funds to support their projects. As the funds were limited, only those projects that would provide the best value would be funded. Consequently, a pound spent on a project that helps young parents’ to go back into education would not be spent on funding clinics offering contraception services. In this respect, the TPSG members had competing interests.

Many decision making situations can be thought of as ‘mixed-motive’ negotiations in which team members may both cooperate to achieve shared goals, and compete to advance their own individual interests (Bazerman et al., 1988; Lax & Sebenius, 1986). In practice, the extent to which interests compete within a team is likely to vary across situations. A source of variation is often a differential access to knowledge, expertise, resources or authority to make decisions, which makes some team members more powerful than others. Teams from a single organisational department may often work together in a clear hierarchy, but in collaborations across departments or organisations, authority and power is often more diffuse. However, those collaborations are often necessary to get work done.

An example is the criminal justice chain, which in most countries involves a cooperation between police, public prosecution, judges and prison services. Prosecutors typically have a central role in this chain, as they set priorities for police investigations and have a major



responsibility in the processing of cases. Similarly, in the Netherlands, the public prosecution had a large influence on what type of cases would be shelved or processed. The Dutch police, however, could decide where to deploy its resources. In the early 2000s, the Dutch government decided to set a higher target for prosecuted cases. At the time, there was a concern in the press that an increased target in the number of cases processed would lead the police to bring in more cases but focus on less serious crimes (e.g. traffic violations instead of burglaries). Thus, even though stakeholders depend on one another to make progress about a situation of mutual concern (Davis et al., 1976; Edmondson, 2016; Gray, 1989; Grint, 2005), they may at the same time look for ways to advance their own agendas and interests. When competitive interests are high among team members representing powerful organisational constituencies or divisions that seek to maintain or strengthen their positions, the team decision process and outcome will be significantly affected.

The concept of social motivation can help to explain the behaviours that arise when team interests are symmetric or asymmetric (e.g. Beersma & De Dreu, 2002; De Dreu & Van Lange, 1995; Giebels et al., 2000; Weingart et al., 1993). When interests are aligned, team members are most likely to exhibit *prosocial* behaviours, meaning that they are motivated to seek consensus, joint outcomes and fairness by reaching agreements that integrate all team members' aspirations. By contrast, when interests are not aligned, team members may adopt a *proself* orientation to act and thus be mostly concerned with achieving their own goals, reducing the potential for mutual gains and the development of appropriate responses to the situation of concern. Note that asymmetric interests within the team can lead to proself behaviours irrespective of whether cognitive motivation is low or high.

When proself behaviours occur at the expense of prosocial behaviours, team members become strong advocates of their own positions, and consequently only mention information that is consistent with that position. As a result, the information that team members share will be biased: advocates may only share information that supports their position or undermines others' positions, even if they may also possess information that does the opposite. This is likely to impact the team decision process in at least three ways. Firstly, the more team members exhibit or adopt proself behaviours, the less likely it is that the team will advance joint goals, which limits the potential for mutual gains. Secondly, because the information shared by proself team leaders is biased, this precludes the team from developing creative solutions or responses that integrate all the relevant information pertaining to the situation at hand. Finally, the occurrence of proself behaviours is likely to produce 'winners' and 'losers', meaning the latter group will feel less committed to implementing the team decision.

There is increasing research evidence showing that the generation, dissemination, and processing of information by team members is a function of the interaction between cognitive and social motivation within the team, and that this interaction will affect the quality of team decision making (e.g. De Dreu et al., 2008; Nijstad & De Dreu, 2012; Resick et al., 2014; Steinel et al., 2010; Toma & Butera, 2015; Van Ginkel & Van Knippenberg, 2008). This is discussed next.

## 2.3 Dynamics of motivated team decision making

When interests are asymmetric, the bias set forth by the occurrence of proself behaviours will be amplified if team members are particularly motivated towards discussing and integrating information conducive to achieving their individual goals at the expense of team goals. In this



case, team members may exaggerate the importance of their ideas, arguments and preferences, and ignore counterevidence provided by others (De Dreu et al., 2008). For example, researchers have found that proself team members put a positive spin on the frames and information they have and endorse, and a negative spin on available or anticipated counterevidence (cf. De Dreu et al., 2008). Additionally, proself behaviours and willingness to exert effort to better understand the situation (i.e. high levels of cognitive motivation) will lead team members to forcefully argue their point, and use different strategies to get what they want. For example, they may withhold unique information during team discussions because they wish to use it for personal gain, or because full disclosure may put them into a disadvantaged position.

If team members are prosocially motivated, the preference for achieving consensus and maintaining harmony can also harm team decision making if cognitive motivation is low. In this case, prosocial team members are more likely to refrain from sharing unique information that runs counter to the team's current opinion, or if this information is shared it might be downplayed. In addition, preference for consensus and harmony is likely to make prosocial members parrot the (biased) information advocated by the team's current opinion, because they evaluate it as more valuable, relevant, and important when they realise the rest of the team possess the same information (Boos et al., 2013; Henningsen & Henningsen, 2004; Mojzisch et al., 2008; Parks & Cowlin, 1996; Postmes et al., 2001; Wittenbaum et al., 1999). By discussing information that everyone shares, people see themselves and each other as more competent, knowledgeable and credible (Henningsen & Henningsen, 2004). After repeating this information, it is more likely that it will be approved by the team and better remembered. Bringing up unique information comes at the social risk of being less positively valued by others in the team, and thus it is less likely to be brought up or further analysed, as it would lead to less favourable reactions by others. Yet, only unique information can help to uncover the best response to the situation at hand.

The interaction between cognitive motivation and social motivation, and how it impacts both the team decision process and outcome, is aptly illustrated by the decision to launch the space shuttle Challenger. On the morning of January 28, 1986, the space shuttle Challenger was launched from the Kennedy Space Center. The temperature that morning was around -5 °C, well below the temperatures at which the shuttle engines had been tested before. Seventy-three seconds after launch, the Challenger exploded, resulting in the deaths of all seven astronauts aboard, and becoming the worst disaster in space flight history. The catastrophe shocked the whole world, and for many Americans it was the most tragic event since the assassination of John F. Kennedy in 1963. The findings of the Presidential Commission on the Space Shuttle Challenger Accident pointed to a flawed decision-making process as a primary contributory cause.

Very few machines rival the space shuttle in terms of its sheer complexity. Manufactured by Rockwell International and operated by NASA, the 250-ton machine operated at the very limit of human engineering. The launch of the Challenger was originally scheduled for January 22, 1986, but was postponed three times. The first two postponements occurred because the previous space mission was late, and the third postponement was based on an unacceptable weather forecast. Finally, a launch attempt on January 27 was cancelled because of high crosswinds. On the evening before the actual launch on January 28, NASA and Morton Thiokol (MT) managers and engineers held a teleconference to discuss the issue of launching the shuttle despite near freezing temperatures expected for the next morning. Morton Thiokol was the contractor that produced the solid rocket boosters responsible for the shuttle's primary propulsion, and had grave concerns that low temperatures would prevent the shuttle booster's

O-rings from sealing, leading to leakage of hot gases that could cause a catastrophic accident during launch. Roger Boisjoly was the key engineer expressing concerns.

All participants in the teleconference were probably acutely aware of a sense of public pressure to launch. Prior delays, along with interest in the presidentially-backed project to send a civilian teacher (Krista McAuliffe) to space would have further contributed to this. Furthermore, the evidence suggests that both NASA and MT held divergent interests pertaining to the launch decision. MT managers were concerned about disappointing NASA and potentially losing a valuable contract with a major client. In turn, NASA managers wanted to avoid further embarrassment and avoid more delays. There were three key players present in the teleconference who held divergent interests: MT engineer Roger Boisjoly wanted to convince others that the O-rings were unreliable at lower temperatures and to ensure that his dissenting opinion was registered; NASA manager Larry Mulloy wanted to launch on time the following day unless he had credible information for not doing so; and MT manager Barry Lund wanted to manage the tension between supporting his engineers and not angering his client.

Roger Boisjoly had been looking at the relationship between low temperatures and erosion in the O-rings for previous shuttle flights prior to the teleconference. The evidence suggests that all participants in the meeting had access to the same data that Boisjoly had prepared. The data was inconclusive as the combination of O-ring erosion and low temperatures had been observed only in a very small number of previous shuttle launches. Boisjoly thus found himself lacking sufficient data to prove his case, and was relying on his intuition to come to the conclusion that cold temperatures were problematic. Without sufficient data, he could not persuade the top managers. On the other hand, data about the temperature at the launch of those flights in which the O-rings did not experience erosion did not surface during discussions, even though this data was known to many participants in the room.

Clearly all parties in the teleconference wanted to make the best possible decision, but NASA managers framed the situation in such a way that launching the shuttle was the default option unless they were persuaded by a counterargument. For NASA managers, the decision was about whether the data presented suggested that the shuttle would fail, and they spent significant cognitive effort scrutinising the data (high cognitive motivation) supporting the claim that low temperatures and O-ring erosion were correlated. The findings of the Presidential Commission indicate that NASA managers were not open to being influenced by arguments from the MT engineers, and instead tried to win the argument at all costs, presenting their views forcefully, suppressing dissenters, and seeing the other party as an opponent (proself behaviours). For MT managers and engineers, the decision was about whether it was safe to launch the shuttle. However, while Roger Boisjoly spent significant cognitive effort in collecting and examining different types of evidence suggesting a relationship between temperature and O-ring erosion (high cognitive motivation), he also downplayed the gaps in the data he presented by giving a positive spin to his arguments through making moral claims (see footnote 4): “launching [the shuttle] below freezing is an act away from goodness” (proself behaviour).

Had all the parties involved been willing and able to spend their cognitive efforts in jointly understanding whether there was a correlation between O-ring failure and temperature, they might have recognised that they did have access to data that was not shared during discussions, and which could have convinced everyone to delay the launch. Indeed, if data about previous flights that had not experienced O-ring erosion was added to the data that Boisjoly presented to NASA, it would have become apparent that O-ring erosion and temperature were indeed correlated, and that a launch delay was thus necessary.

The preceding discussion identifies specific behaviours that are likely to affect the effectiveness of team decision making. In actual practice, team members may differ in the level of cognitive and social motivation they bring to their discussions. As De Dreu et al notes: "...because of temperament, socialisation, or differences in environmental pressures, some group members may have high and others low cognitive motivation and some may have a proself and others a prosocial motivation" (De Dreu et al., 2008, p.42). Research highlights that high levels of cognitive motivation combined with a prosocial orientation fosters effective team decision making. This is because of better information dissemination and integration that leads to high quality insights, agreements, consensus and commitment. This will happen only when there is enough time to make the decision (i.e. low urgency) and team members represent all the key stakeholders in the situation (De Dreu et al., 2008; Nijstad et al., 2014).

The actual differences in the levels of cognitive and social motivation within the team will manifest themselves during team discussions and may lead to conflict that could potentially derail the entire team decision making effort. Furthermore, the actual nature of the conflict experienced by team members will be contingent on team members' cognitive and social motivations, as explained next.

## **2.4 Motivation and team conflict**

A team exhibiting high levels of cognitive motivation will be able to surface the diversity of information and interests distributed within the team. This means that some level of conflict is likely to be experienced by the team. For example, team members may have framed the situation of concern in different ways, and this greatly influences what they would ultimately like to do. This likely means that options satisfying individual needs and interests will have been identified and be favoured prior to a team discussion. Differences in frames and interests can lead to conflict within a team, but how conflict develops is contingent on team members' social motivation. If the team embraces a prosocial orientation, then it is more likely that conflict will remain at a 'cognitive' level, and this type of conflict can be beneficial. An important stream of research has produced evidence that when the conflict experienced is only 'cognitive', it often has positive effects on team decision making because it encourages better understanding of the issues being considered (Amason & Schweiger, 1997; Eisenhardt et al., 1997; Jehn, 1995; Pelled, 1996; Van de Vliert & De Dreu, 1994). Cognitive conflict can be beneficial because it enables team members to pay close attention to both shared and unshared information, and can lead to debates that critically examine key assumptions, alternative frames of the situation of concern, and expose the risks or weaknesses of certain options.

By contrast, if the team adopts proself behaviours, cognitive conflict can become dysfunctional and deteriorate into interpersonal or 'affective' conflict (Amason, 1996; Jehn, 1995), which may prevent team members from working together effectively. Affective conflict arises when team members feel that their ideas, arguments and preferences are challenged by others, or even refuted on the basis of facts and new evidence, making them feel upset or hurt and reacting defensively. When differences of opinion emerge and are difficult to reconcile, team members spend their efforts focusing on each other rather on understanding the situation of concern. As team members begin to experience affective conflict, emotions and stress run high and winning the argument becomes more important than finding a good solution. Team members are likely to strongly advocate their positions and use flexible (even deceitful) ways to get their way.

Research shows that if affective conflict is not managed effectively, it can seriously erode social relations within the team (Eden & Ackermann, 2010).

On the other hand, when teams have low levels of cognitive motivation and a prosocial motivation then conflict is likely to be tabled to preserve group harmony, leading to lazy compromises or effortless concessions (De Dreu et al., 2008; Nijstad & De Dreu, 2012). An example of the latter is a situation known as ‘groupthink’ (Janis, 1972; Turner & Pratkanis, 1988). In this situation, there is already a preferred course of action that has become the group norm which nobody wants to question. Having an ‘elephant in the room’ is another example. To an outsider, it seems as if the team carefully avoids certain topics, even though these stand out as important to the task at hand (the elephant). Team norms, social roles, and status differences can lead team members to tailor what they say to what they think others want to hear (Argyris, 1997; Gladwell, 2008), hence impeding free information exchange and team decision making. By contrast, when teams have low levels of cognitive motivation and a proself orientation then team members will engage in low-effort, selfish behaviour, such as “free-riding” and being unwilling to understand each other’s positions. Consequently, team members will not give in and, instead, engage in vetoing that will be experienced as affective conflict. This in turn may lead to stalemates and indecision.

Obviously how conflict is experienced within the team (cognitive, affective, tabled) is complex, and multiple conflict trajectories are possible within a team. The Challenger case discussed earlier illustrates this complexity; team members may display both prosocial and proself behaviours during their discussions. Furthermore, cognitive motivation may be higher or lower during team members’ interactions, depending on individual differences and situational factors. Additionally, it is often the case that heterogeneous teams are likely to have an asymmetric distribution of cognitive and social motivation. For example, it may be possible to have teams with only a minority of members with high cognitive motivation and proself orientation. Whether this distribution of motivations will enable conflict to remain cognitive, escalate to become affective, or simply be tabled, is a research question to be addressed (De Dreu et al., 2008; Nijstad & De Dreu, 2012).

The notion of teams as motivated information processors (De Dreu et al., 2008; Nijstad & De Dreu, 2012) rests on the assumption that personality and situational variables affect a team’s cognitive and social motivation. Furthermore, increasing evidence shows that prosocial teams with high levels of cognitive motivation are more likely to process information in a deep and systematic manner, engage in beneficial cognitive conflict, and avoid affective conflict, which in turn enables them to reach higher quality decisions. As mentioned, several factors need to be in place if this potential is to be reached: adequate time to discuss the matter, presence of all key stakeholders, and avoiding the tendency of prosocial teams to protect group harmony, thereby ignoring alternative views (Jordan, 2001; Parks & Cowlin, 1996). The question is, then, how to increase levels of cognitive motivation and foster prosocial behaviours within the team while reducing or effectively managing proself behaviours. Research by Kathleen Eisenhardt and colleagues (Eisenhardt et al., 1997) describes a number of strategies that leaders can use to raise the levels of cognitive motivation within their teams, and get team members to surface the cognitive conflict required to debate their differences properly. Unfortunately, high levels of cognitive conflict often lead to affective conflict, and the dilemma then becomes how to elicit cognitive conflict while maintaining low levels of affective conflict. The work of scholars Amy Edmondson and Dianne McLain Smith (Edmondson & McLain Smith, 2006) identifies specific actions that team members can take to manage affective conflict effectively when it rises, and some of these will be discussed in Chapter 15.

In sum, the extent to which team members are willing to search and process information thoroughly (cognitive motivation), and whether they do this in a truthful or deceptive manner (social motivation), will determine if they are more or less likely to engage in productive conflict and realise the synergetic benefits presumably offered by team decision making. That is, arriving together at a better solution that no individual team member could have produced alone. This argument, supported by MIP-G theory and research, is summarised in Figure 2.1.

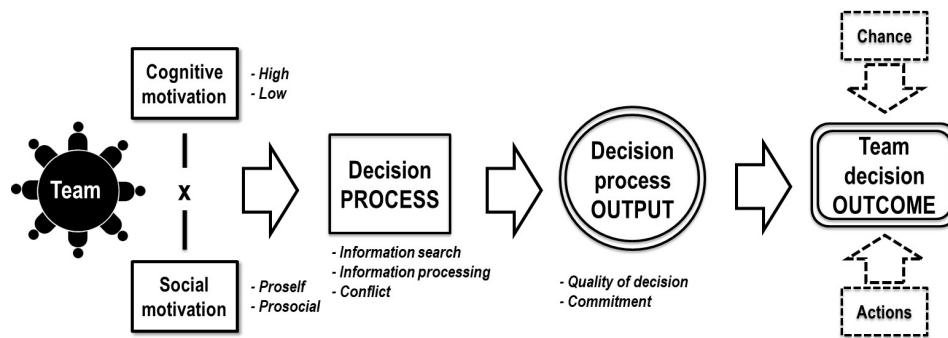


Figure 2.1 Adapted from De Dreu et al. (2008) (Image of team Image by Ricarda Mölck from Pixabay)

## 2.5 Complexity and team decision making

The strategies and actions for managing team conflict mentioned above are certainly useful tools to foster increased cognitive motivation and prosocial behaviours that enable conflict to surface and be managed effectively. This will be discussed at greater length in later chapters. There are, however, complex situations for which the communication and processing of information pertaining to the situation represents a very difficult challenge, even for prosocial teams with high levels of cognitive motivation. The following example illustrates the complexity of such situations.

In the Dutch criminal justice chain, crimes investigated by the police end up as case reports on a public prosecutor's desk, leading to a suspect being brought before a judge in court. If the suspect is found guilty, they are sentenced to pay a fine, spend time in prison or perform community services. During much of the late 1990s, the Dutch prison services were faced with a shortage of prison capacity. In 2000, prisoners serving time for less serious crimes, and who had completed 90% of their sentence, were made eligible for early release. Three years later this figure was decreased to 70%. This dramatically increased the number of prisoners released: from a total of 200 prisoners released early in 2000, to 446 in 2001, and then 4,837 in 2002 (Dienst Justitiële Inrichtingen, 2002). This policy of early release was successful in solving the problem of prison capacity shortage. However, it also created problems elsewhere in the Dutch criminal justice chain. Judges noted that several people they had recently convicted and imprisoned for an earlier crime were reappearing in their court. They recognized some suspects as individuals they had seen earlier and who in fact should still be serving their sentences. Judges then became concerned that sentences passed for earlier crimes were not served to completion. To compensate, they started to pass longer sentences to both old and new offenders. The short term effect of the judges' actions was to increase the demand for prison capacity, going directly against the goal of the prison services' early release policy.

The above case is a typical illustration of a complex situation in which there are multiple *interconnected problems* that need to be managed (Ackoff, 1974, 1981). One reason why complex situations are challenging is because decisions about a problem that is only a *part* of the situation cannot be made without considering the other problems in that situation. Put differently, local solutions to a particular problem tend to generate problems elsewhere, as illustrated in the Dutch prison case. Indeed, the interconnectedness between the different problems in a situation makes complex situations *systemic* and thus particularly challenging. Complex situations can also exhibit high levels of *uncertainty*. In the Dutch prison services case, future levels of crime can never be predicted with complete certainty. In addition, the services did not foresee the reaction of the judges to their early release policy, nor length of sentences and the speed at which they would be given. What is clear is that the Dutch prison services focused on one part of the situation (shortage of prison capacity), while the judges attended to another (sentences served to completion). This example only covers two of the central stakeholders in the justice system, which as mentioned, spans police, public prosecution, judiciary, and prison services. A decision of any of these stakeholders will likely affect all others. Much like a ball of wool, pulling on one strand will bring with it the entire ball. Furthermore, the uncertainty of stakeholders' responses to any such attempt makes it impossible to guarantee that the intended impact is fully realised.

Here is another example showing the impact of stakeholders' actions in situations that appear simple, but are in fact messy. In discussing the lessons to be learned from the attempted takeover of ABN Amro, the Dutch government considered several actions aimed at preventing major banks from getting into problems again (Smit, 2008). One issue was the high salaries paid out to the banks' top managers. A measure thought to be effective in lowering excessive salaries was to force Dutch financial institutions to make the salaries of their top managers public. This was expected to lead to the naming and shaming of those perceived to be receiving disproportionate salaries and thus create pressure for change. While this did happen, the now-publicly available information enabled managers to learn about how much their peers were earning at competing institutions. In at least one bank, a manager who found himself in the lower range of salaries was offered a higher salary by his human resources department. Their justification was that the bank needed to be seen as paying competitive salaries. We can see here that something perceived as a well-defined problem situation (top managers' salaries are too high) was messier than the Dutch government initially thought, because there were many stakeholders involved in the situation, each with different perspectives, goals and power. For a bank's human resource manager, salaries and the bank's competitive position are interdependent. Other banks adopted a similar policy of increasing salaries. Thus the act of making salaries public set in motion a series of unanticipated and interconnected effects, increasing salaries year after year instead of lowering them!

To summarise, in a complex situation there are a number of interacting problems that involve diverse stakeholders, whose unanticipated responses make it difficult to choose where to focus decision making efforts. Even if a clear focus is set, attempts to improve the situation may produce unintended results due to uncertainty around developments in the situation, or the actions and reactions of other parties (Nutt, 2002). So, how can we maximise the chances of a team successfully tackling a complex situation?

There is an extensive management literature that approaches team decision making in complex situations as the domain of leadership (Bratton et al., 2004; Grint, 2005, 2010; Heifetz, 1994; Heifetz & Laurie, 2001; Uhl-Bien & Marion, 2011; Uhl-Bien et al., 2007; Verweij & Thompson, 2006). Specifically, most authors in this area highlight that successful leaders in

complex situations facilitate a collaborative team decision making process involving key stakeholders, and ask the kind of questions that open up useful ways to make progress in a complex situation. However, note that these prescriptions rest on the important assumption that the leader will be able to foster high levels of cognitive motivation and prosocial behaviours within the team. Yet people faced with a complex situation may or may not have high levels of cognitive motivation, which can lead to strong disagreements about how to address the situation (Jehn & Mannix, 2001). Complex situations are also typically associated with competing perspectives and interests of team members, which in turn can trigger proself rather than prosocial behaviours.

In the next chapter, we introduce the notion of using structured procedures to both benefit and mitigate from the effects of motivational influences on team decision making. These procedures, which we call ‘interventions’, can be applied to decision situations of varied complexity to help teams transform their collective knowledge into high quality decisions.

## Chapter 3. Interventions to support team decisions

In practice, launching a team decision making process often comes down to organising and running team meetings that follow a predefined agenda guided by a chairperson (Doyle & Straus, 1976; Schwartzman, 1989). In a traditional meeting procedure, the chairperson is responsible for the agenda but typically also has an opinion on the topic under discussion, which requires managing the process and content of the meeting in parallel. Although used very often, it is difficult to find any reference on the benefits or joys of team meetings. Many team members seem to regard meetings as some sort of necessity, and then go on to lament about time wasted, the lack of clear conclusions, or the feeling that the more important things were said in the hallway rather than the meeting itself. That being said, well-managed team meetings may be efficient and productive, and there may even be people who enjoy attending them. However, in addressing important decision situations, the usual drawbacks of meetings are likely to become even more apparent. Because team members tasked with addressing a decision situation are likely to have different views and goals, specific meeting procedures must be designed and implemented to both elicit team members' inputs and manage any conflict that may arise.

Procedures to improve processes of any kind are referred to as *interventions*. The term 'intervention' can mean many different things. For example, intervention is used to describe individual and group therapy (Snijders, 2006), training to enhance teamwork (Lacerenza et al., 2018), medical or technological procedures, the interference of one nation in the affairs of another, and humanitarian aid in disaster or emergency situations. In this book, we reserve the term 'intervention' to describe a structured decision making process comprised of *designed facilitated activities carried out in order to help a team achieve its goals*. In this context team goals include generating a better and shared understanding of the decision situation, producing a recommendation on how to respond to the situation, or simply making a choice.

An intervention typically requires that team members are drawn from within or across organisations, and act on behalf of the constituencies they represent (e.g. a unit, department, division, organisation). Interventions of this type represent opportunities for entering "*into an ongoing system of relationship, to come between or among persons, groups or objects for the purpose of helping them*" (Argyris, 1970: p. 15). Our definition of intervention also implies that facilitation plays a critical role in the intervention process. Specifically, a facilitated process is central to encouraging the active participation of team members in discussions, so that a mutual understanding within the team can be achieved. In addition, a facilitated process also plays a critical role in fostering the development of integrative solutions that create a sense of shared responsibility about their implementation (Kaner, 2007).

Throughout an intervention, team members engage in divergent and convergent thinking processes (cf. Guilford, 1959). Broadly, the former involves a process of generating ideas in an developmental fashion. For example, surfacing team members' different perspectives of a situation of concern requires divergent thinking. This process is also used in articulating the objectives that team members wish to realise in a situation, as well as generating creative and feasible alternatives for action. On the other hand, convergent thinking refers to the process of organising the set of ideas and information generated by divergent thinking, and transforming it into a small set, where the resulting set may consist of ideas of a higher order, ideas typical for a category, or central ideas. Thus a convergent thinking process will, for instance, consolidate the best ideas into a set of decision options, which would then be evaluated against a prioritised set of objectives. We will discuss further aspects of divergent and convergent processes in Chapter 14.



An important assumption in the intervention literature is that effective team decision making requires both divergent and convergent thinking to take place. Lack of divergence can result in a too-narrow view of the decision, leading to a premature consensus that can result in inferior decisions. However, lack of convergence may mean that no way forward is identified (Kaner, 2007). In addition, divergent and convergent processes do not follow a linear sequence. Rather, they tend to operate in an iterative fashion, enabling team members to cycle between divergent and convergent thinking.

In this chapter, the notion of intervention to support team decisions is further elaborated. We begin by introducing simple intervention approaches such as debiasing strategies, brainstorming, nominal group technique, clustering and prioritising, which have been developed to support divergent thinking, convergent thinking, or both. Next, we introduce more advanced interventions that extend simple intervention approaches by the use of formal representations of the situation of interest as a core decision support tool.

### 3.1 Simple interventions to support team decision making

#### 3.1.1 Debiasing strategies

How can we avoid cognitive biases when making decisions? A number of debiasing strategies have been developed and tested in recent years, from simple to more sophisticated ones, with a view to reduce or eliminate or eliminate biased decisions. The simplest strategies involve raising awareness about the possibility of bias and providing feedback. However these strategies have yielded minimal success (see, for example, Alpert & Raiffa, 1982; Fischhoff, 1982). More sophisticated strategies aim to help people to move away from System 1 thinking and instead engage in System 2 thinking. These fall into three broad categories (Arkes, 1991; Larrick, 2004): *motivational*, *cognitive* and *technological*. The motivational approach assumes that people will engage in System 2 thinking if the stakes are high enough. Put differently, the premise is that an individual possesses an appropriate (i.e. normative) strategy for the decision task at hand, and will use it when the benefits exceed the costs. Research on using financial incentives as a motivational strategy has produced little empirical evidence that it is effective in reducing bias (Camerer & Hogarth, 1999; Larrick, 2004). By contrast, making people accountable for the process and outcome of their decisions appears to be a more effective motivational strategy. Accountability relies on the motivational effects of perceived social benefits such as making a good impression and avoiding embarrassment. Its impact on various cognitive biases has been tested extensively, with particular success in cases where decision processes and outcomes have to be justified to an audience whose preferences are unknown to the decision maker (Larrick, 2004).

Cognitive strategies can be clustered into two groups. The first group consists of instructions or prompts to ‘think harder’, ‘consider the opposite’ or ‘use more information’. This approach has produced impressive results at reducing a number of biases including overconfidence (e.g. Walters et al., 2017), availability (e.g. Dubé-Rioux & Russo, 1988), anchoring (e.g. Epley & Gilovich, 2005) and representativeness (e.g. Lee, 2019). Broadly, the strategy involves asking oneself: "What are some reasons that my initial judgment might be wrong?" (Larrick, 2004, p.323) The strategy is effective because it encourages people to direct their attention to opposite evidence that would not otherwise be considered. Similarly, prompting decision makers to consider alternative hypotheses has been shown to reduce confirmation biases in seeking and evaluating new information (Hirt & Markman, 1995; Lord et al., 1984).

The second group of cognitive strategies involves formal training in basic disciplines such as statistics, economics, and logical reasoning. The use of training is based on the assumption that people often have a rudimentary knowledge about basic statistical, economic and logical principles, but have difficulty in knowing how and when to apply them (Larrick, 2004). For example, people have been successfully trained to ignore sunk costs (e.g. Larrick et al., 1990), use relevant statistical information (e.g. Fong et al., 1986) and seek disconfirming evidence (e.g. Cheng et al., 1986). Interestingly, there is some evidence showing that people trained in more quantitative disciplines (e.g. economics) as opposed to more qualitative ones (e.g. humanities) are more likely to apply rational norms to avoid biases (Larrick et al., 1990). Evaluation studies of the debiasing effect of training have typically measured impact just after the training. More recently, however, researchers have begun to examine whether the effects of training can lead to enduring changes in people's behaviour, and transfers to other situation beyond the specific training environment or context. The emerging picture is encouraging (e.g. Korteling et al., 2021), particularly when training is based on the use of games (e.g. Bessarabova et al., 2016; Dunbar et al., 2014; Lee et al., 2016), but more research is still needed before reaching a final conclusion.

Whilst the aim of the cognitive approach is to improve our mental strategies, the technological approach aims to expand possible strategies to include external support in the form of information presented in various formats, different elicitation protocols, or formal decision aids. For example, it has been shown that an effective technological strategy to reduce biases is to present information as frequencies rather than probabilities (Gigerenzer & Hoffrage, 1995; Sedlmeier, 1999) or in graphical rather than text form (Cook & Smallman, 2008; Ohlert & Weißenberger, 2015; Roy & Lerch, 1996). Similarly, a wide variety of knowledge elicitation techniques have been successfully tested to reduce biases such as overconfidence (e.g. Abbas et al., 2008; Ferretti et al., 2022; Jain et al., 2013). Surprisingly, a notable shortcoming in debiasing research to date is the lack of empirical evidence on whether formal decision technologies such as those developed in the decision and system sciences are effective debiasing tools. We think this is a shortcoming that must be addressed but some evidence is beginning to appear. For example, it has been found that people de-escalate commitment to a failing course of action (thus ignoring sunk costs) when they use a decision aid that shows means-ends relations among important factors affecting the decision task. This type of decision aids have also been used to reduce availability and framing biases (Bond et al., 2010; Hodgkinson et al., 1999; Meissner & Wulf, 2013). Clearly, more research is needed in this area.

Finally, a debiasing approach that focuses on leveraging System 1 thinking to improve decision making has been proposed by behavioural science experts Richard Thaler and Cass Sunstein (Thaler & Sunstein, 2008). Rather than helping people to engage in System 2 thinking using the strategies discussed previously, the approach involves adapting the decision making environment to people's biases so that the chances that they will make wise choices are maximised. For example, the status quo bias creates a preference for default options (Ritov & Baron, 1992), and this insight is used to ensure that the available default is the option that is likely to be best for individuals and/or society (e.g. making enrolment in a retirement savings plan a default). The approach has been proven to be effective in a number of situations but it is not without its critics. This is because the 'one-size-fits-all' nature of many defaults could leave some people with an outcome ill-suited to their personal preferences (for a critique, see Smith et al., 2013).

In conclusion, we have a number of debiasing strategies at our disposal to move away from System 1 thinking and engage in System 2 thinking to avoid falling into the decision traps discussed in Chapter 1.

### 3.1.2 Brainstorming and Nominal Group Technique

The simplest and perhaps most used intervention to support team decisions is *brainstorming*, a well-known approach that encourages divergent thinking within a team. First described by Alex F Osborn in his book *Applied imagination: principles and procedures of creative problem-solving* (Osborn, 1957), the aim of brainstorming is to note down all ideas that may be of interest when thinking about the decision situation at hand, in order to prevent missing anything that might be considered important. Brainstorming is expected to counter a number of human tendencies that stifle creativity: a tendency to evaluate (often focused on negative aspects), a focus on habits, self-discouragement, timidity and so on. In a standard meeting, original ideas often seem unusual or strange, so that the person thinking of them may not even say them out loud. Even when brought up, criticism by others may prevent the idea from being analysed further. Osborn (1957: p. 227) reports applications in several organisations where brainstorming resulted in more and better ideas than were generated using traditional means. The popularity of brainstorming, its claims on effectiveness and variations on the original approach, have inspired over 30 years of empirical research (Stroebe et al., 2010). Further details about how to conduct a brainstorming intervention can be found in Appendix A.

Despite its popularity and apparent benefits, brainstorming as an approach to tackling decision situations has at least two obvious limitations. One relates to the content of the situation, and the other one to the team decision process. Regarding the former, the production of long lists of mostly unconnected ideas does not fully capture the relations between the different elements of a decision situation. With respect to decision process, brainstorming can make the team suffer process losses (Steiner, 1972). For example, it could cause some team members to engage in unhelpful behaviours such as sit back and wait for others to complete the task ('free-riding'), or stop searching for novel ideas because of the need to attend to what others are saying ('production blocking') (Diehl & Stroebe, 1987; Stroebe et al., 2010).

Research into the effectiveness of brainstorming has led to the development of alternative approaches such as the Nominal Group Technique (NGT) (Delbecq et al., 1975). This technique is used with groups comprised of individuals who do not interact, which contrasts to brainstorming in which group members do interact. Research into brainstorming shows that the number and quality of ideas generated in an interacting group are lower than in an NGT group. Studies focused on three alternative explanations for this finding. The first is social inhibition: the fact that the presence of others inhibits airing new ideas. Second is social loafing: not participating in the generation of ideas because you expect that others are doing the work anyway. Third is production blocking. Since, in a group setting, typically only one person speaks at a time, others are forced to wait while trying to remember their contributions. While they are remembering their ideas, they cannot at the same time think of new ideas. A line of research eventually showed that production blocking explained most of the difference between brainstorming and nominal groups (Diehl & Stroebe, 1987; Stroebe et al., 2010). Appendix A describes how to conduct NGT.

Both brainstorming and NGT can be implemented using traditional means such as whiteboards, flipcharts and pens. Alternatively, they can be used in a computer-supported environment (e.g. Nunamaker et al., 1991). Computers have been used to support team decision making since at least the 1980s (DeSanctis & Gallupe, 1987). This support is in the form of a computer-based

group decision support system (GDSS), defined as “... *a set of software components, hardware components, language components, and procedures that support a group of people engaged in decision-related meetings.*” (1984: p. 197)<sup>2</sup>. These support systems are not limited to providing assistance with divergent tasks but also with convergent and prioritisation tasks. Consequently, they support the team during the entire decision process, from ideas to recommendations on actions.

When a computer-based GDSS is used to support a face-to-face team meeting, members will gather in a so-called group decision room. This room contains a series of networked computers arranged in a U-shape. Every team member is seated behind a computer and faces a projection screen. The GDSS software enables the meeting leader to send out questions to the individual computers, collect and project answers on both a central screen and team members’ personal screens, and categorise and prioritise ideas in various ways. Team members contribute to the meeting largely by typing in responses to questions on their computer screen.

While in most applications, team members gather in one place at the same time, a computer-based GDSS may also support meetings in which team members come together in different places and at different times. GDSS technology allows meeting participants to log on to a meeting from their own workspace. Communication via computers has a number of additional benefits. In a traditional face-to-face meeting, team members have to wait to make a contribution until others finish speaking. By contrast, in an GDSS meeting everyone to work in parallel. Contributions can be made anonymously, which increases the chance that sensitive issues are brought to the table. Finally, computer-based GDSSs such as GroupSystems<sup>3</sup> or MeetingSphere<sup>4</sup> make a report of the session immediately available. The fact that a computer-based GDSS enables parallel work, anonymity and fast reporting may increase the productivity of meetings in comparison to traditional brainstorming.

### 3.1.3 Clustering and prioritising

Few sessions end after a brainstorm, with dozens of ideas in an unstructured list. Usually the team wants to organise their ideas in some way, either by grouping similar ideas together, by identifying central ideas or choosing the most important or effective ideas. In this section we present basic approaches for convergence and prioritisation.

Decision making teams usually have a natural need to go from divergence to convergence. Brainstorming, NGT and other methods supporting divergence result in a multitude of ideas. The output of this creative phase may look like chaos to some participants in the team process, but a broad understanding of the problem at hand is needed to prevent too narrow of a focus. Divergence prevents potential problems discussed in the previous chapters, such as the Type III error or anchoring. The creative, divergent phase is usually followed by a phase of convergence. Approaches to convergence range from formal to more informal methods. Taxonomies are on the formal end and use formal rules to place concepts into a category. They ‘categorize phenomena into mutually exclusive and exhaustive sets with a series of discrete decision rules’ (Doty & Glick, 1994: 232). Typologies, while still formal, are developed using

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<sup>2</sup> Whilst many scholars reserve the term ‘group decision support system’ to refer to decision environments that are computer-based, other scholars (mostly in Europe) use the term also to include decision support environments that do not use computers (Eden, 1992; Eden and Radford, 1990).

<sup>3</sup> *GroupSystems* was originally developed by a team of researchers led by Jay Nunamaker at the University of Arizona.

<sup>4</sup> MeetingSphere is a facilitation software that has been transformed into a virtual facilitation tool called Xleap (visit [www.xleap.net](http://www.xleap.net)).

less strict rules and represent ideal types. Each ideal type is a unique combination of characteristics. An example is Porter's (1985) typology of organisational types that maximise competitive advantage.

A more informal approach to categorisation is clustering, which is essentially grouping similar ideas in a two-dimensional space. Clustering can be used to report results, and with participants in a session. In reporting the results of a brainstorm session, it is useful to employ alternatives to writing up a long list. Visualising ideas by depicting them in a two-dimensional space is a more attractive way of presenting results.

After divergence and convergence, decision making groups often wish to prioritise results in one way or another. Prioritisation is in essence ordering ideas on a single criterion, such as importance, feasibility, urgency, effort and so forth<sup>5</sup>. Some simple prioritisation approaches are described in Appendix A.

### 3.2 Advanced interventions to support team decision making

Beyond the simple interventions discussed in the preceding section, there is a family of more advanced approaches that incorporate some, or all, elements of simple interventions, but with the distinct intention to help team members gain an improved understanding of the *relationships* between different elements of a decision situation, and of the consequences of these relationships. This improved understanding often enables team members to reach agreements about how best to respond to the situation.

Management and decision scientists have long argued that successful team decision making requires a thorough understanding of the issues and goals pertaining to the decision situation of concern, and of the relationships between these issues and goals (e.g. Eden & Ackermann, 2010). Research shows that this is often achieved through the creation and use of an external and explicit representation of the situation - a 'model' (Pidd, 2010) - as seen by team members. The model is built by the team, with or without the assistance of modelling experts or computer-support, and its content may include team members' knowledge, frames, assumptions, goals and expectations about the decision situation, as well as elements of the past, present, (possible) future, desired or ideal situation.

Model content is organised in particular ways in order to increase team members' motivation to engage in systematic and deep processing of information about the situation of concern (cognitive motivation). Furthermore, because a model is an external and explicit representation of a situation as perceived by team members, the model will not only surface a diversity of information but also interests within the team. Thus disagreements and conflict about knowledge claims, facts and values pertaining to the situation will often emerge (Kaplan, 2008). Furthermore, the levels of affective conflict that the team might experience when using models will be contingent on the asymmetry of interests and within the team<sup>6</sup>. Thus models to support team decision making must be built and implemented using a process that enables both deep information processing and effective management of conflict.

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<sup>5</sup> More sophisticated prioritisation approaches involve the use of a set of criteria (see Chapter 10).

<sup>6</sup> When the situation to be addressed is perceived as complex, then interest asymmetry is likely to be at its highest level within the team.

In this book, our focus is on *model-driven interventions* (Morton et al., 2003; Rouwette & Franco, 2021) designed to support team decision making in one-off situations of varied complexity and uncertainty, specifically where the construction and use of models is a core element. A model-driven intervention approach offers specific guidelines for managing model content as well as the interaction process between team members. Models are the core intervention tool through which a wide variety of facts and judgments are captured and integrated; the process guidelines act as a facilitative mechanism intended to help team members work towards a collective solution while dealing with conflict in a constructive manner.

In Part II we will describe a selected sample of four model-driven intervention approaches. We had three considerations in selecting this particular set of approaches. First, we chose approaches aligned with the notion of facilitated modelling developed within operational research. Namely, intervention approaches in which a facilitated process is used to construct and analyse models ‘on-the-spot’ (Franco & Montibeller, 2010; Franco & Montibeller, 2011). The second consideration was accessibility. That is, we chose approaches that would-be intervention practitioners could use by themselves without having to buy specific software or equipment<sup>7</sup>. Our final consideration was to choose intervention approaches with a substantive body of research evidence regarding their practical use and effectiveness. Below we briefly introduce our chosen approaches, in no particular order.

### 3.2.1 Group model building

The *group model building* approach was developed primarily for examining the performance of a ‘system’ by looking at the system’s past behaviour (Vennix, 1996). The system under study is one that encapsulates the issue or problem that needs to be understood. A visual model of the system is built with the relevant stakeholders and used as a learning tool to explain past performance by separating causes from symptoms. The model also serves as a visual memory of the team’s discussions, and can be further developed into a form that is amenable to quantitative analyses via computer-based simulations.

### 3.2.2 Group causal mapping

Developed within the ‘soft’ operational research tradition in Europe (Ackermann, 2012; Rosenhead & Mingers, 2001), *group causal mapping* is an intervention approach that supports exploration of the complexity of the issues constituting the entire decision space as perceived by the team<sup>8</sup> (Bryson et al., 2004). By closely examining means-ends relationships between issues that demand attention from the perspective of team members, implied goals and options emerge during team discussions, which then inform the prioritisation of issues, goals, and subsequently, actions. The approach can be undertaken with basic and computer-supported technology.

### 3.2.3 Decision conferencing

Belonging to the family of Multi-Criteria Decision Analysis (MCDA) approaches (Belton & Stewart, 2002), *decision conferencing* is an intervention approach concerned with the evaluation of options against multiple decision criteria (Phillips, 2007; Phillips & Bana e Costa, 2007). The approach involves a process of structuring the objectives, options, preferences and

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<sup>7</sup> Some of the model-driven intervention approaches covered in this book have the option of using specific software and equipment.

<sup>8</sup> Group Causal Mapping is also referred to by its original name, *Strategic Options Development and Analysis* (Ackermann & Eden, 2010). The approach has been further developed into a comprehensive strategy making methodology called *Journey Making* (Ackermann & Eden, 2011).



trade-offs that are relevant to the decision situation at hand. DC is associated with the facilitated modelling approach (Franco & Montibeller, 2010) in general, and with the Value Focused Thinking approach in particular (Keeney, 1996), and can be deployed with simple computer-based technology (e.g. spreadsheets).

### *3.2.4 Participatory scenario development*

The term ‘scenario planning’ encompasses a family of intervention approaches designed to improve the understanding of a current situation by exploring possible alternative futures that are pertinent to how the situation is tackled now (Van der Heijden et al., 2002). *Participatory scenario development* starts by eliciting ideas and data about the future from team members, and then integrating the collated information into one or more narratives<sup>9</sup>. Different possible futures, or scenarios, are captured in these narratives. For example, one narrative might be a story covering a day in the life of a person ten years from now. Team members can then place themselves in the scenarios to gain a better appreciation of what seems appropriate in terms of current action.

All the approaches above represent alternative ways for dealing with data and knowledge. Teams that use group model building and group causal mapping spend most of their time clarifying the causal relations between different aspects of a situation of interest. Participatory scenario development approaches structure information in another way, by writing a story on what a future world would look like. Decision conferencing also looks at the future, but not as a possible context that we might find ourselves in, but as the anticipated consequences of decisions we might make now.

The four approaches covered in this book can be, and have been, combined in practice. For example decision conferencing is often used together with group causal mapping (e.g. Bana e Costa et al., 1999; Franco & Lord, 2011; Franco & Montibeller 2011). In addition, participatory scenario development has been supported by group model building and decision conferencing interventions (e.g. Montibeller et al., 2006; Strohhecker, 2005). Furthermore, some form of brainstorming, NGT, clustering, and voting, are typically deployed within all the four approaches. Despite this flexibility, in this book we describe each intervention approach in isolation from the rest. Our reason for doing so is that every single approach constitutes a complex set of theoretical foundations, step-by-step procedures and particular ways to guide the team decision making process. Therefore, we think that understanding and building experience with each of these approaches separately is easiest when practising them for the first time. For a would-be intervention practitioner, the lack of familiarity with team members or their domain-specific knowledge, the conflicts that can arise during team discussions, and the need to simultaneously manage both process and content poses enormous demands. In addition, the more advanced use of approaches, in challenging circumstances or with a more complex intervention process resulting from combining methods is, in our opinion, best tried after some experience with more simple situations has been gained.

In the next eight chapters, we will describe the four model-driven intervention approaches in more detail. In the last section of the book, we will assess whether model-based interventions do a good job in practice, and if so, why.

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<sup>9</sup> Narratives are models in the sense that they depict the relationships between factors pertaining to a particular future, as well as their consequences. The format of these narratives is typically text-based, although some scenario planning approaches express the narratives visually as a cause-and-effect network (Cairns & Wright, 2017; Wright and Cairns, 2011).





## Preface part II. Structured team decision support

In this part we describe a set of distinct intervention approaches developed to support teams facing decision situations of varied complexity. There are so many intervention approaches to support team decision making that we had to be selective. In this book we are considering intervention approaches that use a model or external representation of the situation of interest, as seen by team members. That is, we are concerned with facilitated model-driven interventions.

The four intervention approaches will be presented in pairs of chapters. The first of the pair will describe the approach using the framework shown in the table below.

Background	The origin, main assumptions and theoretical concepts that inform and justify an intervention's procedures, techniques, and tools
Procedure, technique and tools	Procedure: a structured set of activity guidelines to assist people in undertaking a particular intervention
	Technique: a specific activity that has a clear and well-defined purpose within the context of a procedure
	Tool: an object used to facilitate the application of a technique (e.g. flipcharts, software); or the outcome of applying a technique (e.g. a model; a ranking of options)
Versions	Alternative forms of the approach reported in the relevant literature
Applications	Summary evidence of use

The second chapter in each pair will describe a practical application. These chapters first sketch the background and central issue in the case. The process followed with the decision making team is then described. This shows how the procedure outlined in the previous chapter is put into practice. Two types of results are then described. First the visible product, in the form of workbooks and final reports describing models and other analytical tools. The final section covers the less visible products, such as reactions and insights, which form the basis for implementation and results achieved.

## Chapter 4. Group model building

This chapter describes group model building, an approach that supports decision making by guiding team members through a process of joint model construction. Team members first generate a list of problem elements and then iteratively build the model, one element at a time. Before a new element is added to the model, the facilitator checks for the team's agreement. Group model building uses a particular type of models: system dynamics. System dynamics originated as a quantitative, formal modelling approach and has since developed a strand of qualitative, conceptual modelling as well. In the section on procedure below we sketch the qualitative version of group model building. The quantitative mode is introduced in the section on (alternative) versions.

### 4.1 Background

Group model building is a facilitated modelling method that has its origins in system dynamics. System dynamics is a simulation approach that stems from the work of Jay Forrester at MIT in the 1950s. He started out by applying system dynamics to the study of industrial organisations, initially referring to his new approach as industrial dynamics and only later adopting the broader name of system dynamics. Forrester's later applications included topics such as urban growth, markets, world dynamics and national economies. Since the 1950s the use of the method quickly spread to other institutes and application areas. System dynamics conferences have been held annually since 1985 and attract researchers, consultants and practitioners from all over the world, working on topics in diverse fields such as management, economics, health policy, sustainability, biophysical systems, psychology, and sociology, among others. In these applications Forrester's original focus on the interaction between problem elements, instead of singling out separate elements, is still evident. Forrester's (1961: vii) early description of the field can be generalised to the wide range of present day applications. *'Industrial dynamics is a way of studying the behaviour of industrial systems to show how policies, decisions, structure, and delays are interrelated to influence growth and stability. It integrates the separate functional areas of management – marketing, investment, research, personnel, production, and accounting.'* In a similar fashion, a recent application of system dynamics to understand Alzheimer's disease (Uleman et al., 2021) integrates brain, physical and psychosocial domains.

A basic premise of system dynamics is therefore that the characteristics of the whole are more important than the characteristics of individual parts. The behaviour of a system follows from the interaction between its elements, or in other words: 'structure drives behaviour' (Richardson & Pugh, 1981; Vennix, 1996). This implies that everything essential for the causes and symptoms of the particular behaviour being explored is included in the model (Forrester, 1975). When studying a social system, this means the modeller needs to think carefully about two things: what drives decisions of actors in the system and what are the consequences of decisions. At first sight, the answers to these questions may seem obvious. A decision is driven by a problem, and the result of the decision is that the problem is solved. Imagine a shop owner who wants to keep her inventory up to a certain level. Once she realises the number of items in stock is below the desired level, she orders new items. After some time these arrive and the problem is solved. What this simple example shows is that time plays a central role in decision making: it takes time before new items are received and added to the inventory. The shop owner knows this and takes this into account in her decisions. What the shop owner does not do, is to compare actual inventory to desired inventory every day and order the difference. Another way of saying this, is that it is often too simple to think of drivers causing decisions, decisions leading to

consequences and then the problem is dealt with (Forrester, 1992). Drivers, decisions and consequences are not linked in a linear, open fashion, but in a closed feedback loop. Figure 4.1 below shows how the gap between desired and actual inventory is the basis for the shop owner's orders. Eventually these result in deliveries, which are added to the inventory, and in turn impact the gap.

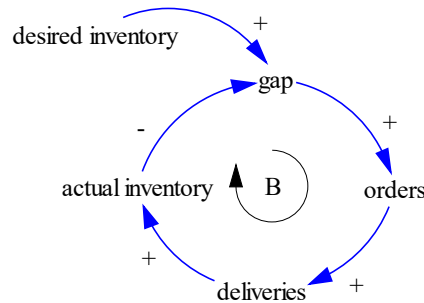


Figure 4.1. Example negative (balancing) feedback loop. A '+' next to a relation indicates that both variables change in the same direction. A '-' indicates that variables change in opposite directions. The 'B' in the middle of the figure points to a negative or balancing feedback loop.

If the gap is then reduced to zero, the process would end there, but the example can be made more realistic in a number of ways. Inventory is depleted by sales to customers, meaning a gap is created, orders are placed again, and so on. Typically ordering is not a one-off decision but a continuous process or policy. Figure 4.1 shows a qualitative system dynamics model in the form of a causal loop diagram. The concepts in the diagrams are variables: entities that can change over time. These are connected by arrows that refer to two types of influence of one variable on another. A positive relation means that if the variable at the tail (the cause) changes, the variable at the head (the effect) changes in the same direction. An increase will lead to an increase, and a decrease to a decrease. A negative relation means that variables change in opposite directions: an increase in the cause leads to a decrease in the effect; a decrease leads to an increase. Relations can combine to form feedback loops, meaning that if we start anywhere in the loop and trace the effects we arrive at the starting variable again. *'The essence of the concept . . . is a circle of interactions, a closed loop of action and information. The patterns of behavior of any two variables in such a closed loop are linked, each influencing, and in turn responding to the behavior of the other'* (Richardson, 1991: 1). When system dynamicists refer to 'structure', they mean the interactions between variables such as shown in Figure 4.1. Feedback loops are an important element of this structure. 'Dynamics' or 'behaviour' of a system refer to the change of one or more variables over time.

Forrester (1975) noted the importance of feedback for decisions and system behaviour in the early days of exploring dynamic systems. Actors use the information about the structure as input to their decisions, and by implementing their decision influence system behaviour. In the negative or balancing loop in Figure 4.1, a change in any variable 'travels' around the loop and eventually results in a change in the original variable in the opposite direction. The loop therefore tends towards stability. In contrast, a positive or reinforcing loop tends to increase the initial difference. An example is a bank account with a positive interest rate. The balance on the account will increase with interest received, generating more interest next year, increasing the account balance, and so on.

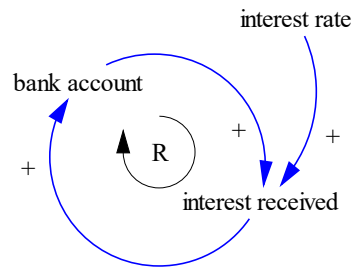


Figure 4.2. Example positive (reinforcing) feedback loop, indicated by the 'R' in the middle of the diagram

Organisational issues, in particular complex issues that touch upon multiple functional areas, are likely to be driven by multiple interacting feedback loops. These loops might cross departmental boundaries and show how decisions in one functional area have consequences for another. An example in Figure 4.3 shows a causal loop diagram developed in a project for the Dutch Ministry of Justice (Rouwette & Vennix, 2007). The lower part shows required detention capacity, which is calculated by multiplying the number of prison sentences with the average time served. If required detention capacity is greater than available detention capacity, a shortage of capacity results. In 2000, the Dutch Prison Administration initiated a policy that made prisoners who are serving time for infractions and have completed 90% of their sentence eligible for early release. In 2003, the strictness of norms for early release was reduced and prisoners who had completed 70% of their sentence were eligible for early release. This increased the potential number of early releases and actual releases. By reducing the average time served by a reduction time, the early release policy frees up capacity for new prisoners. A judge participating in the modelling project recalled that he became aware of the policy after he recognized a suspect as someone recently convicted and imprisoned for an earlier crime. He then became concerned that the suspect's sentence passed for the earlier crime was not served to completion. He foresaw that when judges would perceive an increase in the difference between duration of the sentence and time served (upper part of Figure 4.3) they would compensate by increasing the duration of sentences. Thus, there are three main balancing feedback loops in the causal loop diagram. In the loop at the bottom of the figure, an increase in required detention capacity leads to more prisoners released early. This reduces the average time served and thereby reduces required detention capacity. In this way, an initial increase is compensated by a decrease.

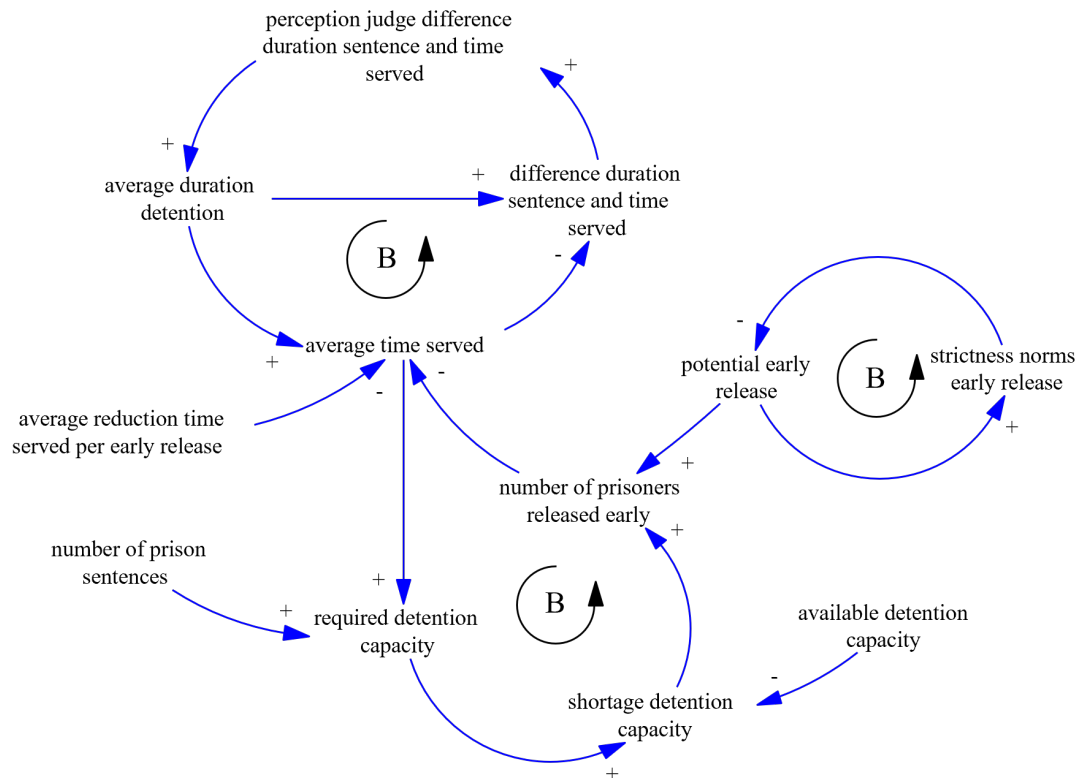


Figure 4.3. Example causal loop diagram on early release policy (from Rouwette & Vennix, 2007)

The model shows how a problem in one organisational department leads to a local solution (shortage of detention capacity leads to early release of prisoners) which then creates an unanticipated negative side effect in another department (widening the gap between sentence duration and time served). The other department then develops a local solution to address their local problem, going against the intent of the first department. This is a clear example of a ‘mixed-motive’ situation discussed in Chapter 2, in which team members have to cooperate to achieve shared goals and at the same time compete to advance their own individual interests. The model in Figure 4.3 was developed in the early stages of a project investigating the increase over time in the number of crimes with a known suspect that were not investigated further (Rouwette et al., 2007). This so-called ‘prosecution gap’ was the result of a lack of capacity in the criminal justice system, but exactly where to intervene in the system to increase capacity was unclear. The model in Figure 4.3 zooms in on (part of) the interaction between judges and prison administration. The criminal justice system also includes police, public prosecution and a range of other organisations. The model above is therefore depicts only a small subset of the decisions of stakeholders and their interactions that in combination result in the prosecution gap. How does the modeller find information on decisions, drivers and consequences, and determine its relevance?

A major task of a system dynamics modeller is to identify feedback loops responsible for the behaviour that is studied. This comes down to identifying loops and testing their contribution to overall behaviour. This has led system dynamicists to emphasise two tasks that at first sight may seem contradictory: getting access to mental and rather than documentary or quantitative data, and the construction of a quantitative (formal) model. On the first topic, Forrester (e.g. 1992) highlights the importance of mental data over other data sources in an organisation. The mental database, so information stored in people’s heads, includes the largest set of data available in any organisation. In contrast, both the written and numerical database are much

smaller. The latter is also more narrow in scope, as it does not reveal the causal relations between variables directly. The importance of mental data becomes clear when we imagine a situation in which only documentary and numerical information are available (Forrester, 1992). Suppose everyone at a university is fired today and new staff starts tomorrow. The new team can only access data stored in documents and information systems. What is the chance that lectures will be given, exams taken and PhD students supervised? Without mental data, or 'knowing how things are done here', chances are quite small. The modeller therefore needs access to mental data and needs to work with experts and stakeholders to find out how decisions are made. However, such information is likely to reveal many drivers and consequences of a range of decisions, resulting in many different feedback loops that contribute to a smaller or larger extent the problem of interest. How can the relevance of feedback loops to overall behaviour be tested? System dynamics posits that for systems including more than one or a few feedback loops, it is impossible to predict behaviour. The human mind lacks the ability to trace the dynamic consequences of a complex system structure. It needs support to be able to do so. System dynamics therefore posits that mathematical models are necessary to infer the dynamic consequences of system structure, which includes the contribution of particular feedback loops contribute to (episodes of) behaviour. Mathematical models require a further specification of variables into either stocks or flows, and capturing relations in equations. A mathematical (also referred to as formal or computer) model simulates behaviour over time and can therefore be used to test consequences of changes in structure. We return to this type of models at the end of this chapter. We note here that models can serve multiple purposes in working with stakeholders, which has consequences for their nature and role. So far we described system dynamics models as a tool for understanding an issue external to the team of decision makers, depicting data and relationships in their organisational environment. Zagonel coined the term micro-world for this use of models (Zagonel et al., 2004). However, an alternative purpose of modelling can also be to capture the consensus view of group of stakeholders about a problem. In that case the model serves as a boundary object (see Chapter 13). When models are used to capture the subjective understanding of a particular situation, quantification is of little use (De Gooyert et al., 2019). When there are significant uncertainties about data and the issue involves many variables that are difficult to quantify, the added value of formal models is also questioned (Coyle, 2000, 2001; Homer & Oliva, 2001).

While working with decision makers and other stakeholders has been a part of system dynamics since its inception (Lane, 2022), an explicit facilitated approach to system dynamics modelling emerged only in the 1980s. Around that time, involving clients directly in the modelling process was greatly simplified by the development of visual software such as Stella (Andersen et al., 2007). While different terms for facilitated system dynamics modelling were and are used, the version known as group model building emerged more or less simultaneously in Albany, New York and in Nijmegen in the Netherlands. In the 1980s in the Netherlands, Vennix and Gubbels were experimenting with involving clients in model construction, building on experiences with questionnaire approaches (Delphi), workshops and interactive gaming simulations (Vennix et al., 1990). Several ways of working with client groups emerged (Vennix, 1996), resulting in either quantitative or qualitative models. In Albany, New York, group model building was developed as part of the work of the Decision Techtronics Group (DTG). Initiated by John Rohrbaugh, a social psychologist working in small group processes, DTG combined insights from social science research on small group process, facilitation and the use of a variety of Operational Research modelling approaches (Andersen et al., 2007). DTG used a portfolio of modelling approaches in facilitated face-to-face meetings of client groups with projected computer support in the room. The first use of system dynamics with clients comes with a story involving David Andersen and John Rohrbaugh, who were involved in a debate over whether

or not it was even possible to build system dynamics models in direct interaction with a client group. *‘Andersen maintained that the formulation and coding of a system dynamics model (at that time done in DYNAMO) was a task that could not, in principle, involve clients. Rohrbaugh persisted in demonstrating through several pilot projects (typically involving having the facilitation and modelling team work through the night) that such group modelling projects were technically feasible. When Richardson, a seasoned system dynamicist, joined the faculty at Albany, Andersen did not have time to warn him of Rohrbaugh’s folly before Rohrbaugh invited Richardson to work on the project. Rohrbaugh and Richardson’s success launched GMB at Albany (Andersen et al., 2007: 692).* The next section outlines the steps in building a qualitative system dynamics model with a team.

## 4.2 Procedure, technique and tools

Group model building is generally conducted with a group of between six and 15 people (Rouwette & Vennix, 2009). The group is guided by at least two persons: a facilitator and a modeller/recorder (Richardson & Andersen, 1995). Together these guide the group through the steps outlined in Table 4.1.

Procedure	
<ol style="list-style-type: none"> <li>1. identify problem variable and reference mode of behaviour</li> <li>2. identify variables using Nominal Group Technique</li> <li>3. identify causal relations</li> <li>4. check feedback loops</li> <li>5. check validity</li> <li>6. identify control and target variables</li> </ol>	
<i>Activity/ technique:</i> <ul style="list-style-type: none"> <li>- Note down ideas on black/ whiteboard, wall or in digital form using modelling software</li> </ul>	
<i>Tool:</i> <ul style="list-style-type: none"> <li>- Board and pens, or decision room</li> </ul>	

Table 4.1. Elements of group model building

The facilitator’s task is to elicit relevant knowledge from the group members, and to help translate elicited knowledge into system dynamics modelling terms. Chapter 13 covers facilitation in more depth. The modeller builds the model with the aid of system dynamics modelling software with a graphic interface such as Vensim or online tools such as Miro and Kumu. Participants in a modelling session are seated in a semi-circle in front of a whiteboard and/or projection screen. The model under construction is shown on the screen and visible to all in the room. In this way it acts as a group memory which documents the model under construction. A separate part of the group memory is used as a parking lot for all kinds of unresolved issues which surface during the deliberations of the group. In combination, the visualised model and parking lot reflect at each moment the content of the discussion up to that point.

Group model building starts by identifying the issue of interest. At the beginning of a modelling project, this issue is no more than a label for a problem that the client group is interested in. The work on structuring the problem, so finding symptoms, causes and solutions that all somehow interact to form the problem, starts after that. The central issue is usually depicted in the form of a reference mode of behaviour (see Figure 4.4). The reference mode of behaviour is a plot of the behaviour of the most important problem variable(s) over the time horizon studied. It summarises the level of abstraction chosen for the model, the time period the group is interested



in as well as the most important behaviour to be simulated, and provides a focus throughout the modelling process. The data for the reference mode may be obtained from a database of the client organisation. Alternatively, participants make a sketch of the problem over time and use that as a starting point. In both cases the idea is that this graph over time represents the behaviour we are interested in. The task for the group then becomes to find the structure responsible for the behaviour.

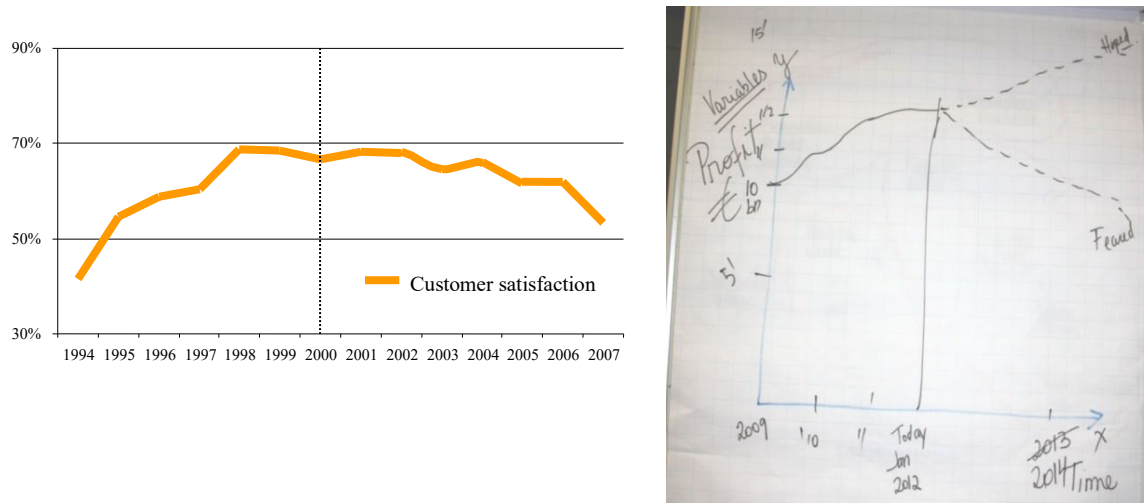


Figure 4.4. Examples of a reference mode of behaviour. The left pane is based on quantitative data from annual surveys. The right pane is a sketch of how participants thought their issue of interest had developed up until the present (January 2012), and their feared and hoped for development into the future (see Rouwette, 2016).

The problem variable, which was depicted in the reference mode, is noted down in the centre of a board or projection screen. This again serves to focus the group on the central question in the next step: which variables (causes, consequences, elements of) relate to this problem variable? Participants are asked to write down variables on a piece of paper, after which these are brought to the board. The facilitator in other words uses Nominal Group Technique (NGT, see Chapter 3) to come to a list of variables that play a role in the problem. It is useful to explain to the group at this point that variables are entities that can grow or decline over time, such as water in a bathtub, personnel in a company, or the national debt.

The second phase is the heart of group model building and asks participants to relate variables to each other. When drawing relations with a group, the rule that applies to all convergent activities also applies here: changes on the board need to be checked and agreed upon by all participants in the room. Once people agree to a proposed arrow, it is added to the model. In this way the model structure grows as new variables and relationships are added. The model purpose and system boundary operate as a limit to the addition of new variables. An element should be left out of the model if model purpose or behaviour are not affected by its inclusion (Forrester, 1975). After working on causes, it is useful to switch to effects of the problem variable.



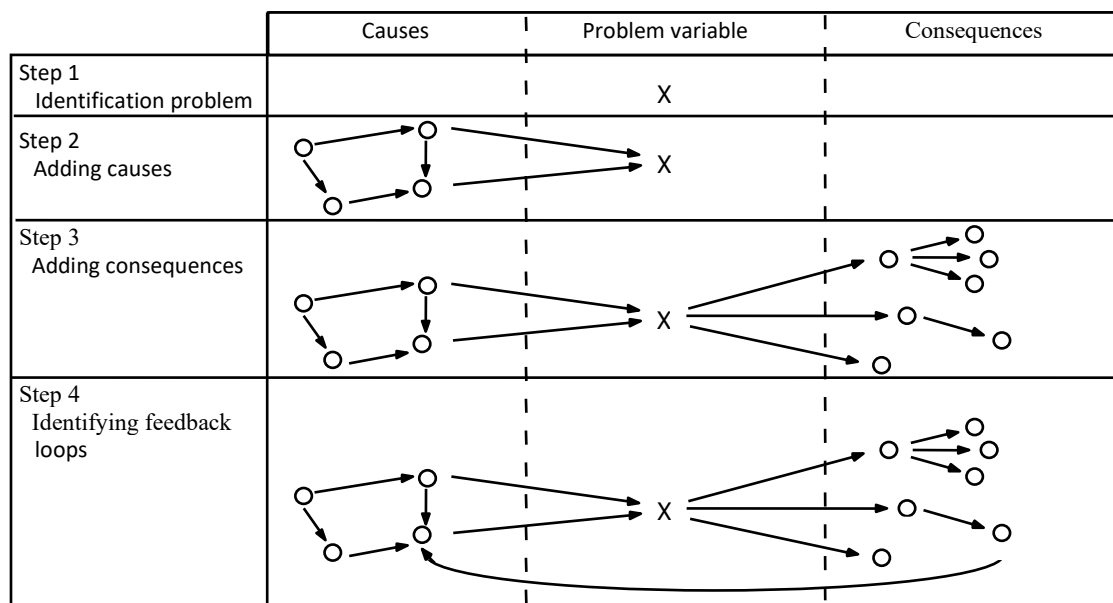


Figure 4.5. Steps in building a causal loop diagram (Vennix, 1996: 120)

As discussed, a central assumption in system dynamics is that feedback loops are the most important part of the structure of a system. Adding relations as done in the previous phase is likely to close feedback loops. It is worthwhile, when feedback loops are found, to check the loop as a whole. It may be that the team members agree on each relation in the loop, but think the loop as a whole does not make sense or is not important.

Model validity concerns the adequacy of the model for representing the problem under study and the confidence the user may have in the model and recommendations on the basis of the model. Ideally modelling proceeds until participants have sufficient confidence that this model structure captures everything that is essential to explain the reference mode of behaviour. Validity is a topic for discussion both in the modelling sessions and in reporting. If the model is used as a boundary object, its aim is to depict the consensus view of team members. Validity then concerns the question: ‘is this model a good representation of how these participants give meaning to their reality?’ (De Gooyert et al., 2019). On the other hand, if the model aims to capture data and relations external to the participating group, validity is about to what extent the model is a good representation given the goal of the model. System dynamics offers a range of tests to check model validity (Barlas, 1996; Forrester & Senge, 1980; Lane, 2015). These concern the model structure, checking for instance whether each variable in the model has a real world equivalent. Structure is then related to the behaviour of the model. Ultimately, the structure identified in the group model building sessions needs to be adequate to explain the behaviour depicted in the reference mode of behaviour. This is difficult when the model remains at the stage of a causal loop diagram, as we then still rely on the human brain to infer the dynamics consequences of the structure captured by the model. Not surprisingly, system dynamics modellers feel that when using a model to understand an external problem, going through the additional steps of building a formal model adds important insights that cannot be gained from a qualitative model. Formal models, while grounded in mental and documentary data, also allow for the use of quantitative data. This in effect allows for triangulation of conclusions, which may correct partial or biased interpretations brought forward by group members (Van Nistelrooij et al., 2015). Triangulation does however not need to take the form of full quantification. Testing crucial model relations against other data (independent from the group conversation) is another option. For instance, when constructing a model on child

protection, team members suggested that professionals in child care left their organisation because of a too high administrative burden. This was then tested against information from exit interviews (Lane et al., 2016)

Once sufficient confidence in the model is reached, the last phase in group model building works towards solutions to the issue at hand. This comes down to identifying those levers for change that steer the problematic behaviour in the right direction, while avoiding negative consequences for other important variables. Levers or control variables are those variables that decision makers can control, for instance hiring new recruits, or increasing the marketing budget. Target variables are those variables decision makers would like to change in a preferred direction. Examples are profit and client satisfaction. The problem variable that formed the starting point of group model building, and was depicted in the reference mode of behaviour, is one of the target variables. However, usually there are other target variables in addition to the problem variable. It does not make much sense for an organisation to optimise client satisfaction at the expense of everything else, such as employee satisfaction and turnover. The long term viability of an organisation typically depends on more than one variable. The first step here is to identify variables under the control of the participants in the modelling sessions. For instance, take the model shown in Figure 4.3 which was developed as part of a project aimed at explaining the widening prosecution gap. The final model includes variables that have an impact on the problem variable, such as number of policemen, available detention capacity and so on. The second step is identifying the target variables. Selecting the most important variables to change is not only a question of choosing the lever with the greatest impact on the original problem. It is likely that policies will have impact on other important variables as well. The model showed for instance that increasing the number of crimes reported by the police to the Public prosecution, did not only lead to a rise in prosecuted crimes (as intended) but also swamped the Public prosecution with work (Rouwette et al., 2007). This in turn led the Public prosecution to lower the number of cases presented to a judge and instead offer a financial settlement to the suspect. This is an unintended consequence that participants would like to minimise.

This section described the main steps in group model building, by highlighting important choices and ways to involve participants. As system dynamics has a tradition of facilitated modelling going back to the 1980s, many more tips and resources on how to combine participation and modelling can be found in the literature. If you are interested in practical guidelines on how to set up and guide modelling sessions, the literature on scripts is a useful starting point (Andersen & Richardson, 1997; Hovmand et al., 2012). A script is a repeatable element of process that, if used in a specified context consistently yields similar outcomes. The total session is broken up into periods of 15 to 20 minutes each and the activity in each period is carefully planned. Scripts describe in practical terms what the facilitator and recorder do, which reactions can be expected from participants and which material is created, and how these link to other scripts. Scripts are accessible online via Scriptapedia (<https://en.wikibooks.org/wiki/scriptapedia>).

## 4.3 Versions

This section goes into alternatives to the generic group model building procedure described above and shown in Table 1. We first summarise in brief what is required to build a formal rather than qualitative system dynamics model. Then we go into a number of approaches that have much in common with group model building, but emphasise particular steps in the process

or were developed for specific application domains such as environmental studies or communities.

While the procedure outlined in the previous section showed how to involve a decision making team in building qualitative models, participation in constructing a quantified model in many situations has clear benefits. As discussed, developing a full-blown computer simulation model is useful when the problem is external to the decision making team, data are available and there are no major hurdles to quantifying variables. A formal model supports decision making by acting as a cognitive aid, helping decision makers to infer dynamics from structure, something they would not be able to do by themselves. In a personal communication (2005), Vennix formulated this as follows: *'What a computer model brings to the process is one additional participant. This participant does not know more than what you have told him. But he is very consistent: he can tell you exactly what the consequences of your assumptions are.'* Formalising the model also makes it possible to triangulate different data sources, which allows for testing the insights gained in the group process. When transforming a qualitative model into a computer simulation model, each relation in the conceptual model is translated into a mathematical equation. All variables in the model are quantified. Most of the model formalisation work is done backstage as it is quite time consuming and members of a management team generally are not very much interested in this stage of model construction. In this stage, the group is only consulted for crucial model formulations and parameter estimations. Experienced group model builders will start to construct a simple running model as soon as possible and complicate it from there on if required. In the end the model should of course be able to replicate the reference mode of behaviour (as one of the many validity tests) before it can be sensibly be used as a means to simulate the potential effects of strategies and scenarios. When using group model building to construct a quantitative model, the final four steps in the procedure outlined in Table 1 change slightly:

- identify causal relations using stocks and flows, and relating stocks, flows and auxiliaries;
- check feedback loops by simulating the model;
- check validity by testing the formal model;
- identify control and target variables by simulate policy runs and scenario runs.

When building a formal model, instead of a causal loop diagram a so-called stock and flows model is used. Instead of using only one type of variable, these diagrams separate stocks from flows. Stocks are entities existing at a certain time period, such as inventory, personnel, or water in a reservoir. Flows are entities measured over a time period, for instance deliveries, recruitments or inflow of water. Relationships in a stock and flows diagram are separated in physical flows and information flows. Figure 4.6 below is a stocks and flow version of the causal loop diagram in Figure 4.1. Information links are depicted with a single and physical flows with a double arrow. 'Delivery delay' is an auxiliary: a variable that is not a stock or flow but included in the model to make the input for calculations explicit.

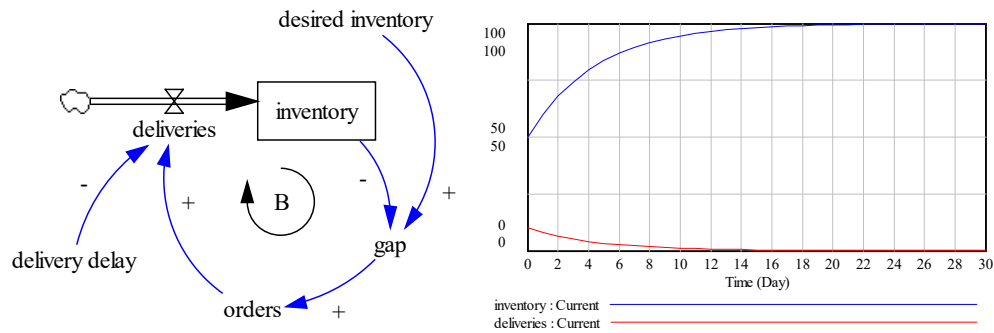


Figure 4.6. Example of a stock and flows model and simulation output

The model output is based on the following equations:

- initial inventory = 50
- desired inventory = 100
- delivery delay = 5
- gap = desired inventory – inventory
- orders = gap
- deliveries = orders / delivery delay
- inventory = initial inventory + INT(deliveries)

The last equation specifies that the level of inventory at any time is the initial level, plus deliveries up to that time (the integration of the flow variable). As can be seen, the mathematics used in system dynamics modelling is to a large extent ‘friendly algebra’ (Morecroft, 1992) which will not unfamiliar to decision makers that regularly work with spreadsheets. More complex forms of equations can include delayed and nonlinear effects. When formalising a model by quantifying relations and assigning initial values to variables, the qualitative model is defined more precisely. Formalisation of the model can cause the modeller to backtrack to an earlier phase, if variables or relationships appear to be inconsistent or incompletely defined. The major advantage of a quantitative model over a qualitative model, is of course that it can be used to run simulations. Simulation increases understanding of model behaviour and the influence of structure on behavioural patterns. The model can then be tested by changing initial parameter values or changing relationships between variables, and observing the effects on model behaviour. Finally, quantification allows for additional ways to identify control and target variables. Parameters or larger sections of model structure can be changed in order to see their impact on system performance. In this phase a scenario analysis can be performed by running the model under different conditions for exogenous variables, which clarifies the robustness of (combinations of) solutions.

Given its long tradition of facilitated modelling, it will come as no surprise that different approaches to working with decision makers and other stakeholders have emerged. Andersen et al. (2007) identify the Reference Group approach, Strategic Forum, stepwise approach, modelling as learning, strategy dynamics and Hines’ ‘standard method’. These approaches differ in terms of the type of model that is built, if and how a preliminary model is used in the process, model size, and finally which phases of model building are supported by direct client involvement. A couple of approaches have been developed with particular application domains in mind. Strategy dynamics applies system dynamics to strategic decision making in private and public organisations (Warren, 2008). Mediated modelling (Van den Belt, 2004) targets environmental issues. Hovmand (2013) adapted facilitated system dynamics modelling specifically to working with communities.

## 4.4 Applications

The development of facilitated approaches in system dynamics has gone hand in hand with assessment of results. Early research was especially driven by an interest in implementation and resulting impact. Implementation was frequently included as the last phase in modelling and concerns the translation of outcomes to the ‘real world’. The ultimate aim of system dynamics is to redesign the system to bring about improvements in system performance. In early work by Roberts (1978) and Weil (1980) it is already evident that implementation is an issue that needs to be considered from the first contact with a client (see also Lee, 1973; Watt, 1977). Some of titles of these studies are quite clear on the impact of formal modelling without client involvement: ‘requiem for large scale models’ (Lee, 1973); ‘Why won’t anyone believe us?’ (Watt, 1977). Implementation came to be seen as both pervasive and evasive. Implementation is pervasive as is not so much a separate phase but occurs throughout the process of model construction. Vennix (1996: 99) describes it as evasive because it cannot be predicted when and which insights will be produced in modelling. As a result, typically the modeller learns most during the modelling process. It therefore seemed a logical step to involve the client more in model construction ensuring that he or she gets first-hand experience of the insights gained in modelling the problem. If that is not (completely) possible, at least attention needs to be given to communicating results.

In essence, group model building aims to elicit ideas from session participants, confront these with one another and finally integrate these in a shared view on the problem at hand. The main intended outcomes have frequently been formulated as an increase in communication quality (compared to unsupported decision making), insight, consensus and commitment to recommended actions. Evaluation of group model building frequently takes the form of case studies. The facilitator helps a particular group of participants to construct a model on a particular problem. Case studies typically describe the modelling process and resulting model in detail, while description of implementation and results often given less attention. Rouwette, Vennix and Van Mullekom (2002) compare 107 such case studies. Keeping in mind that case reports are frequently incomplete and may be biased towards successful projects, reported results are generally positive. Increase in insight (learning), consensus as well as implementation of decisions seems to be a robust outcome of group model building. Beyond case studies, recent research has used pretest – post-test measurements to determine changes in attitudes and other antecedents of behaviour (Rouwette et al., 2011; Scott et al., 2015) and looked in more detail at information sharing and patterns of interaction in modelling sessions (McCardle-Keurentjes et al., 2008; Rouwette, 2016). Quantitative assessment of impacts reinforce the view that modelling changes participants’ understanding. De Gooyert et al. (2022) conducted a study on eight workshops with a total number of 96 participants. Employing a pretest and posttest measurements of participants’ ideas on the central issue modelled (energy transition), they find evidence for cognitive change and consensus formation.

## Chapter 5. Application: building the business model of Sioo management education

This chapter describes an application of group model building with Sioo management education. Sioo offers learning trajectories that help to develop skills in change management processes. Clients can choose between open courses and tailor-made in-house courses. While Sioo had seen stable revenues in the previous five years, demand appeared to be shifting from open to tailor-made courses. Sioo's new dean wanted to learn more about changes in the market and how the Sioo business model needed to adapt, if at all. Below we describe the motivation for starting the project, the two modelling sessions with Sioo employees and some external lecturers, the resulting model and its impact.

### 5.1 Background and issue

Sioo offers learning trajectories around organizational issues. Founded by seven Dutch universities in 1958, Sioo has established itself as a professional education institute that interweaves theoretical understanding, application in practice and personal development. In both open and tailor-made in-house courses, participants develop new insights, apply these in their own practice and reflect on their experiences as part of their learning pathway. Sioo has a permanent core of 17 employees who work from the head office in Utrecht, the Netherlands. Learning pathways are provided in collaboration with more than 200 lecturers who are active in change management in practice, academia or a combination. In March 2018 Jesse Segers started as the new rector of Sioo. Following his appointment he interviewed 60 clients, employees and lecturers on their experiences and expectations of Sioo. The interviewees turned out to have largely similar images of Sioo and pointed out that Sioo's working method and structure had not changed for a long time. A central conclusion from the interviews was that while the organisation seemed stable, developments in the market were less clear. On the one hand, Sioo had a relatively constant total number of clients. On the other hand a shift seemed to be taking place between learning paths, with open standardised courses shrinking and flexible customer-specific courses growing in number of clients. Jesse also noted a set of assumptions that seemed to be central to the Sioo mission but in practice led to confusion. One example is the idea that Sioo is a network organisation, in which there is a bidirectional flow of information and clients between Sioo and cooperating lecturers. However, in practice, lecturers are hired by Sioo to provide a specific service. Another assumption is that Sioo is a professional organisation, much like a law firm, in which marketing is not needed as it's all about reputation. Nevertheless, competing providers of management courses were active in marketing.

Jesse contacted Etiënne Rouwette by mail in May 2018. They had not met before but Etiënne was one of the lecturers at Sioo, involved in a course on group model building for a number of years already. In his first mail, Jesse emphasised that he did not want to 'reveal' the assumptions to Sioo employees, use them to explain all problems and then 'propose' different assumptions that would allow everyone to move forward from that moment on. He would rather explore as a group which assumptions drove the way of working at Sioo, and then see if other assumptions would lead to different outcomes. In a telephone conversation Etiënne proposed to use group model building to this end. The idea would be to start from a central Sioo performance indicator over time, and map the business model that explained this behaviour. In follow-up emails two options for performance indicators were discussed: number of participants of Sioo courses and revenues, both if possible separated into open and in-house courses. As course offerings

changed regularly, the number of participants fluctuated over time. After looking into available data, it turned out to be time consuming to reconstruct exactly how many people participated in which course. Revenues was therefore chosen as the central indicator. While Étienne proposed to start from a graph spanning ten years, Jesse argued that going back more than five years would not add much to the analysis as the situation a decade ago was too different from the present. The central goal of the project was formulated as mapping the business model driving Sioo revenues from 2013 to 2018. The term ‘business model’ was taken to refer to the value created by an organisation for its customers, owners, suppliers and employees and the resources needed to create this value. This means that in addition to using the language of system dynamics (behaviour over time, variables, relations and feedback loops), the facilitator also introduced to participants terms connected to business models such as value creation, resources, business growth, (market) constraints, and so on.

In their mails and calls Jesse and Étienne also discussed a number of practical topics: how many meetings to plan and when, who and how many participants to invite, who would be involved in facilitation, location and setup, deliverables and the possibility of audio recording the meetings. They agreed to schedule two meetings, each with three hours interaction time (not counting breaks for drinks and meals), on June 5 and 21, 2018. Étienne suggested that for modelling in a plenary group, between 10 and 12 participants was ideal and 15 a rather large group. The decision was made to invite 12 to 15, expecting around 12 in each meeting. Participants were drawn from all functional groups at Sioo, such as course coordinators, financial staff, and support, as well as from the group of external teachers. The final decision on who in each of these groups would be invited for the sessions was with Jesse. Jesse would be present in the meetings in the role of participant, meaning after the introductions he would not have more speaking time than others. The facilitation team would be Étienne Rouwette as a facilitator, master student Imke Gommans as modeller (and co-facilitator when people worked in subgroups) and PhD student Jorge Sousa as observer. Jorge asked to be in the meetings because he wanted to experience group model building first hand. His role in the sessions would be to take notes and reflect on (intermediate) results. Meetings would be held in the main office in Utrecht with participants seated in a U-shaped setting, facing a projection screen and whiteboard. Imke would be building the model in Vensim software. Deliverables would consist of a workbook after the first meeting and a final report after the last meeting. The workbook was to summarise insights from the initial meeting and include questions to prepare for the next session. Jesse agreed to audio recording the meetings and participants would be asked for their consent. The recording would be a basis for the workbook and final report, if specific elements of the discussion could not be reconstructed from notes and memory, but also for potential research into the modelling process and results.

## 5.2 Process

On the basis of the discussions in the intake as well as final adjustments once the meetings drew closer, the following agenda was developed for the sessions.



Procedure, agenda and products	
<p><b>Session 1 (June 5, 2018 17-20h)</b></p> <ul style="list-style-type: none"> <li>- 17.00h opening by contact client; introduction participants and facilitators; explanation method and way of working</li> <li>- 17.15h central issue (1); start construction model (2, 3, 4)</li> <li>- 19.30h evaluation and next steps (5)</li> <li>- 20.00h close</li> </ul> <p><b>After meeting:</b> <i>workbook</i></p>	<p><b>Session 2 (June 21, 2018 16-20h)</b></p> <ul style="list-style-type: none"> <li>- 16.00h goal, previous session and further development model (3, 4, 5)</li> <li>- 17.15h dinner</li> <li>- 17.45h work in subgroups (3)</li> <li>- 19.00h analysis and actions; next steps (4, 5, 6)</li> <li>- 20.00h close</li> </ul> <p><b>After meeting:</b> <i>final report</i></p>
<p><b>Procedure group model building</b></p> <ol style="list-style-type: none"> <li>1. identify problem variable and reference mode of behaviour</li> <li>2. identify variables using Nominal Group Technique</li> <li>3. identify causal relations</li> <li>4. check feedback loops</li> <li>5. check validity</li> <li>6. identify control and target variables</li> </ol>	

Table 5.1. Group model building procedure, agenda and products (steps 1-6 in the procedure are added to the relevant places in the agenda; products are in *italics*)

### 5.2.1 Session 1

A total of 12 Sioo employees and external lecturers participated in the first meeting. Participants were seated in a semi-circle, without tables, with name cards next to them on the floor. They faced the projection screen, with Imke seated behind a table off to the side. The meeting started with an introduction by Jesse Segers. In brief he went into the conversations he had after stepping into his new role as dean and some of the insights gleaned from the round of interviews. Sioo seemed to be in a stable situation, but lately open courses seemed to attract fewer and in-house courses more participants. It therefore seemed useful to explore ideas on the past and future of Sioo with stakeholders. In two sessions, participants would take a closer look at the business model. A round of introductions of participants and members of the facilitation team followed. Etiënne then picked up on the aim of the meetings and the rationale for jointly constructing a model. The term 'business model' was explained using two examples. The first is from the book by Ackermann, Eden and Brown (2005) and concerns a consultancy firm. Its mission revolves around three elements: building a great firm, attracting exceptional people and helping clients make improvements in their performance. These elements were captured in a causal loop diagram, to which in the next step resources were added that needed to be in place to make this a reality. Exceptional people are for instance attracted by offering high salaries and access to projects with top level clients. The second example of a business model was a map of the Walt Disney business model in 1957. It shows for instance how music, film and TV material build on one another - with cartoon illustrations. Both examples underline how a business model functions as a system, which means that if we want to explain overall business performance we need to understand how all elements work together. Etiënne then showed the graph of Sioo revenues in Figure 5.1. This was proposed as the central behaviour of interest, keeping in mind the switch in demand from open to in-house courses. The aim in

the meetings would be to determine which structure caused the observed behaviour. Participants agreed that this would be a useful aim for the two meetings.

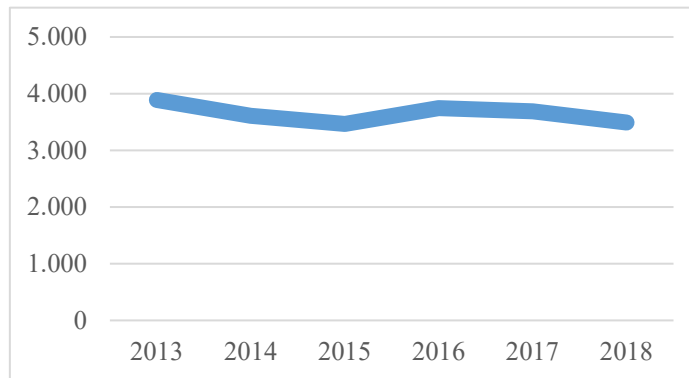


Figure 5.1. Sioo revenues (x 1000 euro) 2013 - 2018

Etiënne emphasised that while the chart focused on the finances of the business, this was only one aspect of a business model. A positive financial result is a necessary condition for the continued existence of a company, but (usually) not the reason for its existence. Its reason for existence is better expressed in the value the organization creates. The last topic before starting to model, was to ask for permission to audio record the sessions. Informed consent forms were passed around and filled out.

The first question for the participants was to think of factors that have to do with Sioo's business model. Factors could relate to the creation of value, the resources needed for value creation, consequences of value creation or other topics. As indicated, revenue was an important factor, but not the essential part of the business model. Using Nominal Group Technique, participants took some minutes to note down ideas individually. Proceeding in a round ribbon fashion, each participant in turn mentioned one variable which was then noted down using the modelling software. This created a list of 37 variables visible to all on the central screen.

The next question for the participants was about the central variable in the model. What value does Sioo aim to create for its customers? Participants referred to a recent meeting on Sioo's vision and mission and derived from this the central value to which Sioo wants to contribute: the development of individuals, organizations and society, or in other words: their learning and development potential. This variable was placed in the centre of the screen. The discussion then turned to what determines value creation and eventually results in the submodel in Figure 2. Organisational development programs can be effective to different degrees. Program effectiveness follows from the quality of the learning process, which has three dimensions: 1. fit to the client's problem; 2. transferability in the sense that what is learned can be implemented in the learner's practice and 3. taking into account the complexity of change questions. While drawing these first relations, the facilitator explained what was meant with a plus or minus next to an arrow.

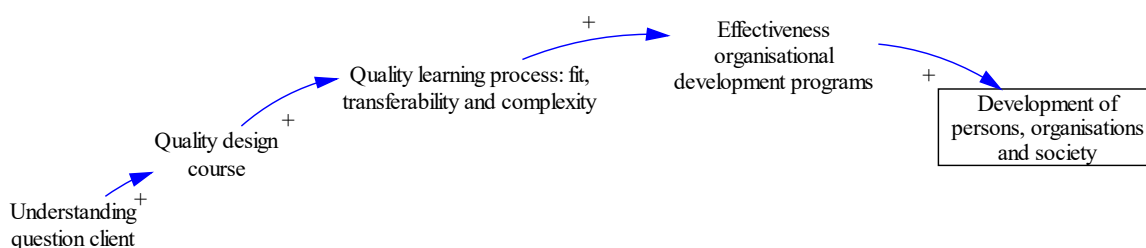


Figure 5.2. Submodel from start session 1

An important prerequisite for a high-quality course is a good design. The design focuses on the three aspects of quality but also takes into account the interaction between learners: learners discuss the course content together, give it meaning and try out things that prepare for practice. The course environment forms a temporary work system in which behaviour can be practised. Understanding the client's demand is necessary for developing a good design. As described in the previous chapter, each of relations in the model was first proposed by a particular participant. The facilitator then visualised this suggestion as a new variable and relation in the model. These additions were then discussed with the group as a whole and only kept in place if everyone agreed. Note also that there is a choice in how much detail to include in variable names. In the case of quality of the learning process, the three dimensions (fit, transferability and complexity) are made explicit by including them in the variable name. In discussing quality of course design participants also referred to several separate dimensions, but ultimately the variable name was kept relatively brief. The dimensions of quality course design were described in the text of the workbook and final report, but not included in the variable name.

The conversation then turned to a two other factors that influence quality of the learning process: teaching staff and the interaction between stakeholders. Next, knowledge development was suggested as a driver for design quality. These submodels can be recognised in the centre and upper left hand side of Figure 5.3. The facilitator then proposed to switch focus to another part of the model. The reason for this is that experiences and interests differ between participants, which also means some participants are most energised when discussing one aspect of the issue at hand while others favour different aspects. For instance, after a long discussion on the finances driving a business model, non-financial managers might want to change to another topic. To switch focus, Étienne asked the participants what would happen if Sioo succeeded in creating added value. What would be the consequences if individuals, organisations and society developed further? Participants' answers pointed out consequences such as organisations becoming more vital, and increased satisfaction both of clients as well as those who pay the bill. Again the meaning of terms was discussed in depth. Vitality refers to the potential to meet the organisation's goal in a complex and changing environment. Satisfaction and vitality both drive Sioo's reputation. In turn, an increased reputation allows for selection of clients more in line with Sioo's offering, which raises the quality of interaction in the team of stakeholders involved in developing a course.

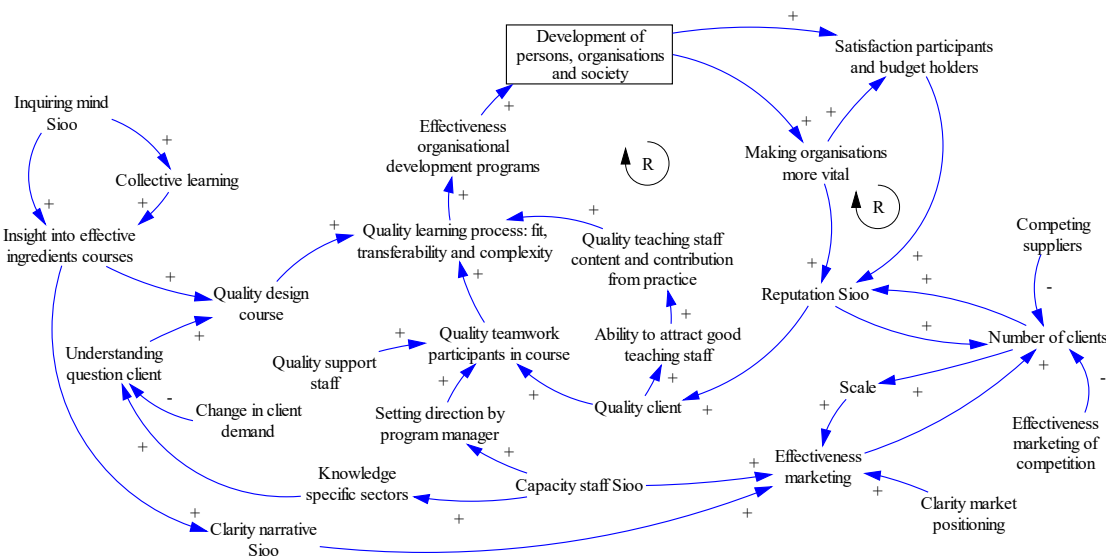


Figure 5.3. Model at end of session 1, 'R' indicates main reinforcing feedback loops

Adding the latter relationships closed a number of positive feedback loops, indicated by an 'R' (reinforcing) in the model. At that point in the discussion the facilitator explained that feedback loops are the 'engine' of a business model and explain how an organisation sustains itself over time. He summarised the core of the loop. According to participants, crucial elements of the Sioo business model are the value it creates in terms of the development of individuals, organisations and society. This, through a number of channels, shapes Sioo's reputation, determines the type of client attracted, and, in conjunction with the knowledge of Sioo staff and a network of lecturers, delivers high-quality learning programmes. Participants agreed to the loop as a whole. These elements are part of positive feedback loops and thus reinforce each other. Starting from an initial increase in any of these elements they set in motion an upward spiral. On the other hand, if one of the elements initially decreases, this will lead to a downward spiral.

Two further themes emerged in the remainder of the first session. A discussion on attracting clients resulted in the lower part of Figure 5.3. Several participants observed that marketing is difficult, both because organisational change is a complex topic but also because it is not easy to capture Sioo's way of working in words. "You only get it when you experienced it first-hand." The last theme is capacity of employees. Directing programs takes a lot of time. The remaining time is divided between marketing and the development of knowledge on specific sectors.

The discussion and resulting model were captured in a workbook and sent to participants. The model was divided in different submodels, each covering a theme as in the previous pages. Care was taken to make the description more than a bland text stating that variable A leads to variable B, which leads to variable C, and so on. Where possible, relations were explained by including examples shared in the meeting that seemed to resonate with the rest of the group. The model description covered about four pages. The total report consisted of 12 pages running text, including an appendix covering the example of a consultancy business model, the full list of 37 variables generated at the start of the meeting, and the final model resulting at the end. The section on model description was preceded by a brief summary of the aim, participants and method. These were explained in such a manner that people who did not attend the meeting could understand what was done. The workbook ended with a number of questions to prepare for the next meeting. These addressed for instance whether feedback loops worked in the same manner for open as well as in-house courses and 'open ends' in the model (variables with no ingoing or outgoing arrows). One question asked participants to reflect on the business model canvas (Osterwalder & Pigneur, 2010). The canvas has nine dimensions of which four were not yet included in the model: costs, client relations, client segments (beyond the open and in-house courses) and channels. Do these dimensions give rise to additional variables? The last question in the workbook explicitly addressed validity: does this model explain the stability in Sioo revenues? If not, which variables are missing?

### *5.2.2 Session 2*

In the second session 11 participants were present, of which three had not attended the first meeting. The meeting opened by taking participants through the model step by step, using what is called storytelling. This comes down to presenting the model in a series of steps, each building on the previous and adding an additional model layer or submodel. Storytelling started with showing the problem variable (development of persons, organisations and society), then adding the initial relations around this variable and recapturing the essence of the discussion around these arrows. It then added the next submodel, again summarising the discussion around

these variables and relations. Storytelling ended with the full model as developed by the end of the first session. Going through the model in some detail not only served as a reminder to those participants who were present in the first meeting, but also gave the three new participants a chance to voice questions and comments.

The plan for the second session reserved one hour for a plenary discussion on further additions to the model. Dinner would be served next, followed by a little over an hour of subgroup discussions. Subgroups were asked to check the overall models for differences between open and in-house courses. The last hour of the meeting would then be spent on checking the final set of feedback loops and the identification of actions.

The discussion on additions to the model started from the questions in the workbook. New variables and relations mainly concerned the part of the model concerned with clients, shown in the lower part of the diagram in Figure 5.4. In addition, several variables were added to the right hand part of the model specifying the impact of (Dutch) economic developments on company training budgets and eventually on Sioo clients. Here for the first time market limitations appear. Next, the plenary group split up in two subgroups. The work in subgroups resulted in a table detailing the differences between open and in-house courses, of which a selection is shown in Table 5.2 below.

	<i>Open courses</i>	<i>In-house courses</i>
<i>Basis for approaching Sioo</i>	Reputation Sioo	English website, international offices (the viability of an international ambition is not recognised by all participants)
<i>Acquisition</i>	Multichannel marketing	Approach people in person
<i>Relation</i>	Particularly after course, with participant	Relationship with top management, prior to assignment, long-term (not yet included in the model)
<i>Basis for decision client</i>	Reputation Sioo and content (change management knowledge)	Idea Sioo plus relationship plus sector knowledge
<i>Aim and basis for design learning trajectory</i>	Starts from question focused on individual learning, participants must make their own move (personal development)	Starts from purpose organisation, focuses on movement in organisation, together (organisational development)

Table 5.2. Selected differences between open and in-house courses

In the last hour of the session subgroups presented their results to one another. Where participants deemed this relevant, insights from the subgroups were added to the overall model. The model was then frozen as the last hour was reserved for model analysis and proposing actions. The main implications of the model structure were discussed with the group, focusing on central feedback loops. As Figure 5.4 shows, there are four reinforcing loops. These loops capture Sioo's growth potential. At their core are Sioo's reputation and quality of interaction between stakeholders. Reputation feeds into attracting clients interested in complexity, growing reputation further via a number of paths. Increased quality of interaction between stakeholders increases scale, frees up capacity of staff, which leads to more time to set direction and further builds quality of interaction. There is only one balancing loop in which new clients reduces the number of potential clients.

Next, to identify actions, participants were asked to indicate where in the model they would focus their efforts in the future. To do this, they could divide an investment budget of 100 euros over model variables. This was not preceded by a plenary discussion of control or target variables, so participants could essentially invest in any part of the model they favoured. The resulting Top 3 of investments was 1. build competence of Sioo and teaching staff for co-creation; 2. increase effectiveness marketing and 3. identify new opportunities and translate these into client proposals.





### 5.3 Final product

The modelling process resulted in two products: the workbook described in the previous section and the final report sent to participants after the last meeting. The final report contains 18 pages of text and has a similar setup to the workbook. It is organised in the following sections: background, method, central aim, model structure, comparison open and in-house courses, analysis feedback loops, conclusions and recommendations. The appendix includes a list of participants, variables resulting from the Nominal Group Technique and the final model. Jorge's reflection on the final model was part of the section on conclusions. He pointed out that only one negative loop was identified, raising the question if all relevant (market) limitations had been addressed. The discussion and model focused to a large extent on service quality, could it be that some parts of the model captured the desired rather than the actual situation? Several important steps in the client choice process were not included: identification of clients, proactively approaching clients, how clients learn about (quality of) Sioo, reasons not to choose Sioo, development of a proposal and determinants of proposal success. These reflections, analysis of the final model and participants' choices of where to invest were the basis for three recommendations. First, to test the business model further by checking for other negative loops and a comparison against available data on in particular clients, proposals and costs. Second, to strengthen co-creation so that open and in-house courses can benefit more from one another. Third, to focus more on marketing.

### 5.4 Implementation and results

The immediate reaction of participants and contact client Jesse to the process and results of the project was positive. The follow-up in the months and years after the project indicate that both the way of working as well as the substantial recommendations were picked up. Constructing a business model in group model building session was used both in a project with an external organisation as well as in another Sioo project. In September 2021 Jesse invited Etiënne to facilitate a similar project on a management education provider in Belgium. In the aftermath of Covid-19, the three sessions in this project took place online.

Many of the conclusions and recommendations of the project were implemented. In August 2018 a fulltime position was created for a marketer and a new person was hired. The model was also used as an organising framework to plan and communicate strategy. On 31 January 2019 a strategy meeting was held with all Sioo staff members. Jesse opened the day with positive news on Sioo's financial performance. In 2018, Sioo had increased 13% compared to 2017 and average productivity per person (total revenue/ FTE) was higher as well. In looking forward to 2019, Jesse noted that some economists the growth of the latter years would cool off. This was not under control of Sioo staff, but the action list was. The new marketing person then presented the actions she had taken since starting in her position, and the plans for the new year. These were placed in the visualised business model. Next, all members of staff were invited to place the strategic initiatives they had acted upon in 2018 in the causal map. In this way the rationale and expected impact of each initiative became clear. It also showed which segments of the model were targeted and which were for the moment ignored. In 2018 several activities had been launched that focused on alumni and targeted the lower right hand part of the model: effectiveness of marketing, new clients and reputation. A year later, on 14 January 2020, a strategy meeting was held with the same team. In 2019 revenues had increased 15% compared to 2018. The visualised business model was used again, but this time in a presentation format so without room for direct participation. The feedback of team afterwards was that they

liked the presentation, but that it did not stick as it did last year. Co-creating the meeting content would have been better. That said, the right hand side of the model had received continuous attention in 2019, by investing in ICT to increase marketing effectiveness further and tasking a person with developing leads. Internal sales days to professionalize the process had been held and partner programs were launched, both to attract clients and increase the number of leads. However, in 2019 the focus had broadened to also include the left hand side of the model. Sioo had reinforced collective learning by starting to publish an edited series of books, coaching meetings with faculty and a joint development of a vision on learning.

In January 2022 Jesse contacted Etiënne on a project following up on the 2018 business model. Hiring a new person had professionalised the marketing function inside Sioo. Sales, ICT and back office had also developed further. The overall revenue since 2018 had increased by almost 60%. However, it seemed that many of the pressures in the new business model came together and had their combined effect on the new marketing function. Email exchanges and online conversations resulted in a choice for ‘tensions between functional areas in Sioo’ as the central variable. Four main functional areas or activities were distinguished: marketing, sales, ICT and back office. Two meetings were held in the summer of 2022. Core insights were that while marketing had a strategic role in building the Sioo brand, it was also approached by individual course coordinators for urgent short term initiatives. These included marketing campaigns to help boost the number of participants in particular courses. While this led to tensions and work stress in the marketing department specifically, the organisation as a whole felt pressure from changes in the market. Pressure that was displaced to another part of the system if one of the functional areas got too much work. In the last five years the complexity and the number of client questions, particularly for in-house courses, had markedly increased meaning that sales spent more time per client. As result sales people would rely more on the back office to support upcoming and ongoing programs. Consequently they would ask for more help from ICT support, who would have less time to support the marketing function. While the marketing function would get more requests from sales people for specific open programs as that business was than somewhat lacking compared to in-house courses, and so on. As in the project in 2018, the end of the last meeting was reserved for identifying actions that could turn this situation around.

## Chapter 6. Participatory scenario development

Will there be a new pandemic? How will Artificial Intelligence develop and which jobs will it affect? Can the worst effects of climate change still be prevented? Answers to these questions have consequences for persons and organisations around the world. In long term planning, analysing the potential future paths of these trends is known as scenario exploration. In everyday language ‘scenario’ refers to a hypothetical sequence of events. Scenarios can for instance refer to the plot of a movie or theatre play, to alternative future trajectories of greenhouse gas emissions and their impact, or to possible outcomes of a war. In team decision making, scenario development or scenario planning refers to a set of approaches that aim to construct descriptions of the future environment of an organisation. Often multiple scenarios are developed as it is difficult to predict events, or, depending on time horizon and sector, even general trends. The future is inherently uncertain, as becomes clear from this Danish proverb: *‘It is difficult to make predictions, especially about the future.’* Preparing not just for one but for multiple plausible futures is a practical way to deal with uncertainty. Practitioners in scenario analysis assume that by imagining what the context of an organisation looks like in the future, an organisation is in a better position to determine what is important in the present. While widely known and used for strategy development, scenario planning has received a fair amount of criticism. Because of the bewildering diversity in approaches and guidelines to constructing scenarios, the method has been called a toolbox rather than a tool. In this chapter we concentrate on one particular school of scenario development which is called intuitive logics. In this school of thought the qualitative input of team members is leading. The process starts by collecting ideas on trends and developments in the surroundings of an organisation. Some of these trends are predetermined, meaning that their future behaviour can be predicted with some degree of confidence. Most interesting are those clusters that are uncertain and important as they may develop along alternative paths. These form the basis for a set of alternative, plausible scenarios. A set of scenarios is developed which each describe, in narrative form, what a possible future looks like and how it came to be. The question that then follows logically is ‘if the future looks like this, what can we do to prepare?’ By analysing what works well across scenarios, in effect using scenarios as a test bed for strategic actions, so-called robust options can be identified. A robust option is a course of action that generates beneficial results, regardless of major developments in the environment. Alternative approaches to scenario building also use quantitative data sources and analysis. The wide application of scenarios has resulted in a range of published case studies which are summarised in reviews. The tentative conclusion from these reviews is that scenarios may help stakeholders to identify adaptable options, communicate with stakeholders, increase understanding and acceptance of uncertainty.

### 6.1. Background

Although the term ‘scenario’ is much older, the use of scenarios in policy making is often thought to have started in 1942. At the time a team of American physicists led by Robert Oppenheimer was working on developing the atomic bomb. Before setting off the first man-made nuclear explosion the team had to assess what the consequences of a nuclear explosion might be. One concern was atmospheric ignition. In a comment on the 2023 movie *Oppenheimer*, nuclear weapons expert Alex Wellerstein, explains this as follows. What if the nuclear explosion would lead nitrogen and oxygen in the atmosphere to fuse together and release energy? One possibility was this would release enough energy to trigger more nuclear

fusion, which would set off a chain reaction and burn the entire globe. In the movie Oppenheimer dismisses this concern as “*chances are near zero*”. In reality, the team developing the atomic bomb found that the issue was too complex for analytic calculation and reverted to simulations of possible outcomes. These simulations indicated that chances were about one in three million, which apparently was small enough to bet all life on earth on. In the 1950s developments in computers spurred a wider use of scenarios and simulation. These took the form of Monte Carlo simulations, game theory and war games. The simulation of social interactions, including conflicts, proved to be a useful tool in defence training and exercise. The RAND corporation brought these three developments together and had a central role in the development of war games (Bradfield et al., 2005). A researcher at RAND, Herman Kahn, is credited with introducing scenarios into non-military decision making (Schwartz, 1997). Around the same time in France a different form of scenarios was developed, which was called La Prospective (Godet, 2000). The La Prospective approach aimed to develop descriptive as well as normative scenarios. Normative descriptions cover, for instance, what France *should* look like in several years’ time. Scenarios became more widely known as a method when Kahn published his book *The year 2000: a framework for speculation on the next thirty-three years* in 1967 and Pierre Wack developed scenarios at Shell in 1973. One of the scenarios developed at Shell described an oil shortage, a possibility which was deemed highly unlikely by most managers and experts at the time. Nevertheless, management at Shell decided to prepare for the event that an oil shortage would become reality. When the OPEC eventually decided to lower the production of oil, leading to the oil crisis in 1973, Shell was prepared to react before its competitors.

Considering alternative, plausible futures in planning was however a major break with the conventional approach to long term planning. Traditionally, forecasting future trends was a popular and unquestioned element of developing strategies. Its attraction lay in the fact that by using statistical analysis, a single forecast of the future was formulated, providing a firm foundation for long term plans. Oppenheimer’s use of scenarios and simulation in 1942 resembles this approach. While simulation does not provide a single prediction, it does produce a range of possible outcomes (scenarios) that can be assigned probabilities. However, predicting an event in the realm of physics is one thing, but using the same approach to predict markets or societal trends is another. In the 1970s and 1980s, the assumption that trends could be extrapolated while ignoring discontinuities and shocks, received more and more criticism. Authors such as management scholar Peter Drucker (1973) emphasised the impossibility of making a single point prediction of the future in the light of discontinuities. Instead planning should be based on alternative future developments. Multiple scenario development and analysis provided one way of doing that. The oil crisis in 1974 alerted many planners to the possibility and impact of external shocks. In the two years after the oil crisis, the use of scenarios by US companies doubled and later doubled again (Klein & Linneman, 1981). Europe saw a similar increase in the adoption of scenario planning, and by the early 1980s in the US as well as Europe scenarios were mainly used by major companies (Bradfield et al., 2005).

Although the experiences at Shell increased the appeal of scenarios as a strategic tool to a business audience, it proved difficult to repeat the process elsewhere. In most organisations its use was still ‘experimental’ (Linneman & Klein, 1983). One reason for that was a scarcity of literature on methodology for scenario development. What did seem clear from the example at Shell was that any use of scenarios needed to combine analytical quality with a process to engage stakeholders. *‘Even good scenarios are not enough. To be effective, they must involve top and middle managers in understanding the changing business environment more intimately than they would in the traditional planning process’* (Wack, 1985: 74). Effectiveness here

means making an impact on decision making. Wack describes how the project at Shell started with an initial set of scenarios, which were then presented to different groups and departments. Although the scenarios were generally received well, nevertheless only about one third of Shell's decision centres acted on the scenario insights. Scenarios were then adapted by highlighting their implications for basic assumptions underlying the worldview of different Shell departments. Exploration and production managers for instance were told that concessions and mining rights might be lost. This new approach did have an impact on the thinking and actions of most managers. Wack recounts that it took several years to invalidate existing worldviews and gain acceptance for scenarios as a bridge to new insights. Insights such as these gradually found their way into the literature and were translated into practical methodologies for scenario development. Although the first publication on a methodology for scenario development already appeared in the 1970s (Zentner, 1975), detailed descriptions of the process of developing scenarios did not appear until the mid-1980s (Huss & Honton, 1987a, 1987b; Ogilvy & Mantle, 1984). In the 1990s a range of approaches appeared (Ringland, 1998; Schoemaker, 1993; Schwartz, 1997; Van der Heijden, 1996). Approaches are different in terms of the number of steps and level of detail on which tools and techniques are described, but similarities can be recognised.

At present, the field of scenario analysis has clearly moved beyond the paucity of publications on methodology. We might even say the field has overshot its mark and at present there are too many alternative descriptions of scenario analysis processes. Several authors deplore the lack of a standard and well-tested methodology. Schnaars observes that the literature *'offers a plethora of methods for constructing scenarios, some of which are reasonable, many of which are arcane and impractical, most of which have never been fairly tested'* (1987: 105). Martelli (2001) summarises the situation as a 'methodological chaos'. Chermack, Lynham and Ruona (2001) see a drawback in the fact that scenario analysis is rooted in practice and not strongly embedded in theory. This means that key steps in the methodology are not clearly articulated: *'The absence of explicit theoretical roots has led to the application of scenario planning as something of a "club members only" philosophy'* (2001: 10). Critique from the strategy field concentrates on the qualitative and intuitive nature of scenarios in the intuitive logics school. Porter (1985) regrets that scenarios are based on 'speculation' rather than facts. Mintzberg (1994: 248) adds that by describing a range of possible futures *'you might just hit upon the right one'*. While this comment seems to confuse the aim of multiple scenario development with that of forecasting, he also points out that the approach had not yet developed into a mature method. The few successful case studies reported in the literature, with Shell as the most prominent example, do not constitute a solid basis for starting a scenario intervention. In Mintzberg's mind, Wack's (1985) case may stand out as remarkable precisely because many similar cases failed. Failure in this sense means either scenarios were not indicative of possible futures or behaviour of managers was not influenced.

However, since the year 2000 a range of reviews appeared that indicate that this methodological chaos is more apparent than real (Cordova-Pozo & Rouwette, 2023). At the base of many of the criticisms of the scenario planning field is the lack of an agreed upon definition. Scenarios are alternatively interpreted as descriptions of possible futures versus normative ideals to strive for, as end states versus paths toward the future, and as descriptions of a context over which decision makers have no control versus plans (e.g., disaster management scenarios). However, recent work suggest there is a synthesized definition that covers most scenario work. The next point of criticism concerns the lack of a standard and well-tested methodology. While there is indeed a confusing diversity of methods and techniques, within the three recognised schools of scenario analysis, the range of methodological choices is more restricted and arguments for

choosing between options are clearer. These schools are known as intuitive logics, La prospective and the probabilistic modified trends school (Amer et al., 2013; Bradfield et al., 2005). Participatory scenario development fits best to the intuitive logics school. In the next section we outline an approach for stakeholder involvement in scenario construction in the form of a series of steps. The section on alternatives will briefly go into the assumptions and techniques used in the two other schools of thought. The final section will go into evidence for the effectiveness of the approach.

## 6.2 Procedure, technique and tools

In this section we acknowledge the diversity of scenario approaches by first giving an idea of the different interpretations offered by the literature, and then making a motivated choice. We do this first for scenario definitions and then for a procedure for participatory development of scenarios. The process of constructing scenarios described in this chapter focuses on creating qualitatively different contextual scenarios. Definitions that fit with this type of scenarios are the following: *focused descriptions of fundamentally different futures presented in coherent script-like or narrative fashion* (Schoemaker, 1993: 195); *the set formed by the description of a future situation and the course of events that enables one to progress from the original situation to the future situation* (Godet, 2000: 11); *an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome* (Chermack, 2004: 305; Porter, 1985: 63). The first and last definition focus on end states: descriptions of the state of the world at some point in the future. The second also includes the course of events leading up to that future state. In the procedure for scenario construction outlined below, the emphasis is on descriptions of the future state. Nevertheless, ‘historic’ descriptions of how that situation came about add to the plausibility and readability of a scenario and can therefore certainly be part of it. In the first definition scenarios are script-like or narrative descriptions but we will not limit scenarios to texts here. Scenarios also come in the form of visual depictions, models, simulation output (e.g. graphs over time) with explanations, movies or other types of media. One study mentions timeline illustrations, colourful drawings, cartoons, oil on canvas paintings and collages (Oteros-Rozas et al., 2015). Causal diagrams (Chapter 4) can depict the end state or developments leading up to the future. Finally, the last definition refers to internally consistent views. In order for a scenario to be a plausible view of a possible future, it should not include any logical flaws. Spaniol and Rowland (2019) review the literature and come to a synthesised definition, which turns out to cover recent definitions as well (Cordova-Pozo & Rouwette, 2023). Spaniol and Rowland’s definition (2019: 1) is as follows: *Scenarios have a temporal property rooted in the future and reference external forces in that context; scenarios should be possible and plausible while taking the proper form of a story or narrative description; and that scenarios exist in sets that are systematically prepared to coexist as meaningful alternatives to one another.* We use this definition here but allow for a broad interpretation of ‘story’, as indicated above. Note that this excludes some of the alternative views of scenarios described in the previous section. We take scenarios to be descriptions rather than normative ideals, end states as well as paths, capturing organisational contexts rather than plans.

As there is no standard agreed-upon approach for participatory scenario development, below we compare the approaches suggested by some of the most cited authors and institutes in the field. We include the eight step process proposed by SRI International (Huss & Honton, 1987a, 1987b; Ogilvy & Mantle, 1984), Schoemaker’s ten steps (1993), Van der Heijden’s process (1996) which introduces the business idea and transactional environment, and Schwartz’ eight

steps (1997), which are the inspiration for among others Ringland (1998) and Wright and Cairns' (2011) approach that adds two elements to increase impact on participants' thinking: consideration of extreme outcomes and identification of stakeholders.

The left column of Table 6.1 below presents our summary of the scenario process in eight steps. Our phases follow the process identified by the majority of methodologies. In some cases we combined or separated steps to ensure that each was either divergent, convergent or prioritising. The table lays out phases as if the process were sequential, but many authors underline the iterative nature of the process in which cycling back to an earlier phase is common. We made minor changes in the order of steps compared to the original publication. For instance, Schwartz (1997) places the selection of leading indicators and signposts in the one before last phase, we moved this earlier. As a last point, note that some key terms are defined differently. Driving forces may for instance refer to all contextual developments or only to a selected set of key developments. Van der Heijden (1996) refers to the actor/ stakeholder matrix which is at present often referred to as the power – interest grid.



	<i>SRI (Huss and Honton, 1987b)</i>	<i>Schoemaker (1993)</i>	<i>Van der Heijden (1996)</i>	<i>Schwartz (1997)</i>	<i>Wright and Cairns (2011)</i>
<i>1. Formulate starting issue or question</i>	Analyse decisions and strategic concerns Identify key decision factors	Identify issue Identify major stakeholders or actors	Articulate strategic agenda Develop business idea (SWOT)	Identify focal issue or decision	Set agenda
<i>2. Identify trends (SEPTE)</i>	Identify key environmental forces	List current trends or predetermined elements	List key trends (SEPTE), develop database	Identify key forces in local environment	Determine driving forces
<i>3. Cluster trends</i>			Cluster data	Identify driving forces	Cluster driving forces Define cluster outcomes
<i>4. Score clusters on uncertainty and impact</i>	Analyse environmental forces	Identify uncertainties	Rank by unpredictability and impact on strategic agenda	Rank by importance and uncertainty	Develop impact/uncertainty matrix
<i>5. Determine driving forces, elements, policies and indicators</i>			Identify driving forces, using inductive or deductive structuring	Select leading indicators and signposts	
<i>6. Translate into scenarios and write texts</i>	Define scenario logics Elaborate scenarios	Start from two scenarios and work towards consistent set Ensure scenario consistency, if needed by formalisation	Scenario development	Select scenario logics Flesh out scenarios	Frame, scope and develop scenarios Include extreme outcomes
<i>7. Determine impact on transactional environment</i>	Analyse implications for key decision factors	Identify behaviour stakeholders in scenario	Power – interest grid Competitive positioning	Determine implications	Identify stakeholders
<i>8. Determine robust options</i>	Analyse implications for decisions and strategies	Formulate decision scenarios	Wind tunnelling in scenario/ option matrix Option planning Stakeholder – option matrix		

Table 6.1. Procedure for participatory scenario development and phases described by main authors in the intuitive logics school

In the remainder of this section we describe the core concepts and choices in each phase, drawing upon the approaches in Table 6.1 where relevant.

Scenario development starts by identifying an issue or question of concern. The central concern may initially be formulated by an organisation's representative that seeks contact with a team experienced in scenario methodology. This concern can be further explored by looking at major uncertainties faced in the past, analysing prior decisions or by identifying the priorities of key stakeholders. SRI proposes to map factors that most directly drive organisational decisions, for instance market size, price trends or resource availability (Huss & Honton, 1987b). At the core

of scenario analysis is contrasting organisational aims with the future environment (the strategic agenda, Van der Heijden, 1996). To better understand the organisation's aims Van der Heijden proposes to articulate the business idea. This captures how the organisation's distinctive competencies answers a societal need, which in turn creates competitive advantage. This bears many similarities to the joint development of a (business) model as described in Chapters 4 and 5. To find out which part of the future environment to focus on, the so-called oracle question can be used: 'if you could ask an oracle anything about the world in [timeframe scenario], what would you ask?' This first phase should result in an understanding of the question that the scenario project seeks to answer, the relevant timeframe, scope and decision makers involved.

In Step 2 the aim is to identify trends or developments impacting the organisation. The procedure outlined here works towards scenarios on the contextual environment: that part of the organisation's surroundings that cannot be influenced by what the organisation does.

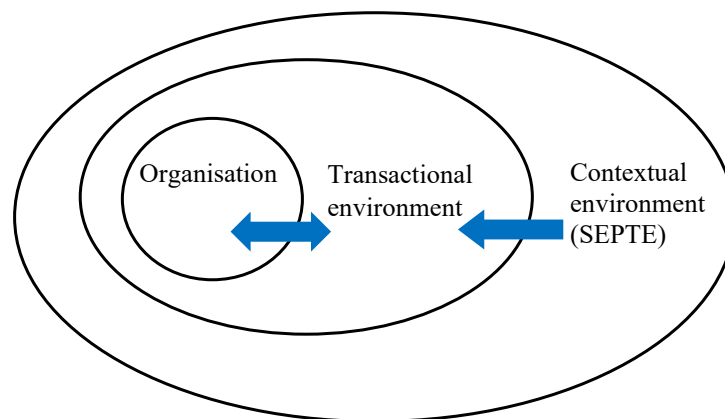


Figure 6.1. Transactional and contextual environments (adapted from Van der Heijden, 1996: 155)

The contextual environment impacts the transactional environment, which is the part of the organisational context with which the organisation has daily interactions (Van der Heijden, 1996: 6; 155). The transactional environment includes customers, suppliers, competitors and employees and is influenced by, and in turn influences, the organisation. The start of scenario construction is identifying which trends shape the contextual environment. These trends can be categorised using the SEPTE acronym, for social, economic, political, technological and ecological developments. (Other versions of this acronym are also used, such as PESTEL which includes legal developments.) The SEPTE acronym is used as a prompt for participants, helping them to generate a wide range of trends and developments. Using divergent methods such as Nominal Group Technique or electronic brainstorming typically generates dozens of trends within minutes.

In Step 3 trends are clustered into themes. These are not any of the SEPTE categories but new topics that emerge in the discussion.

Step 4 takes the clusters of contextual developments and scores them on importance and uncertainty. Given that scenarios aim to help in exploring possible futures, it is especially important to know which of the contextual developments will have a major impact on the organisation. In addition, if it was known which direction the development would take, we would be back in the forecasting mode and planning would be relatively unproblematic. For instance, as our understanding of the impact of climate change is growing, so does the certainty around its effects in the coming years. As a result many countries are now implementing adaptive measures to reduce the impact of flooding or heatwaves. In contrast, the possibility or

timing of another pandemic is much less certain. This means planning on protective medical gear, or Intensive Care capacity needs to ‘fit’ to two very different situations: a world in which demand for medical care is much like it is now, as well as a pandemic.

In Step 5, four sets of variables are identified: driving forces, elements, policies and indicators. An organisation uses indicators to know if it’s still achieving its aims. Performance indicators such as profit or market share can be found in the transactional environment, as they are not in complete control of the organisation but are the result of interaction with its environment. Another term for this is signposts: trends and events that need to be monitored to see if the organisation is going in the right direction (Schwartz, 1997). To keep its course or reach its goal, an organisation uses policies or strategies. It may for instance lower price (policy) to achieve a higher market share (indicator). For scenario planning, in particular those policies are relevant that represent major commitments and cannot be easily reversed. Driving forces are those contextual developments that are both important and uncertain. The number of driving forces selected determines how many alternative scenarios are developed. Selecting two driving forces leads to four extreme scenarios, as in Figure 6.2 below.

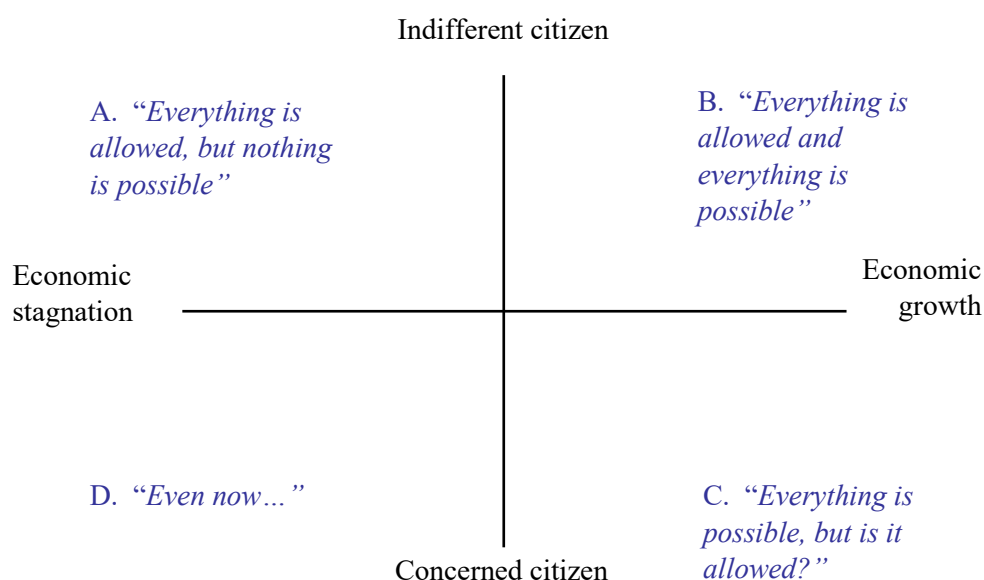


Figure 6.2. Example scenario axes

However, selecting the key driving forces is not just a technical step and not always a straightforward process. The driving forces set the scene for the scenarios, which means they should also be contrasting and capture the attention of the intended audience. For instance, electing economic growth and technological innovation as two axes might be problematic. For a starter, is the scenario imaginable in which the economy stagnates but innovation soars? Several inductive and deductive approaches may help to select driving forces and scenarios (Van der Heijden, 1996). An example of inductive scenario selection is the following. In 1991, Adam Kahane facilitated a scenario workshop with representatives of South Africa’s constituencies (Van der Heijden, 1996: 199). These included ANC officials, trade unionists, activists and corporate executives. Given the tensions and conflicts between these groups, Kahane did not think there would be any agreement on the desired state of the country in the future. Instead the group was asked to discuss what might happen. In subgroups, participants were asked to come up with stories of what might happen to South Africa between now and 20 years. In the plenary discussion that followed, scenarios were presented and the audience was

only allowed to ask two questions: “why does that happen?” and “what happens next?” Some of the scenarios developed in the subgroups were rather wild, such as one in which the Chinese government would help a South African communist liberation movement by supplying arms. When other participants asked “why would this happen?” there was no clear answer and the scenario was dropped from further consideration. By using this process, the initial set of 30 scenarios was brought down to just four.

Step 6 is to write scenario texts. Figure 6.1 shows driving forces selected in a project on public safety for the Dutch Ministry of the Interior. In the contextual environment of the Ministry, economic developments and the degree to which the Dutch citizen was involved in society were found to be the most important and uncertain developments. The four scenarios, of which the names are indicated in the figure, were then written. In scenario writing it is important that each of the scenarios is equally plausible to a reader. One way of establishing this is to make sure all scenarios cover the same topics. In the example this meant for instance that all scenarios needed to say something about immigration. In one scenario immigration may be low and in another high. In addition there may be qualitative differences in how immigration would play out in scenarios, for instance when in one scenarios immigrants are mostly war refugees, while in another scenario immigrants primarily flee the bad economic situation in their homeland. Other topics, such as demographic developments in the Netherlands, were rated as certain and so have the same value in all scenarios. These factors are also called predetermined. For instance, all scenarios would assume the same size of the Dutch population. The uncertain and certain factors that need to be covered in all scenarios are called scenario elements. Scenarios need to be written in such a way that there is a clear storyline and logical flow of argument. Scenarios need to be internally consistent and plausible (Schoemaker, 1993). Schoemaker proposes to work from two opposing scenarios or formalise scenarios to increase consistency. Wright and Cairns (2011) progressively make scenarios more concrete by going through framing, scoping and full development. An important consideration in the writing phase is whether the scenarios connect to the intended audience. Ultimately scenarios need to be not only consistent and plausible, but also original yet credible, and relevant (Amer et al., 2013). Does the scenario challenge managers? Can managers place themselves in the scenario, is it important to their core concerns? Wright and Cairns suggest to consider extreme outcomes to grasp the reader’s attention. Going back to the example earlier in the paper, for Shell managers the nationalisation of mining across the globe was one such extreme outcome.

Step 7 is about laying out the consequences of each scenario in more detail. Here, the scenarios – that play out in the contextual environment – are brought one step closer to the organisation by specifying their impact on the transactional environment. This can be accomplished by identifying stakeholders and their behaviour in each alternative scenario. The power – interest grid is an excellent way of identifying stakeholders and the degree of their influence over developments. An example will be given in Chapter 7. Remember that performance indicators are also located in the transactional environment, as they are the result of the interplay between organisational decisions, clients and competitors. Understanding the behaviour of stakeholders helps to get a better idea on changes in performance scores. This connects to the idea of SRI, which is to go back in this step to the factors that most directly drive organisational decisions, such as with market developments and resource availability (Huss & Honton, 1987b).

Step 8 is about comparing policies and scenarios. Here the alignment between the organisation and its surroundings is determined. The different but equally plausible scenarios are used as a testing bed for policy options. This may be done in two ways. In some cases, the organisation already has a strategic plan which it would like to pursue. This plan can then be contrasted with

the scenarios to see what results it would lead to in each future. If results in all scenarios are positive, the plan would be robust for the developments captured by the scenarios. If in one or a few scenarios results are negative, the plan may be adapted. If changes in the plan are not possible, at least an early warning system may be developed so that the organisation knows beforehand if the environment threatens to go in the direction described in the ‘difficult’ scenario. In other cases, an organisation does not already have a strategic plan. In those circumstances the scenarios can be used in a divergent activity and options can be identified that might generate good outcomes in a particular scenario. Again, the aim is to define options that work well in all scenarios. The literature describes this phase as analysing implications decisions and strategies (Huss & Honton, 1987b) or as or as formulating decision scenarios (Schoemaker, 1993). Van der Heijden (1996) uses the metaphor of a wind tunnel. Similar to testing a plane design by placing a model plane in a wind tunnel, a business idea can be tested against alternative scenarios. The question to be answered is then if the business idea without any changes can survive in a particular scenario or, alternatively, if changes are needed. Other authors do not propose to test the business model as a whole but look at particular policies. The impact of policies in each scenario is determined by the score on performance indicators defined in an earlier phase. Those policies that work out well in all scenarios are called robust options. Option planning and a stakeholder – options matrix (Van der Heijden, 1996) help to specify options further.

### 6.3. Versions

The approach outlined above is particular with regard to the school of thought it draws on, its orientation and scope. It mainly draws on participant insights. This section briefly addresses alternatives to these choices, in particular how participant insights (a qualitative dataset) can be complemented by quantitative data.

The approach outlined in the previous section, as mentioned, fits within the intuitive logics school of scenario planning. It aims to construct contextual rather than policy scenarios, and explorative rather than goal setting (normative) scenarios. The La Prospective school of scenario planning (Godet, 2000) also constructs normative scenarios and may use participation in the process. In terms of scope, the explanation and examples for each step highlighted the development of scenarios for a single organisation. Other types of scenarios concern a sector or several sectors of the economy, or a societal challenge. Global scenarios are used for instance used to explore climate change. Climate scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) illustrate a number of key considerations in the use of large scope scenarios. IPCC develops narrative and model-based (quantitative) climate scenarios (IPCC, 2023) with the ultimate aim to provide scientific information to support climate policies. The panel’s definition of scenarios will by now seem familiar, but does place particular emphasis on consistency: *‘Scenarios provide plausible descriptions of how the future may develop. Based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships, they [...] provide a view of the implications of developments and actions’* (IPCC, 2023: iv). These scenarios are constructed by researchers with expertise in domain areas and modelling with a variety of users in mind. For this topic, user participation in scenario construction is impossible and the foundation in science precludes building extreme scenarios. (Although we could say that these scenarios include extreme events that are likely to draw the user’s attention, cf. Wright & Cairns, 2011.) Therefore, it is not a given that scenarios will affect decision makers and the general public. The report notes that communication of results is difficult as they are phrased in academic language and the large

differences between target audiences (e.g., politicians, board members, consumers). One suggestion the report offers is to use *'storylines to complement graphs, tables, and to illustrate how a scenario evolves over time'* (IPCC, 2023: 24). It seems fair to say that the goal of developing consistent scenarios anchored on the latest scientific knowledge creates a challenge when it comes to impacting decision making.

Naturally there is a great contrast between participative development of scenarios for a single organisation on the one hand, and integrating scientific knowledge into global scenarios on the other hand. Many applications aim to combine a foundation in available evidence with stakeholder participation of some kind. For supporting team decision making, alternative approaches that complement the qualitative analysis of participant input are most relevant. The third school of scenario analysis, the Probabilistic Modified Trends school takes a quantitative approach and builds on traditional forecasting methods (Börjeson et al., 2006; Bradfield et al., 2005). This approach combines extrapolation of historic time series with a consideration of the impact of unprecedented future events. Expert judgment is combined with statistics or simulation modelling. The Probabilistic Modified Trends school uses two distinct methods: Trend-Impact Analysis and Cross-Impact Analysis (Cordova-Pozo & Rouwette, 2023). The first method starts by generating a list of events that could lead to deviations from extrapolated trends, after which experts estimate the probability of these events and their expected impact. Cross-Impact Analysis follows a similar approach but uses a more elaborate process to determine probabilities of future events. Experts do not directly estimate probabilities, but instead determine the likelihood of future events given that specific previous events have or have not occurred.

In considering when which approach is most useful, a major factor is how far we are looking ahead (Van der Heijden, 1996: 92). On the short term predictability is high and forecasting can provide a useful input to decision making. Looking further ahead there is a level of predictability but also substantial uncertainty. Here scenarios based on Intuitive logics or Probabilistic Modified Trends are most useful. On the very long term (almost) everything is uncertain. In this situation of so-called deep uncertainty, there is a conflict or lack of knowledge on the relation between elements of the situation, the probabilities around changes in key elements and/ or values (Marchau et al., 2019). Approaches such as Robust Decision Making and adaptive planning ([www.deepuncertainty.org](http://www.deepuncertainty.org)) are valuable here.

## 6.4. Applications

As mentioned, the use of scenarios for corporate strategic planning soared in the mid-1970s (Linneman & Klein, 1983). In terms of publications, attention grew considerably in the period 1990 – 2005 (Varum & Melo, 2010). Data on publications until 2017 indicate the upward trend continued after that (Oliveira et al., 2018). A 2023 survey of management tools by Bain & Company places scenarios in the Top 5 of strategy support tools in terms of use and satisfaction (<https://www.bain.com>). This position has not changed much over the 30 years that this survey has been in use. Cordova-Pozo and Rouwette (2023) conclude that an increasing number of organizations are employing some form of scenarios, in a variety of disciplines (e.g., management, social systems, education, health, and climate adaptation).

Decision making teams are expected to benefit from using scenarios in a number of ways. Varum and Melo (2010) group these in three main expected impacts. By providing an opportunity to envision plausible future states, scenarios can help to generate strategies that

reduce risks, build on opportunities and avoid threats. They help to pre-experience the future, frame emergent ideas, develop and communicate strategies. Scenarios are also often credited for creating individual and organisational learning (Varum & Melo, 2010). Nevertheless, only few studies evaluate whether these results actually materialise. Out of the 13 reviews analysed by Cordova-Pozo and Rouwette (2023), only four report on evaluation studies. Evaluations that are available are typically single or multiple case studies and a small number is experimental. A relevant example of a single case study is reported by Hodgkinson and Wright (2002) and describes how scenarios pictured a future that was seen as too challenging to the organisation concerned. This raises the point of the distance of scenario narratives to the decision maker's everyday reality. As we saw, extreme events can grasp attention (Wack, 1985; Wright & Cairns, 2011) but apparently a too challenging scenario can backfire. On the other hand, if the scenario narrative is too close to current reality, the reader may not pay attention. Oteros-Rozas et al. (2015) analysed 23 participatory scenario planning case studies conducted by the authors in a wide range of social-ecological settings, and conclude that these result in building common understanding and fostering learning about future planning. They point to three beneficial outcomes of participatory scenario construction, in line with Varum and Melo (2010). First, Oteros-Rozas et al. find that scenarios help to generate policy options and increase the legitimacy and acceptance of policy options across stakeholders. Second, scenario planning creates awareness, an increased need for long-term planning, and enables collective reflection and discussion. In this way a shared understanding is built and stakeholders are mobilised into action. Third, multiple learning outcomes between stakeholders are enhanced by increasing dialogue and resolving conflicts.

The variety of approaches to scenario development makes it difficult to pinpoint why effects materialise. Although success stories of scenario applications are published and widely known, it still remains difficult to establish how results are actually achieved (Hodgkinson, 2004; Mintzberg, 1994). Recent studies have contributed to clarity on central concepts and phases in scenario construction, which puts others in a better position to repeat the procedure and hopefully the outcomes. Using case studies it is difficult to disentangle the impact of elements of the scenario approach from changes in the context of the team or organisation. Experiments are better equipped to discover the path between intervention elements and impacts on participants. Concerning scenario planning, two experiments are especially noteworthy. Schoemaker (1993) conducts four experimental studies on the role of biases in scenario planning. He finds that scenarios are perceived to be more believable if they are more detailed and cohesive (Schoemaker, 1993). This is paradoxical, as more detail will make a scenario less likely. A scenario in which internet sales decline and Brexit is reversed, is more unlikely than a scenario in which only internet sales decline. In part this is due to another bias, called the conjunction fallacy. People fall for this bias whenever they consider that the chance that A and B will happen, is higher than either A or B happening. Using classroom experiments, Schoemaker (1993) finds that scenarios exploit one bias (the conjunction bias) to counteract another bias (availability). His main conclusion is that after working with scenarios, participants accept a wider range of uncertainty (indicated by an increase of subjective confidence ranges) which lowers overconfidence and tunnel vision. Another experiment (Gong et al., 2017) compares scenarios against forecasts. Participants work with a decision support tool in either a scenario or forecast condition. Compared to those in the forecast condition, participants in the scenario condition more often chose the strategies that performed well over the full range of uncertainties (robust options). This difference was not due to the exploration of options, as participants in both conditions explored options in a similar manner. The scenario group however paid more attention to worst case outcomes.



In conclusion, multiple scenario construction is a popular approach for developing strategy. While the approach has been criticized for its lack of clarity, central concepts and phases in the scenario methodology are becoming more clear. There is some evidence that considering plausible, alternative futures supports the identification of robust options and helps to discuss and reflect on plans for the long term. Working with scenarios encourages learning, in the sense that participants accept a wider range of uncertainty. For that to happen, scenarios need to be carefully balanced and strike a middle ground between originality and credibility. If a scenario is too close to current reality, users may not pay attention. A too extreme scenario might lack credibility, be too challenging for the audience and be rejected.

## Chapter 7. Application: understanding possible futures of Nijmegen municipality

This chapter describes an application of participatory scenario development with Nijmegen municipality. At the time of the project, Nijmegen was facing a number of major choices in housing and spatial planning. Policies following from these policies represented major investments, would take years to realise and continue to shape the city for the coming decades. To bring a broad range of expertise to bear on this decision and ensure that policies would work in the light of future uncertainty, a participatory scenario planning project was initiated. A total of 31 city representatives participated in five sessions, constructing scenarios and wind tunnelling policy measures. Below we describe the motivation for starting the project, the two modelling sessions with Sioo employees and external lecturers, the resulting model and its impact.

### 7.1 Background and issue

In March 2015 Jos Sprangers, director Spatial domain and Tom Merks, director Administrative Support and Advice of Nijmegen municipality, sought contact with Radboud University. In his previous position at the Ministry of Infrastructure, Jos had experienced the use of scenarios in strategic planning (Van der Steen et al., 2011). In particular the confrontation of proposed policies with external, uncertain developments appealed to him. In his current job one of the pressing issues was the planned construction of 10,000 houses near to the Waal river, in the Waalfront and Waalsprong districts. In planning these and other construction projects, land exploitation plans (how many dwellings to build, in which price class) tended to be based on a narrow range of predictions about the growth of Nijmegen's population. This assumed demographic changes were relatively predictable, whereas on the longer term these predictions were very uncertain. Besides demographics, other (uncertain) developments influence future construction projects, such as the development of retail and catering in the city centre, ICT and its use in all kinds of activities (such as living, working, recreation and education) and, related to this, the development of urban mobility and economic developments in the region. Beyond spatial planning, Nijmegen municipality is responsible for a range of domains such as among others mobility, social cohesion, sustainability, knowledge valorisation. An exploration of certain and uncertain environmental developments was deemed to be desirable. This would help to clarify which challenges the municipality would face in the coming decades and whether the current plans are sufficiently robust to deal with them.

The goal and planning of the project were discussed in a meeting between Jos Sprangers, Tom Merks, Karin Heiligers (senior advisor on strategy), Vincent Marchau and Etiënne Rouwette (Radboud University) consulted on background and purpose of this process. The aim was formulated as follows: is Nijmegen municipality developing the right things for 2035? The project was to have two phases. The first, planned before summer, aimed to create awareness of the (uncertain) future. This entailed the construction of alternative contextual scenarios. The goal of the second phase, after summer, was to make policies future proof. For this part stakeholders outside of the municipality would be invited to a process of adaptive planning.

A total of 31 people participated in the meetings. Principals were Tom Merkx and Jos Sprangers. The meetings were facilitated by Etiënne Rouwette and Vincent Marchau, supported by Brigit Fokkinga, Monic Lansu and Martijn van Latum (Radboud University). The next section discusses the process followed during the five meetings and the partial results to which the sessions led. Each meeting is briefly evaluated.

## 7.2 Process

The following agenda was developed for the sessions.

<b>Procedure, agenda and products</b>	
22 May 2015	Mapping the contextual environment of Nijmegen municipality: which developments and trends in the social, economic, political, technological and ecological (SEPTE) domain play a role between now and 2035? (1, 2) Clustering developments (3)
12 June 2015	Scoring developments on uncertainty and importance (4) Selection of two driving forces as a basis for four scenarios (5)
3 July 2015	Development of four alternative scenarios in text, in four subgroups (6)
15 Sept 2015	Feedback on scenarios and further development (6) Mapping the transactional environment: which stakeholders are important to Nijmegen municipality? (7) Assessment of stakeholder behaviour in each scenario (7)
16 Oct 2015	Wind tunnelling: how do important policies score in each scenario? (8) Determination of robust and non-robust policies (8)
<b>Procedure participatory scenario development</b> <ol style="list-style-type: none"> <li>1. Formulate starting issue or question</li> <li>2. Identify trends (SEPTE)</li> <li>3. Cluster trends</li> <li>4. Score clusters on uncertainty and impact</li> <li>5. Determine driving forces, elements, policies and indicators</li> <li>6. Translate into scenarios and write texts</li> <li>7. Determine impact on transactional environment</li> <li>8. Determine robust options</li> </ol>	

Table 7.1. Participatory scenario development procedure, agenda and products (steps 1-8 in the procedure are added to the relevant places in the agenda; products are in *italics*)

It turned out to be more difficult than expected to bring over 30 people together for the sessions. This led to a decision to abandon the idea to organise a separate second phase on adaptive planning. Instead mapping the behaviour of stakeholders and wind tunnelling of policies was planned for sessions 4 and 5, after summer. Each meeting was 3.5 hours including breaks. Meetings took place in the group decision room on the Radboud University campus. Electronic meeting support software (MeetingSphere, now Xleap) was used to gather, cluster and prioritise ideas. All meetings were audio recorded.

### 7.2.1 Session 1

The scenario project began with a round of introductions by participants and facilitators. The central question of the project was explained: is Nijmegen municipality developing the right things for 2035? Participants complete a short questionnaire on the topics they consider most

important for the future of the municipality of Nijmegen, and what they would like to know about the environment of the municipality of Nijmegen in 2035. A short presentation highlighted the benefits of constructing contextual scenarios with municipality staff and the steps in doing so. The main part of the first meeting was an electronic brainstorming session. Participants mapped out the municipality's contextual environment. The facilitator used the SEPTE categories (social, economic, political, technological and environmental developments) as a prompt for participants, encouraging them to think of a broad range of developments. After the brainstorm has lasted a few minutes, participants were shown so-called trend cards. Trend cards are pictures of possible trends or developments developed by the Dutch Ministry of Infrastructure. Participants generated over 300 ideas. In the next step they grouped the ideas into 16 clusters. In a follow-up meeting with a subset of participants, the material was further condensed into the following ten clusters:

1. Demographic changes (demographics, migration)
2. Labour market (flexible labour/work demand/supply jobs, demand- versus supply-driven education, mix leisure/work/care)
3. Mobility (e.g., intelligent transport systems)
4. Climate (e.g., water levels/flooding)
5. Health (e.g., population health, food, leisure/work/care mix)
6. Energy (e.g., decentralised/self-sufficient/circular generation of energy, including self-sufficient/local production of food)
7. Role of government (city government and city administration vs province, state, Europe)
8. Economic development (e.g., macro economy, sharing economy, buying behaviour)
9. Living environments (e.g., working follows living, living follows facilities)
10. Technological development

Over the course of the meeting, participants' comments seemed to indicate that they were enthusiastic about the methodology and saw the relevance of the proposed approach. The ideas generated would form the basis for the scenarios to be created and should therefore neither be too close nor too far away from the participants' current world. In the former case scenarios would be unchallenging; in the latter they would be incomprehensible to employees who not present in the session, or too threatening. The more than 300 ideas generated by the brainstorming seem to strike a good balance between these two extremes. A final criterion for assessing the ideas is whether they cover the full space of developments. It is notable that the brainstorming included only limited discussion of safety: only two out of more than 300 developments touch on safety. The question is whether this is a good reflection of the role safety will play in the future of the municipality of Nijmegen.

### *7.2.2 Session 2*

To keep participants keep track of where they were in the scenario construction process, this and every subsequent meeting was started with an overview of the roadmap, an indication of where we were at that moment and a summary of previous results.

The clustering after the first meeting was discussed and adjusted in a small committee. While this approach saved session time that could then be spent on other topics, is brought with it the danger that the other participants did not recognise the new clusters. This potential drawback did not seem to be an issue in this session: after explaining why the clustering was adapted 'en petit comité' and explaining the new clusters, a discussion followed and participants eventually accepted the results.

Getting from possible developments to alternative futures required a next step: scoring developments on importance and certainty. After all, not all developments are equally important to Nijmegen municipality. In addition, some developments can be extended into the future with reasonable certainty and others are much less predictable. The uncertain developments are particularly interesting: they indicate a bandwidth that an organisation needs to take into account. In MeetingSphere, participants gave each cluster a score on importance and uncertainty. A development that turned out to be very important and uncertain was social cohesion or solidarity. In other words, it is difficult to indicate whether in 2035 society will be more individualistic or more inclusive. A second important and uncertain development concerns knowledge institutions in Nijmegen. Will HAN and Radboud University be much larger in 2035 than they are now or will they have left the region? These two developments form the so-called driving forces, because they determine the state of the world in 2035. The combination of driving forces led to four scenarios.

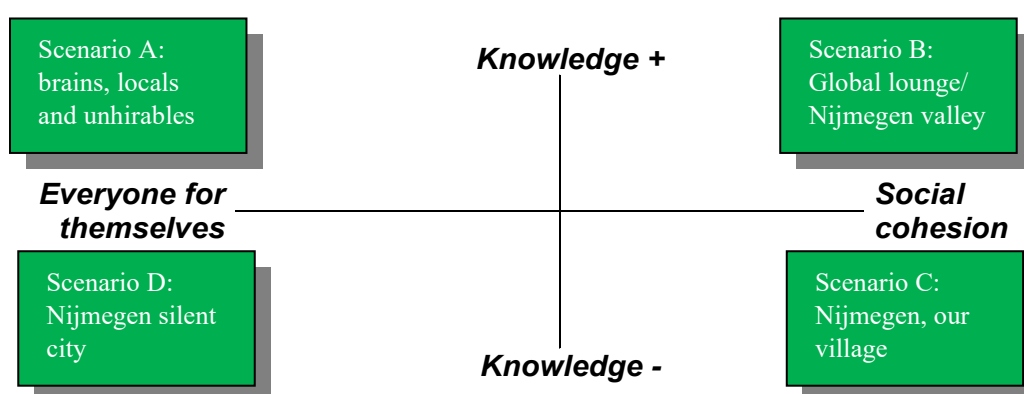


Figure 7.1. Driving forces and scenarios

At the start of the voting process there was some confusion about the criterion 'uncertainty' as it was phrased negatively. The step of choosing the two most important and uncertain developments, the driving forces, inspired a long discussion. As in clustering, also in this step it often seems as if the richness of the material should be reduced to a few overarching concepts. The facilitators indicated that the remaining clusters and the ideas in them could be included in the scenario texts. In the next step participants then made a first sketch of scenarios. In subgroups they wrote a newspaper article and provided it with a catchy title. Below is the newspaper article for Scenario A.

#### *Mayor Jetten receives 60,000th student at Nijmegen train station*

Dieter (22) from Munich would have liked to study in Tilburg, but ended up in Nijmegen because of the major university merger. He now lives on the campus in Dukenburg, where the last resident passed away three years ago. Mayor Jetten solemnly handed him the access pass to the new campus. The mayor: "Dukenburg has become a beautiful campus. A golden opportunity for the city. By truly opting for completely restructuring the Centre and East into student rooms in and relocating other residents to the Beuningen district, the nuisance caused by lodgers has now been minimised. Something we as a D66/VVD college are proud of! The city centre is now a total entertainment centre for the large group of knowledge workers and students, served by the people from Beuningen who commute daily by light-rail to the centre. The mayor continued: "Our community centres have thankfully been repurposed as dispute houses. But I must now excuse myself, I must go and open the third casino on Veur Lent."

Creating the newspaper articles in subgroups eventually went smoothly and the presentations were enthusiastically received. With this, the intended end result seemed to have become more clear to participants.

### 7.2.3 Session 3

This meeting started again with a summary of the results so far, explanation of the roadmap for the project as a whole and where the current meeting fit in. An example of a scenario text from another project was presented. The reason why this was a successful scenario was because it met the four quality criteria for scenarios: consistency, plausibility, originality as well as credibility, and relevance. Participants were asked to add to the newspaper report from the previous meeting and work towards a text that met the four criteria. In doing so, it was also important to avoid creating positive and negative or desirable and undesirable scenarios. All four worlds should be equally probable for the reader, and if a world is considered very negative, there is a risk that a reader will not want to dive into it or even rejects the whole story. In four subgroups, participants wrote a text for each of the scenarios. The table below gives a brief summary.

	<b>Scenario A: Knowledge+/Individual Brains, locals and unhirables</b>	<b>Scenario B: Knowledge+/ Collective Global lounge/Nijmegen valley</b>
<b>Demographic development</b>	210,000 inhabitants, mostly scientific nomads, relatively many 20-40-year-olds	210,000 inhabitants, international knowledge workers who stay in Nijmegen after their studies, migrants and refugees
<b>Labour market</b>	Three-way split: international knowledge workers with top wages, local service providers/ professionals, (unemployed) outsiders including autonomous and creatives	Flexibilisation, many self-employed who keep work via online reputation, entrepreneurs, developers, creatives and scientists meet in global lounges, 40% do not speak Dutch, labour is 24/7, separation of adaptables and non-adaptables
<b>Mobility</b>	Car trains, emission-free transport, RUHAN at Tolhuis/ Zwanenveld, Dukenburg new Nijmegen CS	Scale leap in mobility, public transport grown, with focus on fast, sustainable and clean, there are fewer cars and they are shared, more fast cycling
<b>Climate</b>	Extreme weather and mounds in lower town, heat dissipation big problem	Extreme weather but Nijmegen is water safe, enough greenery and water storage and drainage

Table 7.2a. Excerpt from scenarios A and B

	<b>Scenario C: Knowledge-/Collective Nijmegen, our village</b>	<b>Scenario D: Knowledge-/Individual Nijmegen silent city</b>
<b>Demographic development</b>	From 2025, RU and HAN leave, in 2035 135,000 inhabitants, fewer students and places to go out, relatively many elderly people, reception of refugees, some highly educated and some traumatised and not integrated	110,000 inhabitants, ageing, small town, highly educated people leave Nijmegen and no new influx of young students, reception of refugees, integration is difficult: no money for counselling, indigenous Nijmegen citizens do not contribute
<b>Labour market</b>	Loss of employment due to disappearance of university, more work in recreation: walking, water, history, more work in health care	Middle class disappeared, academics gone, professionals and health care workers in great demand, return of production work due to low wages
<b>Mobility</b>	The city is internally focused, no major traffic flows, not connected to high-speed train network, but shared cars and community bus	After 2020 no more investments in infrastructure, public transport severely limited, roads poorly maintained, fossil car use limited, cycling popular
<b>Climate</b>	Released space used for solar panels, knowledge side channel is monetised	Extreme seasons and parts of Nijmegen (West, Dukenburg) flooded for third time and threaten to become uninhabitable, houses affected

Table 7.2b. Excerpt from scenarios C and D

At the end of the meeting, the texts had advanced substantially but were not yet finished. Over the summer, the four subgroups continued working. Each subgroup had a leader who coordinated the work. Participants agreed to send in scenario texts that would meet the quality criteria before the fourth meeting.

#### 7.2.4 Session 4

The start of the fourth meeting was a final round of comments on the scenario texts. The comments were further processed by the subgroups. The session then continued on the transactional environment: that part of the environment with which the municipality cooperates and conducts transactions. To start thinking about the transactional environment, participants indicated which groups Nijmegen municipality particularly cooperates with. These stakeholders were ordered by power (to what extent can they influence the municipality) and interest (how much do they care about the direction the municipality takes). Figure 7.2 provides an overview of stakeholders.



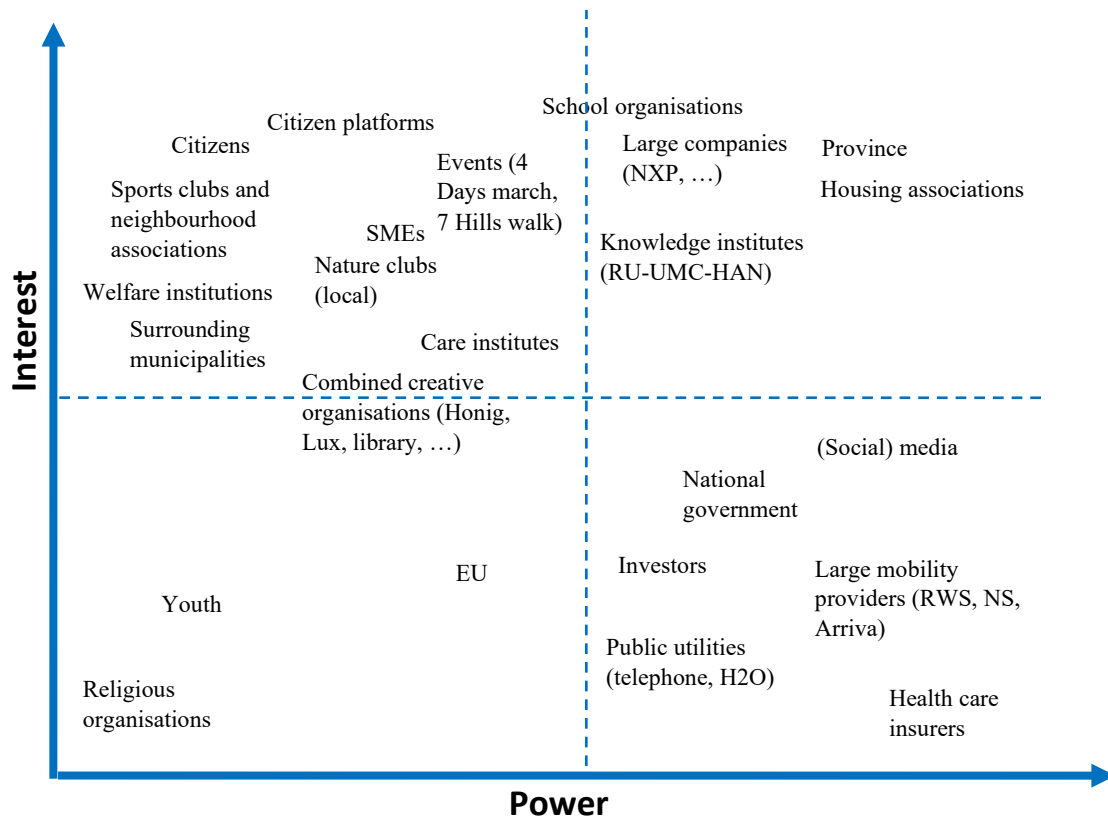


Figure 7.2. Transactional environment: power – interest grid

This classification leads to four clusters of stakeholders. At the top right are the parties that score high on both power and interest. These are the ‘players’ who set the playing field: school sector organisations, large companies, housing associations, provinces and knowledge institutes. At the bottom right are the ‘context setters’: they also have a lot of power, but have less interest. Here we find (social) media, large transport companies, the national government, investors, utilities and health insurers. In the opposite corner, top left, are the ‘subjects’ with little power but a lot of importance. These are citizens and their platforms, welfare and care institutions, SMEs, associations, events and nature clubs and surrounding municipalities. Finally, there are parties with little power and little interest: the ‘crowd’. These are the combined creative institutions, youth, EU and religious organisations. As an example of stakeholders’ preferences in 2035, consider the following.

#### Large companies

- A. Global growth and global revenues. Focus on Nijmegen as a place where these objectives are partly realised. Business climate permanently in order. Room for enterprise. Human capital agenda in order. International profile.
- B. See scenario A.
- C. Large companies no longer exist and do not consider establishing themselves. They are therefore no longer stakeholders.
- D. Large companies no longer exist and do not consider relocating. Are therefore no longer stakeholders.

#### Citizens

- A. Citizens stay in Nijmegen, prioritise their own comfort and satisfy their own interests. On the basis of their diversity, and operating from the principle of ‘what's in it for me’,

they seek out like-minded people from their own group. The vulnerable and unhirables come to the government asking for help.

- B. There is great cohesion among citizens regardless of their wealth and educational differences. Citizens do appreciate maintaining this cohesion, so the municipality is asked to help shape consultation platforms and support.
- C. The city's DNA is changing, the population is ageing, citizens are more forced to arrange things by themselves and to help each other, to act together. Dependence on one another is increasing.
- D. The city's DNA is changing, the motto is now every man for himself, the Diocese for us all. Self-interest prevails and people do not look at opportunities based on interaction with your neighbour, neighbourhood or city, among others. Environment and sustainability are not an issue at all, unless it they provide cheaper options. The government gets to regulate it all, including healthcare. In short, for traditional tasks the government overburdened. It cannot deliver as there is no money, no manpower.

Naming stakeholders, describing their behaviour and wishes towards the municipality gave a lot of new information. This brought the scenarios to life for participants. Some of this information would be used in the further elaboration of the scenario texts.

#### *7.2.5 Session 5*

Prior to the fifth and final meeting, a list of Nijmegen municipality measures and the objectives the measures aim to achieve was drawn up. Based on a comparison of the documents City Vision Nijmegen 2020 and City Budget 2015-2018 and the political agenda, the facilitators made an initial selection. These were then discussed in a smaller committee. Ultimately, the six integral themes in which the municipality divides its field of action are: caring city, living and growing city, city that works and learns, sustainable city, vibrant city centre and city in the region. For each theme, a number of policies and objectives were chosen. This was a difficult process as in some cases policies and objectives turned out to be very close to each other. It was a challenge to describe them unambiguously. Judging from the participants' comments, the description used in the session seemed clear.

In this meeting, participants again worked in four subgroups. For each policy, the subgroup was asked to indicate how well or badly it performs in their scenario with a rating from 0 to 10. This means that participants express all the effects of a policy in one rating. This was chosen because scoring all measures on all objectives would take too much time. Participants are asked to give their scores individually first and then compare them within their subgroups. In the end, each subgroup integrates their scores into one subgroup score per policy and provide a short explanation for their score.

The table below shows the objectives and policies for each theme. Each theme also has a do nothing option (in italics).

<i><b>What do we want to achieve (goal)</b></i>	<i><b>(Specific) objectives</b></i>	<i><b>Policies</b></i>
Caring city (solidarity, together, robust)	<ul style="list-style-type: none"> <li>- inclusive society</li> <li>- cooperation instead of competition between care institutes, linked up with social environment</li> </ul>	<ol style="list-style-type: none"> <li>1. stimulating informal care, use of volunteers</li> <li>2. organise care services/neighbourhood teams</li> </ol> <i>What if we do not invest in care?</i>
Residential and growth city (being able to live comfortably)	<ul style="list-style-type: none"> <li>- sufficient housing for groups we want in Nijmegen</li> <li>- sufficient affordable rental housing</li> <li>- allowing the elderly to live in their own neighbourhood (life-course-proof housing)</li> <li>- sufficient space for companies (including freelancers and new jobs)</li> <li>- water safety</li> <li>- sufficient (sustainable) accessibility</li> </ul>	<ol style="list-style-type: none"> <li>3. build only in Waalfront and Waalsprong (no, unless policy) (4,000 dwellings until 2020, 10,000 building assignments)</li> <li>4. no more investments in student housing</li> <li>5. high-quality public transport, influencing behaviour: out of car, tram, public transport connection with Germany</li> <li>6. life time proof living</li> </ol> <i>What if we do not invest in housing?</i>

Table 7.3. Goals, (specific) objectives and policies for wind tunnelling

Each subgroup also processes the comments to the scenarios raised in the previous session. Final scenarios are five to seven pages. The highlights of Scenario A were the following.

#### *Scenario A Brains, locals & unhirables*

In the knowledge city of Nijmegen, individualism reigns supreme; there is little social cohesion. The city's population has grown to 210,000. Including the villages, the municipality of Nijmegen has 457,000 inhabitants. The university attracts many students and scientists, but they live here too briefly to care about integration and their fellow human beings. They are also too busy trying to stay on board in the international scientific job carousel. The group of 20- to 40-year-olds dominates. Smart software has made the middle group redundant in this knowledge economy. Apart from knowledge workers, the workforce consists mainly of self-employed service providers. Unemployment is high and social security meagre. The gap between knowledge workers and outsiders is deep. Some of the marginalised maintain themselves in a subculture and a flourishing parallel creativity economy, an underestimated pillar of Nijmegen's attractiveness as a city to live in. The local government outsources to the market and directs a network of seconded specialists from a very small organisation.

The table below shows how each policy scores in the scenarios. The do nothing option was formulated positively so that scoring became easier. The final scores were converted into a colour: green for a score of 8 or higher. Orange indicates a score from 4 to 7; red refers to a score of 0 to 3.

Goals	Policies	Scenario A: Brains, locals and unhirables	Scenario B: Global lounge/ Nijmegen valley	Scenario C: Nijmegen, our village	Scenario D: Nijmegen silent city
Caring city	1. stimulating informal care, use of volunteers				
	2. organise care services/ neighbourhood teams				
	We invest in a caring city				
Residential and growth city	3. build only in Waalfront and Waalsprong (no, unless policy) (4,000 dwellings until 2020, 10,000 building assignments)				
	4. no more investments in student housing				
	5. high-quality public transport, influencing behaviour: out of car, tram, public transport connection with Germany				
	6. life time proof living				
	7. extra: connection points public transport				
	We invest in spatial development				

Table 7.4. Excerpt results wind tunnelling: scores of measures in each scenario

What is the result of wind tunnelling policies planned by the city of Nijmegen? What first stood out were the large number of measures that were robust: 12 of the 26 policies score green or orange in every scenario. One measure that is clearly not robust is building 10,000 houses in the Waalfront and Waalsprong. This measure scores red in all scenarios. A number of other infrastructural measures score red in two scenarios: constructing transport hubs, not investing in student housing, spatial development, campus development, investing in the heat network and sustainability. One measure within Care City, stimulating informal care, also scores red in two scenarios.

What did these scores mean for the municipality of Nijmegen? The measures that scored well in each scenario were robust for the contextual developments described in the scenarios. These measures therefore did not need to be adjusted. For measures that scored red in one or two scenarios possible adjustments could be explored. If adjustment at this moment was not possible, another option was to develop a backup plan and monitor how the environment developed. If monitoring reveals that the scenario in which the measure does not work approaches, the backup plan can be implemented. A measure that did not score well in any scenario should better not be implemented in its current form.

At the end of the session, one participant commented that it was quite a shock to see that 10,000 additional homes did not work out well in any of the scenarios. Nevertheless, the results were discussed and acknowledged in the meeting. In a separate meeting with other departments of Nijmegen municipality in December 2015, results were also shared and recognised.

### 7.3 Final product

Participants in the scenario project received a report after each session and a final report at the end. The intermediate reports were generated by MeetingSphere and contained the ideas generated by participants and – when used – clusters or votes. Intermediate versions of scenario texts were also shared. The final report is 67 pages, including 45 pages appendices. The main text includes an introduction specifying the aim, method and participants, the procedure with an agenda for each session, and a description of each meeting. By request of the contact persons, after outlining the process and results of each meeting there is a short evaluation of process results and insights obtained. Results of a short questionnaire on future developments were also included (see the next section). Conclusions highlighted the two driving forces and the results of wind tunnelling 26 municipal policies. For policies that are not robust the recommendation is to develop a monitoring and backup plan. The reader is also reminded that the participants – all working with the municipality – are the only source of information for these conclusions. Results could be validated by comparing them against the opinions of a broader representation of stakeholders and to other data sources. The appendix includes the following: 1. the 300 ideas on trends and developments gathered in the first meeting, placed in clusters; 2. For each of the ten clusters of trends, a definition, the current way of thinking and how it is included in scenarios; 3. a newspapers article for each scenario; 4. stakeholders and for each scenario their preferences in 2035; 5. final scenario texts; 6. comparison pretest and post-test questionnaires on future developments.

### 7.4 Implementation and results

The project started with the question ‘is Nijmegen municipality developing the right things for 2035?’ The meetings provided more clarity on which measures should and should not be further examined and possibly adjusted. Participants established that some measures did not work out well in several scenarios and were willing to look into them further. Thus the goal of making the municipality more aware of the uncertain future seems to have been achieved.

In addition there are some indications that during the project, participants adjusted their views on the future of the Nijmegen municipality. Before and after the project participants were asked to answer the following question: ‘Which three topics do you see as most important for the future of the municipality of Nijmegen?’ A total of 23 participants provided answers at the beginning of the first session and 11 at the end of the last session. The topics mentioned were clustered. The limited number of answers give some indication of collective and individual changes in perception of the contextual environment. There are five clusters of topics (demography, economy, coherence society, governance, spatial and transport) that were expected to change in importance and for three clusters the expectation is supported. In other words, there is a limited change in importance attached to contextual trends. There is also some evidence for individual change. Nine people complete both a pre- and post-measurement, allowing 25 combinations of topics to be compared. Of these, 14 changed, or 0.560 share.

The description of the sessions in the previous section indicated that results were accepted and shared with other departments of Nijmegen municipality in a meeting in December 2015. That acceptance of results is not self-evident is shown by an unsuccessful application of scenarios by Hodgkinson and Wright (2002). In their case, the scenarios made it clear that there were great dangers in continuing with the existing strategy. Some participants responded by withdrawing from the project and distancing themselves from the scenarios. They remained

committed to the existing strategy and shrugged off responsibility for any negative consequences. The scenarios developed with Nijmegen municipality and wind tunnelling of policies seemed to have avoided this pitfall. While it was something of a shock to see that 10,000 additional homes did not work out well in any of the scenarios, in other respects results were not perceived as too challenging.

Whether the scenarios and results of wind tunnelling were too close to current reality remains an open question. Results on the level of the organisation were discussed in a meeting with contact person Tom Merckx in August 2023. In line with the above, he underlined some of the surprising insights that were gained in the scenario sessions. Nevertheless, he also noted that once the results had been taken in, the organisation after some time went back to business as usual. Ironically, an unexpected and major new development - COVID 19 - is one factor in this. In summary, while the scenario project raised awareness of uncertainties and has to a limited extent changed thinking, it did not lead to a major change in direction of the organisation or change in the planning process.

## Chapter 8. Group causal mapping

In this chapter we again describe an approach that covers more than one task in group decision making. Group causal mapping covers divergence, convergence as well as prioritisation. The models constructed in the convergence phase start from issues. ‘Laddering up’ connects issues to higher level goals and shows why issues are important. By ‘laddering down’ issues are linked to actions. Models can be built on a whiteboard but also using computer-supported technology. In the latter mode concepts and relations can be brainstormed anonymously. The software also offers model analysis tools that can help to find priority issues.

### 8.1. Background

An early version of group causal mapping, known as Strategic Options Development and Analysis (SODA) was developed in the 1980s as part of an action research programme led by Colin Eden that started at Bath University (Eden & Ackermann, 2018; Eden et al., 1983). Central to this intervention approach is the idea that individuals differ in their perception and interpretation of one and the same situation because they use different mental constructs to make sense of that situation. These constructs are organised as a hierarchical system: beliefs and values are constructs at the top of the hierarchy –what drives and individual’s behaviour– with those further down the hierarchy representing either issues affecting these beliefs and values, or explanations and alternative courses of action (Kelly, 1955). This often creates a challenge for coordinated action, because different interpretations lead people to take different courses of action. Thus when individuals need to work together to accomplish goals within or across organisations, much of what happens comes down to negotiating and renegotiating between different interpretations and courses of action.

Failure to reconcile different interpretations through negotiation often leads to poor ownership and implementation (Nutt, 2002). Eden argues that the process of negotiation is both social and psychological. Specifically, effective behavioural change leading to commitment to a decision is often the result of individuals socially negotiating a new order - i.e., a new situation - *and* creating a new negotiated order - i.e., new relationships between individuals (Eden, 1992a; Eden & Ackermann 1998; Eden & Ackermann, 2010).

Whilst originally developed with a focus on supporting decision making in complex problem situations, in later years SODA developed into a comprehensive strategy making methodology called Journey Making (Ackermann & Eden, 2010; Ackermann & Eden 2011a). In this book we focus on SODA rather than Journey Making, but will use the term group causal mapping instead. Group causal mapping works by capturing individual interpretations of a problematic situation through a cognitive mapping or causal mapping technique: the former is used when the elicitation process is conducted with an individual in an interview setting; the latter is used for eliciting team members’ interpretations in a workshop setting. These technique allow views to be represented as individual cognitive maps or group causal maps that capture how people construe a given situation by showing the interrelated issues, goals and possible actions they associate with that situation. SODA maps depict means-ends relations and show how certain actions are perceived to help to resolve some issues, which in turn might help to achieve particular goals. Creating and discussing these maps in a facilitated environment is thought to help a team arrive at a negotiated agreement on how to improve the problematic situation of concern. In other words, a facilitated mapping approach is used to influence the psychological



and social negotiation processes needed to create the required levels of shared understanding and commitment to a proposed course of action (Eden & Ackermann, 2010).

## 8.2 Procedure, technique and tools

Group causal mapping can be used in a variety of ways, some of which employ specialised software. In general, cognitive maps can be built using the *Decision Explorer* software. For the case of building causal maps with a team, the *Decision Explorer Connect* software can be used<sup>10</sup>. Here we describe the process of building maps using manual technology comprising a white board around which a small group of participants is seated forming a horseshoe shape. The facilitator guides the group through the mapping process and notes down ideas and relations for all to see using a range of colour whiteboard pens. Deployed in this manner, the procedure is also known as the oval mapping technique (Bryson et al., 2004). Table 8.1 below summarises the main elements of causal mapping.

Procedure	
1.	ask an action-oriented question or prompt
2.	note answers (issues) on board
3.	link issues
4.	split a large map into issue clusters
5.	for each issue cluster, ladder up to goals and down to actions
<i>Activity/ technique:</i>	
-	Note down ideas on black/ whiteboard, wall or in digital form using mapping software
<i>Tool:</i>	
-	Board and pens, or decision room and a group decision support system such as <i>Group Explorer</i>

Table 8.1 Elements of group causal mapping

The start of the process is an action-oriented question or prompt, such as “*what are the key issues that we must address in order to achieve Z within timeframe Y?*” or “*what can we do about problem X within timeframe Y?*”. Team members are asked to note down answers individually, in the form of brief statements that must include a verb and are no longer than 10-15 words. Examples are ‘*strengthen the skills of sales and marketing staff*’ and ‘*increase students’ attention societal impact issues*’. The starting question invites participants to voice issues and concerns about a problem of interest, and is intended to help them share their claims about the nature of the problem and what should be done about it. Team members write their answers on large sticky notes<sup>11</sup> and they can write as many as they wish. The facilitator gathers the answers in a round-robin fashion and places each issue statement on the whiteboard. Often, however, team members are encouraged to place their answers on the whiteboard without the facilitator’s intervention. Answers are placed on the whiteboard using all the available two-dimensional space rather than displayed as lists.

As the elicitation proceeds, issues that the facilitator thinks are related are placed close together in tentative clusters. Generic issues are noted at the top and more specific concepts at the bottom

<sup>10</sup> *Decision Explorer* and *Decision Explorer Connect* are available from Banxia Software Ltd ([www.banxia.com](http://www.banxia.com)). A recent development for supporting teams building maps in virtual environment is *Strategyfinder* (<https://www.strategyfinder.com>).

<sup>11</sup> For example, oval Post-it™ notes or similar.

of each cluster. After all concepts brought to the whiteboard, the facilitator then asks participants to first validate the tentative clusters produced, make any necessary changes, and then to relate the concepts within and across the clusters to one another.

At this point the divergent way of working stops and convergence starts. This means that instead of following the wording as suggested by an individual participant (divergence), now all participants have to agree to either drawing a link between concepts, or changing the wording of the concepts themselves (convergence). Thus, in this convergent phase, whenever a link or re-wording is suggested by a participant, the facilitator checks with the other participants whether they agree before adding the link to or change the wording in the model. This process transforms the displayed material into an emerging causal map, in which the vertical dimension shows how facts or options at the bottom relate to issues in the middle and then to goals at the top of the map. In this way the map represents a visual model that shows how facts or options help to explain or resolve issues, respectively, and how issues stand in the way of achieving goals. The result is a hierarchical network of argumentation. An excerpt from a map developed in a higher education institution to discuss issues concerning academic partnerships is shown in Figure 8.1



Figure 8.1 Excerpt from a causal map

Practical applications indicate a number of traps participants may fall for during the mapping process. For example, some team members' contributions may be written in the form of questions, and these have to be reformulated as propositions that include a verb so that the action-orientation of the contribution becomes clear. Some participants may also phrase their concerns using modal verbs such as 'need', 'should' or 'ought', which indicate covert individual aspirations that form the basis for proposing and prioritising particular actions. For instance: a contribution such as "*need to increase service customization*" may be seen as a means to "*maintain high levels of customer satisfaction*" (an explicit or implicit aspiration), and the use of the word 'need' is already suggesting a sense of priority for action. In this case team members would be asked to avoid take out the word 'need' and instead phrase the statement as, for example, "*increase service customization*". That way, the statement becomes just a candidate proposal for action that could be discussed later in the process, and made a priority if deemed appropriate at that stage.

A common trap is to leave concepts unconnected to the rest of the model. In this case the facilitator will ask the team to identify these ‘orphans’ and link them to other concepts. Another common trap relates to the direction of the link between two concepts, which can be mistaken by participants. For example, a participant may link the concept “*achieve a better image in the market*” to the concept “*better use of social media in marketing*”. This argument starts from an aspiration or goal and then goes to propose an action. The logic of cognitive and causal maps is exactly the reverse: actions contribute to achieving goals, or means-statements lead to ends-statements. Participants are therefore asked to link the proposed means of “*better use of social media in marketing*” to the desired end of “*achieve a better image in the market*”.

Sometimes team members include a causal relation when they word their concepts, as in “*address the management skills of senior people to get the culture aligned with our vision*”. In this case, the word ‘to’ implies a causal relationship between ‘address the management skills of senior people’ and ‘align culture with our vision’, and so these two elements should be considered separate but linked statements. Similarly, transition words or statements such as ‘because’, ‘therefore’, ‘in order to’, ‘due to’, ‘may lead to’, ‘as a result of’, ‘through’, ‘caused by’ should warn the facilitator that causal relations are implied and concepts need to be split into two.

Additional traps emerge when relations between concepts imply a feedback mechanism. As shown in Figure 8.2, in maps causality typically ‘flows from bottom to top’. However, some concepts in the map can be part of feedback loops, as in the case of the two concepts located on the left hand side of the map.

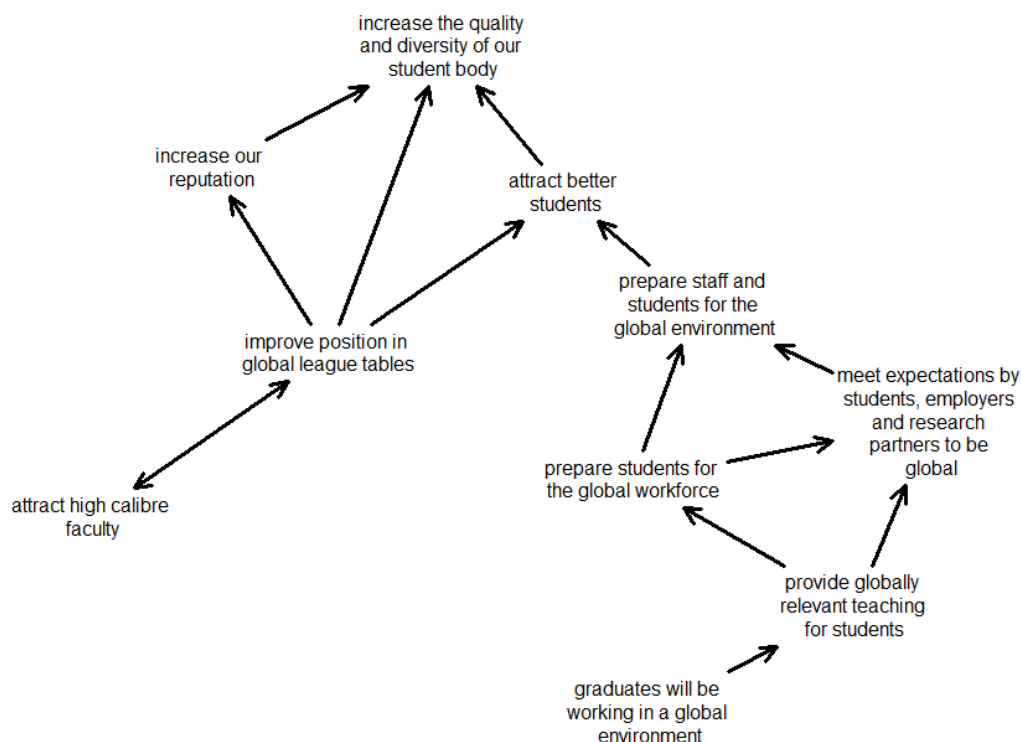


Figure 8.2 Excerpt of causal map with a feedback loop

The trap to avoid here is to draw a feedback loop between just two concepts, in which A influences B and vice versa. Instead, the facilitator asks team members why there is a relation back from B to A, and add that to the map. In the example above there is a direct impact of

improving position in global league tables on attracting high calibre faculty, but the relation in the other direction is perhaps less clear. Indeed, the impact is indirect: attracting high calibre faculty improves the capacity and capability to conduct world leading and internationally recognised research, which in turn enables to carry out research that addresses the global challenges, which increases the reach of research impact and thus improves citations, which then improves position in the global league tables. This line of argumentation is shown in Figure 8.3

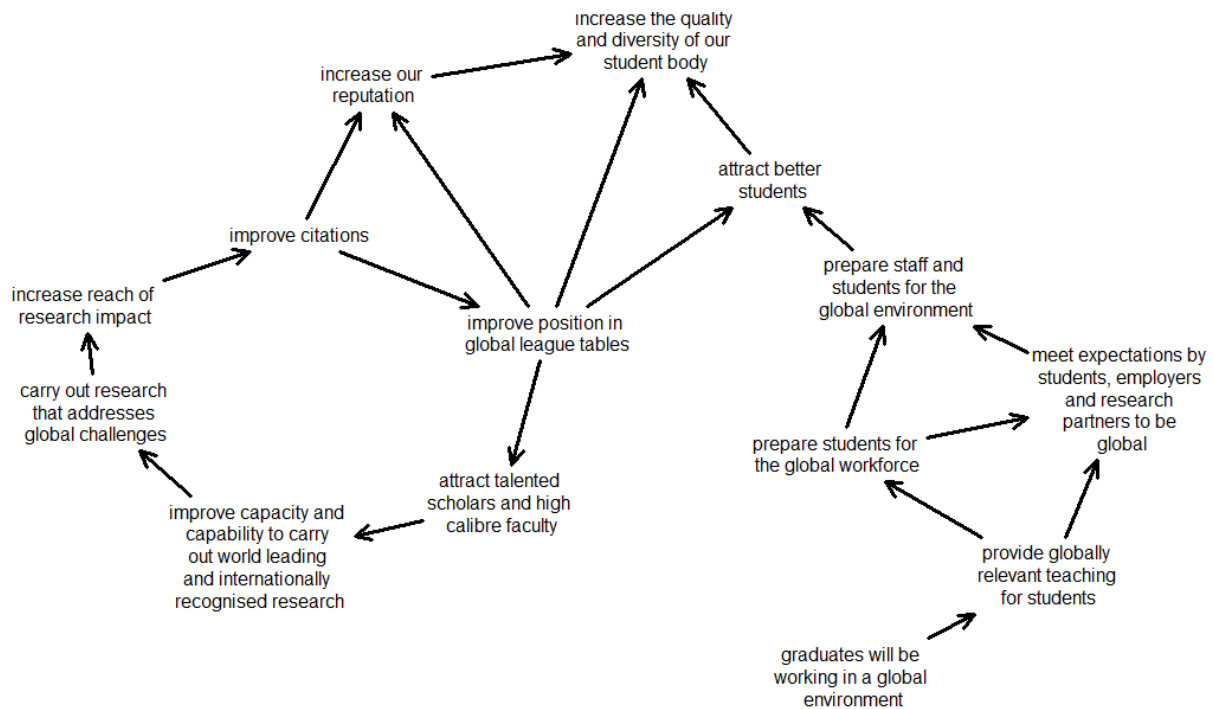


Figure 8.3 Excerpt of causal map with the feedback loop explained

As team members keep adding concepts and relations, the map may grow to become quite large. Ackermann and Eden (2001) report that maps often consist of more than 800 nodes. In this case noting concepts within the space of whiteboard is not feasible. Instead, a wall surface covered with flipcharts can be used, and team members' statements can be placed directly on the flipchart-covered wall. Figure 8.4 shows a very large causal map that resulted after spending substantial time on linking.

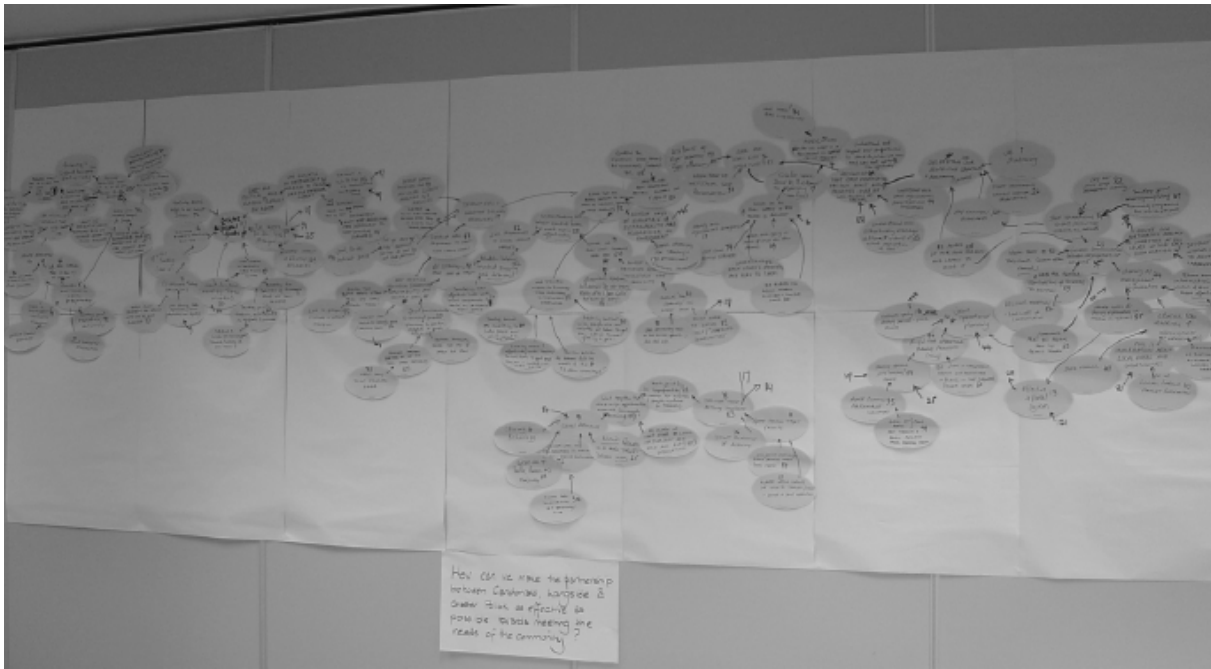


Figure 8.4: Large causal map displayed on a flipchart-covered wall (cf. Eden & Ackermann, 2010)

A complicated map like the one above may be broken down into separate sections. In order to do that, the facilitator can look for clusters of linked issues<sup>12</sup>. All the issues in a particular cluster can be brought to a separate view or section of the map to allow further elaboration. Starting with the first 'issue cluster', the facilitator starts the elaboration process by laddering down and up from the key issue identified in that cluster. 'Laddering down' means asking for actions that help to resolve the key issue in this cluster. The facilitator now tries to arrive at concrete actions and adds these to the bottom level of this map view. Concrete actions indicate the 'who', 'what', 'when', and 'where' of a proposed option. 'Laddering up' means going from the key issue up to its implied high-level goals. This can be done using questions such as: 'if we resolve this issue, or achieve this subgoal, what will happen? What will this help us achieve?' Once a goal is reached that is good in its own right, so does not lead to further goals, this section of the map does not need to be expanded further.

The last part of the mapping session is the identification of priority issues. Typically, the facilitator asks: "*since we cannot work on all of these issues at once, we need to identify where we want to spend our time and energy first*". Participants each receive a number of votes (about two thirds of the number of items to vote on) and, if relevant, one 'veto' vote. The facilitator then asks participants one by one to place their votes, allowing them to either give one vote to each issue they find important, or give several votes to an issue that is particularly important. Having an overview of the issues and their associated goals can help participants with the voting task. After each participant has assigned his or her votes, the facilitator summarises results with the whole group. A logical end point is to look at the high priority issues and the proposed actions that help to resolve those. If actions seem to block one another, an extension of the process would require a compatibility analysis of the actions.

<sup>12</sup> When working with the *Decision Explorer* mapping software, analysis tools are available to help with this. For example, 'central' and 'domain' are two routines that examine the structure of a map and help to identify concepts that are well-elaborated and have a high density of links around them.

### 8.3. Versions

As indicated above, instead of a whiteboard, group causal mapping may be supported by using computer-supported technology. When using *Decision Explorer Connect* team members have each access to a laptop or tablet (similar to a Group Decision Support Systems described in Chapter 3). In the divergence phase participants can add concepts anonymously. After a first round of discussing the concepts and clusters, participants can then also add relations using their laptops or tablets. This typically creates a profusion of links very fast. Both *Decision Explorer* and *Decision Explorer Connect* offers a range of analytical routines to help find ‘busy’ concepts, feedback loops, and candidate options or actions that have the potential to achieve many goals at once (i.e. ‘potent’ options and actions).

Both the manual– and computer–supported version of group causal mapping can be used to support the management of complex problems, but also for strategic decision making. For example Eden and Ackermann (2000) show how mapping can help to identify an organisation’s distinctive competencies. These are the basis for a business model or, in the case of a public organisation, a livelihood scheme. Constructing a business model in this way helps to craft a mission statement that is anchored in the organisation’s day to day work and represents its identity better than a top-down developed statement. Group causal mapping has also been used for the elicitation of systemic risks (Ackermann et al., 2014) and the analysis of disruption and delays in large complex projects (Eden et al., 2000).

### 8.4. Applications

Applications of group causal mapping to real-life problems both in isolation or in combination with other intervention methods are reported in various reviews (Abuabara & Paucar-Caceres, 2021; Howick & Ackermann, 2011; Mingers & Rosenhead, 2004). The large number of case studies shows that the approach is used across different countries and in multi-national organizations such as Shell, British Airways as well as public sector bodies such as the UK Department of Health. In these applications group causal mapping supports the negotiation process resulting in a consensus view on the problem situation (Eden & Ackermann, 2004; Hjortsø, 2004; Paroutis et al., 2015).



## Chapter 9. Application: Prioritising projects to tackle teenage pregnancies in a multi-cultural neighbourhood (I)

This chapter describes an application of group causal mapping with the London Borough of Newham's strategy group tasked with reducing teenage pregnancies. Group causal mapping constituted the first part of a mixed-method intervention. The second part of the intervention, decision conferencing, is described in Chapter 11. This chapter draws on the work by Ewan Lord and Alberto Franco (Franco, 2013; Franco & Lord, 2011; Lord, 2009) who acted as facilitators in the case. In 1999 a report by the UK government's Social Exclusion Unit highlighted the severity of the problem of teenage pregnancy in the UK. Up to 2005, the teenage pregnancy rate in the UK remained similar to that in the 1970s, while in most of Western Europe it halved. In response the UK government set demanding targets to be achieved by 2010. The direct client in this case is the team tasked with making the strategic decisions to achieve the 2010 target, the Teenage Pregnancy Strategy Committee (TPSC). Around 2006 the TPSC realised that although ongoing projects had reduced the teenage pregnancy rate, it had not done so at a pace sufficient to achieve the TPSC targets by 2010. As a result, the TPSC recognised it needed to explore more effective and efficient ways to achieve its targets. Below we describe the motivation for starting the project, the cognitive mapping interviews, the group causal mapping session, resulting model and its impact.

### 9.1 Background and issue

In 1997, the New Labour government in the UK coined the term 'joined-up government' to capture its approach to public sector reform. The term encompassed a wide range of activities and developments intended to improve services for particular social groups or populations, including substantial cross-organisational work to tackle complex social and economic issues. One such issue concerns the impact on welfare systems and society as a whole caused by people becoming disconnected from schooling and further education, and hence the labour market. Drug-taking, crime, family breakdown and teenage pregnancy are often cited as possible explanations for this phenomenon. With regards to the latter, teenage pregnancy rates in the UK in the early 2000s were twice as high as in most Western European countries. Tackling teenage pregnancy was a priority for the government and, in 2002, all local authorities in England were required to set up a Teenage Pregnancy Strategy Group.

The client of the intervention described below was one such group working for Newham, a borough that encompasses a large area in East London with inhabitants of diverse ethnic and religious backgrounds. Newham had been experiencing significant issues of social deprivation and poverty. The area also has a disproportionately young and needy population and a much higher rate of pregnancy amongst teenagers than in other London boroughs. Indeed, the borough has one of the highest teen-age pregnancy rates in the country. In 2003, the number of conceptions for teenagers within the 15–17 year-old range was about 55 per thousand, and the borough was under high pressure to bring this number down to below 30 per thousand by 2010. The team tasked with making the strategic decisions to achieve this target, the Teenage Pregnancy Strategy Committee (TPSC), was made up of representatives from the borough's council, the National Health Service, the education authorities, and other stakeholders such as the voluntary sector which included young parents' representatives. Its budget was made up of a complex mix of direct funding, contributions from participant organisations, and government



incentives for achieving certain targets and key performance indicators. Not meeting the 2010 target would thus also directly affect the resources of the TPSC. The TPSC wished to explore more effective and efficient ways to achieve their teenage pregnancy rate targets, and agreed to focus on the budget prioritisation process as a useful mechanism to achieve this.

Ewan Lord, a MSc student at the time, was looking for an opportunity to work on a real world complex issue for his MSc thesis research. He was acquainted with the Newham TPSC coordinator and they discussed the possibility to work with TSPC as part of a MSc thesis. While the client organisation had much experience in using and participating in research, they were less familiar with team decision support. An initial meeting in 2009 between Lord and Franco (who would act as the thesis supervisor and co-facilitator) and the TPSC coordinator was held to explore the possibility of conducting an action research project with the TPSC. Initially system dynamics was proposed as the way forward. Group causal mapping, using Group Explorer, would provide the basis of the model. Parameters would be estimated on the basis of literature and expert estimation, perhaps using the Delphi method. Historical reference data would validate the model, followed by a workshop on policy simulations that was expected to create an opportunity for organisational learning. This methodology was however rejected early on, for several reasons. Capturing the structure responsible for the issues at TSPC was considered too ambitious for a three month project. Some of the feedback loops involved were deemed to play out on a too long time scale to be relevant to the 2010 targets. Stakeholders' lack of alignment between interests was seen as a central factor in this issue, and an alternative approach was chosen that focused more directly on interests. After some discussions it was mutually agreed that focusing on the budget prioritisation process would be potentially beneficial to the TPSC. The study was to be a paid MSc master thesis project with University of Warwick and the TPSC coordinator would act as the sponsor of the project. Ewan Lord and Alberto Franco would act as facilitators in the group meetings. While Ewan had been trained in the use of the methods to be applied in the project, he was less familiar with the decision evaluation software (Equity) that would be used to build a value tree. In addition, he did not have extensive experience as a facilitator.

The intervention was designed as a mixed-method approach comprising two phases. The first phase was to consist of problem structuring, using interviews as well as group causal mapping to achieve a shared and improved understanding of the issues related to teenage pregnancy. The second phase would entail budget evaluation using decision conferencing. The goal was to highlight a portfolio of projects which would produce the highest value in relation to the aims of the TPSC. There was an acceptance that this could only be conditionally prescriptive.

## 9.2 Process

In preparation for the interviews and sessions, suitable participants were identified using a power-interest grid (Bryson, 2004). Due to lack of time this was done backroom rather than with the client. People with the highest combination of power and interest were targeted for participation in both group causal mapping and decision conferencing; those high in interest only were targeted for problem structuring; and those high in power only were also targeted for decision conferencing. The resulting grid is shown in Figure 9.1; the participants in the different project phases in Table 9.1.

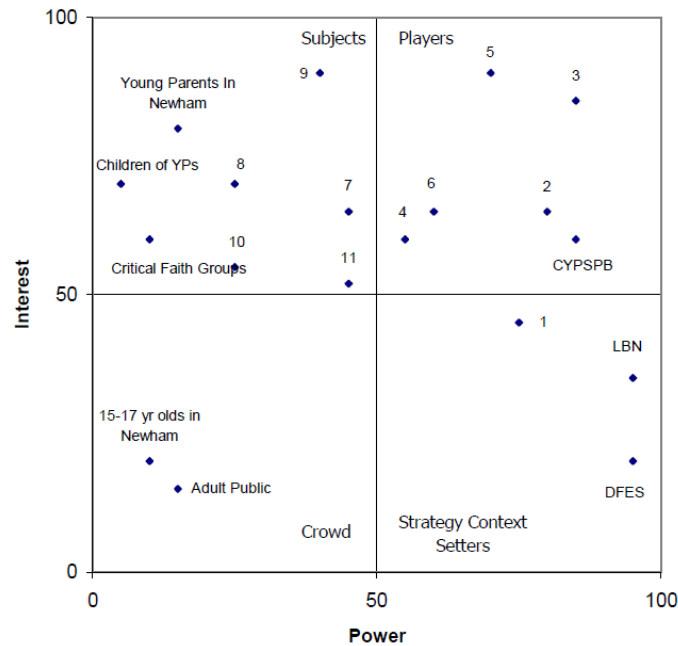


Figure 9.1. Power-interest grid (cf. Lord, 2009)

		<i>Interview</i>	<i>Group causal mapping</i>	<i>Decision conferencing</i>
1.	Civic representative on LBN strategy board		X	
2.	Assistant director of Community Care (Primary Care Trust) Co-chair of Teenage Pregnancy Strategy Group		X	X
3.	Children and young people's commissioning manager (LBN) Co-chair of Teenage Pregnancy Strategy Group	X		
4.	Family planning lead Chair of prevention sub group	X	X	
5.	Teenage pregnancy strategy coordinator	X	X	X
6.	Principle services manager for continuing professional development at LBN Learning and schools representative	X	X	
7.	Children's rights and sex education representative	X	X	
8.	Support to parents personal advisor	X		
9.	Young parents forum representative	X		
10.	Prevention sub group project manager			X
11.	Communications sub group representative	X		X
	<i>Total</i>	8	6	4

Table 9.1. Participants in interviews and two sessions (cf. Lord, 2009)

### 9.2.1 Cognitive mapping interviews

The main aims of the mapping interviews were to elicit values for the definition of criteria and to generate alternatives to be used in the multi-criteria decision model. Mapping would help to identify causal chains of argument between actions and goals. Making these chains of argument explicit would not only support existing actions but also trigger the generation of new actions. Eight available interviewees were identified from the power-interest grid. Interviews were scheduled to be conducted over a period of two days. All interviewees reported to the TPSG and all except for the Support to Parents Personal Advisor were decision makers on the TPSG. Each interview was scheduled for an hour. Where possible the order of interviews was scheduled such that those with highest power were interviewed first, so that any prompts

required by the interviewer when guidance was necessary were framed by earlier interviews. Interviews were mapped on A3 paper with pencil and eraser and recorded on audio with the interviewees' consent. The audio recordings allowed the interviewer (Ewan Lord) to check maps later, as a backroom task. Interviewees were informed that transcription of the interview would be confidential, except that the content would be merged with content from seven other interviews and presented to others in and around the TPSG and included in the final report. At the close of the interview participants were asked whether they wanted to leave anything out or wanted to change any of the language in the interview in case they were worried about being identifiable in the merged content.

The starting question for the interviews was 'What do you think will be the issues in and around teenage pregnancy in Newham until 2010?' This was intended to focus interviewees on the period from the time of the interview up until to 2010 which is when TPSG's final objectives were set and the organisation's existence may come into question. They must focus their strategy and policy on this period of time. Interviewer and interviewee sat at a 90 degrees (or less) angle, allowing the map to be seen by both. In order to elicit values, questions were posed to allow laddering up from the interviewee's most important issues. A typical example in reference to a particular issue was: why is this issue important to you? Laddering down was used to identify actions that would influence issues. This usually involved questioning along the lines of: what causes this issue? Or: what could you do to tackle this? Interviewees were asked to accompany the expression of goals and actions with action verbs in order to produce a map of action. Approximately 15 minutes were intended for exploring issues important to the interviewee, 15 minutes for laddering up to goals, 15 minutes for laddering down to actions and 15 minutes for clarifying and adding detail and checking the diagram. This schedule was not rigidly adhered to but passed quite naturally.

After completing all eight interviews the resulting material was analysed. The seventh map was from the interview with a failed recording. The owner of the eighth map was keen to add links to the rough sketch which were already represented indirectly via other concepts. The shape of the resulting cognitive maps elicited immediately revealed some differences among interviewees (e.g. wider, flatter maps versus narrow, taller maps). An overall map was produced by merging the individual maps using Decision Explorer. Clearly clustered teardrop chunks in cognitive maps were put into sets. Clusters relating to similar issues in other maps were put into sets with similar names so that points at which to merge the maps could be sought between these clusters. Further clusters were defined as sets in each map based on central concepts in each of them. These concepts were identified by a 'centrality' analysis in Decision Explorer. Sets were allowed to overlap. Clusters were grouped into the following nine themes:

1. funding (defence, integration, generation)
2. intelligence (funding influence, prevention, customers)
3. promotion (advertising, word of mouth)
4. support to young parents (housing, education, life skills)
5. prevention (contraception, vulnerability, confidentiality, termination of pregnancy)
6. self-esteem (choice, stigmatism, confidence, opportunities)
7. sex and relationship education (schools, non-school)
8. involving young people (in decision making, in support)
9. health (sexual, general)

Figure 9.2 below shows the relations between themes and clusters.

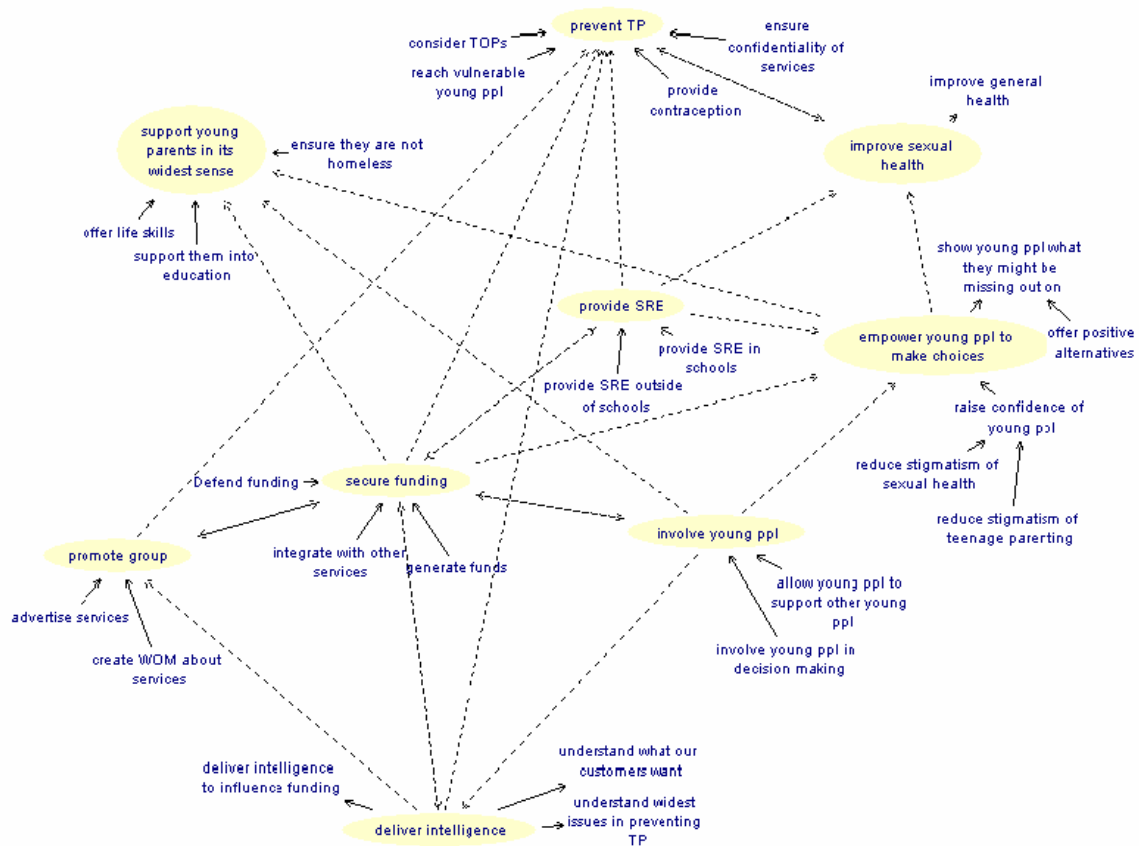


Figure 9.2. Themes and clusters derived from cognitive maps (cf. Lord, 2009)

Analysing and merging the individual cognitive maps helped to prepare for the group meeting in a number of ways. The software allowed for accommodating similar views by merging map nodes without altering the underlying map structure. Differences in views were preserved (but kept anonymous), so that they could be aired during the group causal mapping workshop. Following Eden's guidelines (2004) for analysis of the individual maps revealed the different multi-organisational tensions present within the TPSC. These mainly originated from strongly held views within the TPCS about how to tackle teenage pregnancy issues. The merged map also showed which goals and values were shared amongst the group.

### 9.2.1 Group causal mapping session

The following agenda was developed for the group causal mapping session.

Procedure, agenda and products
<p style="text-align: center;"><b>Session 1</b></p> <ul style="list-style-type: none"> <li>- 09.30h arrival client team and introductions (1)</li> <li>- 09.45h begin building group causal map (2, 3)</li> <li>- 10.30h develop selected clusters further (4)</li> <li>- 11.30h surface goals (5)</li> <li>- 12.00h develop goal system (5)</li> <li>- 12.30h begin generation of action alternatives (5)</li> <li>- 13.00h lunch – allows reflection for further option generation (5)</li> <li>- 14.00h continue option generation (5)</li> <li>- 14.30h build first iteration of value tree</li> <li>- 15.00h criteria structuring</li> <li>- 16.00h agree on areas of alternatives for decision model</li> <li>- 17.00h adjustments, questions, what's next?</li> <li>- 17.30h close</li> </ul> <p><b>After meeting:</b> <i>workbook with individual cognitive map and merged map</i></p>
<p style="text-align: center;"><b>Procedure group causal mapping</b></p> <ol style="list-style-type: none"> <li>1. ask an action-oriented question or prompt</li> <li>2. note answers (issues) on board</li> <li>3. link issues</li> <li>4. split a large maps into issue clusters</li> <li>5. for each issue cluster, ladder up to goals and down to actions</li> </ol>

Table 9.2. Group causal mapping procedure, agenda and products (steps 1-5 in the procedure are added to the relevant places in the agenda; products are in *italics*)

Six participants were invited to the workshop, four of whom had been interviewed resulting in maps. These four had not been shown their cognitive maps before the meeting, so as not to further lock them into their own models. Reinforcing their own views could be a further obstacle to achieving an open form of conversation in the team meeting. Participants were also not shown the merged map before the meeting. This group of six included one participant who was not from TPSG but from LBN's Strategy Board. He was included as he has influence over the TPSG and LBN funding stream and also because he had a role as a faith groups representative which was considered an important input to considering the issue.

The workshop was arranged at Warwick Business School away from the workplaces of the participants. This allowed the laptops, one for each participant and facilitator, their projector and network to be set up and tested on a previous day. Unfortunately the room was the third choice for various practical reasons and was not ideal. Although a U shaped set up closed by the projector was achievable it was only just. The windows were boarded up due to building works going on behind them, further enclosing the space and adding a noise distraction but also removing a visual distraction from the projected group map. It was a hot day and there was no air conditioning. The poor quality of the room was explicitly criticised by the client. Alberto Franco facilitated the group conversation and operated the software; Ewan Lord took notes.

The following question was written on a whiteboard so that participants could refer back to it during the divergent phase: what issues must TPSG consider in trying to achieve its targets by 2010? As with the interviews this question was crucially influential in framing the context. This

question was changed from that posed for interviews because this was for a group rather than a one-on-one interview and because facilitators wanted to emphasise action. Anticipating that participants would contribute a lot of material, 'must' was chosen to focus on what was most important rather than 'should' or 'could'. The projection was left off as participants used Internet Explorer to enter concepts. The intention was to proceed with a second round of idea gathering with the projection of all concepts. In 25 minutes 144 concepts were gathered. As normally about 30 concepts might be expected the group indeed was very productive in generating ideas. This activity took longer than planned but as the participants were still generating ideas the facilitators agreed between themselves to let them continue. The contribution of concepts was not equally shared amongst participants with one contributing 32% while another only contributed 4%. An equal split would have been 17% each. The participant who contributed few ideas was the non TPSG member so this low contribution may legitimately been from a lack of ideas or an acceptance of the relative expertise of others in the group. The participant stated concern, however, that some of their contributions were repetitive. The facilitators also noted some difficulty with the technology.

The large number of concepts gathered and the free format in which they appear on the screen made the first visual depiction of collected ideas rather complex. To the participants, the surprising mess presented once the projection was subsequently switched on may have been impressive but was certainly not clear. It was decided that there was no need for a second stage of gathering concepts and the facilitators moved the group to the next phase of untangling the mess. This was done by asking the participants to look for related concepts and bring them together. Once a group had a handful of concepts it was moved to a new 'view' in Decision Explorer and causal linking was explained and begun. Further concepts were brought into the clusters from the starting screen (with the initial set of ideas) as each was developed. By lunch time there were five well-developed clusters and two which were hardly begun. The seven working clusters were: 1. funding, 2. support to parents, 3. clinical services, 4. sex and relationship education, 5. strategy and communications, 6. workforce development and 7. young people's involvement. Discussion had been reasonably intense with four out of the six participants sharing most of the conversation. Of the other two one was tired, probably compounded by the environment, and the other was the participant who was not a member of TPSG. When one of these two participants had something to say the facilitators made sure they were heard. Being aware of which issues these two participants were expected to have expertise on and having interviewed and mapped one they were given some encouragement to contribute when these issues were discussed. The facilitators however avoided to steer the conversation to them to avoid taking a position on content. As such any steering was done as much as possible discreetly and via body language. In deciding where to focus his efforts, Alberto Franco tried to balance several needs. On the one hand, he wanted to ensure participants would see the results of the workshop as legitimate and for that to happen he needed to avoid 'polluting' the group model too much with expressions of his own mental model. On the other hand, because of the large number of ideas generated in the activity of the day he wondered if the aims of the workshop could still be met in the time available. While preferring to keep to the original agenda to avoid confusing the group, his concern grew that a change in the schedule might be needed to accommodate both the large set of ideas and meet the workshop aims.

After lunch the conversation deteriorated. Only half the participants really contributed to the conversation and one or two members dominated. Nevertheless, in facilitating the group Alberto Franco concentrated on getting consensus on the results needed to move forward to the decision evaluation model after the day. He decided to rely on the participants and second facilitator to monitor group dynamics, while he concentrated on the structuring of a value tree.

Once constructed this could be used as a tool to improve conversation and reach consensus. The meeting agenda offered some flexibility in the sense that it was not essential to conduct option generation during the workshop. Options could be collected from documents, individuals or in the second group meeting. Option generation was dropped from the schedule to free up time for criteria structuring. Since the map was going to be used for the decision evaluation model it was considered essential to surface the goal system. However, there was not enough time remaining to ladder up from all seven clusters and clusters were not fully developed yet. To ensure that the best possible use of time was made and the group would discuss the most important matters first, participants were asked to vote on the importance of issues. Unfortunately it was difficult to get away from the nature of a vote as something which somebody wins and so rather than helping the group to move on the voting results raised much debate about which issues were most important. The group also felt the vote would influence the outcome of the model. Team members could not be reassured that the vote was a mechanism to select which topics to discuss within the time limitation. The choice of what to vote on may also have been a factor here. Participants were each asked to vote on individual concepts while it may have been less contentious to vote between clusters, as they had already worked on these and reached some level of consensus on what they entailed.

Although about half an hour was allowed to debate the conflict of opinion which centred around the relative importance of ‘improve data analysis’ and the two concepts relating to ‘uptake of contraceptive services’, with only about an hour left the facilitators moved the group to the next point on the agenda. Although surfacing goals and developing the goal system was essential in linking the results of group causal mapping to the decision evaluation model there was no time for this. As an alternative and goals and values were elicited via direct construction of a value tree. To change the focus of the group after the conflict over voting, the structuring of a value tree was moved from the projected screen to a whiteboard. The jump in process from map building to a structure which required technical consideration and resulting confusion proved difficult to overcome. Although a value tree was not completed by 17.00h, input for structuring of criteria could still be gleaned from what was produced (see Figure 9.3). Due to the rush to achieve a result this was probably influenced too much by the facilitator.

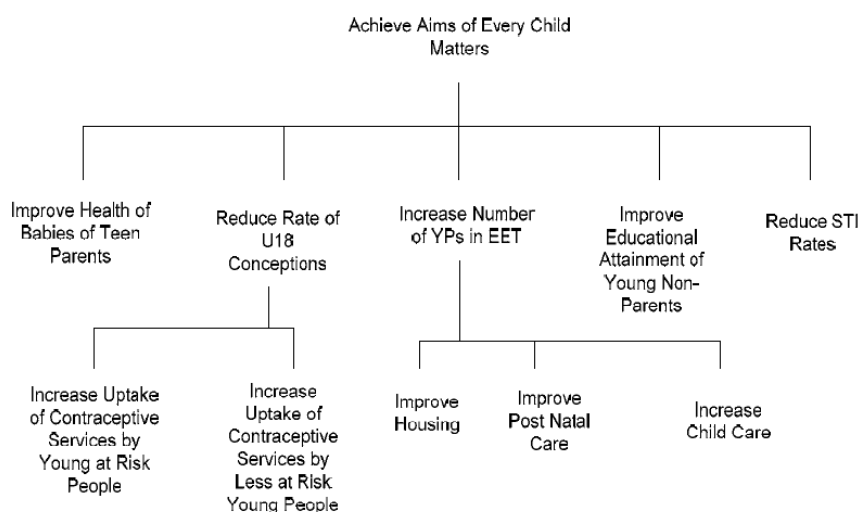


Figure 9.3. Initial version of value tree (cf. Lord, 2009)



### 9.3 Final product

The group map consisted of about 160 concepts, 31 of which remained orphaned. The merged map constructed on the basis of the eight individual maps contained over 600 concepts of which nearly all were linked. However, although the eight cognitive maps was a rich source of material they were merged by the interviewer. The group map on the other hand was constructed in a facilitated group conversation and is owned much more by the group than the merged map. Apart from the differences in the maps, they were also complementary in that they validated each other to some extent, especially as the list of team members was not identical to the list of interviewees. The results of the merged map, group map, the vote on issues and attempted value tree were compared in the following way. First the clusters identified in the merged map were compared to those named in the group map. The maps matched on most clusters. Second, the concepts with the top 20 centrality scores in the merged map and group map were compared. Results again showed large overlap between the content of the two maps. Third, values were analysed by comparing the top ten most central heads of chains in the merged map with that of the group map. These were also compared with the elements of the attempted value tree and the issues selected for voting by the group in the workshop. In interpreting the results we need to keep in mind that major goals are not necessarily heads, that the value tree was largely unusable and that the issues voted on were hotly disputed. The comparison pointed to matches or at least structural relationships between the different analyses. Fourth, a comparison was made between the 20 most potent actions in each map. This revealed more differences than in the prior analyses. Although it was possible to find actions in similar areas of both maps the actions were not the same. This suggests that perhaps there were many more actions to be gathered than were possible in the time available for constructing the group map.

In conclusion, the group causal mapping workshop did not provide as solid and sure results in as much depth and variety as the merged map. The group map was not complete. This however does not make it invalid as the group were more likely than not to have focussed first on the issues they considered most important. Although the portions of the merged map were provided to the interviewees along with their cognitive map with some explanation and analysis, there was probably more ownership felt of the group work than the interviews and resulting maps. Participants probably had a better understanding of the group map (compared to the cognitive maps) as they were involved in construction of the map, and were confronted with other people's arguments explicitly and visually. By expressing themselves in front of the group they had also committed themselves, at least to a degree, to the resulting group map.

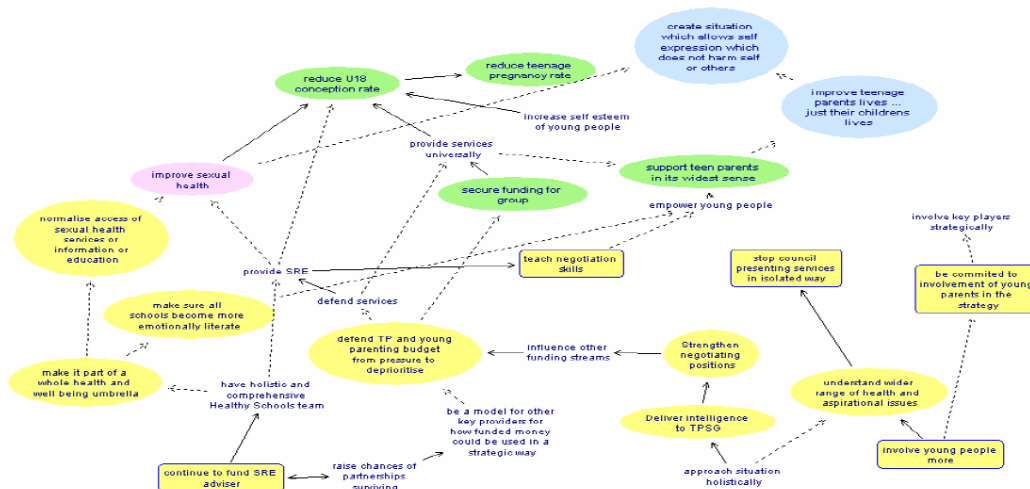


Figure 9.4. Central issues in merged map (cf. Lord, 2009), see text for explanation of colours and shapes

In the map in Figure 9.4, colour and shape are used to highlight concepts which were shown up by quantitative analysis of the maps to be significant or were stressed as significant during the interviews. Green ovals indicate goals expressed as specific to TPSG. Pink ovals represent goal that are more primary for an organisation other than TPSG. Blue ovals stand for higher or meta goals to which TPSG contributes. Yellow ovals are facilitative goals which may be worth aiming for on the way to achieving TPSG or higher goals. Yellow boxes indicate actions which were stressed or analysed to be potent in achieving goals.

The structured problem as perceived by TPSG could be characterised as follows from the analysis: TPSG need to provide services universally in order to reduce, before 2010, the under 18 conception rate by normalising access of sexual health services. In order to increase the uptake of confidential, young people friendly, contraceptive services at risk people need targeting and signposting improving. These services are under threat and funding needs securing. There is recognition that good research is powerful in improving effectiveness by understanding the mechanisms of cause and effect better, identifying at risk people, and defending services by demonstrating need and success.

## **9.4 Implementation and results**

The cognitive mapping interviews and group causal mapping session reported here constitute the first half of a mixed-method intervention. Chapter 11 reports on the second half using decision conferencing. This includes a description of the implementation of recommendations and results.

## Chapter 10. Decision conferencing

In this chapter we describe a participative version of Multicriteria Decision Analysis (MCDA), known as decision conferencing. This approach offers a clear way to compare decision options against relevant criteria. Decision conferencing is most concerned with prioritisation. It is therefore well-suited to the action planning phase of interventions, where solutions have to be formulated and then chosen.

### 10.1 Background

Chapter 4 described how the shortage of detention capacity in the Netherlands became increasingly urgent in the late 1990s. In reaction the Dutch prison administration developed a policy of early release, which freed up capacity for newly convicted persons. When learning about this, judges decided to increase sentence duration because their main concern was that sentences were served to completion. This illustrates that two decision makers who are involved in one and the same situation may see two different problems because either their perception of what is going on or their goals are different. Note that even if a complete description of the current situation could be made, we would still not have the full picture of a problem. Imagine we use the methods outlined in the preceding chapters and develop a causal model of the problem situation capable of explaining observed behaviour. Let's say we also build plausible scenarios of how the situation may develop into the future. While this would take a lot of time and energy and would certainly help us to understand better what is going on, it still ignores part of the relevant information. Without also understanding the desired situation, we still do not know what the problem really is. In our example: what does adequate capacity mean for prison administrators? Probably it would include to have enough room available to house those convicted for serious crimes immediately. Is it acceptable that others wait for a month, or several months? Can we cope with a temporary lack of capacity, knowing that the gap will be closed in a year? Is there a level of early release that is still acceptable to a judge? In the Dutch criminal justice system in the late 1990s, one third of a sentence would regularly be subtracted for good behaviour. This seems to indicate there is some room for not serving a sentence to full completion.

Interestingly, decision makers in this case may have not have readily available answers to these questions. A study by Bond et al. (2008) showed that even in important issues, decision makers find it difficult to list all the goals that are relevant. Zajonc (1980) found that people have an immediate affective reaction to situations, objects or persons, but need to find out and articulate why. The title of his paper captures this beautifully: 'preferences need no inferences', or in other words: you don't need to think before you have an emotional reaction, rather it is the other way around. We could say that preferences exist in System 1 and articulating them involves a step by step process driven by System 2 (see Chapter 1). It is not surprising that Belton and Stewart (2002: 80, 119) find that values and preferences are not already present and waiting to be elicited, but rather they are constructed by decision makers, possibly with the help of an analyst. This brings us to an important distinction between capturing the perceived situation versus the desired situation. Where in the first condition opinions of stakeholders can in principle be checked against other data sources (documents, information systems), there is much less room for triangulation in assessing the desired situation. Ultimately, the desired situation is hypothetical and exists in people's minds. Once it is made explicit it can be checked against the 'official' organisational policy or against decisions made in the past, but these are

in effect consistency checks with other statements of opinions and not observations of the real world.

There is a range of methods available to help decision makers establish and compare preferences. Some of these methods express resources spent (costs) or achieved objectives in monetary terms. Cost-benefit analysis (Adler & Posner, 2006; Boadway, 2006) requires the analyst to determine all the monetary costs and benefits associated with a particular option. The option with the highest net benefit (benefit minus cost) will be chosen. Important in this procedure is that all benefits and drawbacks will need to be expressed on a financial scale. In applying (societal) cost-benefit analysis, monetising effects is a major problem (Mouter, 2014). Another monetary method is cost-effectiveness analysis (Edejer, 2003). This approach is similar to cost-benefit analysis but allows effects to be expressed in non-monetary terms. These monetary methods do not specify a process to involve stakeholders and are not designed with messy problems in mind. MCDA is a method that can make use of non-monetary and qualitative information and has been developed into a facilitated approach. It enables the analyst to integrate information that is very diverse, using different scales, in which natural scales are not available and subjectivity plays a role. Decision conferencing (McCartt & Rohrbaugh, 1995; Phillips & Bana e Costa, 2007) is a facilitated form of MCDA.

The origin of decision conferencing goes back to the late 1970s (Phillips, 2007; Phillips & Bana e Costa, 2007). According to Phillips (2007), after over 25 years of use in over 15 countries, the following elements seem to be central to decision conferences: attendance by key players, impartial facilitation, on-the-spot modeling with continuous display of the developing decision model, and an interactive and iterative facilitated group process. Participants are chosen so that all main perspectives on the issues linked to the decision problem are represented. The facilitator's role is to guide the group process while remaining neutral with regard to content. The role of the model is to feed back to the group the implications of their input (Phillips, 2007). Models are created with support of software tools such as Hiview™ or MACBETH™, although it is possible to build a decision models entirely in a spreadsheet. Additions to the model are made on the basis of the group discussion, and because contributions need to be clarified and linked to the rest of the model, the model also informs the discussion (Belton & Stewart, 2002; Salo & Hämäläinen, 2010). Apart from decision conferencing, other decision modeling technologies are available that generally follow the same principles and phases. For instance, a recent approach, specifically developed for the choice of health interventions, is the evidence-informed deliberative method outlined by Baltussen and colleagues (Baltussen & Niessen, 2006).

## 10.2 Procedure, techniques and tools

Two simple examples will clarify the main issues in supporting prioritisation. The first might be seen as a very early use of process consultation in prioritisation. In a letter in 1772, Benjamin Franklin attempts to help his nephew in choosing whether or not to switch to a new job. Franklin does not advice on which option to follow (an advice on content), but on a method to follow (process advice). His recommendation is to list arguments in favour of the new job and list arguments contra the new position. The decision maker should then choose two arguments of about equal weight, one pro and one contra, and take both off the list. After following this procedure through, one of the two lists will be empty and the answer to the problem will be clear. This letter is one of the first examples of an explicit procedure to arrive at decisions (Figueira et al., 2005). Note that arguments may be of different strengths or weights, in the sense that a strong argument pro may remove two or more weak contra arguments. The second

example concerns a straightforward decision making situation presented by Wijnmalen. The decision maker initially wants to choose two options based on only one criterion. Even in this simple situation, the decision can reach a deadlock in which the decision maker is unable to choose.

Procedure	
1.	identify goals, constraints and generic alternatives
2.	identify values, criteria and scales
3.	specify alternatives
4.	score alternatives on criteria
5.	determine value function
6.	determine weights
7.	choose aggregation method and synthesise scores
8.	rank order options and explain
9.	conduct sensitivity analysis
10.	recommend options
-	Activity/ technique: note down matrix, partial value functions and weights on board or screen
-	Tool: Board and pens, or decision room and a group decision support system

Table 10.1. Elements of multicriteria decision analysis (adapted from Phillips and Bana e Costa, 2007; Phillips, 2007)

Imagine there is an alternative A that scores 2 on the selected criterion, and an alternative B that scores 1. In this case we are still unable to make a choice. We would need to know what the score stands for: positive or negative scores. If the score is taken to mean a positive outcome, we would choose alternative A. The situation can be made slightly more complex by adding a second criterion, on which the score of alternatives is reversed (alternative A scores 1, alternative B scores 2). Adding up scores over all criteria would result in an equal score for both options: 3. Two pieces of additional information may help in choosing: either have more specific scores (knowing that alternative A respectively scores 2.05 and 0.97 while B scores 1.45 and 2.30 may help you in choosing) or adding weights to criteria. Weights represent how important criteria are to stakeholders. Introducing weights makes it possible to calculate weighted scores for each alternative which helps to prioritise them. For each alternative, we multiply the score on the first criterion with the weight of the first criterion, doing the same for criterion two and add up the results. If positive scores represent positive outcomes, the alternative with the highest weighted score is the best option, and so on.

	Weights	Alternative A	Alternative B
Criterion a	...	2.05	1.45
Criterion b	...	0.97	2.30
Aggregated weighted score		...	...

Table 10.2. Effect score matrix

Calculating scores on the basis of an additive model is a simple and widely used approach but others are available (Belton & Stewart, 2002: 120). Suppose that there is an alternative that scores equal or less than another alternative on all criteria. This means that the alternative is dominated by others and one way to limit the alternatives under consideration is to remove dominated options from the list. Another simplification in the example above is that scores directly represent the decision maker's preferences. Imagine that a decision maker has to choose between several job options. She does not want to move and considers alternatives that require less than 90 minutes of travel per day, with longer travel times less preferred. It is likely that her preference for five minutes travel time is not much higher than for 15 minutes travel time.

But a difference between 30 and 40 minutes may make a much larger difference in preference. In other words, the score of an alternative on a criterion is different from the value attached to that score. This is called a partial value function, which transforms scores of an option on a natural scale into levels of preference.

Constructing the problem in such a way that it is suited for MCDA requires that we make explicit alternatives (alternatively called options or solutions) that are expected to improve the situation, criteria (based on the desired situation or goals), scores of alternatives on a natural scale and their related preferences, weights of criteria, an aggregation method to integrate results and finally testing how sensitive results are to the assumptions we made. Belton and Stewart (2002) propose a series of steps to gather this information:

- exploring: structure the situation in terms of stakeholders, alternatives, external constraints and uncertainties, goals and key issues;
- model building: assess values and relate these to each other, determine criteria and natural scales for scoring alternatives on criteria;
- scoring: assess alternatives on a natural scale and determine partial value function;
- weighting: determine relative importance of criteria and normalise weights;
- aggregating: choose aggregation method, synthesise information and explain;
- analysing: assess sensitivity of results and robustness of conclusions.

Each step is discussed in the next sections.

### *10.2.1 Exploring*

As with all the methods outlined in this book, the process starts with a contact client who seeks help from an analyst or advisor. In decision conferencing as in other approaches, it is important to consider which stakeholders to involve in the analysis as a wider representation brings more information to the table and encourages implementation of results. As mentioned values and preferences are constructed instead of elicited, and it is very difficult to determine values for someone else. There are several examples of organisations that attempt to second guess their customers' preferences, only to find out that the new products or services are not liked or even actively opposed. An example is the smart electricity meter, which was rolled out in the Netherlands by electricity distribution companies. While expecting that customers would see the benefits of having more insight into their use of electricity and possibilities for saving, instead privacy of data turned out to be a foremost concern in customers' minds. After determining with the contact client who will be participating in sessions, the overall goals and constraints need to be clarified to the invited participants. The ultimate goal of decision conferencing is to rank order alternatives on the basis of multiple criteria. The process is transparent and auditable and leaves a clear track record that can be revisited should part of the process have to be repeated. Typically when the focus of a project is on prioritisation, some alternatives are already available and discussed in the organisation. New alternatives may be created (Belton & Stewart, 2002: 52; Friend & Hickling, 2005).

### *10.2.2 Model building*

The aim of the model building phase is to make explicit which values are important in the problem at hand and how we may concretely measure these. In decision conferencing, values are often represented in the form of a value tree. A value tree lists the overall objective at the top of the tree and breaks this down into operational objectives, which can be more easily employed to assess the performances of alternatives. An example of a value tree is shown below.

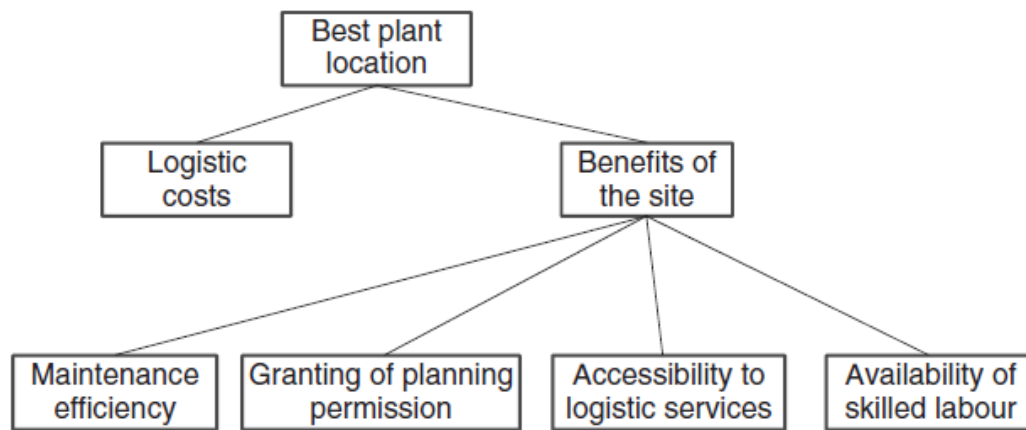


Figure 10.1. Example of a value tree (based on Franco & Montibeller, 2009: 6)

Value trees can be structured top-down or bottom-up. The top-down approach would start from the highest objective, here the best location for the plant, and break this down into logistic costs and benefits of the site. Costs and benefits are then further subdivided if needed. The bottom-up approach starts from the alternatives. Alternatives are grouped into different classes based on their attributes, classes can be grouped into higher order classes, and so on. According to Keeney (1992) it is important to employ a value-focused thinking approach as alternatives are mere means for an organisation to achieve its fundamental and strategic objectives. But as mentioned before, individuals struggle to identify their goals (Bond et al., 2008). A practical approach is to use group causal mapping as described in Chapter 8. These maps help to build an understanding of how actions, via issues, are linked to ultimate objectives.

When structuring a value tree, there are a set of properties against which each objective needs to be checked (Franco & Montibeller, 2009: 7):

- essential: capture all essential organizational objectives relevant to the decision;
- understandable: their meaning should be clear to all team members;
- operational: it should be possible to measure the performance of decision alternatives against each of the fundamental objectives;
- nonredundant: objectives should not measure the same concern twice;
- concise: the set of objectives should be the smallest possible required for the analysis;
- preferentially independent: if it is possible to measure the performance of decision alternatives on one objective disregarding their performance on all other objectives, then a simpler aggregation function can be used to aggregate partial performances.

After identifying values the next question is how to express values on a scale. Expressing values on a scale requires that for each objective placed at the bottom level of the value tree, an associated attribute or criterion is specified. This attribute is a performance indicator employed to measure the impact of each alternative on the objective. Attributes also have to be checked against a number of properties (Franco & Montibeller, 2009: 8). Attributes should be:

- unambiguous: present a clear relationship between the impact of adopting a decision alternative and the description of such impact;
- comprehensive: cover the full range of possible consequences if the decision alternatives were implemented;
- direct: attribute levels should describe as directly as possible the consequences of implementing a decision alternative;
- operational: information required by the attribute can be obtained in practice and allow for making value trade-offs between objectives;



- understandable: consequences and value trade-offs using the attribute can be clearly understood by the decision making team.

### 10.2.3 Scoring

In this phase of the process the effect matrix is created by making a table of all alternatives and criteria. Then the scores of alternatives on the natural scales are listed in the cells (see Table 6). Next is the translation of natural scores into preferences. An example of a value function can be seen in the graph below.

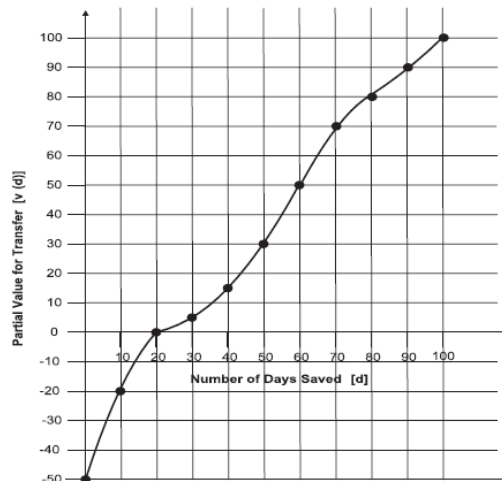


Figure 10.2. Example of a value function (Barcus & Montibeller, 2008: 471)

A practical way to determine preference scores is the bisection method (Belton & Stewart, 2002: 124). This comes down to asking the decision maker which point on the attribute scale is halfway, in terms of preference, between the minimum and maximum on the horizontal axis. This becomes easier when considering the midpoint on the natural scale first (in Figure 11, 50 days saved) and asking a question such as ‘is the progression from the lowest score to the midpoint a smaller or bigger increase in value than going from the midpoint to the highest score?’

### 10.2.4 Weighting

When determining weights, the principle of swing weighting is important (Keeney, 2002). This comes down to the following process. First, assume all alternatives would score (fictitiously) minimal on all criteria. Determine on which criterion is (maximum) improvement most required and which criterion is next (ordering criteria). This can be implemented in the following way. For a given criterion, the facilitator asks the group to look at the least preferred option on that criterion, then at the most preferred, and consider how big that difference is for that criterion, and how much that difference matters to them. Find the criterion with the biggest difference that matters, and give that criterion a swing weight of 100. That becomes the group’s standard for comparison. Second, assign points to relative value of ‘swing’ from minimum to maximum. Keep comparing the value of the ‘swings’ on the criteria (quantifying criteria ordering) against the standard. The facilitator looks at each criterion in turn and compares its swing in value with the value swing on the standard and assigns a number less than 100 such that the ratio of that number to 100 represents the ratio of the value swings. Thus, if another criterion is judged to provide 80% as much value, going from 0 to 100, as the standard, then it would be given a weight of 80. Third, the facilitator records all the weights on a flip chart or the whiteboard.

#### *10.2.5 Aggregating and analysing*

In this phase the facilitator compiles the results (this is a good time for the participants to have a break). The facilitator then highlights any large differences between scores with the group. To rank the options, the facilitator multiplies the scores by the weights (weighted aggregation), adds up the scores, and sorts the options in order of score in a single column.

How robust is the ranking which has been found? A sensitivity analysis can be performed by changing the weights of the criteria. Using a laptop this step can be performed quickly, but this step must be explained and justified to the participants. Typically, the facilitator spends time explaining the results of the sensitivity analysis, highlighting options that appear robust or sensitive, and asks the participants for their reactions. If a participant disagrees with the ranking which has been found, then the facilitator can revisit previous steps in the process (e.g. choosing alternatives, defining criteria, weighting or scoring), which could explain the current ranking. Finally, the facilitator recaps the steps taken in the meeting, and summarises the resulting information in a performance matrix. The matrix includes scores that measure performance or attractiveness of options on a particular criterion. It also includes weights which indicate how important a criterion is versus the others.

### **10.3 Versions**

Decision conferencing and MCDA may be used in different ways depending on the measurement scales, aggregation method and weighting procedure. Approaches that have been used over the years are the following: SMART (1971), SMARTS (1977), SMARTER (1994) and MACBETH (2005). Marttunen et al. (2015) describe a range of approaches to involve stakeholders in preference elicitation and weighting. These include questionnaires, basing criteria weights on information about stakeholders' values and interests, individual interviews and group sessions.

### **10.4 Applications**

A number of studies have assessed the effectiveness of decision conferencing (Belton & Stewart, 2002; Marttunen et al., 2017; Phillips, 2007; Quinn et al., 1985; Rohrbaugh, 1981). McCartt and Rohrbaugh (1989) conclude that decision conferencing provides a fully participatory and goal-centred process. On the basis of a survey of 14 cases, this effect is explained on the basis of an opportunity for open and extended discussion. A retrospective study of 26 projects points to openness to change as another important variable that determines effectiveness (McCartt & Rohrbaugh, 1995). More recently, Schilling, Oeser and Schaub (2007) evaluate six applications of a so-called 'socio-technical' version of decision conferencing. Participants in their study evaluate decision conferencing as more effective than their current decision making procedures in terms of information exchange and information processing, and delivered better results. They also find that decision conferencing results in alignment on scoring of options.

## Chapter 11. Application: Prioritising projects to tackle teenage pregnancies in a multi-cultural neighbourhood (II)

This chapter describes an application of decision conferencing with the London Borough of Newham's strategy group tasked with reducing teenage pregnancies. Decision conferencing was used as the second phase of a mixed-method intervention. Group causal mapping constituted the first part of the intervention and is described in Chapter 9. This chapter draws on the work by Lord and Franco (Franco, 2013; Franco & Lord, 2011; Lord, 2009) who acted as facilitators in the case. In 1999, the UK government recognised the severity of the problem of teenage pregnancy in the UK and set new performance targets to be achieved by 2010. In 2002 local authorities were required to establish a dedicated unit to address teenage pregnancy. The direct client in this case is the Newham team tasked with making the strategic decisions to achieve the 2010 target, the Teenage Pregnancy Strategy Committee (TPSC). The TPSC realised that although ongoing projects were effective to some extent, continuing the current way of working would not be sufficient to achieve the TPSC targets by 2010. The TPSC wanted to explore more effective and efficient ways to achieve its targets. Below we describe the motivation for starting the project, the decision conferencing session, the resulting model and its impact.

### 11.1 Background and issue

The background to this case is described in more depth in Chapter 9. Here we summarise the essential elements. Around 1999 the UK government made tackling teenage pregnancy a priority. Three years later all local authorities in England were required to set up a Teenage Pregnancy Strategy Group. The client of the intervention described below was one such group working for the East London borough of Newham. With one of the highest teenage pregnancy rates in the country, Newham was under high pressure to bring this rate down. The team tasked with making the strategic decisions to achieve this target, hereafter referred to as the Teenage Pregnancy Strategy Committee (TPSC), was made up of representatives of stakeholder groups representing among others medical services, local authorities, education authorities and volunteer organisations. The TPSC wished to explore more effective and efficient ways to achieve their teenage pregnancy rate targets, and agreed to focus on the budget prioritisation process as a useful mechanism to achieve this.

The intervention was designed as a mixed-method approach. The decision conferencing intervention built on the results of cognitive mapping interviews and a group causal mapping session. The overall goal of the intervention was to highlight a portfolio of projects which would produce the highest value in relation to the aims of the TPSC.

### 11.2 Process

#### *11.2.1 Results of group causal mapping and preparation for meeting*

Mapping was useful in managing some of the complexity in the problem, stimulating understanding, co-operation and commitment and identifying goals and actions. This made the problem context explicit which is probably best summarised by the cluster map (see Figure 9.2). However, in the main due to a lack of time, the link between problem structuring and the decision model was not as seamless as originally intended. At the end of the first session point

there was no agreed and specified set of value criteria for use in the decision model and no agreed set of options to be evaluated. In anticipation of time constraints in the decision conferencing workshop, it was decided to include only a handful of criteria, around four or five. Without opportunity for another workshop before the decision modelling meeting it had to be decided whether to begin the meeting with a set of criteria or to specify them with the team. The team in the decision conferencing meeting included two participants who had been in the first workshop, one of whom had been interviewed, a third participant who had also been interviewed, and a fourth who was familiar with the project but had not been involved until that point. It was decided that the team's time in the decision workshop would be best spent on scoring the model. The one person who had been involved throughout all stages of the project was the Teenage Pregnancy Strategy coordinator who was also the project sponsor. In recognition of the complex situation's need for joined up working, a coordinator positioned for a strategic overview was deemed central to each TP Partnership Board. As he had been involved intensively in analysing the problem context, the coordinator participated in structuring the value criteria together with the facilitators.

The following benefit criteria, against which each alternative's impact would be evaluated, were agreed upon and checked against the technical standards required of a multi-criteria analysis model:

1. reduction in number of conceptions amongst 15 to 17 year olds in Newham
2. number of young parents into education, employment and training in Newham
3. extra benefits other than included in the first two criteria
4. speed of impact
5. sustainability of impact
6. confidence in achieving benefits

Criteria could be refined or adjusted during the workshop as long as technical requirements on preference modelling were adhered to. Cost is an essential criterion in order to calculate value as a benefits to cost ratio. Although other costs could be included it was defined in this use of the model as set amount of yearly funding for each alternative.

Although generating alternatives before criteria might be considered putting the cart before the horse (Keeney, 1992) it was often difficult to consider the technical requirements of criteria without knowing what the alternatives were. In contrast to the specification of criteria the generation of options is a much more open and creative process. As such past and current spending alternatives were collected from teenage pregnancy documentation and accounts, and new ideas from cognitive maps, the group map and the coordinator. Option generation can continue all throughout the intervention and the problem may be in limiting them. A list of 28 alternatives was constructed, 20 of which could be implemented at more than one level, and four of them at five or more different levels. This resulted in a far longer list of alternatives than is advised in the literature (French et al., 1998). The facilitators decided to focus alternatives for the first iteration of the decision model on existing expenditure and alternatives surrounding that. As the TPSG was realistically facing budget cuts rather than raises, lower levels of alternatives were also favoured for the first iteration. For example, if two 'TPSG events' were currently funded by the TPSG then alternatives were given for one, two and maybe three events in the first iteration. If the completed first iteration of the model recommended three then the alternative of 'one TPSG event' could be removed and an alternative of 'four TPSG events' added.

C	Clin Servs	Do Nothing	+ EHC Prog	C Card	3 Clinics	LAC Nurse	4 SHINE Workers	SHINE website
C	Media	Do Nothing	+ Annual newsletter	Current Campaign				
X	TPSG Events	Do Nothing	1 TPSG Event	2 TPSG Events	3 TPSG Events			
C	Y Ppls Involvement	Do Nothing	+ Y Pars Involvement	Y Ppls Involvement				
C	SRE	Do Nothing	+ SRE Advisor	School Conference	Faith Work	Peer Ed Projects		
C	S2P	Do Nothing	+ Housing Audit	Goody Bags	Y Parents Directory	Y Fathers Project	Y Pars Adv Worker PT	Violence Work
X	Youth Projects	Do Nothing	1 Youth Project	3 Youth Projs	9 Youth Projs			
C	Workforce Dev	Do Nothing	+ 2 TPSG Training	1 WFD session				
C	Strategy	Do Nothing	+ TPSC	Y Pars Dev Off PT	TPSG Intel Officer	TPSG Proj Officer		
		1	2	3	4	5	6	7

Figure 11.1. Initial list of alternatives. Rows indicate areas (organisational units or functions). White boxes represent alternatives, which are either mutually exclusive (marked 'X' on the left hand side) or cumulative ('C'). Abbreviations are as follows. SRE: sex and relationship education; S2P: support to parents. (cf. Lord, 2009)

In Figure 11.1 rows refer to areas, representing organisational units or functions (Phillips & Bana e Costa, 2007). Each area contains either alternatives that are mutually exclusive or cumulative. Instead of using only exclusive or only cumulative alternatives, the facilitators chose for a combination as this allows for a more sophisticated reflection of the complicated variety of decisions in the issue. This was also deemed appropriate as participants already had a grasp of the complexity of the issue, due to their involvement in problem structuring via mapping. Cumulative and exclusive areas are marked on the far left of Figure 11.1 with a 'C' or an 'X' respectively. In this initial model there are seven Cs and two Xs. The order of the areas was chosen for the following reasons:

- 1. Clinical services: three of the team members would have much knowledge and opinion on this area so it was seen as a good introductory area.
- 2. Media: although the Communications sub group deputy had knowledge and opinions on the Clinical services area, the other three had relatively more expertise in this area. Media was put second to bring her into the group more and because it had few options so could be passed relatively quickly.
- 3. TPSG events: this was put third to introduce an X area once the group were familiar with scoring C areas. This unfamiliarity was useful in raising the level of thinking about the construction of the model. It was more tangible than the other X area which was left to later.
- 4. Young people's involvement: small area to move things on.
- 5. and 6. Sex and relationship education and Support to parents: central issues in the problem structure were put here to remind the participants of the importance of what they were doing at a point anticipated that they might be flagging.
- 7. and 8. Youth projects and Workforce development: small areas of cheaper alternatives to move on.
- 9. Strategy: this was really a judgement of staffing although two of the four posts were not yet filled.

Whether to fund posts is a major consideration for the TPSG in setting its budget. Care over human resources when considering strategy was also mentioned in cognitive maps. This is why the facilitators left it until last when the group should have become familiar with the technique and able to give maximum concentration to the issues. It was also aimed at restimulating in case the group was tired at this point. Alternatives were included in the initial model according to the following reasoning: existing spending should be represented, intended future spending should be included, and at least some imaginative but feasible alternatives should be included. As it was not clear exactly how much time a round of voting would take, the facilitators chose to start simple, reflect and reiterate if time allowed. The TPSG could predict a budget range for the next couple of years within comfortable confidence limits. Further iterations of the model could then be made more useful by refining alternatives which appeared at the frontier (reflecting the most efficient projects) around this reasonable budget level. At the same time the model could be kept simple by removing alternatives that were clearly scoring lower than others.

#### *11.2.2 Decision conferencing session*

The second workshop was conducted about three weeks after the first workshop on premises in London familiar to the participants but removed from any of their workplaces. The environmental conditions were far improved from those in the first workshop mainly by the amount of space available. Only four of the intended participants were available, one of whom had not participated in either the first workshop or the interviews, one who was involved in the first workshop and one who had been interviewed. Only the sponsor, the TPSC coordinator, had been involved in all three (see Table 9.1). The main software support tool to be used in the session would be Equity (Phillips & Bana e Costa, 2007). Ewan Lord would facilitate the team and Alberto Franco would operate the software. The following agenda was developed for the session.

Procedure, agenda and products
<p style="text-align: center;"><b>Session</b></p> <ul style="list-style-type: none"> <li>- 09.30h introduction (1, 2, 3)</li> <li>- 09.40h score areas (4)</li> <li>- 11.00h within criterion weighting (5, 6)</li> <li>- 11.30h across criteria weighting (6)</li> <li>- 12.00h propose a feasible package under next years expected budget (7, 8)</li> <li>- 12.30h explore first iteration: examine nearby frontiers, sensitivity analysis, trade-offs (9)</li> <li>- 13.00h lunch</li> <li>- 14.00h SWOT analysis for further option generation (3)</li> <li>- 13.00h second iteration (4, 7)</li> <li>- 15.00h explore second iteration (8, 10)</li> <li>- 16.00h close</li> </ul> <p><b>After meeting:</b> <i>final report</i></p>
<p style="text-align: center;"><b>Procedure group causal mapping</b></p> <ol style="list-style-type: none"> <li>1. identify goals, constraints and generic alternatives</li> <li>2. identify values, criteria and scales</li> <li>3. specify alternatives</li> <li>4. score alternatives on criteria</li> <li>5. determine value function</li> <li>6. determine weights</li> <li>7. choose aggregation method and synthesise scores</li> <li>8. rank order options and explain</li> <li>9. conduct sensitivity analysis</li> <li>10. recommend options</li> </ol>

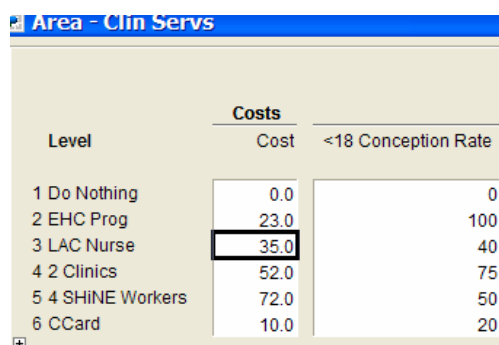
Table 11.1. Decision conferencing procedure, agenda and products (steps 1-10 in the procedure are added to the relevant places in the agenda; products are in *italics*). Note that part of step 1-3 was also addressed in the first (group causal mapping) session

After a very brief introduction of how the project had progressed so far and what the aim of this second group workshop was, the initial model was introduced. Facilitator Ewan Lord explained that each row represented an area of spending and each box in a row a spending alternative for TPSG. The difference between C and X areas was also explained. In anticipation of uncomfortableness over which area alternatives where exactly placed in, it was stressed that the group would build the model so that during the course of the day all was adjustable, that this was just a starting point and areas were for the purpose of managing the complexity of the decision problem.

Criteria were checked for understandability within the group and the scoring begun. Alternatives within the Clinical Services area were introduced and participants were asked: which alternative of the seven in this area would have the greatest impact on reducing the number of conceptions amongst 15 to 17 year olds in Newham (the first criterion)? The chosen alternative of 'EHC Prog' (emergency hormonal contraception program) was given a score of 100. They were then asked if any of the alternatives would have less of an impact than the 'Do nothing' alternative. None were judged to so and 'Do nothing' was given a score of 0. It was possible to have a 'Do nothing' score greater than zero if another alternative in the area was evaluated to have a worse impact on the criterion than doing nothing. The group were then



asked to rank the remaining five alternatives from second to sixth in terms of impact on reducing the number of conceptions as defined by the criterion. Each of these was then given a rating between 1 and 99 by the group evaluating the alternative's impact on the criterion as a proportion of the difference in impact between 'Do nothing' and 'EHC Prog' (see Figure 11.2).



Level	Costs	
	Cost	<18 Conception Rate
1 Do Nothing	0.0	0
2 EHC Prog	23.0	100
3 LAC Nurse	35.0	40
4 2 Clinics	52.0	75
5 4 SHINE Workers	72.0	50
6 CCard	10.0	20

Figure 11.2. Scores for the first area on the first criterion (cf. Lord, 2009)

This is known as 'direct rating' as employed by SMART (Von Winterfeldt & Edwards, 1986). The facilitators chose not to ask participants to construct a partial value function as this was expected to inspire a long discussion. As the evaluations already led to plenty of dialogue, to require more in defining a partial value function would have had severe diminishing returns of benefit. The team seemed to find it acceptable that they were evaluating according to their own subjective judgements. The same procedure was then followed to score the area's alternatives on the next four criteria.

The sixth criterion of 'confidence of achieving benefits' had to be treated differently than the previous five. This criterion was included to account for the uncertainty surrounding the issue in terms of values, other stakeholders' agendas and cause and effect relations (Friend & Hickling, 2005). For instance, there is uncertainty on the values of different cultural groups in the borough. Political agendas might change which could impact a public sector organisation like the TPSG. Finally, cause and effect relations around teenage pregnancy involve uncertainty as well. The 'confidence' criterion was required for completeness but care had to be taken when considering its judgemental independence. It was important to be clear when scoring an alternative against the first five criteria that participants were being asked to evaluate the impact of the alternative on the criterion assuming the expected benefits materialise; instead of the 'likely' impact of the alternative on the criterion. Evaluating the 'likely' impact would be taking confidence into account in each criterion's value function. There are many ways to include risk in an analysis but classic decision theory would apply expected utility values calculated from a decision tree to represent the participants' appetite for risk. Eliciting a utility function would involve much extra work for which the time in the workshop was deemed too short.

To score alternatives against the 'confidence' criterion the group was asked to estimate the probability of the alternative achieving the impacts by which scores on the previous five criteria had been evaluated. Separating risk from the other criteria with the 'confidence' criterion allowed diminishing marginal utility to be modelled. This approach was simple but could always be remodelled in later iterations. The confidence criterion does not take full account of risk which is usually defined as:

$$\text{Risk of taking action} = \text{probability of failure} \times \text{severity of consequences}$$

Both the probability of failure and the consequences are likely to be uncertain. In the simple approach chosen here, consequences other than the impacts perceived when evaluating the alternative were not modelled. This kind of issue did begin to surface during the workshop when, for example, the group found it difficult to agree on whether the effects of getting more young parents into housing had a positive or negative effect on some criteria. There was uncertainty, not just about the size of the impact as with other alternatives, but also about the direction of the effect on the criteria. Generally, however, the group were comfortable with this scoring against the ‘confidence’ criterion.

As with the group causal mapping session, despite the initial model being designed for simplicity with unrushed speed of first iteration in mind, the schedule still proved optimistic. Not all areas were scored by lunchtime and one of the participants had to leave at 15.00h. Although it never became as rushed as the first workshop it was necessary to move things along as much as possible while still fostering dialogue and the facilitator not polluting the model by bringing in own opinions. The team were keen to remodel the alternatives in the third area of TPSG events to a more sophisticated set. Instead of the choice in this X area between the alternatives of one, two or three TPSG events at a cost of £5,000 each, four exclusive and realistic alternatives were defined:

1. two small events at a cost of £5,000 each
2. one big event plus a small event at £10,000 and £5,000 respectively
3. three small events
4. one super event at £15,000

At lunch time the seventh exclusive area of Youth projects was removed and the lowest level of this added to the SRE (sex and relationship education) area. This would make it clear if any Youth centres at all, none of which were funded from last year’s budget, would be included in a recommendation.

C [X] [Y] Y Ppls Involvement	Do Nothing	+ Y Pars Involvement	Y Ppls Involvement				
C [X] [Y] SRE	Do Nothing	+ SRE Advisor	School Conference	Faith Work	Peer Ed Projects	1 Youth Project	
C [X] [Y] S2P	Do Nothing	+ Housing Audit	Goody Bags	Y Parents Directory	Y Fathers Project	Y Pars Adv Worker PT	Violence Work

Figure 11.3. Combining two areas: area Youth projects is removed and one alternative in this area (1 Youth project) is added to area SRE (cf. Lord, 2009)

Scoring of the end model was completed around 15.00h, after which the team turned to the weighting of criteria. Despite the increased importance of this being stressed participants were quick to reach consensus on both ‘within criterion’ weighting between areas and ‘across criteria’ weighting of the values. They had no problem grasping the swing weighting concept, and quickly turned to weighting differences in the moves between 0 and 100 for within criterion weighting. First they were asked to imagine a situation in which for all areas, the alternative with the lowest score was implemented. On which area would they like to improve first? This area would receive a score of 100 as it represented the biggest swing in impact on the criterion from 0 to 100. Alternatives with a score of 100 in the remaining areas were then scored as a proportion of that 100. As the confidence criterion was scored on a cross criteria scale there was no need for within criterion weighting for it and it was given an equal score of 100 across all areas. Again for across criteria weighting they chose the criterion whose area with a within criterion score of 100 represented the highest value to them and the remaining criteria weighted as a proportion of this value. When comparing the confidence criterion it was expressed as

‘concern for risk’ or how important the level of risk was. The facilitators explained this step to the group by saying that what they were comparing with this criterion against others was in effect the importance of the lowest confidence level they gave for any alternative. It should also be noted that as the confidence ratings would have a negative impact on the aggregated value of each alternative, the higher the across criteria weight for it the more risk averse the group were.

Costs		Benefits					
	Cost	<18 Conception Rate	Added Value		Sustainability		Confidence
			Y Parents into EET	Speed of Impact			
Clin Servs	-	95	20	40	100	90	100
Media	-	40	10	25	50	20	100
TPSG Events	-	15	5	20	80	10	100
Y Ppls Invlment	-	5	70	30	15	40	100
SRE	-	80	70	40	80	60	100
S2P	-	5	90	30	50	40	100
Workforce Dev	-	20	10	20	70	20	100
Strategy	-	100	100	100	40	100	100
Across Weights	100	100	90	40	50	40	50

Figure 11.4. Final within and across criteria weightings (cf. Lord, 2009)

The workshop continued past 16.00h and there was about half an hour left for examining the model. Unfortunately this left no time for fresh alternative generation via a SWOT (strength, weaknesses, opportunities and threats) or merged model analysis (see Chapter 9) or for further iterations. Having sorted all the areas according to value the group were asked to select a package of alternatives which they might feasibly fund next year. The result is shown in see Figure 11.5. The proposed package is indicated by the blue alternatives marked with a P. The B markings represent the alternative in that X area, or lowest value alternative in that C area, that would provide higher value for a similar cost in the overall cross silo portfolio. The C markings represent the level at which the same value could be had more cheaply.

Clin Servs	Do Nothing	+ EHC Prog	LAC Nurse	2 Clinics	4 SHINE Workers	CCard
Media	Do Nothing	+ Annual newsletter	Current Campaign	SHINE Website		
TPSG Events	Do Nothing	2 at 5	1 at 10 + 1 at 5	3 TPSG Events	1 15k Event	
Y Ppls Invlment	Do Nothing	+ Y Pars Involvement	Y Ppls Involvement			
SRE	Do Nothing	+ 1 Youth Project	Faith Work	School Conference	SRE Advisor	Peer Ed Projects
S2P	Do Nothing	+ Goody Bags	Housing Audit	Y Fathers Project	Y Parents Directory	Y Pars Adv Worker PT
Workforce Dev	Do Nothing	+ 2 TPSG Training	2 WFD session			Violence Work
Strategy	Do Nothing	+ Y Pars Dev Off PT	TPSC	TPSG Proj Officer	TPSG Intel Officer	
	1	2	3	4	5	6
						7

Figure 11.5. Alternatives sorted by value and a portfolio proposed (cf. Lord, 2009)

The area with similar costs but higher value, or similar value with lower cost is represented by the triangle C-P-B in Figure 11.6. The fact that the triangle is not right angled demonstrates that portfolios of exact equal benefit or of exact equal cost do not usually exist. For instance, a small increase in cost might be required to generate a substantial increase in value.

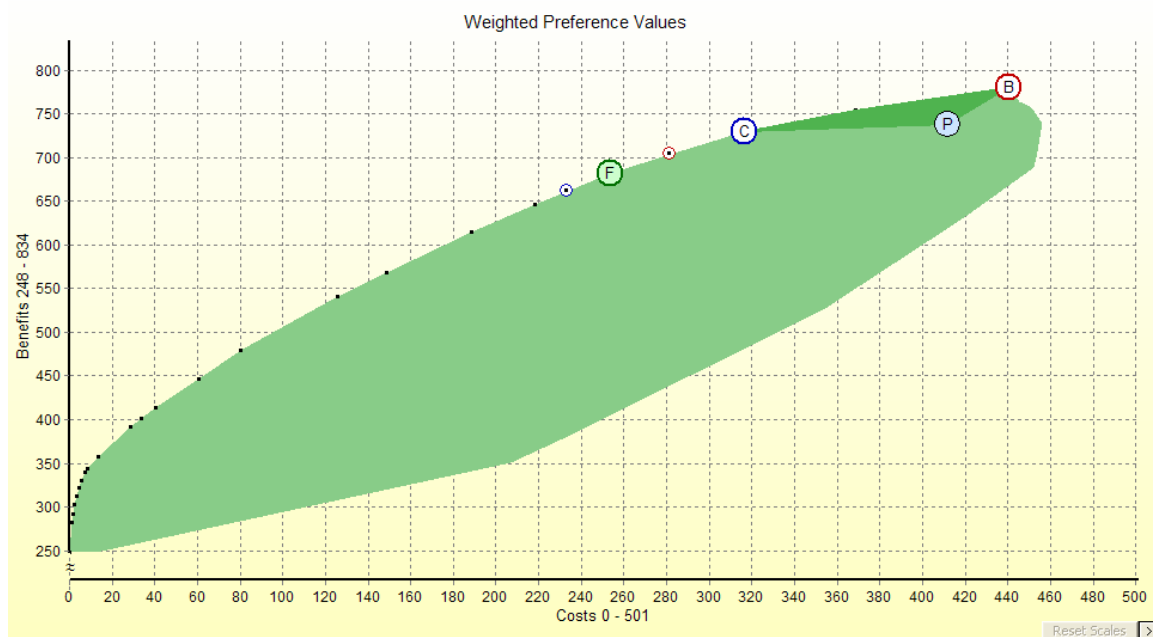


Figure 11.6. The area of all possible portfolios (cf. Lord, 2009)

As the TPSG was facing budget cuts in the following year, a realistic portfolio of projects was identified at lower costs. This is represented by point F in the figure above. Compared to the portfolio selected by the team, this meant significantly reducing projects in the cumulative area of clinical services: sacrificing most of the SHiNE related services and the LAC (looked after children) nurse, as well as the Domestic violence work. On the positive side, it also meant upgrading one of the small TPSG events to a big TPSG event. Overall, the realistic proposal presented somewhat of a shock to the team as SHiNE services were an important part of TPSG's identity. The implications of adopting alternative and more efficient project portfolios were intensely discussed, and the model was adjusted to reflect the discussions. Sensitivity analysis showed that the portfolio was fairly robust to changes. In addition several trade-offs between alternatives were explored with the team. For instance, if two SHiNE clinics were chosen as part of the portfolio, the TPSG intelligence officer post and the Media campaign would have to be taken out.

### 11.3 Final product

Further analysis of the decision model built in the workshop, by exploring the impact of changes in scoring and weighting, did show that more efficient portfolios in terms of value could be found than that proposed by the group. Table 11.2 below indicates alternative portfolios.

	Benefit	Cost	Average value (benefit/cost)
Proposed	490	412	1.19
Better	532	440	1.21
Cheaper	483	316	1.53
Realistic	434	253	1.72

Table 11.2. Alternative portfolios (benefits and costs x £1,000) (cf. Lord, 2009)

TPSG could not afford the portfolio P which they proposed during the workshop. It costs £490,000 whereas next year's budget will be 52% of this at £254,000. The model suggests that

the TPSG could get more value if they spent more (the better portfolio) although this is marginal with the benefit to cost ratio, as for both the proposed and better proposal the ratio is around 1.2. More significantly by spending only 76% of the P budget they could get 99% of the benefits (the cheaper portfolio). At the portfolio closest to next year's estimated budget (realistic portfolio) they would be getting 89% of the benefits for 52% of the cost. Some of this gain might be unsurprising to the TPSG if diminishing returns of benefits for costs were already expected. At the budget of £253,000 (realistic) which is the closest frontier portfolio to their next year's budget of £254,000, the model built in the workshop proposed the portfolio in Table 11.3.

	<i>Cost</i>	<i>Benefits</i>	<i>Benefit/ cost</i>
Young parents forum	1.0	35.0	35.0
2 TPSG training sessions	0.6	9.8	16.3
Annual newsletter	0.8	10.8	13.5
1 Youth project	1.0	9.3	9.3
2 Workforce development sessions	1.0	8.8	8.8
Faith work	1.0	8.6	8.6
Goody bags	2.0	9.4	4.7
Housing audit	1.0	4.2	4.2
Young fathers project	5.0	14.6	2.9
1 large TPSG event followed by 1 small event	15.0	33.0	2.2
1 School conference	5.0	9.6	1.9
Young parents' directory	7.0	12.4	1.8
SRE advisor	20.0	33.0	1.7
Part time young parents development officer	20.0	33.0	1.7
TPSC	45.0	62.0	1.4
EHC programme	23.0	27.4	1.2
Peer education projects	40.0	46.0	1.2
TPSG project officer	30.0	32.0	1.1
Part time young parents advisory worker	15.0	15.3	1.0
Current level of media campaign	20.0	19.8	1.0
<i>Total</i>	<i>253.4</i>	<i>434.0</i>	<i>1.7</i>
<i>Mean</i>	<i>12.7</i>	<i>21.7</i>	<i>1.7</i>

Table 11.3. Frontier portfolio (realistic) at budget of £253,000 (cf. Lord, 2009)

This recommendation would have serious implications for TPSG. It includes, for example, no SHiNE related alternatives which were core to the TPSG strategy. This raises two opposing arguments. First, TPSG are suffering from selection of alternatives on benefit only rather than value meaning that big projects are selected first and small ones effectively used to fill up the budget rather than a lot of small, high value projects being funded. Second, scoring of the first alternative in an area frames the scoring of the others. With the rating techniques used here scoring of all alternatives are likely to be closer to the first scored at 100 than they should be to truly reflect judges' values. This is a well-known framing effect (see Chapter 1) which it is part of the facilitator's job to deal with. It leads to the model favouring cheaper projects. Considering that the facilitator is trying to remain neutral by not influencing scores it is difficult to dispute a group's judgement especially when consensus has been reached. Nevertheless, this was done a few times and apparently made the team reconsider its choices, resulting in some adjustments to the model. However, framing probably had a significant effect on scoring and seriously affected the portfolio recommendation.

## 11.4 Implementation and results

In a subsequent budget planning meeting of the TPSC, and counter to what the model results had indicated at the workshop, it was agreed that the projects within the SHiNE services area were still going to be funded, albeit from a mix of sources within and outside the TPSC. It was noted, however, that the actual impact of these projects would be closely monitored and the decision to fund them revisited in the following annual budget cycle. Although the recommendations following from the model were not implemented, the model in this case served a purpose as a tool for dialogue. This is evident from team members' evaluation of both the meeting process as well as the impact beyond the meetings. The project involved team members in an open conversation on the critical issues the TPSG was going to face in the years to 2010. On the basis of interviews with all team members, Franco (2013) concludes that the model helped to create a shared language for discussing the issue and contributed to developing shared meanings. As the Prevention sub group project manager commented after the project: *"I certainly haven't had those conversations with the department before....it's not often that we sit down and really look in a very, very structured way as we did then, you know with all those different partners"* (Franco, 2013, p. 725). One such shared insight was for instance the realisation that the TSPG must focus on their core objectives in order to achieve them under limitations of time and resource (Lord, 2009). Despite the need for joined up working the team should not be distracted by goals outside of their direct area of responsibility. The selection of the first two benefit criteria for the decision model (reduction in the number of conceptions; number of young parents into education, employment and training) clearly reflects this focus on core objectives. Nevertheless, time limitations in both meetings meant that some discussions were started but could not be finished. In the words of the Co-chair of the TPSG: *"Maybe that's where people would come in from their specialty interests. Maybe [name of Family Planning Lead] was voting for prevention, [name of Learning and Schools Representative] was voting for the educative. It was evident that we were short of time but it did lead to quite a bit of conflict I remember on the day, quite a heated discussion between the two issues and it wasn't really resolved"* (Franco, 2013, p. 729).

Beyond the project meetings, the main contribution of the decision model was its role in beginning to discuss difficult decisions faced in an environment of budget cuts (Lord, 2009). This started having an impact on a small scale. The TPSG for instance decided to disband the Support to parents sub group for being little more than a 'talking shop'. As the sub groups' members all worked in other capacities this was not a direct criticism on the individual members but on the effectiveness of this grouping for these purposes. However, even though the model helped to create a shared language and shared meaning, it stopped short of transforming interests to such an extent that a way forward was agreed upon (Franco, 2013). This is evident from a comment by the Family planning lead: *"I suppose I think we were all quite..., when you did that presentation I think we were all quite shocked, I mean me because you know the clinical services are something that I have a direct relationship with but I think lots of other people were quite shocked [...] if it comes down to actually stopping young people getting pregnant you don't have the clinical services to provide contraception then how are we going to stop young people getting pregnant"* (Franco, 2013, p. 729).

In conclusion, the combined use of group causal mapping and decision conferencing in this case clearly resulted in improved communication and shared insights. Time constraints however meant that differences between interests became apparent but could not be discussed fully. No agreement was reached on a shared action plan.

## Part III. Intervention practice

The approaches discussed in the precedent part have been designed to be deployed in a manner that is consistent with their purpose, that is, as intended by their developers. In practice, however, it is possible to have some degree of variation in how an intervention is implemented while remaining consistent with the intervention's intended purpose. Consequently, those with extensive experience and expertise with an intervention approach are likely to conduct the intervention differently from those who are relatively new to the approach. In this part we discuss important practical issues that need to be considered by those tasked with conducting and guiding an intervention designed to support team decision making. These issues apply to any intervention approach chosen and thus are general in nature.

We begin Part III by discussing issues related to the design of a team decision support intervention. These are typically negotiated between those tasked with delivering the intervention (the analyst), and those who have a leadership position regarding the intervention (the client). There are some leverage points that analysts and clients must consider for increasing the chances of a successful intervention. First, the scope and roles pertaining to the decision task must be jointly defined and mutually agreed. Next, the composition of the team can be jointly designed not only to ensure that key stakeholders are included, but also contingent on the requirements of the decision task. Equally, analysts and clients should discuss how to establish a team environment that is conducive to candid and effective communication, as well as the choice between adopting a simple (Chapter 3) or a more sophisticated (Chapters 4 to 11) approach to team decision making. In sum, the aim of this earlier part is to provide practical guidelines regarding making choices about intervention design.

The next chapters of Part III take a closer look at the intervention process, that is, at the nitty gritty of facilitating a model-driven team decision making process. We will cover issues regarding team facilitation and managing team conflict. We will draw on extant research and our own experience to provide examples from actual decision support practice, so that the reader can get a sense of its interactional and situation specific aspects.



## Chapter 12. Designing interventions

The opening chapters made clear why teams can sometimes find it difficult to make high quality decisions. We then presented a collection of practical intervention approaches, simple and more sophisticated, designed help to improve team decisions. Taken together, these approaches can help to make unbiased judgments, stimulate appropriate levels of productive conflict, and use all the relevant knowledge and information needed to make the decision. This chapter takes a closer look at key choices in creating the conditions for an effective team decision support intervention, and introduces a conceptual framework to help analysts and their clients think about the impact of these choices. We use the term ‘client’ when referring to the individual who seeks help from an analyst regarding a problem of concern<sup>13</sup>, and to whom the analyst is accountable for conducting the intervention and producing the intervention deliverables. The client is often a leader in the organisation who is the problem owner. Sometimes, the client is also the budget holder who sponsors the intervention.

Choices about intervention design shape and influence how an intervention process will unfold in practice, either enhancing or hindering the quality of the solutions or responses developed by the team to tackle the problem. Analysts and their clients make four important choices that create the conditions for an effective intervention process. First, the scope of the problem, and the roles that analysts and consultants will play in the intervention process must be mutually agreed upon. What is the problem that needs to be addressed? How will the analyst direct the intervention process? And what tasks will the client perform during team discussions? Second, the membership of the team tasked with developing a response to the problem must be established. Who should have the opportunity to participate in the process? What should drive this choice? Third, the environment in which team discussions will take place needs to be discussed. What principles and norms will regulate the interactions? Finally, the choice about how team members will think and talk about the problem should be considered. How will team members share and exchange issues, assumptions, facts and opinions about the problem? How will they structure the problem and generate and evaluate alternative responses to address the problem?

Preceding these four choices, however, is what kind of expertise the analyst and client contribute to the decision making effort. Simply speaking, the client knows about the *what* and is responsible for delivering information pertaining to the problem. The analyst is responsible for the *how* by proposing a procedure and attending to process. In the remainder of this chapter we turn to this division of labour first.

### 12.1 Content, process and procedure

Before introducing our conceptual framework about intervention design, it is important to clarify the meaning of the terms ‘content’, ‘process’ and ‘procedure’ used in this book. *Content* refers to what people know and say about the problem or decision of concern. Content is typically communicated via talk during team meetings. In principle, if we audio record a meeting and then transcribe what was said, we end up with a complete report on the meeting’s content. Content can be found in documents, but also captured and represented in artifacts such as visual displays and models. *Process* refers to how team members work together to complete their tasks or achieve their goals. During team meetings, process is about who speaks for how

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<sup>13</sup> Richard and Andersen (1995) use the term ‘gatekeeper’ to refer to the person who contact the analyst for help.

long, intonation, bodily posture, whether some speakers always get a reaction by other team members or their contributions are largely ignored. Thus process has a large role in how content is interpreted. Below is an example of how content and process interact to shape interpretation.

### *Case nitrogen*

In June 2022, the Dutch government announced a new policy on nitrogen emissions. Nitrogen deposits were held responsible for depletion of the soil, groundwater and surface water and degradation of ecosystems. The main aim of the policy was to reduce emissions by 50% by 2030. Since agriculture and livestock are responsible for about half of nitrogen depositions, this has grave consequences for farmers. Reductions in livestock of about 30% were foreseen. In particular farms close to natural habitats would be effected and the government published a map indicating regional reduction targets.

Needless to say, for the farmers concerned the new policy would have an immediate impact on their livelihood, a livelihood that was part of their core identity and occupation going back generations. Immediately after the government plans were made public, farmers started protests across the country. They blockaded roads, dumped manure and visited politician's homes to vent their anger. The Dutch flag hung upside down, with the blue stripe on top, became the symbol of the protests and could increasingly be seen not only in villages and the countryside, but in inner cities as well.

In response to the protests the Dutch government asked a former politician and independent facilitator, Johan Remkes, to meet with farmers and representatives of farmer's organisations. These meetings took place over summer. In September the secretary of Agriculture stepped down because, as he said, he had not succeeded in his task of formulating a new perspective for the agricultural sector. In October 2022 Remkes presented his report to an audience of politicians and farmer organisations (Remkes, 2022). The sixty-page report contained 25 concrete recommendations to make progress in the nitrogen discussion. These included concrete measures such as taking the proposed map off the table as a policy instrument as well as 'creative' solutions such as keeping to the 2030 deadline, but reconsidering in 2025 and 2028 whether the time schedule needed updating. The report however did not propose changes to the core policy of reductions in emissions and livestock.

The response immediately after the presentation and later in the press was very positive. Political parties from left to right indicated this gave them new hope; a near unanimous reaction which is unusual in times of increased polarisation. What is telling is how often reactions referred to the tone of the report. In his presentation Remkes mentioned that in his talks over the summer he saw despair in the faces of very reasonable people. A dairy farmer's reaction was: *"That sentence touched me. And now that I repeat it, it touches me again. That recognition is what we needed so badly. That we are no criminals or polluters". "C'est le ton qui fait la musique"* (Smouter, 2022). Some reactions plainly recognised that the content has not changed significantly yet were still positive: *"The secretary (...) speaking after Remkes more or less had the same story. But for some reason you trust her less. There is a sense of 'sorry for the map, but now let's stop being difficult.' "* In a press conference later that day, a politician did not realise his microphone was still open and commented that the cabinet would need to come with a reaction to the report fast, *"before the farmers have a chance to read it and get back on their tractors again."* *"Everything they were angry about stays in place"* (Smouter, 2022).

The reactions clearly show that process matters in how information is interpreted, even if the topic is very important to stakeholders and they recognise that the content of the message is essentially the same. Finally, *procedure* is what the analyst uses to guide the process. A procedure is often a method or technique deployed as part of an intervention approach. For example, causal mapping is a procedure used to guide the elicitation of team members' knowledge about the problem or decision, which is part of the group causal mapping intervention approach (see Chapter 8). Beyond well-established procedures (e.g. brainstorming), the analyst can design new procedures to achieve a particular goal (e.g. a new way of asking questions to increase the number of team members' contributions; a new method for collecting team members' preferences).

It is worth noting that we typically refrain from trying to intervene in the process directly. Team members are likely to feel that interpretations of and direct recommendations on the team process are out of bounds (Phillips and Phillips, 1993: 546). We prefer to monitor the team process and the content of team discussions, and if these are not developing as desired, adapt the procedure. For instance, if a particular agenda item results in few reactions by the team, the facilitator would note that. She then can choose to share that observation in terms of content (e.g. *"this question does not seem to generate a lot of ideas"*) or in terms of process (e.g. *"it seems we have little energy to work on this particular task"*). While we think observations on process can be helpful, we would refrain from making the process the topic of conversation, by turning to an interpretation of process. This means we would avoid questions such as *"does anyone have suggestions on why the team has little to say about this topic?"* Instead, the analyst could reformulate the question to be addressed (changing the prompt with the aim to generate additional comments) or decide to move to another agenda item.

## 12.2 Scope and roles

Decision support interventions involve several people whose interactions and behaviours shape the decision process and outcome. Whether the decision under consideration is simple or complex, it always pays off to be clear on what the analyst and client see as their role in the intervention, and what both parties envision the results of the intervention should be.

### 12.2.1 The client

Every intervention typically starts with one person in an organisation wishing to address a problem and reaching out to an analyst for help. If an intervention is feasible and agreed upon, the analyst will work for this person who then becomes the client. Typically, the client expects the analyst to have the content knowledge or methodological expertise to be able to help her with her problem. However, for the intervention approaches described in this book, the division of labour between client and analyst is agreed as follows: the analyst takes responsibility for designing the procedure and guiding the process during team discussions, and the client is responsible for providing relevant content. The source of content is varied and can include, among others, documentation, databases, models, the client herself and a designated team of relevant stakeholders.

Before approaching the analyst, the client may have talked to her colleagues to come to some sort of consolidated idea about what the problem is. However, in our experience, neither are likely. Thus the analyst needs to come to a preliminary understanding of how the client herself views the problem and its potential solution. Thus a critical design choice is the *scope of the problem definition*. Scoping this preliminary problem definition is important for several

reasons. First, the choice of scope clarifies the aims of the intervention to the client as well as to the analyst. Indeed, formulating the problem forces the client to make explicit what she is trying to accomplish, which helps the client to start thinking about goals (Schein, 1987: 49). Clarity on goals in turn makes clear where the analyst can be most helpful.

Second, the choice of scope also has implications for the sponsorship of the intervention. If the client and sponsor roles fall within different individuals, the sponsor needs to be convinced of the need to address the problem presented to her and the relevance of the proposed intervention approach before she will make the funds and organisation members' time available. And this is more likely when the initial problem description appeals to important goals or stakeholders in the organisation.

Third, the choice of scope is also important because serves as the basis for inviting others to participate in team meetings. If the problem that is going to be addressed is described too narrowly, some people may feel there is no problem, or if there is, it is not their responsibility or they have no information to add. Choosing the right phrasing of the problem to be addressed is very important in order to motivate a group of people beyond the client to spend time on the project. Failing to do so may mean that some participants with relevant information or implementation power are not present in meetings and their information is missed. Simon (1973: 270) notes that management attention is a scarce resource. At any moment there are many different things going on in the organisation and its surroundings, and a manager will have to decide which are important enough to spend time on.

Another critical design choice is *when to introduce the client's definition of the problem and her preferred solution*, as it can have a critical impact on the effectiveness of team discussions. Research by Michael Roberto has shown that when leaders reveal their views too early in the decision making process, three serious adverse effects may happen (Roberto, 2013). First, team members may think that the decision has already been made by the leader and so feel that there is no genuine opportunity to influence the decision process. Second, team members' views may become framed by those of the leader's, which can constrain their thinking and thus narrow the possibilities for action that could have been considered during team discussions. Finally, when the leader reveals her position team members may feel discouraged to express minority views or challenge the leader's views.

Introducing a preferred definition of a problem or solution is one thing, but often managers go one step further and impose a solution, expecting the rest of the organisation to take action accordingly. An extensive study by management scholar Paul Nutt shows that introducing a solution early has a severely negative impact on implementation. Nutt (2002; 2011) analyses 400 decision making situations and finds that in the majority of cases the top manager conceives of a solution and imposes it on the rest of the organisation. Wanting to solve the problem fast, management prefers a top-down approach. The expectation is that it will take too long to involve others in a joint process of discovering what the problem is about and which solutions seem promising. However, in practice a top-down approach is slower. Nutt (2002) finds that imposing a solution takes longer than a discovery process: around 22 rather than 14 months. In addition, in the first case only half of decisions are adopted versus about 85% in the latter.

Why is idea-imposition so popular and why does it fail so often? Nutt explains that imposing a solution seems like a fast way to solve a problem, it creates delays when translating the solution into action. Implementation is slower because of the political and social forces that are stirred up (Roberto, 2013). Confronted with a top-down decision, others in the organisation may feel

their interests are threatened and passively or actively block implementation. Since the decision maker has already committed to a course of action, there is little he can do to change this situation. Identifying additional arguments backing up the plan, possibly with the help of external analysts who start new research, is one option. It is however unlikely that this new research will be seen as neutral and convince others affected by the decision. A joint discovery process works better because the initial commitment is not to a particular solution but to a problem: the decision maker motivates why a certain issue merits attention at this moment, and invites others in the organisation to look into the issue and help craft solutions. If the problem focus is set but analysis and identification of solutions are still open, people can have a voice and their input can meaningfully be taken into consideration. This expands the range of ideas considered and, as discussed above, builds commitment.

Thus, the analyst must warn the client about the potential risks of disclosing her views at the start of team discussions. Instead, the analyst can suggest that the client's views could be withheld until the end of the intervention process or, alternatively, the client could introduce her views to the team as only tentative, making it clear that these could change if as a result of the team discussions superior recommendations are produced.

### 12.2.2 The analyst

While talking to the client for the first time, the analyst will already start forming a picture of what is going on. Who is involved? What actions have stakeholders taken in the past and why? What developments outside and inside of the organisation have shaped the situation? What future developments are likely to have an impact? A critical task then is making an inventory of problem symptoms so that the analyst comes to an initial understanding of the scope of the problem. This is the basis for the project proposal, the sponsor's commitment of resources and participants' willingness to spend time on the project.

A critical design choice for the analyst regards the *extent to which she intends to manage the process and content of team discussions*. We have already mentioned our preference for the analyst to manage process (and procedure) but not content. However, scholars are divided about whether the analyst should focus only on managing the process but not the content, or whether some content management is allowed (see also, Chapters 13 and 14). For example, decision scientist Larry Phillips (Phillips & Phillips, 1993) argues that analysts should refrain from contributing to the content of team discussions for three reasons. First, contributing to content may interfere with the effective management of the process. Just as writing and talking at the same time is difficult, attending to both process and content at the same time is problematic. Second, revealing expertise in the content during discussions can cause team members to feel de-skilled, which can adversely affect teamwork. Finally, if the final recommendations include content that reflects the views of the analyst, team members' commitment to the final decision may be partial and implementation may consequently suffer. By contrast, management researchers Chris Huxham and Steve Cropper (Huxham & Cropper, 1994) posit that some content expertise is actually expected by the team, and can be used to demonstrate understanding of what the team is discussing and hence, be a basis for gaining their trust and credibility.

Let's assume that Maria, a manager of a library services provider, contacted you about a situation she is facing. In the initial conversations she mentioned several intertwined developments that were affecting the organisation: fewer people loan books, CDs, DVDs or other material from libraries in turn leading to less demand for support to libraries. In addition, a decline in government subsidies to libraries is imminent although its extent is highly

uncertain, and the market will be opened for other service providers. You are considering how to go about helping Maria and after talking to her and others in her organisation, you may decide that more research is needed. In that case you may opt for a round of interviews with employees and clients, find and analyse data the organisation has gathered on client satisfaction, study its competitors and combine that information in a report to Maria and the management board. In doing so you have taken the role of a researcher and used empirical research methods. The quality of your work is measured against well-known criteria such as validity and reliability, which are discussed in texts on empirical research methodology in the social sciences (see Appendix B). Note that methods in this field are concerned with the knowledge you produce, while what is done with that knowledge (implementation of changes) is not part of the method. As a researcher you collect and analyse information in a neutral and objective manner and report the results and implications. Your report offers new knowledge on the problem at hand and points to solutions, but supporting implementation of solutions is not part of your role. In essence, in this role you assume that 'the facts speak for themselves'.

There are of course other ways to approach Maria's request for help. Let's assume you have experienced situations like this before, are of a slightly more self-confident nature, or both. After giving the situation some thought, the answer seems clear to you: the organisation should focus only on those services which are profitable and conduct transactions with client libraries on a purely commercial basis. This would constitute an advice with regard to content. Yet another way to approach the situation is the following. If your answer would be that Maria should list all the arguments for and against 'going commercial', this is an advice that specifies a process to follow. The previous answer implies you take an expert role, while the latter implies that you do not voice your own opinion but propose a procedure and leave the responsibility for finding an answer to the client.

This last approach is in line with Schein's (1987) *process consultant* role. A fundamental principle of process consultation is that the client continues to own the problem<sup>14</sup>. A central assumption of this book is that for most problems perceived as complex, an analyst that is an outsider and learns about the situation for the first time, is highly unlikely to come up with the best possible solution. And even if he or she did, the solution will not be accepted by those who have stake in the problem. Both the quality and acceptance of the solution are needed. A perfect solution which is not followed up is useless, while following up on bad advice does not improve the situation much either. If we intervene in a team we hope to achieve that all team members support the conclusions reached. In a team setting, acceptance takes the form of a consensus on the way to move forward. This means that we seek to support teams in such a way that important information is brought out into the open, analysed and integrated into a consensus view. We find that the process consultant role fits best to this goal.

Authors such as Vennix (1996, 1999), Phillips and Phillips (1993) and Bostrom, Anson and Clawson (1993) have built on or added to Schein's work and described in more concrete terms what an analyst does when supporting teams in this way. In designing the intervention, it is important that the analyst makes clear to the client that she will not be taking the problem off

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<sup>14</sup> This is different from the *expert* model which comes down to giving advice with regard to content. According to Schein (1987), when calling on an expert the client expects a clear answer that will solve his problem. In this situation the client is in fact saying 'please take the problem off my shoulders and bring me back a solution'. Schein also describes a third, intermediate, consultant role: the *doctor*. In the doctor role the client communicates what the problem area is (the 'symptoms') without leaving out any information that is relevant. The analyst in the role of the doctor has the expertise to identify the problem behind the symptoms (the 'diagnosis') and recommends a 'cure'.

the client's shoulders. How to do that is part of the description of facilitation tasks that will be discussed in Chapters 13, 14 and 15.

A successful discussion of roles between analyst and client should ideally align each other's expectations as much as possible. This may be difficult. For example, the analyst and the client may expect the project to deliver 'scenarios' but what that term means to each of them is actually different. Thus the analyst should be sure to check with the client, and check again. Part of managing expectations is being clear on roles and responsibilities and come to an agreement on a design for the intervention, as detailed as is possible in this early stage. This includes selecting and inviting others to participate in the intervention, something for which the analyst typically depends to a large extent on the client, as discussed next.

### 12.3 Team design

From the initial problem definition a picture will emerge of the persons inside, and possibly outside, the organisation, whose views are important in coming to grips with the problem. Thus one of the first tasks for the analyst is to find out how other people understand the problem. Often there are large differences of opinion on the problem, or even on the question of whether there is a problem, and this is particularly true of complex problems and decisions (Vennix, 1999). Consequently, the analyst works with the contact client in drawing up a list of individuals to invite to meetings.

A crucial design choice concerns the *size of the team* that should be assembled for taking part in the intervention. The general consensus within the group research community is that as the size of the team increases, effectiveness also increases because there are more individuals to contribute to tackling the problem at hand (Hare, 1981; Hill, 1982; Thomas & Fink, 1963). However, team effectiveness increases only up to a point, beyond which adding more participants makes the team less effective. In other words, there is an optimal level of team size. As size increases passes this optimum, differences in participation become more pronounced to the extent that a few team members come to dominate the discussions (Shaw, 1981). The optimal team size depends on the specific team and problem at hand, but the perception of scholars and practitioners is that, in general, it is rather small, typically between 6 to 8 members (Roberto, 2013). Most of the methods covered in this book have been developed to be used with small to medium-sized teams of up to 16 people (Shaw et al., 2004). However, tackling more complex decision problems may require that larger teams are assembled, from within or even across organisations, to provide enhanced information processing capabilities and viewpoints, in which case the same methods described in this book could be used with appropriate computer-supported technology (Eden & Ackermann, 2010).

Beyond team size, there is also a choice regarding the *type of individual* that needs to be involved in the intervention. A key consideration here is to gain access to relevant knowledge expertise in relation to the problem at hand (Eden & Ackermann, 2010; Roberto, 2003). In practice, this requires the involvement of individuals from certain functions or roles across the organisational hierarchy. In some cases, the nature of the problem requires the involvement of individuals drawn from different organizations. The Teenage Pregnancy Group case discussed in Chapters 9 and 11 is a good example of this.

When discussing potential team members, the analyst should ask the client whether there are any individuals within the organisation who could provide information or insight related to the



problem that others do not possess. However, considerations of expertise alone should not be the primary determinant of team membership when designing an intervention. Management scientists Fran Ackermann and Colin Eden argue that consultants should consider a wide range of people whose stance regarding the problem and its solution makes them key stakeholders (Ackermann & Eden, 2011b). Specifically, they advise to include those who are likely to be interested in the problem and have the power to influence, positively or negatively, the outcomes of the intervention. A grid with the two dimensions of interest and power can be built by the consultant to aid in the process of stakeholder identification. By using the grid, the consultant can help the client to prioritise who might be involved in terms of their relative power and interest. At a minimum, Ackermann and Eden suggest that those individuals categorised as both very powerful and interested should be included in the team, as this will increase the chances of implementing the outcomes of the intervention. Indeed research has shown that involvement of people responsible for implementation is associated with successful decision making in high-stakes situations (Bourgeois III & Eisenhardt, 1988). Some scholars suggest that when considering who to involve, the consultant should also look at a range of potential roles that team members could adopt during discussions. The ideal team would then be one in which all roles are covered (F. Ackermann & C. Eden, 2011a; Belbin, 2010; Nutt, 2002).

Another important consideration related to team roles is the *level of team diversity* desired. If the analyst is helping the client to address a complex decision problem, it may seem obvious that forming a highly diverse team is appropriate and likely to increase the quality of team discussions due to the access to different perspectives on the problem and its solution. By a 'diverse team' we mean a team whose members exhibit differences in terms of their age, gender, history of working together, functional background, and cognitive style, among other factors. Many scholars argue that heterogeneous teams should outperform homogenous teams because the former ought to exhibit greater cognitive diversity than the latter (Van Knippenberg et al., 2011; Van Knippenberg & Schippers, 2007). Put differently, teams that possess greater cognitive diversity benefit from interactions among individuals with different points of view and expertise, because they generate the required levels of cognitive conflict that can enhance the quality of team decision making (Amason, 1996; Roberto, 2013).

The empirical evidence regarding the impact of team diversity on decision making and problem solving performance, however, is inconclusive (Williams & O'Reilly III, 1998). For example, research has shown that whilst diverse teams do generate higher levels of cognitive conflict, it is often the case that these raised levels of cognitive conflict lead to personal frictions, displays of heated emotions and personality clashes, the kind of affective conflict that reduces commitment to proposed solutions, and hinders the development of shared understanding (Amason, 1996; De Dreu, 2006; C. K. De Dreu & L. R. Weingart, 2003). This does not mean that forming diverse teams should be ruled out. Instead, as analyst and client start to discuss the composition of the team, they should assess the level of team diversity emerging, and then seek measures to counterbalance the pitfalls associated with high levels of either homogeneity or heterogeneity.

Finally, the analyst should highlight to their clients the possibility of drawing on people whom they trust and respect (Roberto, 2003), who can act as sounding board on key aspects of the problem or particular solutions, but who are not necessarily key stakeholders in the problem being addressed. They can also play the role of devil's advocate during team discussions, by offering constructive critique. While inviting the client's trusted individuals to participate in the intervention process is not always necessary, there are some methods that do benefit from their inclusion, such as the scenario planning method (see Chapter 6).

## 12.4 Context design

Ensuring that the team tasked with addressing the problem is comprised of the right mix of individuals is only a small part in designing an effective intervention. The analysts and the client must also co-design the context or environment within which team discussions will take place. A team's context both shapes and influences how an intervention process unfolds, and so careful consideration should be given to how different environmental factors can affect the team's ability to engage effectively in the intervention. There are four distinct factors to consider: organisational, situational, social and physical. *Organisational factors* include mechanisms such as reward and punishment systems, accountability structures, and monitoring and control instruments, which can all affect team behaviours and thus decision making effectiveness (F. Ackermann & C. Eden, 2011a; Sterman, 1994; Wageman, 1995). These mechanisms tend to stay stable over time, although subtle changes can have noticeable effects on organisational behaviour. However, these mechanisms are unlikely to be changed for each problem that needs to be tackled, and so the consultant (and even the client) will have little opportunity to influence or exercise control over these factors. Nevertheless, the consultant should make the client aware of their significance, as organisational factors can affect individual and collective behaviours in very powerful ways.

Team behaviours are also affected by *situational factors* such as time pressure and sense of urgency. Clients can make time pressure more or less salient to team members by setting tight deadlines and milestones. Similarly, a sense of urgency can become salient when clients stress capabilities developed by competitors or increasing concerns by customers or stakeholders. However, increasing time pressure or a sense of urgency can lead to a need to achieve closure too quickly by the team (Kruglanski et al., 2006), or impair team performance due to undue stress, anxiety, and arousal (Janis & Mann, 1977). Consequently, the analyst should help the client consider the risks associated with heightening or lowering these factors for a particular intervention.

*Social factors* such as shared behavioural principles and norms also affect team behaviours and hence the intervention process. Scholars have shown that the social factors governing a decision making process can be changed at the outset of an intervention process. For example, analyst and client can co-design and implement ground rules that seek to ensure smooth and harmonious interactions during team discussions (J.R. Hackman, 2002). In addition, creating a team environment of 'psychological safety' can stimulate effective problem solving and learning (Edmondson, 1999, 2003). Team members feel psychologically safe when they share the belief that the group is safe for taking interpersonal risks. This means that individuals will feel comfortable to speak up about issues and problems at the risk of being seen as ignorant, incompetent, disruptive or negative. A psychologically safe environment fosters candid communications about the problem at hand, which include not only raising claims about issues, but also expressing dissent, admitting mistakes, and making requests for help.

Finally, intervention scholars have long recognised the importance of the *physical factors* of a team's environment (Hickling, 1990; Huxham, 1990). For example, Colin Eden argues that avoiding interruptions from day-to-day work can help team members to better concentrate on the issues to be addressed, and thus the possibility to hold team discussions away from the client's premises should be considered (Eden, 1990). Thus the consultant must discuss with the client the advantages and disadvantages of organising team meetings on- or off-site. Eden also

stresses the importance of physical aspects of room design such as layout, lighting, furniture, and equipment, as these can affect team performance during discussions (F. Ackermann & C. Eden, 2011a; Eden, 1990; C Eden & F Ackermann, 1998). A common room layout is a 'horseshoe' shape where team members sit around a central display, thus enabling all to read easily what is projected or written on the display, and see one another. Typical furniture includes movable tables and chairs, and sometimes plenty of wall space when a central display is not used. Equipment options vary depending on the level of structure designed for team discussions (Franco & Montibeller, 2010). In sum, by discussing choices about physical aspects of the team's environment, the analyst will help the client to create the kind of atmosphere that will stimulate team members to actively engage in the intervention process.

## 12.5 Communication design

Methods or procedures for thinking and talking about the problem represents the final aspect of intervention design that the analysts must consider with the client. Analysts can offer their clients a range of choices in this regard. Broadly, there are two approaches to thinking and talking about a problem: *unstructured* and *structured*, and these are discussed next

### 12.5.1 Unstructured communication

In the unstructured approach, the consultant acts as the chair of team discussions, encouraging team members to discuss their views and ideas freely and openly without adherence to a specified procedure for how discussions should unfold. By contrast, when the structured approach is adopted, the consultant uses a well-defined script that dictates quite specifically how team members will make contributions to the discussion, prioritise issues, compare and contrast alternatives, and come to a conclusion.

Scholars have labelled the unstructured approach the 'consensus method' because of its emphasis on reaching common ground so that a solution acceptable to all team members can be found, and because it tends to foster high levels of commitment and team harmony (Murrell & Stewart, 1993; Priem et al., 1995; Schweiger et al., 1986). The consensus approach, however, may lead to premature agreement or convergence on issues or options during team discussions. In trying to reach common ground, it is also possible that dissenting voices are suppressed or that minorities are pressured to conform as a majority opinion emerges. Furthermore, early convergence may not uncover key issues and assumptions, clarify uncertainties and perspectives, and generate more innovative responses to the problem.

### 12.5.2 Structured communication

In order to foster the requisite amount of divergent and convergent thinking (see Chapter 14), together with enhanced levels of critical thinking and debate (see Chapter 15), the analyst can suggest adopting a structured approach to communication. Scholars and consultants have developed a range of structured procedures and associated techniques and tools for thinking and talking about problems, and a selected sample of longstanding model-driven approaches was presented in Chapters 4 to 11. These approaches stimulate the generation of multiple issues and options, and help to identify critical assumptions, uncertainties and values, as well as relationships between different aspects of the problem. Furthermore, they offer a means to foster a great deal of cognitive conflict within the team, which has been shown to enhance the quality of decision making processes (Eisenhardt et al., 1997; Roberto, 2013).

Although the use of structured approaches can offer many benefits for clients wishing to tackle messy problems, they are not free of risks. They take time to learn and master for the consultant, and often clients and their teams need some training before using a particular approach (Ormerod, 1995). In addition, the levels of cognitive conflict generated by the use of these approaches can generate affective conflict, which can reduce commitment and shared understanding within a team (Amason, 1996). Therefore, analysts must use these approaches with care, and assess whether using a structured approach is warranted for a given problem.

The argument in this book is that the complexity and ambiguity that is characteristic of situations where the stakes are high require interventions based on the use of a structured approach (e.g. Midgley, 2000; Reynolds & Holwell, 2010; Rosenhead & Mingers, 2001) such as those introduced in Chapters 4 to 11, but those new to this field will find it difficult to know which approach is best suited for their specific needs<sup>15</sup>. To help choose from the set of structured approaches discussed in this book, it might be useful to establish whether those involved wish to focus mainly on gaining a better and shared understanding of the antecedents and potential consequences of the decision situation of concern, or developing appropriate responses to tackle the decision situation effectively in the present. This is illustrated in Figure 12.1.

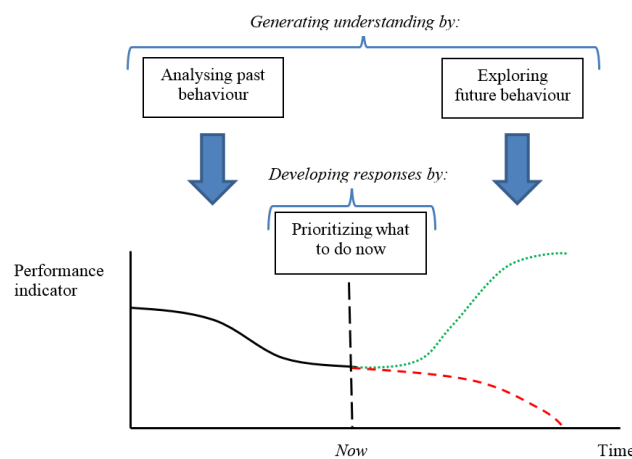


Figure 12.1. Primary focus of a structured approach to intervention

A decision situation often arises when inadequate performance on some indicator of importance to those with a stake in the situation is perceived to become an issue in the future. The left part of Figure 12.1 shows how well an organisation is doing on a particular performance indicator over time until now. For instance, think of market share or customer satisfaction for a private organisation, or the rate of teenage parents completing school monitored by a public organisation such as a ministry of education. Typically a decision situation comes to the stakeholders' attention if performance on an indicator of interest drops below (or goes above) an acceptable standard, or is expected to do so if no action is taken. This is shown in the right part of the figure by the red and green lines. The red line indicates performance in the business-as-usual scenario. The green line is what the organisation would want the performance indicator

<sup>15</sup> For studies on how expert facilitators choose intervention approaches see Kolfshoten and Rouwette (2006) and Velez-Castiblanco et al (2016).

to look like. The widening gap between the two indicates that the problem is expected to worsen over time and thus the demand for a decision will increase.

Let's assume that at the present moment a decision situation has arisen, and that the relevant stakeholders are willing to spend effort, time, and resources, on addressing the situation as a team. Now they have choices on where to start the decision making process. Team members may choose to: (i) complement their current understandings by analysing their past experiences of the situation in more depth using group model building (Chapter 4); (ii) explore alternative futures that could develop from the current situation using scenario planning (Chapter 6); or, (iii) articulate their preferences, priorities, available options, responses and actions at present before selecting a particular option, response or action using group causal mapping (Chapter 8) or decision conferencing (Chapter 10). The first two choices are mainly focused on gaining a better and shared understanding of the situation in terms of its antecedents or possible consequences; the last one is intended to develop a concrete action plan to address the situation now. Of course, a decision making process that considers all three choices will increase stakeholders' confidence in the proposed action plan that results from the analysis<sup>16</sup>.

### *12.5.3 Bringing team discussions to a close*

Irrespective of the approach used, *how to bring closure* to team discussions and the overall intervention is an important design choice regarding communication. Typically, the analyst will act as a facilitator (see Chapters 13, 14 and 15) and will strive to find common ground during team discussions. If the prospects of reaching a collective agreement are deemed to be challenging prior to the intervention, the client should be prepared to step in. In this case, the analyst can suggest that the client takes on the role of an arbitrator. This involves the client making clear to the team that all the arguments and proposals generated during team discussions will be carefully listened to, but that she would have the ultimate responsibility for the final decision.

The importance of spending time discussing how closure will be brought, and what will be done with the outputs of team deliberations cannot be overestimated (Edmondson et al., 2003). Team members can become frustrated and heavily disappointed if the approach to reaching closure to discussions does not conform to their expectations. Consequently, the analyst and the client must prepare and agree on a clear process road map, and announce it to the team at the beginning of the intervention. The proposed intervention process should in other words be transparent and offer a logical procedure to achieving the intervention goal. The role that the client will adopt in bringing team discussions to a close should be included in this process roadmap. Overall, by carefully designing and implementing a transparent process roadmap, team commitment to the final decision is more likely to be achieved because perceptions of procedural fairness will be enhanced (Kim & Mauborgne, 2003; Korsgaard et al., 1995).

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<sup>16</sup> Indeed, as each situation is unique, it may require the use of one or more approach within the same intervention (Mingers & Brocklesby, 1997).

## Chapter 13. Learning to facilitate team discussions

The previous chapter described critical factors that can affect the successful deployment and use of intervention approaches to support team decision making. This and the next two chapters build on these insights by turning to the actual delivery of team decision support interventions. In what follows, we discuss *what* the analyst does when working with teams, and *why* these ‘doings’ are important. ‘What’ is about the tasks performed by the analyst, which are grounded in a particular set of attitudes that the analyst displays during team discussions. For instance, one task is to select a problem to work on that is relevant to all team members, which is in line with a ‘helping’ attitude. ‘Why’ captures the rationale of the analyst’s tasks, that is, how completing these tasks helps to bring about high quality team decision making.

How can an analyst help a team by attending to procedure and process? In other words, how can an analyst perform the role of *facilitator*<sup>17</sup>? Furthermore, what is effective team facilitation? Vennix (1996) points out that much of the literature on facilitation simply states what a facilitator is supposed to do, i.e. what tasks the facilitator must perform. This advice is problematic because variations in the performance of facilitator tasks can serve different purposes. For example, a facilitator often is advised to ask questions rather than state opinions. However, questions can be phrased in such a way that a particular answer is implied (Franco & Nielsen, 2018). Or a question can be asked with the intention of revealing a gap in the knowledge of the recipient (Tavella & Franco, 2015). Thus, the advice to simply ask questions is not sufficient; a facilitator also needs to understand the rationale behind asking questions.

Vennix (1996, 1999) clarifies this rationale by formulating a set of attitudes associated with different facilitation tasks. We believe these attitudes represent core aspects or, to use Poole and DeSanctis’ (1992) term, the *spirit* behind the use of the intervention approaches described in the previous chapters. Our assumption is that the more the facilitator’s behaviour is in line with these attitudes or this spirit, the more effective they will be in supporting a team decision process. Below we describe five facilitator attitudes (helping, neutrality, inquiring, relational engagement, self-reflexivity), as well as the facilitator tasks aligned with each of these attitudes.

### 13.1 Helping

A facilitator has a helping attitude, which means the client’s problem is central and determines the overall intervention goal. The helping attitude serves at least two important functions. In Chapter 12 we discussed that an important step in designing an intervention is to choose a problem that is important to the client. Only then can we expect team members to take the time and effort to discuss the issue. Sharing and integrating information held within the team takes effort, and only motivated team members will engage in deep processing of information. Deep information processing is needed to achieve changes in team members’ opinions and behaviour, which are central elements of team decision making.

Secondly, if the facilitator is genuinely trying to help the client and the client’s problem drives the intervention process, that means the facilitator does not have an agenda of their own. In other words, there are no predetermined outcomes or preferred solutions that the facilitator is

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<sup>17</sup> It is worth highlighting that depending on the intervention approach chosen, a *facilitation team* may be required to conduct the intervention. In that case the facilitator team is comprised of various individuals in specific roles, e.g. facilitators, modellers, recorders.



working towards. Furthermore, the facilitator must be authentic in their behaviour and their actions are in line with their statements on their roles and responsibilities in the intervention. If the facilitator's behaviour is not in line with their professed role, this may be unethical. In addition, as Vennix (1996) notes, if the facilitator is not authentic the participant group is likely to find out. Team members will see through tricks and find out they are led towards certain outcomes, which erodes trust in the facilitator.

## 13.2 Neutrality

The second attitude relates to the notion of neutrality and clarifies further how team members' input will be considered in facilitated meetings. The facilitator is neutral about the information discussed by team members. That is, they do not value certain problem dimensions more than others, or favour a particular point of view. Furthermore, neutrality means that elicitation of opinions, analysis of the resulting material and using this information to develop recommended solutions is all done by team members. In short, everything done in the facilitated meetings revolves around displaying neutrality when considering team members' input. After the meetings, whether recommended solutions are actually adopted by the client, is also a question of the negotiated agreement with the responsible management on the scope and boundaries of the problem addressed. For instance, in the case on nitrogen presented in Chapter 12, recommendations in the report presented by Remkes still had to be taken over by the Dutch parliament.

Neutrality with regard to team members' input facilitates an open information search that makes possible the comparison, combination and creation of ideas. Tavella and Franco (2015) observe that changed understanding and new knowledge are produced when team members are invited to contribute ideas, and subsequently clarify and reframe them. On the other hand, when the facilitator is not neutral and deploys authority to demarcate and fix team members' inputs, current understanding and existing knowledge remain unchanged. Black and Andersen (2012) find that the facilitator has a major role in rendering team member's contributions to the discussion explicit, by checking on their formulation and noting them down on a central screen. As the discussion proceeds, these visualized contributions can then be altered to reflect a changed understanding. Both studies show that changed understanding and new knowledge are a basis for action. Recall the case on nitrogen reported earlier, in which a novel, creative proposal was to keep to the 2030 deadline for reducing emissions, but to reconsider at earlier points in time whether the schedule needed updating. This recommendation signals to farmers and their sector organisations that their concerns are heard, and makes it more likely that they support the plan and act accordingly.

The notion that a changed understanding or new knowledge is necessary for creating action is in line with social psychological research (Chaiken et al., 1996; Petty & Cacioppo, 1986). Once participants engage in deep information processing, they will be able to analyse the information they receive to see if it supports or goes against their opinions. In essence, they will be looking for arguments: validated, high quality messages that may persuade them to change their mind. An argument is likely to be persuasive if it is both new and relevant. In psychological research, controlled studies on persuasion usually include a preparation phase aimed at finding those arguments that are new and relevant to the particular group that is going to be involved in the follow-up study. If we take a moment to consider how this applies to decision makers working on an organisational issue, we can see why identifying convincing arguments in this setting is not easy. Decision makers are likely to have built up considerable expertise and experience in



their organisation. They will feel they know all relevant information on the issue at stake, so identifying information that is both relevant and new to them is difficult (Rouwette et al., 2009). Bringing different perspectives on the issue together and ensuring a productive exchange of views increases the chance that novel insights will be created (Roberto, 2013).

Refraining from intervening with regard to discussion content, together with careful consideration of team members' inputs, gives team members the opportunity to use their contributions to influence the decision making process, which helps to build decision commitment (Kim & Mauborgne, 1993; Korsgaard et al., 1995). However, since the facilitator actively guides the group process there are clear boundaries around neutrality, of which we highlight at least three. First, the facilitator influences discussion content by specifying a particular format in which to exchange information. In group model building (Chapter 4) for instance any element of the issue at hand can be raised and discussed, but the issue needs to be formulated as a variable, i.e. something that can change over time. In decision conferencing (Chapter 10), objectives need to be formulated in such a way that they exhibit particular properties such as being operational, concise and nonredundant, among others.

Second, the facilitator and the particular intervention approach employed focus team members' attention on specific elements of the issue. In group causal mapping (Chapter 8), actions are connected to issues which are in turn linked to goals. Issues that appear relatively isolated in a causal map because they show few connections to other material, are singled out for further discussion. Similarly, when intermediate versions of the model are discussed in group model building sessions, most attention goes out to central feedback loops. These are all examples of how building a visual representation of an issue helps a team to direct its attention to underdeveloped areas of the model. It makes problem understanding more consistent and coherent and guides the team to unique, unshared information. Thus, while it is up to the team members to bring in ideas for discussion, the facilitator shapes the information exchanged by setting a format and directing attention.

Third, facilitators influence discussion content when they reflect back to the team what they heard. As Franco and Nielsen (2018) note, facilitators produce various formulations to make sense of team members' contributions to the discussion. Although these formulations are delivered on behalf of the team, and require confirmation from the team members, their impact on the trajectory of the team discussion cannot be underestimated. The extent to which these formulations shape discussion content depends on various factors, such as whether facilitators use their 'substantive expertise' (Huxham & Cropper, 1994; Tavella & Franco, 2015) to produce a formulation, whether team members are given the opportunity to co-produce a formulation, and which contributions are chosen by the facilitator to be formulated. Similarly, as will be discussed in the next section, the type of questions produced by the facilitator also influence discussion content.

### 13.3 Inquiring

There are two sides to an inquiring attitude: asking questions and active listening. The former boils down to overcoming the natural tendency to give answers rather than ask questions. The latter means reflecting back what you have heard using phrases or formulations such as "so what you are saying is ..." or "do you mean that ..." (Franco & Nielsen, 2018; Vennix, 1996). By asking questions reflection is encouraged, which helps to increase insight into the subject being discussed. Already in the 1950s, Bales started to observe discussions in small groups. He

coded verbal contributions (content) into four categories: questions and attempted answers, positive and negative reactions. The first two help the group to achieve its task and are information-oriented; the second two help to manage the social aspects of the group discussion including the emotions that arise. His conclusion after extensive research is that questions account for only a limited part of the discussion: 7% of contributions are questions, 56% attempted answers, 26% positive reactions and 11% negative reactions (Bales, 1951; Bales, 2002). Why are so few questions asked in group discussions? Bales points out that by asking a question, a person makes room for another group member. The sender gives up his speaking turn and with that the opportunity to strengthen his position.

Questions however serve a number of important roles. Questions are likely to be asked more often after a period of tension, for example when team members disagreed to premature proposals to define or solve the problem. As they will probably not lead to strong emotional reactions, they help the team to establish common ground again and refocus on the task. Questions are a way to raise an issue without expressing a strong commitment to it (McCardle and Rouwette, 2018). Nevertheless, asking a question in a team discussion means intervening in the decision making process, in a way that influences others' behaviour, thinking and feelings. *"Every question or inquiry is (...) an intervention and must be treated as such"* (Schein, 1997, p. 207). In this way they are a way to attend to and steer the meeting process.

By (re)focussing on a topic, questions help to elicit information. In Chapter 2 we saw that teams do not automatically share all relevant information. Before joining the discussion, team members may feel they already have a clear idea on the direction in which a solution can be found. The research on hidden profiles (Stasser & Titus, 2003) showed that this may bias the discussion toward focussing only on the preferred alternative, while sharing information would have shown that the best solution lies elsewhere. Bales also finds that groups do not use their information effectively. What is needed is a *"better orientation to the problem and more information about the facts at the beginning of meetings, if not all the way through"* (Bales, 2002, p. 239). This is all the more important in complex situations. As in the hidden profile situation, team members deciding on a complex issue each have unique information that needs to be brought together to identify the best way forward. However, even if information is brought up in the discussion, its meaning and significance to the overall issue may not be immediately clear. In Chapter 2 we described two reasons for this. First, functional backgrounds colour interpretations of a term, and differences in interpretations often go unnoticed. Franco (2013) gives the example of a project brief that is understood very differently by project managers and architects. Second, certain actions may have beneficial consequences in one department but undesired consequences elsewhere. Chapter 2 presented the example of the Dutch criminal justice chain. Prison services introduced a policy of early release of prisoners to solve the problem of crowded prisons. However, for judges this meant that sentences were not served to completion and as a result started passing longer sentences. Longer sentences in turn increase prison crowding again. In short, to appreciate the significance of an idea or action, it is worthwhile to explore how it is interpreted by different team members and how it connects to other elements of the issue at stake.

Clarifying ideas and their interrelationships helps team members to assess the value of new information and to contrast it to their own understanding. As we saw before, social psychological research shows that people only take the effort of analysing information in depth, when the issue is important to them (motivation) and when new, relevant information is available (arguments). There is a third factor that also needs to be present: *ability* (Petty and Cacioppo, 1986; Chaiken et al., 1996). Team members need to be able to attend to information.

This goes beyond having expertise or experience in the problem at hand. In fact, expertise may even colour understanding of concepts and relations in a way that makes it more difficult to grasp an alternative way of looking at things. A facilitator can increase the ability of a group to attend to information by, for instance, ensuring that team members' communication are understood by everyone in the room and attended to (Vennix et al., 1996).

A final reason for a facilitator to ask questions, is that it provides a role model to the team members. Questioning is something that is both observable and (usually) implementable. Our experience is that in many team discussions, participants start to mimic the facilitator's behaviour, often without being directly aware of this. A colleague gave the following example. In a project on quality of life in a city district, a representative of the municipality grew impatient with the discussion on the problem and repeatedly tried to steer the discussion towards policies to improve the situation. Other participants listened politely to her suggestions but then continued their previous discussion, not taking her suggestions on board. Midway through the second meeting the civil servant got ready to suggest a solution again but then seemed to collect herself and said: *"Oh, I think at this point I need to ask a question."*

### 13.4 Relational engagement

In team decisions the content under discussion and the relations between team members are intimately linked. Content may influence relations, for instance when the discussion reveals past decisions associated with less than optimal outcomes. In this case those involved might seek to justify their past decisions, to avoid being blamed. Imagine if over the course of the meeting, the discussion seems to concentrate more and more on problems in one specific team member's area of responsibility. This may have repercussions for the team member's status and power, their future responsibilities and interactions with others.

Vice versa, relations also influence content. A study on team development over time illustrates this (Van Oortmerssen et al., 2014). The study describes a newly formed board with members drawn from schools, local governments and companies which was charged with deciding on their future cooperation and realising a new building. When comparing the initial meetings of the board to the final ones, after meeting every month for a year, there were some remarkable differences. In the initial meetings board members tended to make long statements, with little or no interruptions by others, followed by a statement by another participant. Statements were relatively unrelated; team members seemed to want to share their own opinion without necessarily building on what was said before. Over the course of the year, turn-taking became faster, people interrupted each other more, and communication was more open. Van Oortmerssen et al. (2014) relate these changes in interaction to the trusting relationship between board member that developed over time.

The close interplay of discussion content and team members' relations in decision making is substantiated by other research and highlights the crucial role of particular ways of communicating during team discussions. When facilitators say something to the team, they tacitly convey an attitude to the kind of relationship they want to have with team members, as well as the kind of relationship they want team members to have with each other. The attitudes discussed so far (helping, neutrality, inquiring) are in the main concerned with the content of the team discussion rather than with its relational aspects. Research shows that when the modality of interaction fostered by facilitators and adopted by team members is that of *relational engagement*, team discussions are more likely to be productive and conducive to new

knowledge creation (Tavella & Franco, 2015; Tsoukas, 2009). In relational engagement individuals take active responsibility for both their joint tasks and the relationships they have with each other (Tsoukas, 2009). Consequently, when team members are relationally engaged, they feel psychologically safe to make themselves more open to one another (A. C. Edmondson, 1999, 2003), take interpersonal risks, and be open to mutual influence. This in turn enables team members to self-distanciate from previous ways of thinking, which facilitates the generations of new understandings and knowledge (Tsoukas, 2009).

It is often claimed that teams are able to make productive use of their differences in understanding and expertise. However, this is not always the case. In Chapter 2 we described the danger of escalating task conflict, which may turn to interpersonal conflict that not only blocks progress on the team decision but threatens to stop team cooperation altogether. Even before tensions rise, differences in knowledge and expertise complicate team decision making. Different training backgrounds, terminology and taken for granted assumptions raise problems for communication in disciplinary teams (A. C. Edmondson, 2003). In coming to a decision, team members need to share information and reflect on routines while not knowing exactly where the discussion will take them. This brings with it significant interpersonal risk. Team members are more likely to take this risk when they perceive is psychologically safe to do so (A. C. Edmondson, 1999, 2003), which is more likely when they trust each other (Van Oortmerssen et al., 2014). The Campus Connect case described earlier highlighted the role of trust between team members. Team members pointed to two specific instances that built trust among the team members. One was an interpersonal conflict that was resolved successfully, leading to more clarity on team member values and commitment to the joint task. The second was achieving a tangible outcome in the form of the completion of the new building. The former occasion indicates that interpersonal conflict should not be avoided at all costs. Rather, successfully steering through an episode of interpersonal conflict builds trust, which in turn leads to more and better information exchange.

What, then, can the facilitator do to foster a modality of relational engagement that can help maintain or build positive relationships in a decision making team? Keeping in mind that the intended outcome of decision support is both a high quality decision as well as commitment to actions, the facilitator does two things. To foster decision quality he needs to ensure that all relevant information is brought to the table, even if that turns out to be sensitive and potentially reflects negatively on one or more team members. For this to happen, team members need to speak up and share information openly. On the other hand, if shared information damages team members' reputation and limits the willingness to work together in the future, commitment to solutions will be reduced. In other words, the facilitator needs to be aware that what is discussed may have a personal impact for team members present and ensure that this does not hamper sharing of information or working relations. When an interpersonal conflict develops, it should not be sidestepped as it may be an integral part of the issue at hand, and because working through the conflict builds trust among team members. Trust in turn fosters psychological safety so that people are willing to speak up and resolve task conflicts, as relational engagement between participants supports the creation of new knowledge.

### 13.5 Self-reflexivity

The preceding description of facilitator attitudes, in particular helping and neutrality, hopefully make clear that the facilitator is not in a privileged position versus team members in terms of shaping discussion output and conclusions. The inquiring attitude emphasises that it's not the

facilitator but the team members who have intimate understanding of the subject matter, and the job of the former is to elicit this understanding so that others in the team can build on it. Although the facilitator clearly has a voice in designing the process of team interaction, this actually comes down to co-design as proposed steps have to make sense to, and be accepted by, team members. Although he shapes the format of information exchanged, guides the trajectory of team interaction and reflects back what is said, the facilitator is neutral with regard to the content raised in the discussions.

The description so far may paint a picture of the facilitator as an outsider, remaining aloof from the team discussion, unaffected by anything that is said or implied. The facilitator as a supervisor of the execution of team tasks, not a member of the team, a black box (Veltman, 2023). This however does not come close to our experience of facilitating teams discussing issues that matter to them. Typically, rather than remaining aloof, we find that a facilitator is highly engaged with, and impacted by, the team process. Facilitation is often an intensive and exhausting task, as it requires paying close attention to what people say and how they say it. Trying to understand what is meant and representing that understanding, while avoiding own ideas from influencing a proposed formulation or a suggestion for linking ideas, takes energy.

In other words, although facilitators have a different role than team members, they are very much engaged in, and affected by, the moment-by-moment development of the team discussion (L. F. Franco & C. Greiffenhagen, 2018). The facilitator is clearly impacted by what happens in the team. Importantly, this impact is as much about ideas, so cognitive, as about emotions. The team process has a cognitive impact on the facilitator when the topic discussed brings to mind own expertise or beliefs. Similarly, there is cognitive impact when the discussion connects to knowledge that may come from a previous engagement where a team talked about a similar issue. For instance, Bleijenbergh and Van Engen (2015) report on two facilitated modelling projects on women's careers in academia. In both projects the topic of masculine norms came up. In the first case, masculine norms included an emphasis on fulltime work and a culture of overwork. It is likely that when masculine norms came up as a point for discussion in the second project, the facilitator was reminded of the work-related dimension encountered in the earlier case. Neutrality and an inquiring attitude require the facilitator to try to elicit the interpretation of masculine norms that is relevant in the present situation, and avoiding 'filling in' the concept for the team. Realising that a concept raised in the discussion brings to mind own ideas and trying to keep these from influencing the conversation is not always straightforward, as described in the section on neutrality.

Although less obtrusive, the emotional tone of the team interaction also has an impact on the facilitator. Phillips and Phillips (1993) note that teams express the full range of emotions experienced by individual team members. For instance, teams may feel frustrated and threatened because they are not meeting their goals or deadlines. Or a team may feel happy or elated if an important milestone has been met. Phillips and Phillips give the example of a senior manager, who has called the meeting, leaving midway in the session. The other team members are left feeling angry, which is not the best motivation to continue working on the goals agreed on with the manager. While it might happen that such an event immediately leads a team member to express his or her anger in words, what occurs more often is that emotions build up from more unobtrusive signals such as facial expressions and bodily movements, to a reluctance to take up the task, eventually making a discussion on the lack of progress unavoidable. The emotional state of the team, including its level of energy, clearly influences how the task gets done.

Perceiving the emotional state of the team as a whole is complicated by the fact that emotions observable in a team are expressed by individual team members, but at any one time not all team members will experience the same emotion, or to the same extent. It may happen that individuals give every sign of going along with the team, but privately feel different. There is however evidence that emotions expressed by others, even unobtrusively, have a clear influence on people. Emotions are said to have a communicative function (Oatley & Johnson-Laird, 2014) or even be contagious (Hatfield et al., 1994). This also means that the facilitator shares in the emotional experience of the team. Phillips and Phillips (1993, p. 544) give the following example: *'A group was struggling to discuss the difficult issues it faced in considering a new strategy for the group. The facilitator began to feel dreary and tired, and anxious that he was not competent to deal with this group. Observing that many participants also seemed inattentive and distracted, the facilitator reflected back to the group that there seemed to be a mood of dreariness about.'* In the ensuing discussion team members admitted that they did not feel up to their task.

In this example the facilitator realizes how he is feeling and reports this back to the team, which then leads to a conversation on the task and possibly a revised agenda. However, precisely pinpointing the cause of a feeling is notoriously difficult. It may also happen that a facilitator, seeing the discussion range widely and the topic seemingly becoming more and more complex, grows increasingly concerned about his ability to help the team and begins to experience high levels of anxiety and uncertainty. Phillips and Phillips (1993) note that in this case it will often be necessary to hold and tolerate these feelings.

In conclusion, observing emotions expressed by a team may be difficult as team members are likely to react differently and signals may be weak. Initial cues to a change in emotions such as facial expressions and bodily movements are open to different interpretations. Alternatively, facilitators can monitor their own feelings to get a sense of the emotional state of the group (Phillips & Phillips, 1993). *Self-reflexivity* is, in our view, a crucial attitude in this regard. This fits with the broader concept of reflexivity, which refers to questioning what is taken for granted in one's own and other's beliefs and actions (Bleijenbergh et al., 2018). As discussed in earlier chapters, we see these beliefs and actions as shaped by social and organizational factors and see benefit in a collective process of eliciting ideas underlying them (Ripamonti et al., 2016). Researchers often emphasize dimensions of reflexivity such as choice of methodology and the impact of personal characteristics on data collection and analysis (Amis & Silk, 2008; Brannick & Coghlan, 2007). Others however suggest that the importance of emotions and relations in work in organisations means that understanding and reflection on these dimensions is important as well (Reedy & King, 2019). While we agree that choice of methodology and being aware that own ideas can influence the team process are important, we think that in facilitating an ongoing conversation the emotional dimension of reflexivity plays a crucial and underappreciated role. An important reason for this is that the emotional channel is often faster than the cognitive: 'preferences need no inferences' (Zajonc, 1980). The table below summarises our description of facilitator attitudes.

<i>Attitude</i>	<i>Tasks (what)</i>	<i>Rationale (why)</i>
Helping	Select problem important to client	- Problem importance fosters motivation to contribute and process information
	Demonstrate authenticity	- Authenticity creates trust in facilitator
Neutrality	Encourage open information search without contributing to content, but set format, focus attention and reflect back the content of the discussion	<ul style="list-style-type: none"> <li>- Open information search allows for the combination of team members' inputs, which helps generate new information (arguments) that in turn changes minds and positively impacts decision quality</li> <li>- Refraining from contributing to content, together with careful consideration of team members' inputs, gives team members the opportunity to use their contributions to influence final decision, which increases commitment to resulting decision</li> <li>- Open information search ensures productive cognitive (task) conflict, which in turn enables participants to process information</li> </ul>
Inquiring	Ask questions and listen actively	<ul style="list-style-type: none"> <li>- Questions relieve tension</li> <li>- Asking questions and listening actively promotes open information search, which helps to identify and share all relevant information</li> <li>- Questioning and listening provide a role model for other team members</li> </ul>
Relational engagement	Limit but do not sidestep interpersonal conflict	<ul style="list-style-type: none"> <li>- Resolving interpersonal conflict builds trust but high levels impede progress on group task</li> <li>- Trust and team psychological safety help team members to speak up and share information</li> </ul>
Self-reflexivity	Attend to own and others' emotions	<ul style="list-style-type: none"> <li>- Highlights ideas that go against own taken for granted beliefs and actions</li> <li>- Indicates level of motivation for particular steps in process, which is a basis for updating agenda</li> </ul>

Table 13.1. Summary of facilitator attitudes, tasks and their rationale



## Chapter 14. Facilitating the process and content of team discussions

The previous chapter described a set of facilitator tasks, their rationale, and a set of facilitator attitudes that altogether represent the fundamentals of facilitating team discussions. This chapter addresses the facilitation tasks in more depth by unpacking the various ways in which they can be performed when supporting team discussions.

One broad aspect to consider before facilitating a team discussion is the general approach to managing the process. When team discussions begin, analysts may or may not intervene actively to guide the pattern of participation and interaction. The intervention literature distinguishes between a *directive* and a *laissez-faire approach* to facilitating team discussions (Edmondson et al., 2003; Larson Jr et al., 1998; Nadler, 1998; Schwarz, 1994; Webne-Behrman, 1998). In the directive approach, analysts guide the timing and extent of participation by team members during their discussions. They invite specific team members to offer their views, and they inquire repeatedly as to where individuals stand on specific topics. They ask questions of clarification and play back team members' contributions to ensure that they have been understood correctly by either summarising them or drawing out their relevant implications (Heritage & Watson, 1979). Furthermore, analysts that adopt a directive approach emphasise points in the discussion that they deem important, but which perhaps have been overlooked or misinterpreted. By contrast, analysts adopting a *laissez-faire* style take a more hands-off approach for guiding the team discussions, allowing team members to enter and exit their discussions more freely, and they deliberately try not to influence where people focus their attention.

Research has shown that a directive style is more effective when there is asymmetry of information within the team. That is, when there is information that is not accessible to all team members or, put differently, when team members possess a great deal of private information, which they even may not be aware that exists. Research by Gerald Stasser and colleagues has shown that teams are more likely to repeat commonly shared information during discussions while paying less attention to privately held data (Stasser & Davis, 1981; Stasser & Titus, 1985). Failure to reveal this private information can lead to suboptimal and even flawed solutions to the problem at hand. By adopting a more directive approach, consultants can create opportunities for team members to disclose unshared information, as well as recognise when privately held data is revealed during discussion. On the other hand a *laissez-faire* approach would be more adequate when there is symmetry of information within the team. In this case, all team members possess commonly shared information that is likely to surface during discussions without the need of active prompting by the analyst.

Another aspect to consider is the how to structure the interaction process of the team discussion. Researchers have shown that while teams may follow a variety of paths towards making a decision (e.g. Poole, 1983; Poole & Roth, 1989), successful teams tend to break their process into two broad phases that can be cycled many times through their discussions. They start a cycle with a divergence phase where team members either search for possible issues or solutions, and then move to a convergence phase, where they select either the core issue or problem to address, or the best solution to adopt. Effective search and selection processes can address some of the shortcomings of team decision making discussed in Part I. For example, an enhanced searching process can reduce poor information processing, and a selection process

that considers the future impacts of adopting various solutions can counteract the tendency to escalate commitment to a losing strategy.

All the intervention approaches described in earlier chapters are comprised of divergent and convergent tasks that are completed within one or more divergence-convergence cycles. For example, when using the decision conferencing intervention approach, team members search for relevant objectives (divergence) before classifying them into means and fundamental objectives (convergence).

In the remainder of the chapter we discuss how the facilitator sets the stage for a team meeting by working towards agreement on the goal, roles and agenda of the session. We then turn to supporting the team through a divergence-convergence cycle, which particular emphasis on the management of the team discussion content and process. The chapter ends with recommendations on how to close an intervention.

## 14.1 Opening

Imagine you have been invited by a colleague in your organisation to reserve time in your agenda for three meetings of three hours each. The topic is something you have been concerned about for quite some time. You understand that other departments will be present in the meetings too. Apparently some novel procedure is going to be used and an outside analyst will facilitate the sessions. Balancing the substantial amount of time this will take with the expected chance of actually making progress, you decide to give it a go and attend. You don't really expect the issue will be solved after these meetings – how could it, after people have been working on it for months already – but hey, hearing what's on the mind of the other meeting participants would be a useful exercise in itself. After all, if the first meeting goes nowhere you can always find a reason that prevents you from taking part in the next meeting. And the next.

We expect that the above roughly captures the state of mind of the majority of attendants at the start of a first session, before going into the divergence phase of a divergence-convergence cycle. The expectations participants have at that point in time are based on an invitation specifying the topic and task, the proposed way of working, and who else will be involved. Other than that, team members will have their own ideas on the topic matter and on the reputation of the sender of the invitation, as well as possible previous experiences with similar intervention approaches. The first meeting typically starts with a welcome by the client of the intervention, who will remind the team of the topic to be addressed in the session, why it is relevant now, introduce the facilitator briefly and then hand over. The facilitator then introduces her role, the general design of the intervention and the expected end result. The expectations which were initially agreed upon with the team leader, are now also discussed with the participating team. The facilitator will again emphasise that she is responsible for the intervention procedure and process, and the team members for the content of the discussion.

While the problem focus is agreed with the client, and stated in the invitation to participants, it is always wise to check at the start of the first meeting if team members agree this chosen focus is a relevant topic to spend their time on. In a small number of cases, we experienced that team members did not find the issue that important and were reluctant to engage with the agenda. Alternatively, the relevance of the chosen focus can be raised by highlighting the different perspectives in the room, as illustrated in the following example.

The case relates to the articulation of the business model of a regional economic board in The Netherlands. This cooperation brought together regional education institutes, municipalities and large firms. Its general aim was to grow the economy in the region. The first item on the agenda was to discuss the value proposition of the board. Initially, there was little response from the participants in the room and no ideas were suggested. Then one participant voiced his surprise with this question as *“we have discussed this in the past and we all have the same idea”*. Others indicated their support, leading the cooperation’s leader and daily manager to indicate that she thought there might be less agreement on the value proposition of the board than expected. One participant then stepped in and said: *“OK, let me be the one to give a first answer. To me the board is about bringing new firms into our region.”* This led to an immediate response by someone else: *“I thought the board’s goal was to grow the existing businesses.”* This started off a lively discussion and got the group to engage with the first item on the agenda. In this example we see that highlighting disagreements is a way to raise the relevance of the issue to be discussed. Typically, if people in the room need to work together, a shared understanding of core aspects such as the goal and way of working is needed. Showing that these are understood differently will get people’s attention.

Not only the problem focus, but also the proposed agenda needs to make sense to team members. Throughout the sessions, the facilitator will have to guide participants through a procedure that to them is a useful approach to the task at hand. That means it gives them relevant and new information, conflicts are not side-stepped and an agreement on future steps is reached. Team members often allow some time for introduction and setting the scene, but after that some of these outputs will have to materialise otherwise frustration will slowly make itself felt. If the team is not active and working on their problem within 20-30 minutes after starting the meeting, then the agenda may need to be adapted in line with the team’s need (Andersen & Richardson, 1997; Bryson, 2004).

## 14.2 Divergence phase

After both the problem focus and proposed agenda make sense to the team, the first agenda item typically asks for active contributions from team members. Irrespective of the intervention approach used, team members are invited to generate ideas using a simple procedure such as brainstorming or the nominal group technique (NGT). On the other hand, depending on the approach chosen, team members’ contributions may take various forms, such as variables, trends and developments, issues, options, evaluation criteria, preferences, or actions. The facilitator asks open questions such as *“what are issues the organisation is currently phasing?”*, *“which trends do you see in the environment of our firm?”*, *“what is the best software to design and produce?”*, and the like

The facilitator can support the process by helping team members to express ideas as clearly as possible, using active listening. When using the approaches described in the previous chapters, we are often looking for contributions in a particular format: variables, means or ends, trends or developments, options, objectives, criteria and preferences. What happens regularly in a facilitated meeting is that team members initially phrase their ideas more broadly, and need help in clarifying their contributions. A technique that is useful here is *drawing people out* (Kaner, 2007, p. 45). Imagine a scenario session in the phase of identifying future trends or developments. This topic might lead a participant to sketch in detail a possible bleak future for companies in his sector. A basic form of drawing out is to first paraphrase the participant’s contribution, and then ask an open question such as *“can you say more about this?”* or *“what*

*would you conclude from your example?”* A more specific form of drawing out would connect to the type of information sought after. Applied to this example, the facilitator could ask “*which developments would help to create the future you just sketched?*” or “*how could we get from the current situation to the world you describe?*”

It is important to note that in the divergent phase, the person who contributes the idea determines how it is written down. Team members verbalise their ideas, the facilitator summarises them into written statements, then checks if these statements represent what was meant. For example, facilitators often paraphrase (Kaner, 2007) a team member's contribution in their own words. Then they end with a check by, for instance, asking “*is this what you mean?*”. The facilitation task then involves active listening in the form of clarifying meaning and agreeing or affirming meaning (Tavella & Franco, 2015). The aim is that the written idea on the board or screen captures what the individual contributing the idea tried to say. The facilitator checks with the rest of the team if the contribution is understood. Whether other team members find this idea important or not, whether it overlaps with other ideas already mentioned, can or cannot easily be related to other ideas, does not matter at this point.

Contributed ideas and solutions are collected and displayed in visual form on a board or screen for everyone to see. The facilitators ensures that each contribution is captured in the format required by the procedure being used, and carefully considered. When the team is so engaged with the topic that multiple participants start speaking at the same time, a simple way to guarantee that everyone has a chance to speak and at the same time ensuring that each contribution receives adequate attention, is *stacking* (Kaner, 2007, p. 48). When using stacking, the facilitator acknowledges that multiple people want to speak, assigns a number to each person, and calls upon each when it is their turn.

Team members are encouraged to contribute anything they see as relevant, ask each other questions for clarification, but to refrain from evaluating (let alone criticising) one another's ideas. Giving everyone the chance to express their own ideas, and at the same time making everyone feel that their ideas are carefully considered during discussion is critical. For having voice without consideration often leads to team members' resentment and frustration, which affects their perceptions of fairness about how the discussion was conducted, and can cause resistance to implementing the resulting decision (Garvin & Roberto, 2001; Kim & Mauborgne, 1995; Korsgaard et al., 1995). If during discussions, a team member signals that the facilitator gives more attention to some individuals or ideas than to others, a good advice is to admit mistakes, as not doing so would negatively affect perceptions of fairness.

In our experience, team members engage readily with a divergent task; they find generating ideas easy and enjoyable. Hearing ideas of others is likely to generate some surprises, since (as discussed before) there is no single team member that has a complete overview over the issues under discussion. Team members have in-depth knowledge and experience based on their own role in relation to the issues, and at least some ideas from other perspectives will be novel to them. This underlines that exploring an issue by taking time for idea generation already adds benefit to the team discussion, even before ideas are related or prioritised. This is also part of showing to the team that the idea-generation procedure followed helps to make progress with the task at hand. When working with a large team that was used to long and in-depth deliberations, Jac Vennix decided to gather comments on an intermediate report by asking team members to comment one by one, without interrupting one another. One team member afterwards commented “*this was the best discussion we ever had*” although discussion in the

sense of contrasting and building on each other's ideas clearly did not take place (Vennix, personal communication).

In sum, the role of the facilitator in the divergent phase is in the main to encourage team members to share any information that is thought to be relevant to the task at hand. Being clear about this aim and emphasising that all contributions are welcome helps the team to start sharing ideas openly.

### 14.3 Convergence phase

Confronted with a large set of ideas, team members often feel an urge to 'make sense of them', 'structure them' or 'put them into some sort of order'. A logical follow-up to a divergent activity is then some form of convergence. This can be a 'light' version in which team members cluster similar ideas together, or the somewhat more demanding task of combining ideas by writing a narrative or story. In our view a quite rigorous and cognitively demanding alternative is to ask team members to identify relations of a specific type: causal, input-output, means-ends or another.

Convergence by necessity means that a team works towards a shared understanding of their contributions. It starts with a team member proposing relations, and then discussing each proposed addition with the full team. In this phase it is no longer an individual team member who determines what is added or changed on the central board or screen, but the whole team needs to come to an agreement. As a consequence, the meaning of ideas is likely to shift. When an idea or preference is related to another, someone will have to articulate in what sense they are similar (in the case of clustering) or one impacts the other (in the case of relating). This reasoning is then checked by the team and if it is not accepted, the idea will not be put in a cluster or a relation will not be drawn, or a preference will not be established. Sometimes the initial explanation is readily accepted by the team, but often it gives rise to comments such as *"This is not exactly how I read the idea on the board. In my understanding, there is also another aspect to this, which is ..."*. In this process differences in meanings will come to the fore. Ultimately, an agreement will emerge on the shared understanding of an idea. Figure 1 shows the central role of convergence, in the sense of agreeing on relations between ideas, in a supported team meeting.

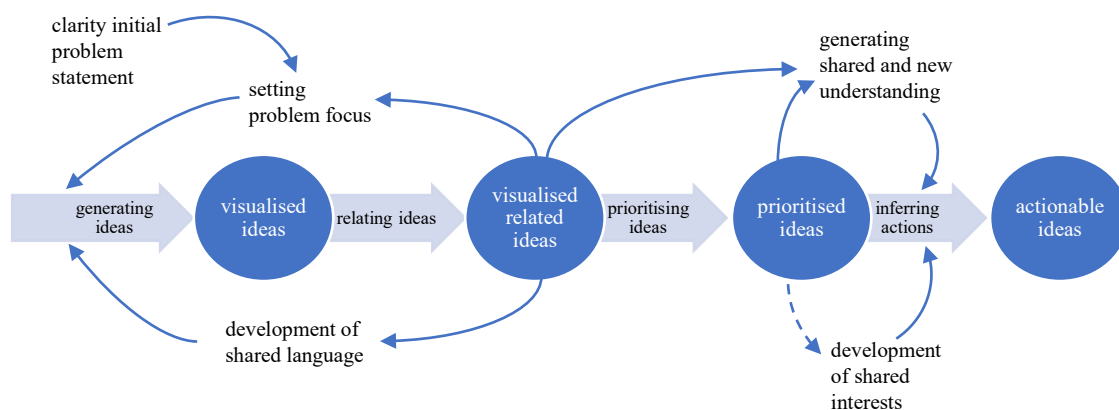


Figure 14.1. Transformation of ideas in team meetings supported by visualisation and facilitation (see also Black and Andersen, 2012; Franco, 2013); the dashed arrow indicates that we assume change in visualised related ideas is necessary but not sufficient for the development of shared interests

The left hand side of Figure 1 shows the first (divergent) task for team members in a decision making meeting: generate ideas on a particular issue. Generating ideas means that out of everything that comes to mind when thinking of an issue or a potential solution, team members put their ideas in words and then, with help of the facilitator, translate them into written statements that are visualised on a board or screen that all team members can see. Black and Andersen (2012) note that this way of working signals two important principles to a participant: the facilitator hears me, and I can change the wording of an idea.

In the next (convergent) task relations between ideas are proposed and then visualised on the board or screen. Each added relation is an incremental increase of agreement and makes it clearer what the issues or proposed solutions under discussion are all about. This in turn supports articulation of additional ideas because it further clarifies the problem focus. The captured relationships form a visual model that is always in transition as the discussion progresses (Eden, 1992b). The model that team members jointly build does not only help to identify other relevant content, but also shapes the form in which team members exchange information. It gives them a shared language which helps them to effectively communicate their perspectives to one another (Franco, 2013).

As shown in Figure 1, relating ideas has a number of other effects. For example, identifying a new link from an idea to other parts of the model may change the interpretation of that idea and therefore generate new understanding. In the case of the Dutch criminal justice chain (see Chapter 2), representatives of the prison administration were well aware that early release of prisoners lowered the average duration of prison sentences. By learning that it also caused judges to pass longer sentences, the interpretation of early release is likely to have shifted. For instance judges, to the extent that they were aware of the new early release policy, will not have fully realised the extent of prison crowding that motivated it. As all team members can suggest changes in the model and are asked to acknowledge and check proposed changes, we can expect that interpretations not only change, but that these change in a particular direction: towards a

new shared understanding of the ideas under discussion. Put differently, the competing and contested perspectives initially held within the team begin to converge (Cronin & Weingart, 2007; De Gooyert et al., 2022; Kaplan, 2008), which often is sufficient to generate joint action (Franco, 2013).

Sometimes, in the course of relating and prioritising ideas different interests are revealed that create barriers for joint action. What is required is a process in which team members negotiate and are willing to change their individual interests (Carlile, 2004; Franco, 2013; Tavella & Franco, 2015; Tsoukas, 2009). In the criminal justice case, at the start of the project we interviewed representatives of the Dutch police, public prosecution, judges and prison administration. At the end of the interview, we asked about the overall goal of the criminal justice system. Although each organisation has distinct tasks and responsibilities, there was a remarkable similarity in the answers to this question. Most answers referred to the aim of keeping the Dutch citizen safe, by ensuring that a criminal act would not go unpunished. *“A perpetrator will not get away with it but will serve the sentence laid down in Dutch law.”* Another way of saying this is that sentences need to be served in full. If serving sentences in full is the aim or common interest of all partner organisations in the criminal justice chain, the policies of increasing sentence duration and at same time lowering the time served go directly against this aim. Once these two ideas are seen to have a negative effect on serving sentences in full, their interpretation will change. They are likely to be seen in a more negative light and less likely to be chosen as policies to improve the situation at hand.

The realisation that all members of the team have a role to play in the problem, either as problem creators or problem solvers, may make it easier to agree on how to move forward (L. J. Black & D. F. Andersen, 2012). Nevertheless, we take the view that while models may be necessary for the development of shared interests, they are certainly not sufficient. Models clarify how possible solutions or actions have consequences for particular interests. Although the intervention approaches outlined in this book emphasise collective goals over individual interests, and advocate checking for team agreement in each step of building a model, there is nothing in these methods that forces team members' goals and interests to become more aligned. As already mentioned, a possible outcome of achieving more clarity may also be that team members realise their goals and interests are incompatible (Franco, 2013). That would mean participants have consensus on the problem but do not agree on solutions to improve the problem situation, which is a result found in several modelling applications (Rouwette & Smeets, 2016a, p. 141). We speculate that in this respect the person of the facilitator is more important than the method, as trust in the facilitator (e.g. Harper et al., 2021) may encourage team members to participate actively, which increases the chance of finding common ground, move beyond seeing the issue as a zero-sum game and identify actions that benefit everyone.

How can a facilitator help a team to generate, relate and evaluate ideas, and agree on actionable ideas? First, we first note that a number of facilitator actions that were important in the divergence phase also need attention in the convergence phase. For instance, transparency on task aims and outputs of each step on the agenda is also still important, as is the clarification of roles with regards to process and content, and the willingness to freely admit mistakes. Similarly, paraphrasing, and drawing people out are also appropriate in the convergence phase. However, whilst open questions are also used in the convergence phase, these have a different purpose: to invite contributions about relations between ideas, or between the strength of preference of different solutions. Furthermore, these relationships are captured using the format required by the procedure being used (e.g. cause-effect, means-ends, input-output).



A powerful way to help a team visualise relations is by using models. As shown in Figure 1, developing models with a group supports information exchange in a number of ways. Black and Andersen (2012) and Franco (2013) emphasize that models can serve as so-called boundary objects: visualisations that help to articulate knowledge, create shared meanings and identify common interests. They can only fulfil this role if they are supported by adequate social processes. Adequate here means that everyone in the room has a chance to change the model shown in front of the team. Ideally, speaking time is divided evenly between team members through stacking (see previous section). It also means that proposed changes to the model are visualised and checked with the whole team. Only if no one in the team objects to the proposed change, it is implemented in the model. If a suggestion by a participant cannot be implemented in the model, it is a good idea to include it on the so-called '*parking lot*'. The parking lot is an area of the group memory that functions as a 'to do list'. It serves as a reminder of topics the team still needs to attend to.

In general, we feel that it is a good rule of thumb to keep in mind that each team member's contribution needs to result in a change on the visual display in front of the team. This can be in the model or on the parking lot. Finally, if major changes are implemented in the model, for instance in between sessions, a good idea is to maintain visual consistency. This means that care is taken that team members still understand the model, and see how the new version relates to the last one they worked with. If modelling is indeed supported by adequate social processes, team members will focus their attention on the model and jointly develop it further. As a result, the model will be a reflection of the team's understanding of the issues and proposed solutions up until that moment. The facilitator can direct the team members' attention to parts of the model that need to be elaborated further. This might be the list of ideas that are not yet included in the model, or an area that is relatively isolated from the rest. However, it is also worth noting that convergence can be a more difficult process in which progress at times seems slow. That means that showing that it is all the more important to point out to team members how the intervention approach helps them in accomplishing their task. This for instance takes the form of publicly noting intermediate results such as agreements or new insights. As convergence is more demanding than divergence,

Team members usually find the divergence phase (e.g. sharing ideas without criticizing one another) easy and enjoyable. By contrast, team members perceive the convergence phase as difficult because convergent activities are more demanding. Specifically, in the convergence phase, the team will have to agree on how to word the ideas displayed in the model, and on which relations will be drawn. This asks team members to consider carefully how their ideas are similar or different than those of others, and this task can be challenging. Kaner (2007) has coined the term '*groan zone*' for the transition between divergence and convergence. This '*period of confusion and frustration is a natural part of group decision-making. Once a group crosses the line from airing familiar opinions to exploring diverse perspectives, group members have to struggle in order to integrate new and different ways of thinking with their own*' (Kaner, 2007, p. 18). Warning team members that the groan zone will come, and acknowledging frustration once it is there, helps the team to move forward. In our experience it is also useful to switch focus regularly. Imagine for instance that the discussion has focused on financial aspects for some time. This may lead the attention of people not working in that area to drop after a while. Focusing on another topic area helps to engage people again.

The facilitator more actively engages with the content of the discussion in the convergence phase. During the discussion, the facilitator produces formulations that summarise or project their prior talk, which team members then need to make sense of (Franco and Nielsen, 2018).

This can take the form of looking backwards, as in the clarification of previous talk to determine the ‘gist’ of the conversation. It can also consist of looking forward, as in thinking further, building on previous talk. This is called formulating the ‘upshot’ of the discussion. Both the gist and upshot of a discussion can involve sentences starting with “so...” or “are you saying that...”. What the facilitator is in effect doing is handing back information in changed form (Phillips and Phillips, 1993: 545). This enables team members to recognise it since it resembles the main points of what they were saying, but also brings in a new perspective that provides new meaning. When gist and upshot formulations are being produced, the facilitator is often proposing a new meaning or building on team members’ contributions to develop alternative meanings (Tavella and Franco, 2015)<sup>18</sup>.

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<sup>18</sup> Research shows that sometimes team members refer to superior knowledge or expertise to justify the legitimacy of a proposed meaning, or deploy authority to eliminate alternative meanings (Thomas et al 2011; Tavella and Franco 2015). In the case of the facilitator, attempts to justify or eliminate meanings often takes the form of a check on the format of a contribution, to ensure that is in line with the intervention approach and type of model used (Tavella and Franco 2015).

<i>Phase</i>	<i>Facilitator tasks</i>	<i>Facilitator actions</i>
Divergence	Demonstrate authenticity	<ul style="list-style-type: none"> <li>- Be transparent on aims and intended outputs of team discussion; welcome all contributions</li> <li>- Discuss expectations and emphasise own responsibility for procedure and process, and team's responsibility for content</li> <li>- If appropriate, admit mistakes</li> </ul>
	Select problem important to client	<ul style="list-style-type: none"> <li>- Check with team members if problem is relevant to them, adapt problem focus if needed</li> <li>- Raise relevance of chosen problem by highlighting differences in opinion</li> <li>- Adapt agenda in line with team needs</li> </ul>
	Ask questions, listen actively	<ul style="list-style-type: none"> <li>- Invite and welcome each participant to contribute ideas by asking open questions</li> <li>- Paraphrase, draw people out, clarify and agree on meaning of ideas</li> </ul>
	Encourage an open information search without contributing to content, but set format, focus attention and reflect back the content of the discussion	<ul style="list-style-type: none"> <li>- Collect and display ideas in visual form; divide speaking time equally (stacking)</li> <li>- Ensure that each contribution is captured in the appropriate format</li> <li>- Do not allow criticism on contributions and ensure they are carefully considered</li> <li>- Show that approach used helps to make clear progress on issue of concern</li> </ul>
Convergence	Demonstrate authenticity	<ul style="list-style-type: none"> <li>- Be transparent on aims and intended outputs of team discussion</li> <li>- Discuss expectations and emphasise own responsibility for procedure and process, and team's responsibility for content</li> <li>- If appropriate, admit mistakes</li> </ul>
	Ask questions, listen actively	<ul style="list-style-type: none"> <li>- Invite and welcome each participants to contribute with proposed relations between ideas, or strength of preference for different ideas by asking open questions</li> <li>- Paraphrase, draw people out, clarify and agree on meaning of ideas</li> </ul>
	Encourage an open information search without contributing to content, but set format and guide trajectory of discussion	<ul style="list-style-type: none"> <li>- Collect and display ideas and relations in a visual model; divide speaking time equally (stacking)</li> <li>- Ensure that each contribution about relations is captured in the appropriate format, either in model or on parking lot</li> <li>- Visualise proposed changes and test for consensus</li> <li>- Maintain visual consistency</li> <li>- Direct attention to underdeveloped sections of model</li> <li>- Show that approach helps to make clear progress on issue of concern</li> <li>- Acknowledge team member's emotions in groan zone</li> <li>- Switch focus regularly</li> <li>- Actively engage with content of discussion by producing formulations (gist/upshot)</li> </ul>

Table 14.1. Facilitator tasks and actions in managing divergence and convergence

## 14.4 Reaching closure

Using the procedures described in this book, major insights on the issues and helpful solutions will emerge over the course of team discussions. For this to happen, we need a team of knowledgeable people with a stake in the decision, supported by adequate procedures. We have seen in the previous sections that under these conditions, open communication and trust and team psychological safety will codevelop. Team decision making is inextricably bound up with differences in opinions and personalities that are bound to create conflicts. We think the facilitated procedures in this book help to make task conflict productive, avoid side-stepping interpersonal conflict, and keep process conflict to a minimum.

This also means that major insights and emotional experiences will happen in the team process and closure is not a question of writing a summary report that brings all information together. In fact the final report should not have any surprises for the decision making team. There are a couple of reasons why the group process has implications for action (Roberto, 2013). First, the incremental nature of the procedures ensures that the problem is broken up in small, manageable parts. The group will only proceed to the next topic if the former is closed. For instance, when building a model, new relations are only added after testing for team consensus. Second, procedures alternate between divergence and convergence in a series of iterations, thereby preventing both premature convergence on a subset of the problem as well as polarising divergence. Third, the approaches described here capitalise on ‘small wins’ throughout the decision making process. Small wins can concern the process or the content of decision making (Roberto, 2013). The facilitated procedures in this book help to create process wins such as agreements on goals, assumptions and criteria. In terms of content, they contribute to formulating alternatives and reaching agreements on actions. Agreements on actions, for instance, are invited in the formulations the facilitator uses for closing discussions by asking for the ‘upshot’ (Franco & Nielsen, 2018, p. 18) : *“So, what does the previous conversation imply for future actions?”* Likewise, the previous section described in detail how effective as well as affective outcomes are created (Wardale, 2013), resulting in high quality decisions and commitment, by considering the emotional impact of the information exchanged.

The end of an intervention is typically marked by writing and handing over a report to the client, which summarises the suggested response to the client’s situation. The client will also be interested in the process underpinning the recommendations, so it is important to provide details about the methods used, as well as the participants and data sources that contributed information. In line with guidelines on reflexivity, the end report should include a motivation of the choice of intervention approach as well as a discussion of (personal and other) problems that impacted data collection and analysis (Amis & Silk, 2008; Brannick & Coghlan, 2007).

For the facilitated interventions described in this book, the choice of team members is a major influence on data collection that should be included in the reflection. As mentioned, the report should not include any major surprises. The most important insights will have been generated during the intervention process and will, to some extent, already be part of the conversations in the organisation. The intervention approaches covered in this book focus on uncovering problem structure, possible futures and comparing solutions against guiding values. They stop short of prescribing implementation steps and change plans. For this phase particular methods are available, such as action planning and project management.

After implementing proposed changes, both the client and facilitator will be interested in establishing whether expected impacts are actually realised and whether new problems have

arisen. Evaluation can be used to establish impacts and may reveal that new issues have emerged, requiring a new round of selecting and using intervention approaches. For clients, evaluation of a completed intervention is important to ensure that expectations are met and evidence-based accountability is achieved. For facilitators and analysts intervention evaluation is important to improve their practice. As reflective practitioners, this is a good moment to test their own expectations on what worked and why. Chapter 16 will go into evaluation of intervention approaches.

## Chapter 15. Managing team conflict and emotional dynamics

Since interventions involve bridging differences of opinion and interests, conflict is likely to arise within team discussions and thus the effective management of conflict becomes paramount. Earlier in the book we discussed some of the perils of team decision making, one of which was the lack of productive conflict. Productive conflict is encouraging cognitive conflict (up to a certain level) while keeping affective conflict in check (Roberto, 2004). One way in which conflict can turn unproductive is when multiple viewpoints are brought to the table but never integrated. Discussions then remain unfinished and the same topic can reappear in discussions time and time again. Another way in which conflict can become unproductive is when conflicts on the task at hand turn personal. We saw in Chapter 2 that when progress on the team task stalls, team members find themselves repeating the same arguments over and over (Edmondson & McLain Smith, 2006). People then become frustrated and comments can become personal. The discussion gets heated and fuels further impulsive, emotional reactions. Escalation of emotions was another peril to team decision making discussed in Chapter 2.

The topic of this chapter is to describe ways in which the facilitator can stimulate productive conflict while avoiding emotional dynamics that could spiral out of control during team discussions. First, we start by briefly describing what the facilitator can do to stimulate adequate levels of cognitive conflict, so that the team is able to bring all the relevant information to the table. Next, we look at the role of conflict and emotion in successful team decisions. We end the chapter with concrete facilitator actions intended to manage affective (interpersonal) conflict and emotional dynamics

### 15.1 Stimulating productive cognitive conflict

As mentioned in Chapter 2, the evidence to date suggests that moderate levels of cognitive (task) conflict are generally beneficial to team performance (De Wit et al., 2012; DeChurch et al., 2013; O'Neill et al., 2013). This is because cognitive conflict can increase team members' tendency to engage in deep and deliberate processing of task-relevant information, which in turn increases team performance. Importantly, surfacing and managing cognitive conflict is central to the intervention approaches described in this book. Cognitive conflict often arises when the model reveals inconsistencies between team members' definitions of the decision or problem at hand. When such gaps are not apparent, the model is often used as a medium to stimulate cognitive conflict by facilitating the differentiation of views. Contrasting viewpoints are then openly discussed through model-supported analysis and interaction, which can prevent conflict escalation. This is possible because team members' attention is centred on the views contained in the model, independent of where those views come from within the group. Furthermore, the model-supported process helps team members to clarify and test assumptions underpinning contrasting viewpoints in an organised and participative manner, which can reduce misunderstandings and increase perceptions of fairness within the team (Kim & Mauborgne, 1998; Roberson et al., 1999).

By enabling a collective and systematic examination of viewpoints within the team, the model-supported process can help to maintain moderate levels of productive cognitive conflict throughout group discussions. In addition, model-supported processes often foster collaborative problem-solving behaviours that can facilitate the development of integrative solutions that take

a diversity of viewpoints into account (Rouwette & Franco, 2021). In this way, how conflict is handled within a model-supported environment resembles the well-established ‘differentiation before integration’ model of effective conflict management (Walton, 1968).

However, there is some empirical evidence that model-driven support alone may not be enough to stimulate cognitive conflict in teams (e.g. Engin et al., 2023; Sambamurthy & Poole, 1992). Therefore, what can facilitators do to ensure that an intervention can effectively stimulate and facilitate the management of cognitive conflict in teams? One possible way is for facilitators to use simple conflict stimulation strategies (e.g. Okhuysen & Bechky, 2012; Van de Vliert & De Dreu, 1994) or incorporate structured conflict stimulation procedures —e.g. Devil’s advocacy, Dialectic inquiry (Schwenk & Valacich, 1994; Schwenk, 1990). The procedure for these techniques is outlined in Appendix A.

In addition, facilitators can establish communication norms about conflict (Tjosvold, 2000) that help create a climate of ‘psychological safety’ (Edmondson, 1999), that is, an interaction space in which team members feel it is appropriate and acceptable to openly discuss disagreements. Regarding the latter, the facilitator can also focus attention to parts of the model that would highlight disagreements, particularly in the earlier part of the discussion, to avoid the shared-information bias (Stasser & Titus, 1985) that often leads to premature consensus (see Chapter 2).

## 15.2 The positive cycle of trust and information exchange

The Campus Connect case (Van Oortmerssen et al., 2014) described in Chapter 13 offered an example of a successful team decision. The case follows a board that meets every month over the course of a year. In that time the interaction among board members changed greatly. Differences in ideas and personalities emerged and clashed, leading to frustration and anger but also enabling the team to come together and identify a more effective way of working. In this case both interpersonal and process conflict were successfully managed, creating a positive interaction between trust and open information exchange. Below we analyse the positive spiral driving the Campus Connect case and describe two negative spirals, showing how decision making teams can get stuck in interpersonal conflict or process conflict. A facilitator can help a group by nudging it onto the positive spiral, or recognising early signals of entering either of the negative cycles and then intervening accordingly.

Cognitive theories on emotion, although diverging on a number of aspects, in the main agree that emotions are caused by appraising events in terms of concerns (Oatley and Johnson-Laird, 2014). Emotions arise when personal goals become important. If a change in the environment affects personal goals, people react in two phases. The first reaction is an immediate feeling of arousal (energy) and pleasure or displeasure. In the second stage the emotion is interpreted and labelled (Oatley & Johnson-Laird, 2014; Russell, 2003). Let’s imagine you receive a mail saying that the training budget in your organisation is expanded. As a result you now have five extra days each year, in which you are taken out of your primary task to instead spend time on external training. With all expenses paid. We expect this mail would make many people feel positively energised. In the secondary reaction goals will come into play. A goal such as ‘develop my skills further’ may inspire happiness, with some initial plans on how to use these days already forming. On the other hand, the initial reaction may also be negative. When the first goal that comes to mind is ‘finish work in fewer days’ the feeling is one of irritation, followed by plans to work around what is perceived to be a nuisance.





Phillips (1993) see the management of emotions as one of the main tasks of a facilitator. Emotions can arise because members have different goals, but also because of personality differences or their status relative to others. *'Members wish to be accepted by the group (...) and they want the group work to go well. But to be accepted and liked, to 'fit in' to the group culture, means sacrificing much of the uniqueness that is one's self'* (Phillips & Phillips, 1993, p. 538). Being immersed in the team can lead to anxiety that may express itself in disengagement with the task, outbursts against other team members or against the facilitator. Sterling et al. (2019) point out that team members often have needs that they cannot articulate easily. Over the course of the team discussions they discover their motivations, *'which in some conflict situations might be related to feelings of being disrespected or undervalued, or to disparities in social power among participants'* (2019, p. 8).

In summary, facilitators should be aware that in team decisions differences in personalities and goals are likely to become manifest. The facilitator can reduce tensions by paying attention to the emotional state of the group, recognising a threat against individuals if it occurs, and working with the team to change a situation in which one person's loss is another person's gain to a win-win situation (Phillips & Phillips, 1993). Identifying shared goals is a way to do this (Eisenhardt et al., 1997). A simple way to remind the group that 'we are all in this together' and to foster thinking in terms of shared goals (Eisenhardt et al., 1997), is to keep addressing the group as 'we' (Vennix, 1996).

While the Campus Connect case was an example of a positive spiral of interaction and emotion, team decision making can become trapped in a negative spiral as well. Two negative spirals are particularly dangerous. The first is a cycle of tension between individual and team goals setting off negative, person-centred communication and blaming, limiting progress on the task and feeding further tensions. The second negative spiral starts with the gradual realisation that the challenge facing the team may be too great for the time and resources available. Panic and avoiding to discuss threatening information prevent the group from effectively discussing the problem at hand, increasing the perceived challenge and fuelling further panic.

### 15.3 The negative cycle of lack of progress and person-centred comments

In Chapter 1 we saw that there is a clear danger that team discussions escalate from task conflicts to interpersonal conflicts. When the discussion impacts strongly held personal beliefs, participants may be keen to bring others around to their point of view by repeating the same arguments. When that does not lead to the desired result, the conversation turns to interpersonal issues and blaming the lack of progress on the other person's personal agenda or lack of expertise. Once negative personal attributions arise, emotions become the focus of the interaction and progress on the task comes to a standstill. Parties blame each other openly. The negative spiral between emotions and interactions takes over: *'Suggesting, even indirectly, that others are incompetent, ignorant, or immoral gives rise to defensive reactions that inhibit others' willingness to continue to express their views, making it all but impossible to resolve a conflict effectively'* (Edmondson & Smith, 2006, p. 14).

Reasoned argumentation 'in the heat of the moment' is difficult, and impulsive 'hot' reactions take over. In the short term, repetitive argumentation and negative personal comments impede progress on the task. In the longer term, it creates so-called undiscussables. Undiscussable topics are those that are avoided because team members fear they may set off unmanageable interpersonal conflict (Argyris, 1990). If a team feels their task links to many undiscussables,

conversations rarely touch on anything important and little progress is made. This means differences are not discussed and resolved, but the discussion is dropped prematurely or ended by one side giving in (e.g. Poole & Dobosh, 2010). These interacting negative cycles are shown in Figure 15.2.

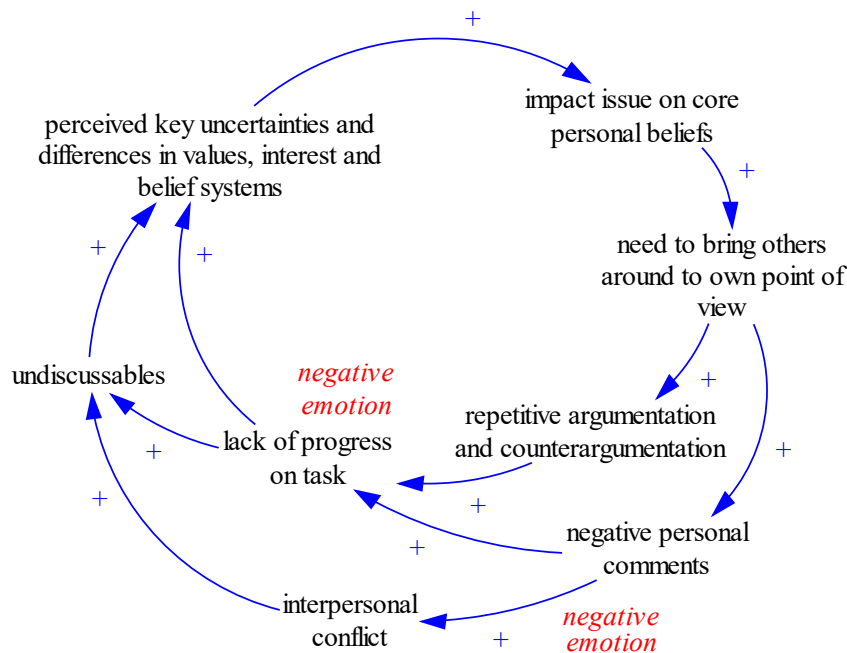


Figure 15.2. Negative spiral in which an issue touching on core personal beliefs sets off repetitive argumentation and negative personal comments

When conflict and emotions are low, the facilitator can use many of the techniques described in the preceding chapter: sharing ideas and analysing information, supported by visualisation and communication techniques. There are additional actions a facilitator can take to recognise the shift from task-related to person-centred communication and prevent interpersonal conflict from flaring up. Once a heated interpersonal conflict is underway, a second set of actions may help to cool down emotions. Ultimately, as we saw in the Campus Connect case, the experience of having navigated emotional conflict also has benefits for future cooperation and the facilitator can assist in creating these benefits.

The first set of actions aims helps the facilitator to note when the conversation shifts from the task to persons. This is likely to be accompanied by a change in emotional state in the group. In the previous chapter we already discussed ways to notice weak emotional signals such as the facilitator attending to shifts in her own emotional state. Early shifts in group emotions are usually indicated by nonverbal communication. One important nonverbal cue is what participants are looking at: the model or another team member. The model represents a form of group memory, which in fact visualises the state of the team discussion up to that moment. The group memory almost automatically disconnects ideas from persons. When building a model, while model elements were suggested by one team member, relations are discussed with the whole team, making it likely that contributions are no longer associated with a particular person. In electronic brainstorming and group causal mapping, idea contribution is usually anonymous. When team members discuss while looking at the model and using model terms, we can generally conclude they are oriented on the task at hand. When they turn to face each other this may signal a shift to person-oriented communication (Franco, 2013). A final indicator is lack of further development of content, or repetitive argumentation and counter argumentation (Edmondson & Smith, 2006, p. 10).

A second set of actions helps the facilitator to cool down emotions. As emotions involve incompatible goals, there is one action that was discussed earlier but also applies here: bring shared goals back into focus (Eisenhardt et al., 1997). It is worth realising that associations between persons and ideas also exist in the wider organisation. In major organisational issues, persons may be known for their view or be seen to back one particular side of an ongoing argument. Learning and building a shared understanding means that individuals change their minds. Eden (1992c) warns that changing opinions may cause a loss of face. If a sensitive issue was discussed and an agreement has emerged which implies one or more team member have made a major change in their thinking, the facilitator may deliberately choose to phrase the outcome in generic terms. Allowing for ambivalence or some level of vagueness lowers the chance that a person loses face from being seen to change her mind. The type of team leadership also has consequences for the discussion. When a team leader has a coaching style, which is supportive and non-defensive in reaction to questions and challenges rather than authoritarian or punitive, team members are more likely to discuss information openly (Edmondson, 1999). Reminding team members that their input is needed and desired increases the chance on open sharing of information (Edmondson, 2003). In addition, the team leader supports open discussion by minimising power differences in the team. Self-disclosure, or being open about own mistakes, and emphasising the need for teamwork (referring to the team as 'we'), are ways to bring this about.

Notice that a coaching style, encouraging team members to share information and minimising power differences in the team, are all closely in line with facilitator attitudes discussed in Chapter 13. The discussion in Chapter 14 on managing content and process in a facilitated meeting, emphasised the importance of carefully trying to capture team members' contribution to the discussion. Occasions may arise when all actions to prevent a discussion from heating up fail, and emotions run high. The aim is then to get team members out of their 'hot' emotional reactions back to 'cold' processing of information. One way to cool down emotions is by inviting participants to reflect on their reactions (Edmondson & Smith, 2006). This asks team members to step out of experiencing a reaction to turning reactions into objects of reflection, or in terms of Oatley and Johnson-Laird (2014), moving from the primary emotional reaction to the secondary interpretive stage. Once participants engage in reflection, reframing becomes possible. Two new frames are important here. The first is the realisation that, on the basis of different beliefs, one person will see things the other misses. The second new frame is that each person is responsible for discussing their views so that the other can learn what we might be missing. If the team is able to manage their conflict in this way, it will better understand what motivates each member and will likely bring team members closer together. Over time, gaining more experience with this reframing approach to handling conflicts, teams can proceed to address undiscussables.

The third set of actions is relevant after a team has navigated an episode of interpersonal conflict. As we saw in the Campus Connect phase, a conflict is also an occasion in which team members 'show themselves as they are' and get to know each other on a more personal level (Van Oortmerssen et al., 2014). This was an important factor in the creation of trust. A similar but slightly broader factor was team psychological safety, which is the shared belief that the team is safe for interpersonal risk-taking (Edmondson, 1999, 2003). If the team has successfully worked through an interpersonal conflict, it will have explored the underlying beliefs, emotions, and both task and interpersonal conflicts. Speaking up on these matters involves considerable personal risk. In the Campus Connect case team members were more likely to take such a risk if they had trust in the team. As one of the board members indicated, if team members feel they

can express themselves without the danger of being ridiculed, they will share their thoughts and feelings more freely (Van Oortmerssen et al., 2014, p. 680). Therefore, the facilitator can assist a group by handling interpersonal issues in a respectful and impartial manner. This will contribute to creating trust and team psychological safety. As indicated in Figure 15.3, this in turn makes it more likely that the most sensitive issues, or undiscussables (Edmondson & Smith, 2006) will be raised.

#### 15.4 The negative cycle of panic and avoiding discussion of the problem

Even when a team avoids the trap of spiralling off into interpersonal conflict, it may fall into a second trap involving excess process conflict. The negative cycle around process conflict starts from the realisation that the team may not succeed in achieving its task, and can also be recognised in the Campus Connect case. In the two-day meeting, when the board members realised they were no way near a shared understanding of the cooperation's future, while such an understanding was necessary to communicate with partners on the short term, a negative mood took over. Here it is not the mismatch between personalities or goals of team members that causes negative emotions, but the mismatch between the team's desired outcome and the perceived situation. We noted at the start of this chapter that team members need to experience some level of urgency before they will attend to a problem. Different authors referred to this as disconfirmation (Schein, 1999), problem importance (Roberts, 1978) or motivation (Chaiken et al., 1996; Petty & Cacioppo, 1986). An intermediate level of urgency leads the decision making team to mobilise resources and increase efforts in sharing and processing information. Indeed, in the Campus Connect case, the realisation that task progress might be too slow to meet deadlines was probably an important incentive to discuss team member's goals, reaffirm shared goals and change the decision making procedure.

However, high levels of problem urgency may lead team members to switch to ineffective coping mechanisms. In situations of major disruptions and high arousal, where there seems to be no possibility or time to develop realistic solutions, decision makers become hypervigilant or use defensive avoidance (Janis & Mann, 1977). Hypervigilance refers to the panic arising when time is running out. Defensive avoidance arises when each available solution seems to have serious negative impacts on important goals. Hodgkinson and Wright (2002) describe a scenario planning intervention in which three forms of defensive avoidance can be recognised. The decision making team was unable to find an alternative to the current, failing strategy. Realising this had a major effect on team members, and especially on the CEO: *'One of the participants went so far as to say that the effect on the CEO had been 'the psychological equivalent of thrusting a medicine ball into her stomach', and that the results of our exercise, thus far, had greatly unsettled the rest of the group'* (Hodgkinson & Wright 2002, p. 962). In reaction, the team first tried to delay making a decision and postpone considering the problem. This strategy of procrastination was followed by so-called 'buck-passing' in which the responsibility for the decision was shifted to other individuals or groups. Procrastination and buck-passing are both forms of avoiding a decision. Since the team refuses to engage with the problem it is in effect avoiding task conflict. Using the third strategy, bolstering, the team rationalised the least objectionable decision alternative. Here we see that when major disruptions occur and a team anticipates it will fail at its main task, emotions run so high that decision making is impaired. Task conflict is not resolved because either the team refuses to address the issue at hand or does not process information adequately. Figure 15.3 summarises the processes just described.

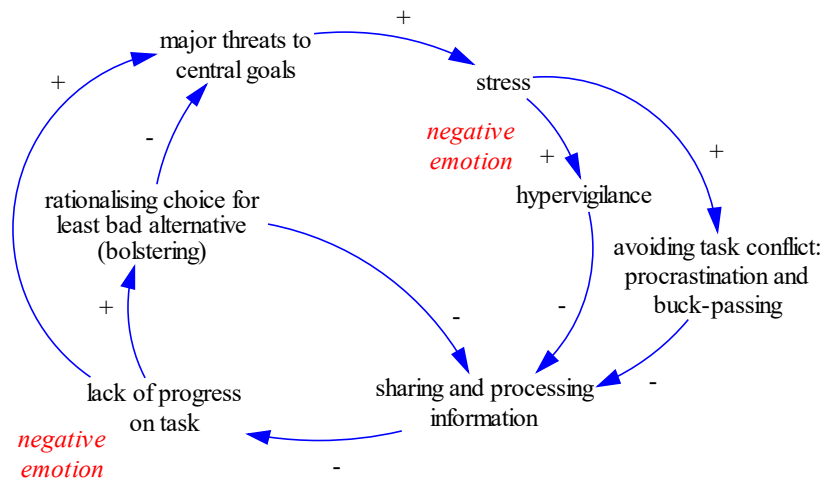


Figure 15.3. Negative spiral in which major threats cause stress and inadequate information sharing and processing, leading to the identification on a single choice which temporarily reduces the threat, but ultimately hinders progress on the task and increases threat further (procrastination is refusing to engage with the decision; buck-passing is denying responsibility)

Again we see a downward spiral of negative emotions and slowing progress on the task, this time not caused by interpersonal conflicts but by a perceived inability to cope with an external threat. Hodgkinson and Wright (2002) note that in their case, the volatile environment of the client organisation, combined with a strong need for control exhibited by the CEO, made it impossible to start a process of open communication and the intervention ultimately did not lead to any change. In the Campus Connect case, the realisation that there was a gap between the current situation and desired outcome spurred team members into action instead of immobilising them. It seems likely that the perception of a gap increased arousal and stress, but not to such a level that it impeded decision making. Perhaps the only advise for a facilitator in addressing an issue leading to extreme stress, is to recognise the perception of threat in an early stage so that effective communication is still possible and helps to defuse the situation.

Table 15.1 brings together facilitator tasks and actions discussed in this chapter.

<i>Task focus</i>	<i>Facilitator tasks</i>	<i>Facilitator actions</i>
Emotion	Attend to own and others' emotions	<ul style="list-style-type: none"> <li>- Monitor own energy level, and change to another task if relevant</li> <li>- Monitor own emotional state (positive - negative) , and change to another task if relevant</li> <li>- Monitor energy level group, signal stress</li> <li>- Monitor emotional state group (positive – negative), signal emotional tension</li> </ul>
	Encourage an open information search without contributing to content, but set format and guide trajectory of discussion	<ul style="list-style-type: none"> <li>- Identify shared goals</li> <li>- Address team as 'we'</li> </ul>
Conflict	Encourage an open information search without contributing to content, but set format and guide trajectory of discussion	<ul style="list-style-type: none"> <li>- Use simple (cognitive) conflict stimulation strategies or structured conflict stimulation procedures</li> <li>- Disconnect ideas from individual team members to encourage a psychologically safe team climate</li> <li>- Move from hot to reflective interaction by using reframing</li> </ul>
	Listen actively	<ul style="list-style-type: none"> <li>- Note repetition of arguments and counterarguments, bring shared goals back into focus</li> <li>- Note when discussion shifts from model to team members, identify win-win situations</li> </ul>
	Limit but do not sidestep interpersonal conflict	<ul style="list-style-type: none"> <li>- Adapt agenda to address interpersonal conflict when it arises</li> <li>- Adapt agenda to address process conflict due to perception issue as threat to major goals</li> <li>- Prevent loss of face by allowing for ambivalence</li> <li>- Handle interpersonal issues in a respectful and impartial manner to help build trust</li> </ul>

Table 15.1. Facilitator tasks and actions in managing emotion and conflict



## Part IV. Evaluating and using team decision support

The first part of this book discussed why teams often fall short of their potential and make faulty decisions. We then presented a range of basic and more advanced approaches to help teams make better decisions. The previous part addressed the design and deployment of team decision support interventions. This last part goes into two questions: what evidence do we have that these interventions actually improve team decision making? Followed by: how can I build my competences in researching and applying team decision support approaches?

Chapter 16 reports on the evidence by first specifying the range of applications for each approach, followed by academic reviews of their use. Claims of visible and less visible products are listed. Finally, evidence for impact is addressed.

Chapter 17 closes this book by outlining how a research and practitioner in the field of team decision support can build their competences. This is done by contrasting interventions to theory oriented research and action research. Researchers studying interventions can choose to focus on causal explanations for observed effects (a variance approach) or analyse how interventions evolve over time (a process approach). Building competences as an intervention practitioner can be done as part of an apprenticeship or in the classroom. Three areas of competences are important: for conducting analysis, addressing process and appreciating context. A sequence of building skills, from more basic to advanced, is proposed. Researching and training build on one another and is the basis for further development of the team decision support domain.

## Chapter 16. Do team decision support interventions work?

This chapter takes stock of what we know about the effectiveness of team decision support interventions. In Part I of this book we identified several deficiencies of unsupported team decision making: team biases, insufficient sharing of information, unproductive conflict and escalation of emotion. Part II presented simple and more elaborate procedures for team decision support. Part III outlined generic factors in designing and delivering team support, including setting up a supportive team environment and ensuring effective facilitation. These procedures and generic factors are said to remedy deficiencies in team decision making. How confident can we be of the validity of this claim? If we had evidence that particular procedures reliably result in particular outcomes, this would be a great help in deciding whether to use a procedure and choosing between available options. In some situations simple procedures might be adequate, in others more elaborate procedures or combinations of approaches might be needed.

In health care, education, consultancy, and other fields, professionals strive to make their interventions evidence-based. They recognise that at present many of the decisions taken by doctors, surgeons, educators and consultants are not always founded on empirically tested claims but on personal experience, habits and untested ‘best practices’. They expect that grounding more of their practice in empirical evidence improves their decisions and ultimately their effectiveness. In this chapter we summarise the evidence for effectiveness of decision support approaches. We start by reviewing the use of approaches in practice drawing from published surveys, academic reviews and case studies. Second, we bring together claims on products generated and impact created by team support procedures. This is followed by an examination of the evidence supporting or questioning the actual achievement of the products and impacts claimed by approaches. Finally, we critically reflect on our findings and discuss what in our view are the most pressing issues in advancing research on effectiveness of team decision support.

### 16.1. Evidence of use

In this section we provide a short account of the practical application of team decision support approaches in two ways. First, we compare the applications reported in earlier chapters. Second, we look into published survey evidence and academic reviews, to capture actual use and the range and distribution of team decision support applications.

#### *16.1.1 Examples of practical applications*

Chapters 5, 7, 9 and 11 reported on the background, process, products, implementation and results of team support applications in practice. Table 16.1 below summarises the main elements. Comparing the four applications immediately makes clear that there are large differences between starting questions and the process followed. The question group model building seeks to answer is explanatory, trying to find the structure responsible for past problem behaviour. All other approaches answer future-oriented questions. The number of sessions and participants vary widely. With regard to visible products, applications are similar in that they all use workbooks in between meetings and deliver a final report at the end of the project. The degree of implementation differs again, with recommendations put into action in the Sioo case and further use of the method and a relative lack of impact in the case of Nijmegen municipality.

	Chapter 5 <i>Group model building</i>	Chapter 7 <i>Participatory scenario development</i>	Chapter 9 <i>Group causal mapping</i>	Chapter 11 <i>Decision conferencing</i>
<i>Background</i>	Which business model explains Sioo revenues between 2013 and 2018?	Is Nijmegen municipality developing the right things for 2035?	What issues must the Teenage Pregnancy Strategy Group consider in trying to achieve its targets by 2010?	
<i>Process</i>	Two meetings of three hours each, 12 and 11 participants	Five meetings of 3.5 hours each, about 30 participants	Interviews with cognitive mapping, eight participants One full day meeting, six participants	One full day meeting, four participants
<i>Product</i>	Workbook and final report with causal loop diagram	Workbooks and final report with scenarios and results wind tunnelling	Workbook with individual cognitive map and merged map	Final report
<i>Implementation and results</i>	Proposed actions implemented, model used in further strategy meetings, use of method continued	Some indications of change of collective and individual insights, no implementation in organisation	Improved quality of communication and shared meaning, no implementation in organisation	

Table 16.1. Comparison of practical applications of four team support interventions

Many more reports on applications of team support methods can be found in the literature. These include surveys and reviews of method use in particular regions, application domains or in specific academic journals. Some of these focus on a on a single method, including those described in this book, others extend to other approaches that support team decision making by combining facilitation and other forms of modelling. In practice, approaches for team decision support are flexible and their use is adjusted to the particular problem and team in focus. Their flexibility allows for combining approaches in practice, not only with facilitated methods but also with other quantitative and data analytic approaches used in Operational Research/ Management Science, data analytics and statistics. Combined approaches are known as ‘multi-methodology’ (or ‘mixed-method’) interventions (e.g., Munro & Mingers, 2002a). Below we report on surveys on the use of facilitated modelling and scenario planning and then go into academic reviews of their practical applications.

Note that these two academic domains developed somewhat in isolation. The literature offers extensive discussions on the distinguishing characteristics of model-based decision support methods, and by extension on which approaches are or are not part of the ‘family’ of facilitated modelling or related groupings of methods. Franco and Rouwette (2022) propose that the core of these approaches – not surprisingly – is their use of facilitated group processes and models. Models are expressed in visual or diagrammatic form. They are transparent and accessible to team members and can describe the present as well as the future, desired or ideal situation. Different types of models may be used, expressing various kinds of relationships: between concepts, activities or stakeholders; relationships of similarity or influence; and relationships between options (Franco & Rouwette, 2022, p. 742). Quantitative scenarios clearly use models of this kind. In its quantitative mode, scenario planning is based on statistical, simulation, optimisation or other types of formal models. Participatory scenario development however often takes a qualitative form. The process of scenario construction employs visualisations of intermediate products such as ideas on trends and developments, clusters of trends, and scoring tables. Final products of qualitative scenario planning are narratives, tables such as used for

comparisons of impacts of options across scenarios (wind tunnelling), and visualisations such as (rich) pictures. A narrative description of a possible future expresses relations between driving forces, possibly via needs or actions of stakeholders in the transactional environment, ultimately to performance indicators. In the latter sense a scenario may be called a model. Nevertheless, a narrative in the form of written text is clearly a model of a different kind than a word-and-arrow diagram (as used in group model building and group causal mapping). We therefore refer to both model and narrative in the following. We start our discussion of surveys and reviews on team decision support from a recent overview of published work on facilitated modelling (Franco & Rouwette, 2022) and add studies on scenario planning. We do not include simple methods in our overview as their use is ubiquitous and generic.

### *16.1.2 Surveys of facilitated modelling and scenario planning use in practice*

Published practical applications of model-based team decision support have grown steadily over time, as evidenced in recent surveys (e.g. Abuabara & Paucar-Caceres, 2021; Gomes Jr & Schramm, 2021; Ranyard et al., 2015), although the bulk of applications is probably larger as most published accounts are written by scholars rather than practitioners. The earliest published study including team decision support approaches is a survey of the combined use of approaches (Munro & Mingers, 2002b). Practitioners included in the survey see their use of team support approaches as successful, but an operational definition of success is not provided. More recent surveys have examined the use of methods in specific areas. O'Brien (2011) for instance surveyed practitioners in the UK to investigate the use of approaches in strategic planning. The survey results indicate that many quantitative techniques are used to support the strategy process, but facilitated modelling is not regularly used despite practitioners being aware of this type of methods. A more positive picture is given by Ranyard *et al.* (2015), who report the use of various quantitative techniques, including facilitated modelling. Group causal mapping (SODA) is one of three model-based approaches that is being used fairly regularly in the UK, but much less frequently in the rest of the world. The results of this survey confirm a gradual increase in the use of facilitated modelling over time, although information on diffusion beyond the UK is sparse.

The use of scenarios is reported in several surveys. As described in Chapter 6, the use of scenarios for corporate strategic planning soared in the mid-1970s in the United States (Linneman & Klein, 1983) as well as in Europe (Malaska, 1985; Meristö, 1989). After a decline in popularity in the 1980s (Bradfield et al., 2005; Martelli, 2001), attention grew considerably in the period 1990 – 2005 (Varum & Melo, 2010). A 2023 survey of management tools by Bain & Company places scenarios in the Top 5 of strategy support tools in terms of use and satisfaction (<https://www.bain.com>). This position has not changed much over the 30 years that this survey has been in use.

### *16.1.3 Academic reviews of facilitated modelling and scenario planning applications*

A number of scholars have conducted literature reviews that focused on the application of particular model-based approaches. These were described in the chapters on the respective approaches but we summarise their gist here.

	<i>Group model building</i>	<i>Participatory scenario development</i>	<i>Group causal mapping</i>	<i>Decision conferencing</i>
<i>Reference</i>	Rouwette, Vennix and Van Mullekom (2002); Scott, Cavana and Cameron (2015); De Gooyert et al. (2022)	Varum and Melo (2010); Oteros-Rozas et al. (2015)	Abuabara and Paucar-Caceres (2021)	McCartt and Rohrbaugh (1989, 1995)
<i>Number of cases</i>	107; 26; 8	101 (only a small subset focused on evaluation); 23	200 (of which 19 participatory)	14 (114 individual questionnaires); 26 (274 individual questionnaires)
<i>Period</i>	Until 1999; 2001 to 2014; 2013	1945 to 2006; 2003 to 2014	1989 to 2018	1982 to 1985; 1982 to 1989
<i>Results measured</i>	Communication, learning, consensus, commitment and implementation (among others); Idem; Cognitive change (learning) and consensus	The few papers that include an empirical evaluation report on policy options, ideas on long-term planning, individual and organisational learning; Idem	No evaluation results reported	Decision process effectiveness, decision benefits, project characteristics (e.g., presence facilitator, construction action plan); Managerial openness to change, team size, number of decisions made, decision making effectiveness

Table 16.2. Single method reviews of applications of four team decision support approaches

Please note that to identify the studies in Table 16.2 and the multi-methodology reviews below we only looked at published academic articles. This has the advantage that using a search on Web of Science and other databases, we can get a complete overview of what is published in academic journals for a specific timespan and topic. Moreover, the search strategy is transparent and repeatable. The disadvantage is that much of the work on facilitated modelling and scenario planning appears in books and grey literature such as unpublished dissertations or company reports. For instance, our search strategy excluded the book chapter by Phillips (2007) that mentions 16 applications of decision conferencing. It also ignores the unpublished PhD thesis by Chun (1992), who compares 22 applications, mentioned by Phillips. While this strategy will underestimate the actual use of team decision support approaches, we also need to keep in mind that reports may be biased towards successful projects. Indeed the number of failed cases reported in the facilitated modelling and scenario planning literature is very small (G. P. Hodgkinson & G. Wright, 2002; Rouwette et al., 2002).

The single method reviews in Table 16.2 report on method use for a broad range of organisations and look at a variety of impacts. Rouwette, Vennix and Van Mullekom (2002) draw on the system dynamics literature (journal, conference proceedings and books) until 1999 and identify 107 group model building applications. Client organisations are active in a range of sectors, from private organisations in service and production, to non-profit organisations such as universities, secondary schools and research agencies in defence or energy, to government bodies at the national or regional level. The group model building studies identified assess a large set of impacts, among which communication, learning, consensus, commitment and implementation. Several years later Scott, Cavana and Cameron (2015) repeat this search in a broader set of journals and identify 26 applications. The papers they identified also cover a broad range of sectors and impacts, but there is a shift in research design from qualitative case

studies to quantitative assessment of impacts. Finally, De Gooyert et al. (2022) compare the impact of group model building on cognition (learning) and consensus across eight projects in the energy sector. Abuabara and Paucar-Caceres (2021) surveyed published applications of group causal mapping in the form of SODA from 1989 to 2018. They found a growing interest in SODA over the period of analysis, with applications reported in many sectors. Most areas where SODA had been used partially, fully or in combination with other methods included strategic management, sustainable development, information systems, and performance evaluation. Notably, only a very small proportion of the reported applications (9.5%, or 19 papers) involve facilitated model-supported workshops. Abuabara and Paucar-Caceres suggest the lack of facilitation skills as a barrier to deploy SODA in practice as originally intended. Decision conferencing applications were studied by McCartt and Rohrbaugh in 1989 and again in 1995. Their applications are in the main in the public sector (more than half are state government agencies, some are colleges and universities), the remainder is about equally divided between the profit and (corporate management teams, policy-making task forces, and national professional organisations) and not for profit sector (social service agencies). The first study looks at 14 and the second at 26 decision conferencing applications. Both studies reserve an important role for decision process effectiveness and decision benefits, linking these to other intervention element such as project characteristics, team size and number of decisions made.

Other scholars have undertaken broader reviews of facilitated modelling applications. Mingers (2000) surveyed reported applications published during the 1990s in reputable, peer-reviewed journals. The review covered applications of methods used in isolation or in combination with other methods. The main areas of application were organizational design, planning, IS/IT and health services. Schilling, Oeser and Schaub (2007) evaluate six applications of ‘socio-technical’ decision analysis, a combination of multiple criteria decision analysis and decision conferencing. Client organisations are companies and public sector organizations in Germany.

Decision makers in these projects compare decision analysis to their current process of decision making in terms of information exchange, information processing and results. In addition, Schilling et al. measure change in alignment on decision options. Marttunen *et al.* (2017) surveyed the peer-reviewed literature covering the 2000-2015 period, reporting on the combined use of facilitated modelling approaches with multi-criteria decision analysis methods. The most recent review of facilitated modelling to date was undertaken by Gomes Jr and Schramm (2021), who surveyed an eclectic mix of journals covering articles published between 2010 and 2020. They found that approaches were used to support the management of problems affecting businesses, society, healthcare services and the environment. Franco and Rouwette (2022) conducted a targeted review of facilitated modelling applications published during the 2010-2020 period. The authors searched in Web of Science for publications in mainstream OR journals as well as journals in the field of decision support in which facilitated modelling scholars regularly publish their work. The initial search yielded 143 papers. After excluding papers on ‘desktop’ applications in which authors do not involve an actual stakeholder group requesting support, 50 papers remained. In nine of these papers (group) causal mapping was used as a single method or in combination with others. The use of group model building and decision conferencing was reported less frequently, in five and two papers respectively. Approaches were used across a wide range of domains: mining, agriculture and fishing; manufacturing and production; services; information and communication technology, education and R&D; health; government; sustainability and community.

With regard to scenarios, a number of academic reviews are available. Cordova-Pozo and Rouwette (2023) bring together 13 of such reviews. In trying to achieve a broad overview of

the literature they used a combination of keywords in the abstract, key words and title: various terms referring to scenarios (scenario planning, building, thinking) combined with either review, systematic, mapping or overview. They looked for studies published until December 2021 in five databases: Web of Science, Ebsco, Embase, PubMed and Scopus. Out of the resulting 13 reviews, only four report on an empirical evaluation of scenarios. Another eight focus on the concept of scenarios and three on techniques for building scenarios. By far the most comprehensive of these reviews is the one by Varum and Melo (2010). Their review aimed to conduct an assessment of academic publications on scenario planning. A broad search in the Science Citation Index Expanded (SCI) and the Social Sciences Citation Index (SSCI) for academic papers published from 1945 to 2006 identifies 101 publications. About one in three publications (37%) is on strategic management. The main other domains in which scenarios are used are change management (13%), technology (13%), economies, government and policies (13%) and finance (9%). Only few papers evaluate effectiveness of scenario planning, although there is no shortage of claimed impacts. Oteros-Rozas et al. (2015) analysed 23 participatory scenario planning case studies conducted by the authors in a wide range of social-ecological settings, and look at learning and shared understanding on future planning. They analyse three impacts of participatory scenario construction, in line with Varum and Melo (2010): generating and achieving legitimacy for policy options; awareness and need for long-term planning including reflection, discussion, shared understanding and mobilisation for action; learning.

Several products have been claimed to be the result of the use of facilitated modelling and participatory scenario building. The intended products and the mechanisms claimed to facilitate their achievement, together with supporting evidence of their attainment after use, are discussed in the following section.

## 16.2. Claims of intended impact

Table 16.3 below displays those products that have been claimed for model-based decision support and scenario planning by numerous scholars in relation to their use with single and multi-organisational stakeholder groups (e.g. Eden & Ackerman, 2004; Franco, 2007; 2009; Mingers & Rosenhead, 2004; Rosenhead & Mingers, 2001; Varum & Melo, 2010; Vennix, 1996). We use the term ‘products’ to refer to the visible and less visible outputs that result from using team decision support (Friend & Hickling, 2005). These products may be generated during or at the end of the decision support process, and their actual achievement is thought to be facilitated by specific mechanisms.



<b>Mechanisms</b>	<b>Claimed <i>less visible</i> products</b>	<b>Claimed <i>visible</i> products</b>
<ul style="list-style-type: none"> <li>- Taxonomy</li> <li>- Model as recording device</li> <li>- Model as transitional object</li> <li>- Model as boundary object</li> <li>- Facilitated, participative process</li> </ul>	<ul style="list-style-type: none"> <li>- Improved communication</li> <li>- Increased shared understanding</li> <li>- Accommodation of conflicting positions and interests</li> <li>- New knowledge and cognitive change, including acceptance of a wider range of uncertainty</li> <li>- Consensus on, and ownership of, final problem frame and action plan</li> <li>- Commitment to support implementation of action plan</li> </ul>	<ul style="list-style-type: none"> <li>- Final model or set of narratives containing agreed problem frame</li> <li>- Action plan to address the problem (typically in the form of ‘partial commitments’)</li> </ul>

Table 16.3. Products claimed for facilitated modelling and scenario planning, based on Rosenhead and Mingers (2001), Vennix (1996), Franco (2013) and Varum and Melo (2010), adapted from Franco and Rouwette (2022)

The most visible and common product is obviously the final model or set of narratives developed during the team decision process, which describes the agreed problem understanding. While each team decision support method captures individual understandings of team members as well as the ensuing agreed problem understanding, each type of model or narrative will represent the agreed upon problem definition in different ways. In group causal mapping, for example, the problem represented by the model will contain a network of statements about issues, goals and options. In group model building, the problem representation will depict the structure underlying observed behaviour, with special emphasis on feedback loops. In scenario planning, the problem will be defined in terms of driving forces, alternative configurations of scenario elements, options and scores on performance indicators. Although facilitated modelling can be used only for structuring the problem, all approaches are intended to facilitate agreements to act (Eden & Ackerman, 2004; Eden & Ackermann, 2006).

Consequently, a second visible product of team decision support is an action plan or list of planned actions to tackle the problem. Actions plans are usually expressed as what Friend and Hickling (2005) call a ‘commitment package’, which contains a mix of espoused or recommended decisions, policies or research explorations, and which may or may not include supporting argumentation derived from the model or narratives. Typically, action plans represent only partial commitments on the part of the decision making team because, it is argued, the only way to make progress, in particular in complex issues is by adopting an incremental approach (Colin Eden & Fran Ackermann, 1998; Friend, 2001; Rosenhead & Mingers, 2001). In scenario planning, this starts from the identification of robust options which subsequently can be translated into more concrete action plans (Cordova-Pozo & Rouwette, 2023).

The agreed problem frame and action plan are the consequence of achieving six less visible yet critical products during the team decision support process: improved communication; increased shared understanding of the problem; accommodation of conflicting positions and interests; new knowledge and cognitive change (including a greater acceptance of uncertainty); consensus on, and ownership of, the final problem frame and action plan; and, commitment to support implementation of the proposed action plan and, where relevant, to maintain group membership.

The achievement of these less visible products is thought to be facilitated by specific mechanisms. The model or set of narratives is built using a specific taxonomy (e.g. issues, goals and actions in group causal mapping; variables and feedback loops in group model building). By using these taxonomies as a shared language to talk and think about the problem of concern, it is argued that communicative exchanges are more comprehensive and accurate because participants are able to better specify their different perspectives, dependencies, and knowledge about the problem (Akkermans & Vennix, 1997; Franco, 2006, 2013), which results in an improved communication among those involved.

Models and other visualisations support communication in the decision making team because they make it easier to handle a large set of information. They act as recording devices that enable to survey and trace content of group discussions ‘on-the-hoof’ (Franco, 2013). Better specification of group members’ views, dependencies and knowledge is also thought to be facilitated by the model and visualisations acting as a transitional object (de Geus, 1988; Eden & Ackerman, 2004; Winnicott, 1953) which enables experimenting with problem structure. This means that through the analysis of relationships embedded in problem structure and the direct inputs of team members the model is constantly changing, which is thought to increase their shared understanding of the problem situation, of organisational processes and cultures, and of others’ beliefs and values. Increased understanding, development of new knowledge and cognitive change or learning are intimately linked (Checkland, 1981, 1999; Colin Eden & Fran Ackermann, 1998; Franco, 2013; Friend & Hickling, 1997).

The role of conflict was addressed in Chapter 2 and Chapter 15. Increased shared understanding and learning can increase awareness of particular perspectives, knowledge and interests, which generates conflict within the stakeholder group. If the conflict stays at the cognitive level, it is expected that the mutual exploration of problem structure captured by the model or other visualisations (acting as a transitional object) benefit the decision making group in two ways. First, by creating new knowledge and fostering cognitive change (i.e. people changing their minds). A particular form of cognitive conflict is created when team members are confronted with challenging narratives on a plausible future. Given the right distance between current perceived reality and the narrative, team members can come to accept the developments sketched in the narrative as more likely (Schoemaker, 1993). Second, by building consensus on, and ownership of, the final problem frame and the recommendations for action (Eden, 1992a; Rosenhead & Mingers, 2001). As described in Chapter 1, group members’ anticipations of the consequences, perceived or real, of their increased understanding and learning can sometimes escalate to a relational level (Edmondson & Smith, 2006), especially in complex situations characterised. Such conflict will commonly require group members to reach an accommodation regarding their positions and interests (Checkland, 1981; 1996; 2001). This is thought to be facilitated if the model and visualisations, as a transitional object, also becomes a boundary object (Black, 2013; L. J. Black & D. F. Andersen, 2012; Carlile, 2002; Franco, 2013) during group members’ interactions. Chapter 13 described that a model acts as a boundary object if it is able to help group members defuse their entrenched positions and develop common interests. Achieving these accommodations also facilitates new knowledge creation, cognitive change, consensus and ownership and, in addition, cognitive and emotional commitment (Eden, 1992a; Rosenhead & Mingers, 2001) to support the implementation of action plans. Group members’ active engagement in the participatory process is also argued to produce strong ownership and commitment (Franco & Montibeller, 2010; Rosenhead & Mingers, 2001).

## 16.3. Measuring impact of methods

### 16.3.1 How to assess impact

The majority of the papers included in the reviews of applications are single case studies. These provide a rich description of the complexities facing the decision making team, in terms of problem context and stakeholders. As noted, team decision support approaches are flexible and facilitators adapt the standard procedure to the client and problem setting. Studies often cover the procedure applied in the case and the process in detail. This includes the incremental development of visible products and main points of discussion in the team meetings. Claims of less visible products are often based on conversations with members of the decision-making team during or immediately after the intervention process. A case study is natural approach to studying a complex phenomenon in its real-world setting, drawing on multiple sources of data (Yin, 1984). Case studies are however less well suited to determine the relations between elements of the research setting. (Appendix B gives more information on choices in empirical research concerning data collection and research designs.) In other words, while a case study results in rich information it offers little help in isolating the effective ingredient, or the factor(s) that caused observed changes over time, from the multitude of elements that were present in the case. Nevertheless, if we are interested in the effectiveness of team decision support interventions, we need to be able to disentangle the effect of different factors. Chapter 6 showed how scenario planning was suspected of only being successful when used by gifted practitioners (Mintzberg, 1994). Finlay (1998, p. 199) levels the same criticism against facilitated modelling approaches: *'There is confounding of many things - of the facilitator him/herself, of the methodology, of the situation in which the methodology is used, the implementation of any computer-based aid etc.'* In their study of decision conferencing applications McCartt and Rohrbaugh (1995) find that team members' openness to change was the strongest predictor of reported beneficial outcomes, more so than characteristics of the context or method.

We can look to other academic disciplines for guidance on how to assess the effect of interventions in human or social systems. Establishing the effectiveness of methods and procedures has a long history in the medical sciences and is a more recent phenomenon in for instance education, management and consulting. Tranfield, Denyer and Smart (2003: 210) describe a hierarchy of evidence for effectiveness of health care interventions. At the lowest level is personal experience: an expert in a particular procedure has found that this approach works. Experiences of a committee of experts carry slightly more weight. At the next level we find uncontrolled experiments, cohort studies and case studies. These types of evidence are similar in the sense that no control group is used. Either the group using the procedure is tested before and after the intervention (uncontrolled experiment) or followed through time (cohort study), or the intervention and its impacts are described in a holistic manner (case study). At the highest level of evidence is a randomised controlled trial or a variant of this. Here the effect of the procedure is compared against a group that does not take part in the intervention.

Systematic review and meta-analysis of two or more randomised controlled trials	↑	Experiments
One or more large double-blind randomised controlled trials		
One or more well-conducted cohort studies	↑	Cases
One or more well-conducted case-control studies		
A dramatic uncontrolled experiment		
Expert committee sitting in review; peer leader opinion	↓	Personal experience
Personal experience		

Table 16.4. Levels of evidence in health care (Tranfield et al., 2003: 210)

It is probably clear why this hierarchy of evidence applies to medical studies: we need to be able to exclude other factors that might have an effect (so use control groups), would like to have a pre and post-test (to determine changes) and test subjects that actually experience the effects of the intervention (without relying on the opinion of the person administering the procedure). When applying this to intervention methods, an additional concern arises: we would like to test the procedures with the relevant group of stakeholders, namely those individuals whose input is needed to tackle the messy problem at hand. This creates a problem as doing a randomised trial with this type of group is virtually impossible. Finding two identical messy problems, addressed by two identical stakeholder groups is unlikely. Asking a group of stakeholders in one messy problem to split up into two groups that each will use a different procedure is also a difficult sell (but see Huz et al., 1997). Some evaluation studies of intervention methods thus rely on situations and groups that are easier to control. Many brainstorming studies use this approach (Stroebe et al., 2010). However, they are vulnerable to the critique that results cannot be generalised as they do not apply to ‘real’ groups confronted with ‘real’ messy problems.

One of the earlier arguments against conducting systematic evaluations of facilitated modelling interventions was based on the notion that any approach to their evaluation must fit the complexity of the intervention because facilitated modelling approaches are complex ‘technologies’ dealing with messy problems (see, for example, Eden, 1995, 2000; Eden & Ackermann, 1996; Finlay, 1998). Eden for instance warns that controlled experiments require an extensive structuring of the complex situation in which a method is used, and may in the case of facilitated modelling lead to a ‘controlling out of the experiment’ of key elements of the situation and intervention (2000, p. 219). However, these considerations do not mean that the need for evaluation has dwindled within the team decision support community. Indeed, now it is widely accepted that claims about the achievement of facilitated modelling cannot only be based on self-reflective or impressionistic accounts of intervention success (e.g. Sørensen et al., 2004) or failure (e.g. Houghton, 2013), but also on empirically grounded evaluations (e.g. Franco, 2008; White, 2006). Overall, then, there is clearly a role for formal, systematic evaluations of the actual achievement of claimed team decision support products in the field (Midgley et al., 2013; Rouwette et al., 2009; Westcombe et al., 2006).

Ideally, we would like to conduct an evaluation that optimises both rigour and relevance. Rigour, being able to determine a clear link between the intervention and observed effects, is a strong point of experiments. Relevance, establishing results that apply to the procedure and group we are interested in, is a strong point of case studies. Unfortunately, achieving both rigour and relevance is difficult in practice. Yet it is possible to conduct rigorous case studies (see, for example, Gibbert et al., 2008). Once we have established expectations on the impact of particular elements of a method and particular effects, relevant experiments can be designed. Clear examples of these are the controlled study on the effect of alternative scenarios on decision making biases (Schoemaker, 1993) and various comparisons of the effect of different model formats (Franco et al., 2021). Two approaches to non-experimental evaluation of team decision support approaches have emerged in recent years, the first employing an evaluation framework and the second drawing on social scientific theories.

One evaluation approach to team decision making support is based on the development and use of a framework that relates the mechanisms of the intervention to their claimed products, and takes into account the context and purpose of the intervention being evaluated. An example is the framework developed by Midgley and colleagues (Midgley et al., 2013), which is based on

the tradition of multi-method systemic intervention (Jackson, 2000; Midgley, 2000; Mingers & Brocklesby, 1997). Another one is the meta-framework proposed by Donais *et al* (2021), which draws from Chess' (2000) environmental public participation framework. This meta-framework focuses on evaluating multicriteria decision analysis interventions, but is applicable more widely. There are at least two advantages of using an evaluation framework. First, an evaluation framework can inform the development of suitable questionnaires to elicit participants' views before and after the intervention (e.g. Huz et al., 1997), which can then be analysed to produce quantitative evidence of the achievement of intervention products from the perspective of those involved. Second, repeated use of an evaluation framework can help build a corpus of accumulated evidence from different evaluation studies, and subsequently inform the design of further evaluation studies that could add to the corpus of evidence.

The second evaluation approach is theory-based, and stems from the need to understand why the products claimed for team decision support interventions were achieved (or not) in a particular application context. A theory-based approach could use an established theory in a 'top-down' fashion to analyse the data generated from the intervention to assess the actual achievement of team decision support products. A good example is the study by Rouwette and colleagues (Rouwette et al., 2011), who use Ajzen's (1991) theory of planned behaviour to evaluate seven group model building interventions. Overall, they found that group model building changed participants' attitudes, subjective norms and intentions, each of which can be related to participants' problem frames, consensus and commitment, respectively. Alternatively, a theory-based approach could analyse the data generated from the intervention to build a theory 'bottom-up'. Theories developed in this way can provide a locally meaningful evaluation based on how participants make sense of the intervention in which they are engaged (e.g. Henao & Franco, 2016). Some facilitated modelling scholars argue that bottom-up explanations must also fit into the broader patterns of interactions within which the modelling intervention is embedded (e.g. White, 2006). In this way, a 'middle-range' theory (Pawson, 2002) can be built to explain why the team decision support products were realised (or not), and for whom. Such theory also recognises that using the same intervention in one situation may work, but it may not work in another situation (Franco, 2013; White, 2006).

It is our contention that the framework-based and theory-based approaches to team decision support evaluation should be seen as being complementary rather than as competing or opposite. Combining the insights generated from the two approaches can provide a richer understanding of the actual achievement of team decision support interventions products than any one approach can provide by itself.

Finally, it is worth noting there is very little written about the impacts of team decision support beyond the intervention. For example, we know little about whether the use of decision support approaches can be linked to positive organisational change or performance. This is not to say that team decision support cannot contribute to long-term impacts. Indeed, the high-profile cases by Ormerod at Sainsbury's (Ormerod, 1995; 1996) and by Eden and colleagues at Bombardier (Ackermann et al., 1997; Williams et al., 2003) are a testimony that team decision support can indeed make a tangible and significant difference to organisations beyond the intervention. However, published accounts like these are rare in the literature. In a few cases, team decision support scholars have gone back to stakeholder groups (or the organisations to which they belong) to identify any long-term effects following an intervention (e.g. Franco et al., 2004; Henao & Franco, 2016; McCartt & Rohrbaugh, 1989, 1995; Rouwette & Smeets, 2016b). Yet, again, these are the exception rather than the rule. For example, the study of SODA applications by Abuabara and Paucar-Caceres (2021) indicated that SODA use has been mostly

limited to achieving products within, rather than beyond, the interventions they surveyed. This should not come as a surprise: it would be very difficult to claim long-term impacts given the myriad of uncontrollable factors, both within and outside the team using decision support, that could affect the implementation and impact of recommendations. This is unfortunate, as not being able to demonstrate the link between team decision support and long-term organisational impacts can make their dissemination and take up more difficult.

### *16.3.2 Levels of impact*

What does it mean to say a particular method creates impact? In the preceding sections we noted that the effect of the method needs to be separated from that of the person doing the intervention, and from the contextual factors having to do with the problem situation, organisation or team involved in the decision. Beyond the simple procedures described in Chapter 3, the four procedures outlined in later chapters are complex interventions that lead a decision making team through various divergent, convergent and prioritisation phases. The four methods approach complex problems from different angles (for instance, problem structure in group model building, uncertain futures in participatory scenario development, decision options and their impact on criteria in decision conferencing) and aim to create specific visible products. Nevertheless, they share a foundation in facilitation and visualisation using models and narratives, as described in Chapters 13, 14 and 15. They are also similar in their use of basic methods, which is most evident in the divergent phase as they all use Nominal Group Technique or (electronic) brainstorming. This shared foundation in facilitation principles as well as similar use of basic methods is important, as it means we can establish effectiveness at three levels: at the generic level of facilitation, at the level of particular ‘complex’ methods, and at the specific level of basic methods that constitute some of the ‘building blocks’ of the latter. Table 16.5 below organises the steps in the four complex team decision support approaches into problem setting, divergent, convergent and prioritisation phases.

The efficacy of Nominal Group Technique and electronic brainstorming (in comparison to freely interacting or brainstorming groups) has been shown in a series of studies (Stroebe et al., 2010). This means that in the divergent phase, scenario planning and model-based team decision support rely on well-tested approaches. In the convergent and prioritisation phases there are some similarities (e.g., the use of clustering, ranking and voting) but overall this is where the largest differences between methods are evident.

	<i>Group model building</i>	<i>Participatory scenario development</i>	<i>Group causal mapping</i>	<i>Decision conferencing</i>
Opening	1. Identify problem variable and reference mode of behaviour	1. Formulate starting issue or question	1. Ask an action-oriented question or prompt	1. Identify goals, constraints and generic alternatives
Divergence	2. Identify variables using Nominal Group Technique 6. Identify control and target variables	2. Identify trends (SEPTE) 5b. Determine policies and indicators	2. Note answers (issues) on board 5. For each issue cluster, ladder up to goals and down to actions	2. Identify values, criteria and scale 3. Specify alternatives
Convergence	3. Identify causal relations 4. Check feedback loops 5. Check validity	3. Cluster trends 6. Translate into scenarios and write texts 7. Determine impact on transactional environment	3. Link issues 4. Split a large maps into issue clusters	5. Determine value function 6. Determine weights 9. Conduct sensitivity analysis
Prioritisation		4. Score clusters on uncertainty and impact 5a. Determine driving forces and elements 8. Determine robust options		4. Score alternatives on criteria 7. Choose aggregation method and synthesise scores 8. Rank order options and explain 10. Recommend options

Table 16.5. Opening, divergent, convergent and prioritisation phases and steps in four approaches to team decision support

Methods are also clearly similar in their use of facilitation. In Chapter 13a facilitator attitudes were outlined which formed the basis for a set of facilitator tasks in supporting decision-making groups. Table 13.1 summarised the rationale for each attitude which was drawn from empirical research on group and organisational decision making. In the same vein, Chapter 12 presented the research by Nutt (2002) who found that in a data set of 400 decision making situations, about one in four decisions were made in a process of joint discovery with stakeholders. Joint discovery, in comparison to top down decisions, leads to a faster decision making process, more implementation and better outcomes. Joint discovery is similar to facilitation in the important sense that it gives stakeholders a voice in the decision. Nutt's study and other research into the effectiveness of facilitation provide an empirical base for the effectiveness of the facilitator actions as outlined in Chapters 13, 14 and 15.

#### 16.4. Evidence of impact

In this section we discuss the evidence for claimed effects of methods for team decision support. These were listed as the less visible products in Table 16.3: communication, shared



understanding, accommodation of interests, new knowledge and cognitive change, consensus and commitment to implementation.

For two of the four approaches to team decision support, participatory scenario development, and group causal mapping, few evaluation studies are available. The review of scenario planning by Varum and Melo (2010) identifies 101 academic papers of which 41% are empirical. Varum and Melo find it difficult to come to a conclusion on effectiveness due to the variety in domains of application and different methodologies that go under the name of scenario planning. After analysing applications in companies in more depth, Varum and Melo (2010, p. 365) conclude that *'there is a notable lack of research on the use and effects of scenario planning in business'*. The 23 applications of participatory scenario planning analysed by Oteros-Rozas et al. (2015) provide some evidence on positive impacts. They find scenarios help to generate policy options and increase the legitimacy and acceptance of policy options across stakeholders. Second, scenario planning creates awareness, an increased need for long-term planning, and enables collective reflection and discussion. In this way a shared understanding is built and stakeholders are mobilised into action. Third, by increasing dialogue and resolving conflicts, scenarios enhance individual and collective learning. The review on SODA by Abuabara and Paucar-Caceres (2021) identifies 200 published applications, of which only 19 are participatory so are applications of group causal mapping. Unfortunately, Abuabara and Paucar-Caceres do not report on impacts of these applications.

The evidence on the impact of any of the group decision support approaches outlined in this book consists mostly of case studies. For example, in the case of group model building applications, Rouwette et al. (2002) note that out of 107 applications, 88 gather evaluation data in the main through observation that informs personal reflection. And although we cannot disregard the reflections of highly experienced facilitated modelling scholars and practitioners, we should exercise caution: personal reflections alone are not reliable evidence of impacts. Self-reporting as a sole basis of evaluations is fraught with difficulties, as people struggle to distinguish between subjective and objective effects associated with group decision support (De Gooyert et al., 2022; Rouwette, 2016). In the few cases where questionnaires or interviews have been used to support the evaluation of team decision support applications, very few or no details are given on the recruitment of the sample of respondents and interviewees, the impact of the sample on data collection, or the data analysis approach employed.

Overall, systematic evaluations are rather scarce in the literature. Exceptions are two early studies on decision conferencing by McCartt and Rohrbaugh (1989, 1995), and a limited number of more recent studies identified by Franco and Rouwette (2022). McCartt and Rohrbaugh (1989, 1995) applied decision conferences through the Decision Techtronics Group of the State University of New York. A cross-section of projects representative of different types of client organisations was selected, resulting in 14 respectively 26 applications. Questionnaires were sent to all participants in these projects. Measures included elements of the context, process in terms of decision process effectiveness (including openness to change), and impacts in terms of number of decisions made and decision making effectiveness. Key results are the following. Team members felt that in the majority of projects (60% and 70%, respectively), important decisions had been made. Most projects were also judged to be effective, both in terms of process and outcomes (only about one-third of the projects in the first study, and one-fourth in the second was rated low on these aspects). In the second study, team members' openness to change, favouring a flexible, creative process over thorough analysis of all data, was the strongest predictor of reported beneficial outcomes. More recent systematic evaluations on team decision support interventions are reviewed by Franco and

Rouwette (2022). The authors searched for facilitated modelling evaluation studies in a broad set of journals, but for the 20-year period between 2000 and 2020, they only found twelve studies that assessed whether the products listed in Table 16.3 had been realised after the intervention. Notably, almost all studies evaluated group model building interventions. The remaining study evaluated decision conferencing. Overall, evaluation studies of practical group model building interventions (e.g. Rouwette, 2016; Rouwette et al., 2002; Scott et al., 2016) provide evidence for a positive impact on communication, cognitive change (learning), consensus, commitment, and implementation of results. Recent studies (e.g. de Gooyert et al., 2021; Valcourt et al., 2020) lend further support to an effect on consensus and alignment. However, it has proven difficult to reproduce these results in controlled environments (McCardle-Keurentjes, 2015). In their study on decision conferencing interventions, Schilling et al. (2007) use questionnaire data on six cases and found a positive effect on commitment and team alignment on solutions.

### 16.5. Critical reflection and questions for the future

Overall, surveys and academic reviews show that modelling and scenario planning for group decision support are used across a wide range of domains, in complex real world problem settings. Moreover, over the years the number of published applications has increased (Cordova-Pozo & Rouwette, 2023; Franco & Rouwette, 2022). Decision support approaches are based on facilitator guidelines which are supported by empirical research (see Chapter 13). In particular in the divergent phase, they employ methods such as Nominal Group Technique and electronic brainstorming that have been evaluated extensively (Stroebe et al., 2010). However, the procedures as a whole also include convergent and often prioritisation activities and use particular visualisations (types of models, narratives) that are thought to help team members in gathering and processing information. Practitioners and researchers alike claim that team decision support consistently creates certain outcomes. These include visible products such as a model or set of narratives, and an action plan. More difficult to establish are less visible products such as an increase in quality of communication, shared understanding, accommodation of interests, new knowledge, consensus on problem frame and action plan, and commitment to implementation of actions. Overviewing the literature on team decision support using scenarios and models, the evidence that these impacts materialise is accumulating. In particular the impact on cognitive change (new knowledge) and alignment (consensus) is now shown in several studies in real world settings, using a pretest post-test design (e.g. de Gooyert et al., 2021; Rouwette et al., 2011; Valcourt et al., 2020). Implementation of actions has been observed in a range of case studies (McCartt & Rohrbaugh, 1989, 1995; Schilling et al., 2007). A number of in-depth studies (e.g. Franco, 2006; Rouwette, 2016) trace the impact of team decision support on communication. One claimed outcome of group decision support that remains understudied is accommodation of interests. We noted in Chapter 13 that models (or narratives, for that matter) have the potential to align interests but may not be sufficient. More research on this claimed impact of team decision support is needed. It is at present not clear if results of one team decision support approach can be generalised to another approach that uses a different type of model, or narratives instead of a model. We note therefore that while there are certainly many publications on participatory scenario construction and group causal mapping, relatively few of these are evaluation studies.

So, all in all, do we think the approaches to team decision support described in this book are evidence-based? Our answer is a careful ‘yes’, based on the combination of evidence from real world applications in the form of cases and systematic evaluations of particular impacts. When

used by a trained facilitator, we feel confident that these methods reliably help teams working on complex issues to – among others – improve their quality of communication, build their understanding and arrive at a consensus on what the problem is about and what to do about it.

Which directions are important for future research? We noted three topics of interest: alignment of interests as an understudied impact, differential impacts of model (or visualisation) formats and two particular approaches (participatory scenario construction and group causal mapping) that can be evaluated in more depth. Three ways to approach this come to mind. First, the surveys and academic reviews in this chapter in the main looked at published work in academic journals. Incorporating (chapters of) book, conference papers and grey literature will expand the scope of reviews. Second, rigorous case studies or comparative field experiments, using consistent research methods, can help to explore meaningful differences between approaches or, keeping the approach constant, between contexts (e.g. Scott et al., 2015). Third, differences in model or visualisation formats can be explored in relevant experiments, building on results of controlled studies on other Operational Research/ Management Science interventions (Franco et al., 2021). The approaches outlined in this book concentrate on and are most different in the convergent phase. While there is ample research on divergent processes, procedures that are effective in convergence deserve to be studied in more depth.

The next chapter gives more guidance on how to conduct and research team decision support interventions.

## Chapter 17. Building skills in the practice and research of team decision support interventions

Team decision support is an active area of research. Judging from the number of published applications, its use is growing over time. There is every reason to expect its continued usage in the future, as there is no lack of issues that are complex both in an analytical and social sense. However, for that to happen, methods need to continue to be developed and adapted to new circumstances. New generations of practitioners will need to be supported in developing their skills in team decision support. We think in this respect it is useful to consider research and intervention in combination. First, because broadly speaking, team decision support practitioners conduct ‘research’ in the sense of investigating a problem located within a system of interest. Similar to empirical research, their aim is to create insights that are empirically grounded and analytically sound. However, interventionists go beyond insight as they also aim to create an action plan that will be implemented. This goal is similar to action research. Second, evaluating team decision support interventions is important to practitioners, clients and researchers. For practitioners knowing more on what worked and what did not is a crucial basis for professional development. Clients often want to know more about the visible and less visible products of a team decision support intervention. Researchers can use insights into method effectiveness to adapt existing methods or develop new ones. Third, academic practitioners want to report applications and method development in peer reviewed journals. Clarity on how intervention research is similar or different to other types of research helps to motivate methodological choices.

We start this chapter with contrasting intervention research to other forms of research. We discuss differences and similarities in terms of data collection and research design. Theory oriented research, action research and intervention research are compared. Next we describe different approaches to evaluating team decision support evaluations. The final section offers further guidance on how to become a competent practitioner in team decision support.

### 17.1. Interventions as a form of research

In this section we highlight how intervention research differs from other types of research. An important distinction is theory driven versus practice driven research. The quality of theory driven research is measured against classic criteria such as validity and reliability, which indicate how much confidence we can have in the insights derived from a study. For practice oriented research, another criterion is at least as important: relevance to the stakeholders concerned. A particular type of practice oriented research, action research, offers alternative options to work towards confidence and relevance.

#### *17.1.1 Theory driven research*

There is a wide diversity of types and aims of empirical research. A researcher can choose from three types of research designs: a survey or experiment which are typically used in quantitative research, and a case study which is predominantly used in qualitative research. A researcher also needs to consider which data source to draw on: situations, texts, individuals or groups. (Appendix B provides more information on data collection methods and research designs.) In choosing among these options, a researcher is guided by both the type of research question and aim of the study. Research can aim to contribute mainly to theory or practice (Vennix, 2019). In the first case the researcher is primarily interested in learning more about certain phenomena,

so generating knowledge for its own sake is the ultimate aim. Her audience then primarily consists of other academic researchers, who will carefully pore over each methodological step and check the novelty of the study's results. Interestingly, checking methodology does not include defining the starting question. Methodology is about whether a claim to knowledge is justified, not about where the claim comes from (Vennix, 2019). The start of research, so the moment when an idea suddenly springs to mind, or a new connection between events appears, is said to be in the 'context of discovery' (Reichenbach, 1964). There are examples of researchers staring into a fire or sitting under a tree when the new insight suddenly hits them. Methodology is not about the discovery phase, but about the next steps: translating an idea into concepts, definitions and measurements, setting up a study, gathering data and analysing results. These next steps constitute the 'context of justification' which is of interest to methodologists. Two quality criteria are particularly important here. Validity refers to the extent to which measures represent the concept as intended. Reliability refers to the stability of measurements: will we get the same results if a test is taken again at a later time, or when administered by another person? Checking research against these criteria tells us how confident we can be in results. Research for the sake of building understanding can of course be very relevant to practical life. Scientific discoveries have led to medical and technological breakthroughs that have changed the life of many people. Nevertheless, this form of research is 'fundamental' or 'theory driven' and whether or not results can be applied is of secondary concern. In contrast, in applied or practice oriented research the practical problem is the starting point. Here the audience is a team of people representing an organisation, multiple organisations or societal groups. This audience has a much more active role in shaping the research. It is not so much a forum to whom the researcher defends methodological choices and novelty of results after the research is completed, but has an active role from the start and throughout the study. In practice oriented research, stakeholders have a say in the formulation of the research question and are a major source of information throughout the study. They have to have confidence in results, but at least as important is whether results are relevant to their issue of concern. In other words, this type of research aims to create both novel understanding but also to enable participants to change their situation. Some forms of practice research emphasise creation of insights and employ methods similar to theory oriented studies. One particular form of practice research, action research, puts equal emphasis on achieving change.

### *17.1.2 Action research*

The term 'action research' was introduced by Kurt Lewin (1946) to refer to his studies on social change and group relations. He saw the role of action research as helping practitioners change social reality. Lewin inspired the development of a particular approach to empirical research that has continued to develop and adapt to circumstances. Major application areas are community development and organisational decision making. Three characteristics set action research apart from other forms of research: its participatory, emancipatory and scholarly nature (Bleijenbergh et al., 2023). Participatory means that individuals and groups that are being studied are involved in the research. This has consequences for the position of the researcher. Instead of being a neutral observer of the situation or of research 'subjects', the researcher is involved in the change process. The emancipatory nature of action research is illustrated by Lewin's efforts in supporting the democratization of society by developing knowledge that improves the situation of minority groups (Bleijenbergh et al., 2023; Lewin, 1946). The aim to improve the situation of particular groups that are affected by a problem is therefore a necessary element of action research, and in an organisational context it should at least support solving problems for (groups of) individuals who are directly affected by the issue (Eden & Huxham, 1996). The scholarly nature of action research follows from the unique type of knowledge it can bring to light. It assumes that participation is necessary to really understand what is going

on in any problem in which human action plays a role. Lewin summarised the basic idea behind this approach as ‘if you want to understand something, try to change it’. Studies based on observations by outsiders, or even interviews with people involved in the problem, may not be adequate to find the real reason for behaviour in the problem. Argyris and Schön (1974) find that if people are asked to explain their behaviour, what they will answer reveals their espoused theory. They have no direct access to their reasons for behaving as they do. Alternatively, they may be reluctant to share their opinions as they want to portray themselves in a particular way, for instance to appear competent or knowledgeable. In terms of Argyris and Schön, real reasons for behaviour are part of the theory in use. The theory in use can only be inferred from action in the problem situation. In Chapter 1 we discussed System 1 and System 2. Not knowing the real reason for one’s own behaviour is much like System 2 trying to determine why System 1 reacts in a particular way. Action research thus assumes that if we knew the real trigger for behaviour, taking away that trigger would lead to different behaviour. Without testing our understanding in this way, we are not sure about the validity of our knowledge. To achieve this level of understanding the researcher needs to work closely with stakeholders and not remain an outsider.

How are these characteristics reflected in action research studies? Bleijenbergh *et al.* (2023) review 317 action research papers published between 2005-2020 in leading management journals. A case study is the most often used research design and only very few studies use a survey or experiment. Researchers and participants work together for an extended period of time; the average duration of a study is no less than 30 months. The participatory nature of action research is apparent in the studies reviewed. In about half of the studies, participants took part in the research process based on co-production of knowledge, together with the researchers. In about one third, the researcher took a role as a consultant, most often involving the participants as discussion partner. With regard to the emancipatory nature, apparently in management studies action research has a less radical aim than originally envisaged. Only about one in six papers discussed action research that explicitly targets giving a voice to specific groups or improving a specific group’s situation; most papers (about two out of three) aim to improve organisational processes. Regarding the scholarly aim, papers focused mostly on theory development (about half) and method development (about one in three). Thus, although action research studies aim to generate knowledge relevant to participants, published studies also highlight the contribution to advances in theories or methods. Bleijenbergh *et al.* (2023) find that action researchers rely on a range of criteria to assess the quality of their research. Relevance and validity are among the most often used criteria (both by two out of three studies), reliability only in about one in three studies.

### 17.1.3 Comparison theory oriented research, action research and intervention research

Table 15.1 below compares three forms of research. We see that in theory oriented research both the starting question and the researcher are placed ‘outside’ of the study. The research question is taken as a given and the researcher should influence the study as little as possible. All data sources are used. In the case of theory development a qualitative design and analysis method will be used. Nevertheless, we can expect most studies aim to test hypothesised relations and employ a quantitative design and analysis method. The main aim is to contribute to knowledge, which means validity and reliability of knowledge claims are the main quality criteria.

	<i>Theory oriented research</i>	<i>Action research</i>	<i>Intervention research</i>
Starting question	Outside of research (context of discovery)	May be given or adapted in study	Essential part of research (problem structuring)
Position researcher	Does not participate	Participates, works closely with participants	Participates, co-creates with participants, is neutral towards content
Data source	All (situations, texts, individuals, groups)	Main source is group, also uses situations, texts, individuals	Main source is group, additional sources (interviews, secondary data) may be used
Research design	Quantitative (survey, experiment) and qualitative (case study)	Mainly qualitative (case study), quantitative (survey, experiment) is possible	Case study
Data analysis	Statistics, content analysis	Content analysis, may use statistics	Joint development of model or narrative, may be validated against other data
Quality criteria	In the main validity, reliability	Relevance, validity, less emphasis on reliability	Relevance, validity, less emphasis on reliability

Table 17.1. Comparison of theory oriented research, action research and intervention research

The starting question is in both action and intervention research part of the research process. Both types of research give participants a say in determining the focus of the study. Team decision support interventions are however more explicit about the need to structure the problem in close interaction with the participant group (Franco & Rouwette, 2022). Since the intervention addresses a complex issue, it will be interpreted differently by different stakeholders and finding out that the issue is about is a major part of the intervention. In both action and intervention research the researcher actively works with participants. Team decision support interventions, as described in Chapter 13 assign the interventionist the role of a facilitator who remains neutral with regard to content. Action researchers and interventionists see working with groups as an important part of the research. This is not only because a group is an important data source, one that allows for eliciting insights and testing these against other opinions bias (which can be seen as a form of validation, cf. Bleijenbergh et al., 2011), but also because of its impact on participants. Participation in the group allows one to witness firsthand the emergence of novel ideas, to provide counterarguments and shape the group process and outcome. In contrast, if a person only participates in a study by providing data, and the final results will reach her later in the form of a presentation or a paper report. Chapter 13 presented several arguments as to why participation is particularly effective in fostering implementation. In terms of research design, action research predominantly is qualitative but quantitative designs can be used (Bleijenbergh et al., 2023). Interventions seem to have much in common with case studies. The study concerns a real life situation and its complex nature makes it difficult to determine what is in focus and what is part of the context. This requires finding out about central factors and their interrelationships, which draws on interpretations of study participants. Interpretations and observations by team members are the main data source, but may be tested against other (secondary or interview) data. Using other independent data sets to check interpretations in process of triangulation supports validation. It means the analyst does not have to work on the assumption that ‘the answer is in the room’ (Geurts et al., 2006). Data analysis in action research typically comes down to content analysis. If quantitative data is used statistical analysis also has a role. In intervention research, the joint development of a model or narrative is the main analysis tool. Finally, both action and intervention research focus on relevance and validity as quality criteria. Action and intervention research place less emphasis on reliability as they are practical and situation-specific, which means that repeating a study is fraught with problems (Bleijenbergh et al., 2011).



## 17.2. Evaluating team decision support interventions

The discussion in this section will focus on the empirical investigation of the practice of using team decision support ‘as it happens’ (Franco & Greiffenhagen, 2021) on the ground. This puts the human, social and organisational challenges associated with their practical use centre stage. The latter aspects are well known to decision support practitioners, but their empirical interrogation is typically absent from published accounts of team decision support interventions. This can only be done by examining what practitioners and users actually do when they engage in a team decision support intervention, which places the study of intervention practice within the domain of the behavioural and social sciences. A similar concern is shared by Operational Research scholars working within the sub-discipline of Behavioural Operational Research (Brocklesby, 2016; Franco & Hämäläinen, 2016a, 2016b; Franco et al., 2021). Treating practice as research problem demands specific competences that are distinct from those of mainstream academics and practitioners working in this field. Here, the discussion will concentrate on what are more likely to be the main options regarding research methodology open to researchers interested in studying practice, as well as the required competences for implementing these options (Franco & Rouwette, 2022).

First, researchers can adopt the so-called *variance* approach (Mohr, 1982; Poole et al., 2000) to investigate team decision support use. In general terms, variance research seeks explanations of change in terms of relationships among independent variables and dependent variables. Explanations take the form of causal statements captured in a theory-informed research model that incorporates these variables (e.g. A causes B, which causes C). The model is then tested with data generated by the team decision support intervention, and the model findings are assessed in terms of their generality. The variance approach for investigating team decision support use requires the implementation of quasi experimental or ‘pretest and posttest’ research designs (see Appendix B). This involves careful selection of independent variables, which might be either manipulated (e.g. method, computer support), or left untreated (e.g. experience, demographics). It also requires choosing and measuring dependent variables that act as surrogates of the less visible products claimed for team decision support interventions (e.g. learning, consensus, see Chapter 16). Measurements can be taken in absolute or relative terms, and can also include perceptions about intervention outcomes (e.g. commitment, confidence) and the intervention itself (e.g. satisfaction, usefulness), which can only be measured subjectively via self-reports. Variables that act as either covariates or moderators through which independent variables influence the dependent variables (e.g. ‘conflict’ as moderating the relation between ‘method’ and ‘consensus’) can also be included. Once information about all variables is collected, data is quantitatively analysed using a wide range of statistical techniques (e.g. analysis of variance, regression, structural equation modelling). Generally speaking, the competences that are required to conduct variance research align well with those of a quantitative social science researcher: review the literature and identify relevant theory, formulate hypotheses, test these empirically, and then develop a causal explanation that further specifies the theory. Indeed, the few systematic evaluation studies of team decision support discussed in the previous section adopt have adopted a variance approach.

Despite its obvious appeal to the mainstream team decision support researcher, a variance approach will only produce explanations that contain a small number of variables, which will not always be applicable in cases where the overall intervention outcome is both complex and emergent. If the interest is in understanding how team members respond to events and

circumstances within an intervention, and how their responses affect results, then group decision support researchers can adopt what is known as the *process* approach (Mohr, 1982; Poole et al., 2000). Generally speaking, process research seeks explanations of how a sequence of events leads to an outcome. Rather than using variables, a process approach considers an evolving actor (individual, group, organisation) to which events occur or who makes events happen as the unit of analysis. Process explanations provide ‘thick’ narratives that account for how one event led to another, and that one to another, and so on to the final outcome (Poole, 2007). Diverse and eclectic research designs are used to implement a process approach, and central to these designs is the task of identifying or reconstructing the intervention process through the analysis of activity and events taking place over time. Typically, process studies derive theory inductively from observation and ethnographic-type methods, which requires collecting and analysing large amounts of qualitative and quantitative data from which a process explanation is developed. It is also possible to test theory-informed models of the intervention process, or use theories to guide empirical observation in an ‘abductive’ or ‘retroductive’ mode (Mingers, 2012), which then further specifies the theories (Poole et al., 2000). It might be apparent that the demands placed on the researcher wishing to implement a process approach are higher than if a variance approach is adopted. Specifically, becoming acquainted with theories from the social sciences, as well as gaining competence in social science research methodologies is not straightforward. Yet, the process approach has attracted growing attention of team decision support scholars in recent years, (e.g. Fran Ackermann & Colin Eden, 2011; Ackermann et al., 2018; Burger, 2020; Franco, 2013; L. A. Franco & C. Greiffenhagen, 2018; Shaw et al., 2003; Tavella & Franco, 2015; Tavella et al., 2020; Tully et al., 2018; White, 2009; White et al., 2016). It is worth noting that not all process research presents the same challenges for those wishing to adopt it. As Brocklesby (2016) notes, some types of process research represent a more feasible proposition for a wider population of team decision support researchers (e.g. Ormerod, 2014a). For those interested in pursuing more complex types of process research, there are several heuristics and systems available in the literature that include both, qualitative (e.g. Langley, 1999; Pentland, 1999) and quantitative (Poole et al., 2000) process research.

### **17.3. How to become a competent intervention practitioner**

What are the competences required to deploy team decision support in practice? In a review of the extant literature that examines team decision support competences, Ormerod (2014b) identifies core competences under three broad headings: conducting analysis, designing and managing process, and appreciating context. Developing these competences is often best done through apprenticeship, in which a novice has access to observing an expert in action, as well as applying the methods in practice. However, apprenticeship opportunities like this are not always available. Instead, university programmes that incorporate team decision support into the curriculum, as well as specialist team decision support training courses offered by expert providers, have traditionally addressed this gap. Here, there are two approaches to developing team decision support competences. The first one aims to develop competences via small consulting projects with a real organisation, in which participants can have hands-on experience of using team decision support under the supervision of an academic with team decision support expertise. When conducting projects is a formal part of a university programme or training course, then this approach to develop team decision support competences is the closest to the apprenticeship model.

The second approach is to develop team decision support competences in the classroom, but this is significantly more challenging for those teaching, and being taught, team decision support (Ackermann, 2011). The size of the challenge will depend on the specific competences that are the target of development. For example, competence in conducting analysis requires mastery of qualitative modelling techniques, which can be developed via experiential learning (e.g. Williams & Dickson, 2000), case studies, and the understanding gained from ‘textbook’ descriptions of various team decision support approaches, such as those presented by Rosenhead and Mingers (2001) or Reynolds and Holwell (2010). Although the use of experiential learning tasks, case studies and textbooks cannot replicate the complex reality of team decision support practice, this approach is nonetheless effective for helping novices develop a minimum level of desk-based analytic competence in team decision support. Similarly, the need to develop competences in appreciating the complexity of the context in which team decision support is deployed can somewhat be addressed by sharing the personal experiences of team decision support teachers and trainers with students and trainees<sup>19</sup>. This can be complemented by bringing former clients into the classroom to talk about their experience of facing past problem situations, and discuss how useful they found team decision support in tackling those situations (Ackermann, 2011).

By contrast, developing competences in designing and managing process is significantly more challenging, particularly within the boundaries of a standard university programme or training course. This requires designing a learning environment that not only can bring the real world of team decision support practice into the classroom, but also one that provides learning materials that capture the uncoded tacit knowledge of team decision support experts, which is not revealed in textbooks (Keys, 2006). To gain competence in designing and managing the process, the general approach seems to be engaging team decision support novices in meaningful tasks in which they have a stake (Ackermann, 2011; Carreras & Kaur, 2011), or tasks based on realistic consultancy projects (e.g. Hindle, 2011). Such tasks aim to provide opportunities for team decision support novices to develop experience in performing tasks that are typical of team decision support interventions such as, for example, preparing a proposal, interviewing, facilitating a group, presenting results, and recognising and justifying the added value brought by the use of team decision support approaches. This is a useful approach to competence building, one that can help novices to move beyond just having desktop qualitative modelling skills and an appreciation of context.

Any approach to competence building needs to carefully consider which knowledge and skills are basic and need to be built first, providing a basis for more advanced competences, and so on. To take one example, the Business and Analysis Master programme (part of the European Master in System Dynamics)<sup>20</sup> aims to build students’ competences in group model building. The programme starts by building system dynamics modelling and analysis skills. This serves to familiarise students with the ‘language’ that will be used in group modelling sessions. After this part students will be able to build models individually, using documents, one on one interviews, databases and/ or academic papers as an input. To introduce them to using a group as a data source, they first engage in a group model building session as participants. The idea

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<sup>19</sup> Some team decision support approaches also contain specific tools to gain an appreciation of context, for example, the use of ‘rich pictures’ and analysis I, II and III (cultural stream analysis) in Soft Systems Methodology (Checkland 2000) or the twelve questions on boundary critique in Critical Systems Heuristics (Ulrich and Reynolds, 2010).

<sup>20</sup> For more information on the BAM master programme, see <https://www.ru.nl/opleidingen/masters/business-analysis-and-modelling>. More information on the EMSD programme is on <https://www.europeansystemdynamics.eu/>.

here is that they are ‘immersed’ in the situation, and get a first-hand experience of the sometimes confusing reality of a modelling workshop. At some moments the session seems to progress smoothly and the team is engaged in a task. At other times everything seems to be happening at once, for instance when a difficult to model problem is discussed while some group members give every sign of having run out of energy. Building the model and working with the group sometimes pull in opposite directions, and the facilitator needs to decide on the spot on which deserves her attention first. This is followed by several sessions in which students alternate between the role of facilitator and participant. Each session the facilitators guide the team of participants through a series of preselected scripts<sup>21</sup> (Ackermann et al., 2011; Andersen & Richardson, 1997). A member of staff who is experienced in group model building is present during the session and leads a round of debriefing at the end. After having built experience with a range of scripts in a ‘simulated setting’ (with fellow students), in the next course period students are brought into contact with a public or private organisation that wants help in deciding on a complex issue. Students do the intake, select team members with the contact person, design and facilitate sessions and report to the client organisation. A coach is available to discuss design choices or reflect on (intermediate) results. This way of working has been employed since 2010 and generally led to satisfied clients and positive reactions by students. Many students subsequently engage in group model building projects as part of their master theses.

It is worth noting however that the students’ first engagement with a real world issue, with participants from actual public or private organisations, may exhibit a high level of complexity, uncertainty and conflict but does not involve interpersonal conflicts or large power differences. In this sense, even these real world situations are still ‘sanitised’ versions of the situations for which team decision support approaches were developed. We feel that while scripts contain a clear and well-defined set of expected behaviours by team decision support users and are very useful didactic devices, working in situations of interpersonal conflict and power differences requires more than the use of scripts. Indeed, we feel that the third of Ormerod’s (2014b) core competences, appreciating context, is probably the most difficult to develop. It requires in-depth knowledge of the strengths and limitations of different decision support approaches, and the ability to combine elements to develop a session design that fits to the situation at hand (Rouwette, 2022).

We do not mean to say that such scripts are divorced from real team decision support practice. The main issue resides in their inability to capture the interactional and situated specifics of using team decision support approaches in practice, which is an aspect certainly well known to team decision support experts. In other words, scripts must be ‘accomplished’ on the ground, and therefore cannot determine or prescribe what team decision support users actually do *in situ*. They need to work in a meeting in which at some moments multiple things happen at once.

To the extent that the current approach to develop competences in designing and managing process, and its supporting learning materials, do not fully correspond to actual practice, team decision support students and trainees are at a disadvantage. An approach to competence building based on real team decision support practice will need to be informed by research that collects and analyses team decision support practice as it is performed by experts on the ground (e.g. L. A. Franco & C. Greiffenhagen, 2018; Franco & Nielsen, 2018). Analyses of multiple

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<sup>21</sup> A script is a repeatable element of process that, if used in a specified context consistently yields similar outcomes. A typical script covers 15 to 20 minutes of a session. Scripts for different phases of team work are accessible online via Scriptapedia (<https://en.wikibooks.org/wiki/scriptapedia>). See Chapter 4 for more information.

instances of recorded team decision support practice can identify the actual organisation and trajectories of different team decision support intervention tasks and activities, with a view to identify what works and what does not. With the knowledge accrued from these analyses it would be possible, for example, to develop facilitation ‘role plays’ grounded in the actual, rather than simulated, activities of anonymised team decision support facilitators. The structure of such role plays could be designed in a way that the trajectory of a given facilitated task would only be revealed after students and trainees do something at a particular point in time<sup>22</sup>.

In this way building our knowledge on what works in group decision support interventions, and under which circumstances, helps to improve training for decision support facilitators and adapt decision support to new challenges. Ultimately we hope this book contributes to combining smart analysis with stakeholder involvement. In our view this combination is urgently needed given the many pressing challenges societies wrestle with today. The interplay of societal, ecological, and economic goals makes it likely that issues in the future will be as complex if not more complex than the ones we face today and that more stakeholders will want to have a say.

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<sup>22</sup> This approach to competence building has been pioneered in other professional fields such as mediation (Stokoe, 2014) and education (Kane and Staiger, 2012).

## Appendix A. Basic interventions

This section outlines the procedures of a set of basic interventions: brainstorming, Nominal Group Technique, Devil's advocate, Dialectical inquiry and simple prioritisation techniques.

### A1. Brainstorming

Brainstorming is a term introduced in a book by Osborn in 1953. In order to apply brainstorming in a group setting, a number of principles and steps are important. Osborn (1957: 84) describes the following principles:

1. criticism is not permitted: the participants do not evaluate each other's ideas
2. free-wheeling is welcome: the wilder the idea, the better
3. quantity is good: the more ideas there are, the better the chance of a good idea
4. we are looking for combination and improvement: by building on each other's ideas, or combining ideas, new and better ideas are created

The principles can be applied in a number of ways. One possible procedure is the following:

#### *Discussing the problem and the rules*

Participants are invited to take part in the session with a specific aim. They are experts and/or stakeholders in a specific area and are asked to use their knowledge to gather as many ideas as possible about a topic. The meeting therefore begins with a clear delineation of the problem that will be the focus of the session. As stated in the course description, every participant has already read up on a role within the case. The central problem in the session therefore involves the case, but you are free to choose a more specific problem that is important to the organisation concerned. After this, the group members will explain the above-mentioned principles in their own words.

#### *Reformulate the problem and choosing a starting question*

You now refine the problem to a very specific question that you present to the group. Formulate an open and specific question in order to begin the brainstorming session. Osborn (1957) gives a number of examples. Do not formulate the question during the session, but do this beforehand with the three facilitators.

#### *Warming up*

To help the participants become comfortable with the creative assignment, it's a good idea to let them practice briefly with a fictional problem that does not involve the organisation concerned. This warming up is also a useful exercise for practising the rules of brainstorming (especially the first one: don't evaluate).

#### *Make notes about the flow of ideas*

To make sure that people can build on each other's ideas, make notes about all ideas in a way that is visible to everyone. While making notes about the ideas, try to use the participant's own words as much as possible. Also make sure that the notes of the contributions are not too long.

#### *'Wildest idea'*

If the flow of ideas dries up after a time, you can get it going again by asking for the wildest idea that anyone can imagine. Decide beforehand how you will present this question to the group.



## A2. Nominal Group Technique

Nominal Group Technique is described in the book by Delbecq, Van de Ven and Gustafson. (1975). The full procedure includes a round of voting at the end. This is left out here so that the steps support only the divergent phase of group decision making.

*Remind the group of the problem.*

Write the central problem in the centre of a white board or blackboard.

*Introduce contributing ideas*

Ask the participants to write down ideas about things that involve the problem variable. Be clear about the format you are looking for. for instance, when the aim is to gather variables for group model building, the following specification of format can be used. Indicate to participants that ideas may be on causes or consequences of the problem, or any elements a participant feels are important to the issue at hand. Ask the participants to do this as much as possible in terms of variables. If it is not possible to formulate an idea as a variable, it does not really matter; the facilitator and the rest of the group can work together to find a variable.

*Invite participants to note down ideas*

Give the participants a few minutes to write down their own ideas.

*Introduce gathering ideas*

Explain that you are going to gather ideas and show them on the board or computer screen for everyone to see. Ask each participant for one idea and write this on the white board or blackboard. Pay attention to the conversion into variables and check to see if the other group members know what the person contributing the idea means. Allow a clarification of meaning, but not a discussion on the relevance or importance of the idea. Explain that in this phase, the person contributing the idea has the last word: if he or she prefers a particular formulation even if other object, the proposed formulation will be put on the central board or screen.

Stop collecting ideas after two or three rounds. Emphasize that the aim of this phase is only to create an initial list of variables so that model building can begin, and that variables that were not written on the board for the group are not automatically discarded. During the model building process, variables from the individual lists or even entirely new variables can be added.

## A3. Devil's advocate

Devil's advocate is an approach to improve the quality of strategic plans (Janis, 1982). The plan is attacked by one or more persons playing the devil's advocate who try to demonstrate all that is wrong with the plan. Below are the steps involved in Devil's advocate .

1. Divide the group in two subgroups; one subgroup is assigned the role of devil's advocate.
2. One subgroup (not the devil's advocate) develops written recommendations accompanied by arguments which are supported by all key assumptions, facts and relevant data.
3. The first subgroup presents its written recommendations to the devil's advocate group.
4. The devil's advocate group develops a formal written critique in which they attempt to uncover all that is wrong with the recommendations or assumptions. The subgroup presents their critique is presented to the first group
5. The other group revises its original recommendations based on the critique.



6. These steps are repeated until both subgroups can accept the recommendations.
7. The final recommendations are written down.

#### **A4. Dialectical inquiry**

The Devil's advocate approach asks for critiquing a plan with the aim to improve it. However, using this approach runs the following risks (Mason, 1969). First, although it may help to expose some of the plan's underlying assumptions, it does so in the context of what is wrong. It does not serve to develop a new managerial world view. Second, if the negative critique prevails and the plan is rejected there is no new plan to replace it. Third, there is a tendency for the team offering the critique to have a destructive rather than constructive attitude. Fourth, in response to extended criticism the decision maker's psychological response might be to come up only with safe plans in the future.

One way to implement dialectical inquiry is the following (Roberto, 2013):

1. Divided the team into two subgroups.
2. Subgroup 1 develops a proposal, fleshing out the recommendation, key assumptions, and supporting data.
3. Subgroup 1 presents the proposal to Subgroup 2 in written and oral form.
4. Subgroup 2 develops a detailed critique of these assumptions and recommendations. It presents this critique in written and oral form.
5. Subgroup 1 revises its proposal based on the feedback.
6. The subgroups continue in this revision-critique-revision cycle until they converge on a shared set of assumptions.
7. Based on those assumptions, the subgroups work together to develop a common set of recommendations.

#### **A5. Simple prioritisation techniques**

A basic approach to prioritisation is voting by using sticky dots. This involves the following steps:

1. Participants are each given a set number of sticky dots stickers
2. Participants are instructed that they can put all of their dots next to one idea, or divide them over different ideas.
3. Participants place dots next to the ideas they like.
4. Ideas are prioritised from top (most dots) to bottom (fewest dots).

A variation is to give participants dots of different colours, for instance green dots to indicate liking and one or a few red dots indicating 'vetoes'. Another alternative is to not use 'physical' dots but a limited number of votes. When these are collected by the facilitator in front of the plenary group, an element of excitement is added ('which option will win?'). Do keep in mind that if some ideas end with a roughly equal number of votes, the last team members can swing the vote from one idea to another.

## Appendix B. Choices in data collection and research design

### B.1 Data collection

Empirical research comes in many different forms. Data sources are a useful starting point for classifying types of research (Vennix, 2019). Some data that are relevant to a study may already exist, either in ‘raw’ or unprocessed form, or processed. Raw data come in many forms, for instance as texts or visual material. Processed data are for example provided by various commercial and government organisations that conduct surveys, such as a polling agency that reports on approval rates of politicians or policies. If a researcher gathers new data, there are in principle three sources to turn to: real world situations, people and texts. If we subdivide people further into individuals and groups, we come to the following overview of data sources and data collection methods.

<i>Data source</i>	<i>Data collection method</i>	<i>Versions</i>
Situation	Observation	Quantitative, qualitative non-participatory, qualitative participatory
Text	Content analysis	Quantitative, qualitative
Individual	Survey	Written questionnaire or oral interview; more or less structured
Group	Group interview	More or less structured

Table B.1. Data sources and data collection methods (adapted from Vennix, 2019, p. 146)

All of these data sources can have a role in research on team decision support interventions. For instance, in their study on group model building, Huz *et al.* (1997) use data from meeting observations (situations), archival analysis of meeting agendas and summary notes (texts), between meeting interviews (individuals) and facilitation team reflections (groups).

### B.2 Research designs

As can be seen in Table 1, each data collection method has a qualitative and quantitative version. At first sight, qualitative and quantitative may be taken to refer to the type of data generated: text or numbers. However, arriving at these results implies particular choices in research design at the start of the study. Quantitative (or empirical-analytical) research departs from a clear idea on central concepts and their relations. Each concept is defined and operationalised, meaning that corresponding measurements are selected. For instance, in quantitative research, observations would require an observation protocol (Vennix, 2019). If a researcher wants to observe a particular phenomenon, it will be described and operationalised into observables. A protocol will be constructed for observers to follow, so that they know which behaviours to record (code) and observations do not depend on the person doing the coding. Qualitative (or interpretative) research would not use an observation protocol but observe more freely. Researchers in this tradition might also choose to participate in the situation.

These two main types of research – quantitative and qualitative – tend to use different research designs, although a strict categorisation is a too simple representation of the large variety in research approaches that are used in practice. Qualitative research is typically associated with a case study. A case study investigates a phenomenon in its real-life context, in which the

boundaries between the phenomenon and context are not clearly demarcated, and multiple sources of evidence are used (Yin, 1984). (Some of these sources may contain quantitative data.) The study by Huz *et al.* (1997) is clearly a case study as he contrasts data from different sources and works towards an understanding of how the modelling intervention and organisational context together shape project results. Using multiple sources of data allows for checking if an interpretation based on one data source also holds when other types of data are considered. This process of confronting several independent data sets and checking them against each other, is called triangulation. Quantitative research often takes the form of a survey or experiment. A survey as a research design (not to be confused with a survey as data gathering method) is a way to gather data on a large number of objects in a systematic manner. It is probably best known for opinion polls, in which the objects are individual people which all answer the same set of questions. But ‘objects’ can be anything, for instance items on stock in petrol stations across Europe, or the number of days in a year with temperatures above 30 degrees Celsius. In many ways a survey takes the opposite approach from a case study. Where a survey results in limited data on a large set of research objects, a case study gathers a lot of data on one or a few research objects. The final research design is the experiment (Cook & Campbell, 1979). Here the researcher manipulates a variable (the stimulus or the treatment) and observes the effect on another variable. To determine that there is an effect means we have to find out if there is a change over time, meaning that a pretest and posttest are needed. To increase confidence that the effect was actually caused by the stimulus, additional measures can be taken. A control group can be used that does not receive the stimulus, but might receive another treatment that is not effective (a placebo). If an effect is found for the experimental group, but not for the control group, we have more confidence that the stimulus caused the change. Nevertheless, this so-called pretest-posttest control group design does not rule out the possibility that differences between participants that existed before the experiment influenced results. For instance, imagine we design a classroom experiment and place students in groups as they register. If we place all students registering early in the experimental group, and those who are late in the control group, we might inadvertently at the same time create a difference in motivation (to the extent that time of registration is an indicator for motivation). By using randomisation, the effect of pre-existing differences between the experimental and control group is neutralised as far as possible. An experiment is ideally suited for research into causality (Vennix, 2019).

In Chapter 14 we looked at levels of evidence for interventions (Tranfield *et al.*, 2003). We noted that for assessing effectiveness of medical interventions, case studies carry less weight than a randomised experiment. The preceding discussion of research designs hopefully makes clear why. An experiment is better at isolating the actual cause for change from a host of other factors in the context. Nevertheless, a case study is a logical design to research how a particular team decides on a particular, unique, complex issue. While a single case study may not give much confidence in establishing a link between method and impact, as more case studies are added in which the method is held constant but decision makers and issues vary, confidence increases.

### **B.3 Choosing between research designs and data collection methods**

How does a researcher choose between different research designs and data collection methods? The first consideration here is the type of research question that the researcher is interested in. In the examples on experiments above, the researcher is looking into cause and effect relations. That means she is seeking to answer an explanatory question. Before being able to provide an

explanation, or put differently to establish a causal relation between factors, we need clear definitions and operationalisations of each factor. Here we see again that an experiment fits within the quantitative tradition of research: before data are collected, we need to know exactly what we are looking for. Definitions and measurements can be derived from theories and previous empirical research, or developed anew. In novel situations it may not be clear whether existing theories and insights apply which makes open exploration a useful first step. Imagine a researcher in the early 2000s, at the time when social media are rapidly becoming more popular. If he wants to know more about the role of new media in the life of teenagers, he is interested in an explorative question. Once central concepts, definitions and measurements become more clear, descriptive questions can be asked (e.g., how many hours per day does a teenager in the UK on average spent on a particular type of social media?). These could then lead to explanatory questions (e.g., does extraversion explain number of hours spent on social media?). In other words, at least three types of research questions can be distinguished: explorative, descriptive and explanatory (Vennix, 2019).

Another distinction between types of research which is an important input into the choice for a design or data collection method, is the primary aim and audience of the study. Research can be fundamental or theory driven, which means that understanding is the main aim and the primary audience are other researchers. Alternatively, research can be applied or practice oriented research a practical problem drives the study. The study then not only needs to deliver understanding but also provide a basis for taking action.

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