SOLVING COMPLEX PROBLEMS

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PROFESSIONAL GROUP DECISION-MAKING SUPPORT IN HIGHLY COMPLEX SITUATIONS

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The value of an idea lies in the usage of it.
Thomas Edison

Simplicity is the ultimate sophistication.
Leonardo Da Vinci

These two quotes could not describe better the idea behind this book and behind our work: analysing situations, training and teaching people, coaching, guiding and facilitating them towards good decisions.

Something has value for society if it gets used, in whatever form.

People are best motivated to act upon complex problems when the essence of the problem is captured in a simple way. This helps people to understand and oversee the problem and, eventually, make decisions and act in situations where it is not at all obvious what to do.

This book helps you to help people decide.

We dedicate this book to all of our students and the people we work with.

You are our teachers.

We hope you enjoy it and, especially, use it!

Alexander de Haan
&
Pauline de Heer

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1.1 Introduction

If you love to work on complex issues concerning our ever-changing world, where unpredictability confronts people with different interests and goals, then this book on solving complex problems is for you.

A complex world with complex problems
The world has become more complex, and so have the problems we encounter. Drivers for this complexity are, for example, globalisation, access to vast amounts of information through the internet, increased intercultural contact (through the internet and being able to travel around the world) that takes place on a continuous basis, and the fast (but sometimes still uncertain) developments in technology. Also, problems that would have been local some fifty years ago, with only a few people involved in the decision-making process, and only those people with access to information, have turned into public, political, and even global discussions, in which people use information from other regions as input.

For example, exclusively local discussions on the availability of educational facilities no longer exist: different government bodies will interfere (including international ones because of international policies on the availability of educational institutions), local pressure groups gather information on comparable cases worldwide, technology companies want to show their technical solutions for long-distance learning, etc.

Moreover, most problems are not 'stand-alone' problems, appearing locally and to be solved by only a few people (like a car manufacturer making a 'cleaner' car, or a government deciding to build more roads). Fields like transport are deeply embedded in our society and have so many links with so many countries, people, organisations and users that the challenges faced are 'global problems'. They are global in terms of causes, effects and solutions. Many organisations and the behaviour of many people cause the problems we face with transport; the adverse effects of contribution to climate change affect everybody, and possible solutions such as cooperation, research and the development of policies are required in order to solve current problems originating from transport.

By complex problems we mean problems that do not have a single solution available (or perhaps none at all) due to the level of complexity mentioned above.

In many ways, the world has become more dynamic: the high-speed developments in technology continue to change the way we live at an extraordinary rate. In some areas, for instance, people are less bound to their homelands and migrate, within the region or to the other side of the world, and people also tend to change jobs more often. Finally, we see that, because of the internet and other means of communication, political change can gain momentum in a very short time span.

Everything is dynamic in time and becoming increasingly complex, far too complex to fully comprehend. With many people involved in every decision-making process, it is almost impossible for all of them to reach an agreement when it comes to issues like climate change, intermodal infrastructures, healthcare, energy sources and power supplies, information and communication networks, and fighting existing and emerging diseases. In short, it is difficult to come up with a uniformly satisfactory solution accepted by all parties involved in the problem. This is the shadowy aspect of decision-making on which our book will shed some light.

Due to all this complexity, there is a need for new ways to tackle the ever-present uncertainty in deciding what to do about a problem situation.

A first step towards understanding this complex world requires having a firm grip on the problems at hand. Groups of diverse individuals, across a spectrum of disciplines, work together in order to untangle complex multi-actor problems and find the core of the matter. What is the problem precisely? And ultimately, what should be done about it? For instance, how to address road congestion without sacrificing the environment? In what ways can we organise air traffic in the following fifty years so that it allows for international access in conjunction with less noise and CO_2 emission? What is the best way to learn from trial and error in healthcare without jeopardising the health and welfare of patients? What should be the long-term investment strategy for a company so that it meets its development goals in a cost effective manner?

These dilemmas cannot be solved overnight, and for almost all of them there is not one solution, but many (or even none at all). This is where you, as an analyst, come in; to make the problem explicit and to compare (i.e., to rationalise) the different potential solutions. Good analysts are sharp thinkers and well equipped to communicate the results of their

sophisticated analyses in a simple manner. The demand for people with good analytical skills will only increase with the evolving complexity of the world. With the techniques and methods provided to you in this book, you can advance yourself in these highly valued skills as well. This book gives you a new way of looking at the world, like a new pair of glasses. Many of you will never have looked at problems in such a way before. The techniques presented here though, are relatively simple. We give you specific techniques to deal with the complexity of the problem you are challenged to solve.

Professional group decision-making support – bringing actors together

The title of this book is 'Solving Complex Problems – Professional group decision-making support in highly complex situations'. Now that we have covered the complex problems and situations, let us focus on the 'group decision-making support' part of the title.

We believe that actively involving people who are experiencing a problem, have ideas for solutions, or are influenced by one of the solutions (the so-called stakeholders), in the process of making explicit and rationalising will help in finding a better solution to the problem. The more open and transparent the decision-making process is, the better. Giving stakeholders a true voice in the process can bring more understanding and support for whatever solution is chosen in the end. The techniques we cover in this book can be used to support the group decision-making process.

This mindset stems from the cultural background, experience and perspective from which this book is written. Cultural aspects will differ from country to country, and even from sector to sector (for instance, healthcare will differ greatly from construction). We cover this issue throughout this book in our many examples and anecdotes from personal experience, especially in the sections that deal with the

ways in which our described techniques influence the thinking of both individuals and groups. Remember to constantly reflect on the problem situations you encounter! In what way can you involve actors, given the cultural setting you are in?

The techniques are not a flawless step-by-step recipe – be creative!
This book is not a 'how-to' guide, like a cookbook with a flawless recipe for success; we are dealing with problems which are far too complex for rigid solutions. Find a way to make the suggested techniques, methods and ideas your own. You will not be penalised for being creative! As with any deviation from presented ideas and thoughts which are based on experience and have a firm theoretical grounding, you must always remain cautious and carefully examine the effects of your actions. The advantage of the techniques in this book is that you have the final say. In the role of analyst, you choose the technique and the implementation. You are in charge of the outcome and we are just giving you a helping hand in the process.

1.2 How to use this book

The techniques suggested can be applied to many different problem fields, and can be used when you need to analyse a problem situation. The techniques will help to make the problem situation clear to both yourself and to your colleagues, clients, or other people (actors) involved. It is your choice whether you use the techniques on the back of an envelope, just to make things clear for yourself, or as a means of conveying what the problem is truly about. Both can be very valuable.

As we have already mentioned, these are not step-by-step instructions. We advise you to use this book as a guide while you start exploring your problems with the techniques presented. You can use a problem you are already working on, or you can use news topics to do a quick analysis.

Each technique is accompanied by a section on 'common mistakes' to give you the opportunity to check your own analysis.

We also encourage you to team up, both with other readers of this book, and with colleagues that do not know a thing about the techniques we cover. The first group of people will help you in critically assessing your own analyses, and will show you the differences between your analyses and theirs: no two causal diagrams (chapter 2) will be the same, due to your background knowledge, interests, and urge for perfection. Together, you can alter such an analysis and improve on it to include your joint preferences. Colleagues that do not know the techniques are the perfect guinea pigs: show them your analysis and ask them what they think.

1.3 Intended readers of this book

This book is intended for any person who is interested in solving complex problems of the type we described in section 1.1. Professionals can learn the techniques from this book and apply them in their work. The book can also be used in educational settings in the fields of public and business administration, engineering (especially where there is a focus on social engineering challenges), etc.

1.4 Focus on the problem, rather than on solutions

Global issues such as climate change, energy supply, healthcare and sustainability are often seen as 'problems'. But consider how these problems get addressed most of the time: 'we should stimulate the market for the electric car', 'we should make a transition towards hydrogen', 'let's have vaccinations available in developing countries', or 'take the train instead of the car'. Think about it, *are these problems*

that are being addressed? No, these are, at best, solutions to problems illustrating that everybody seems to know what should be done about it, but do they know why? Typically, they announce their 'solution' and defend it. This will not help in constructively solving the problem.

Note that usually people talk about a solution when addressing a problem. Cognitively, both problem and solution appear to be coupled in people's thoughts. The resulting behaviour is usually as follows: talking about the problem-solution issue in terms of encumbrances experienced, e.g., 'it takes me two hours each day to get to the office', and what should be done about it, e.g., 'when are they going to add an extra lane to the highway?' When this person gets into a group he might mention his unhappiness by complaining about the hours lost in traffic jams every day and that it is obvious that an extra lane has to be built. Colleagues living in the same area might agree, as they also sit in traffic jams. On the other hand, citizens living near the highway might fear serious hindrance from construction works and an increase in noise, emissions, and pollution due to the increased traffic density. The citizens disagreeing with the proposed construction of an extra lane will simply tell our commuter to wake up a little earlier in order to reach the office before rush hour starts.

On a regional level, other people could disagree with the extra lane since they might prefer recreational space to highways. They would advise our commuter to use public transport.

In addition, the regional government might want to spend money on other issues rather than highways since they might have committed themselves to improving the telecommunication grid during the election campaign. Similarly, as public health is also an issue high up their political agenda, they might try to motivate people to use their bicycles to travel to work (and take the bus when it rains).

Clearly, all of these people disagree with our commuter's proposed 'solution', but, in the same way as the commuter, they also announce what, according to them, the 'solution' should be. Bringing these people together would lead to lengthy discussions, each announcing and defending their own 'solution', trying to convince others, and looking for people who support their vision (commonly known as 'coalition forming'). This will delay decision-making, and might suppress alternatives that could be a good solution for the majority of people.

In short, there are two different issues at hand: (1) the cognitive action of thinking directly about a solution for the problem rather than in terms of what the real problem is. This easily leads to (2) announcing-and-defending behaviour when in a group, giving rise to group dynamic processes of discussion, coalition forming and ultimately no decision-making.

Beating the built-in habit of solution-thinking

People seem to have a built-in habit of immediately thinking about and expressing a potential solution the moment a problem is presented. This impulse often leads to no decision-making in complex problems where many (and often diverse) people are involved, all having different solutions in mind. This 'problem-solution thinking' is so natural and so strong that it even appears when somebody else is experiencing a problem (just think about all that unasked-for advice you have received in your life!).

It is a bit like telling your techie friends you want to buy a new PC, or telling your consulting firm colleagues you will 'have to' choose a new lease car. Everybody will tell you what hard drive to select, what car brand to choose. You will get (unasked-for) advice about gigahertz, the size of flat screens, parking sensors and horsepower. Which of your friends and colleagues *asks* you anything? Or, more precisely, asks you why you need a new PC or lease car in the first place? Who asks you about the problem you are having which can only be solved with a new PC or new car?

In order to facilitate decision-making in complex, multi-person problem settings, a simple and straightforward methodology is needed that disconnects the impulsive habit of immediately thinking about one (and only one!) 'solution' when a problem is experienced. This methodology should also help cut back the announce-and-defend strategy people apply when they gather around in groups involved in the problem field. The method should give insight into the root causes of the problem and the objectives sought, which they can then use to support arguments either in favour or against certain potential solutions. These arguments should be explicit and easily accessible in order to encourage a process of decision-making based on facts as much as possible. Those characteristics of the problem field that are hard to represent in numbers (or cannot be represented at all) should be explicitly stated in order to facilitate a fruitful and practical discussion among the people involved.

This book will guide you towards making better decisions within a group of 'disagreeing' individuals by providing relevant information to facilitate the process of decision-making from start to finish.

In order to do this, you and your group members have to train yourselves to perform different-from-standard cognitive actions, e.g., not simply thinking in terms of one solution, and to show different–from-standard individual behaviour, e.g., not announcing and defending your idea as the 'one and only solution'. Keeping these two things in mind will most likely lead to a different group dynamic, resulting in fewer overlooked possibilities and more support for application and implementation.

1.5 Making the problem explicit and rationalising alternatives

A step towards dealing with a group of people with different objectives, who focus on a specific solution (thereby forgetting others that might be more suitable), is to make the problem very explicit. Causes and effects

in the problem field should be analysed. Also, the interests of all actors or organisations involved are to be brought forward, as are the effects of the different suggested 'solutions', or alternatives, and on what criteria they can be compared or rationalised.

By putting everything in writing, it becomes clear for everybody to see what is being discussed. You see how other people think about the problem. When the problem field has been made explicit, alternatives or possible solutions can be designed. Because the objectives of the parties involved have also been made explicit, it is then possible to compare those different alternatives on the basis of the objectives. The explicit information, as well as the rationalisation or comparison of the different alternatives, facilitates the decision-making process, as the amount of discussion between involved parties is substantially reduced, and allowance is made for both open and content-based discussion.

'Rationalising' is sometimes seen as the equivalent to 'optimising', i.e., objectively trying to find the best solution. Keep in mind that 'rationalising' compares different alternatives on a set of well-balanced criteria, whereas optimising focuses on only one of these alternatives: the objectively optimal one that scores best for a specific (often economic) criterion.

Our viewpoint emphasises that decision criteria are valued differently for every actor and, probably, these perceptions also vary in time. The problems that we study are so complex (many actors, different objectives, changing perceptions, etc.), that 'optimal solutions', if they exist at all, cannot practically be found.

In short, this book guides you in two crucial steps in your problem analysis: (1) 'making explicit' and (2) 'rationalising'.

1.6 Content of this book

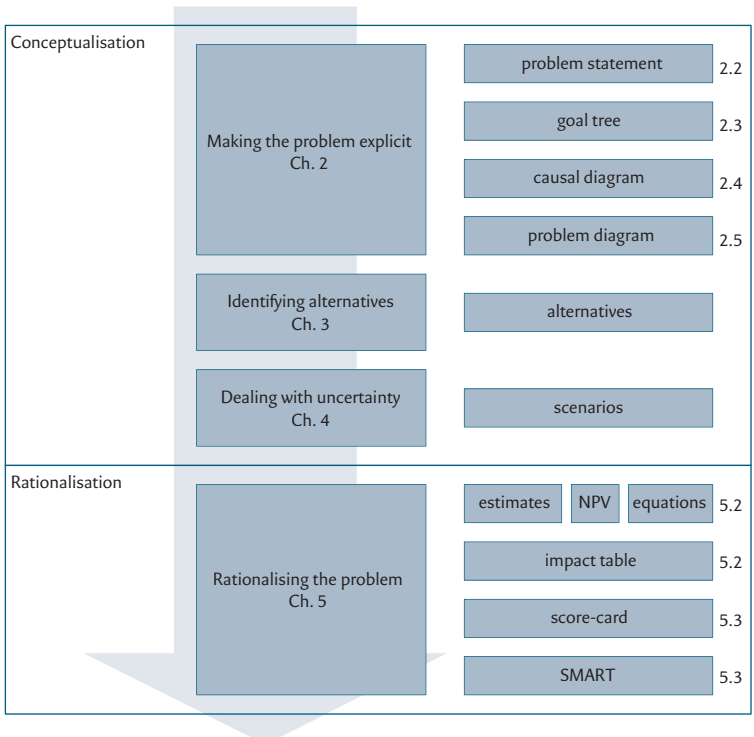
Making explicit what the problem is (conceptualising), determining the merits of each alternative and comparing them (rationalising), and using the results in different (cultural) settings through presentations, workshops, games, discussions etc., are all different phases in solving complex multi-actor problems. This is a long process that requires good communication amongst the individuals working together. Lots of attention needs to be paid to group dynamics and intercultural interactions ('culture' refers to both native cultural background and corporate culture).

Throughout the book, and within each chapter, different techniques are introduced that can help you in conceptualising the problem, rationalising it and presenting useful information in the decision-making process. We provide you with common situations for which we think the illustrated techniques are suitable. Next, we apply the given technique ourselves on a sample case and deliberate over the different results (there is never a single correct answer!). We present many examples of common 'mistakes' we have seen in our practical and educational experience, not that we assume we know the only way of applying all the different techniques presented. However, we show you what happens if you make these 'mistakes'. You can decide for yourself what you think of it, and how you will use the technique in your professional life. At the end of the book, we have suggestions for further academic reading to expand your theoretical knowledge about the ideas presented in this book.

In this chapter, we have introduced the relevance of complex problem solving. Another four chapters will follow. In chapter 2, we illustrate methods in order to make the problem explicit, while chapter 3 helps to find many different alternatives. In chapter 4, we discuss techniques that deal with the ever-present uncertainty about the future, and chapter 5 gives techniques for comparing the effects of the different alternatives.

Chapters 2 to 4 form the conceptualisation phase of the problem analysis. In short, you make an overview of what the problem is, who is involved, what decision criteria there could be, what alternatives people consider and what types of uncertainty the future holds.

Chapter 5 represents the rationalisation phase, in which alternatives are compared on a well-balanced set of criteria. The last phase is the presentation of the results of the analysis that can be done in any format suitable for the situation, however, always based on the rationalisation done in chapter 5. The following figure – which we will present in every chapter – gives an overview.



The phases of the problem solving process described in this work are suitable and substantial enough to provide support in decision-making. This becomes especially relevant for complex problems in which technology, politics, culture and many different people with different (and often dynamic) opinions and objectives come together. The phases consist of a set of relatively simple techniques, but that does not necessarily make it easy to carry out a good analysis. Combining all techniques consistently and interactively to create added value in a decision-making process is not easy to learn. To put it bluntly, there is only one way: try, practice, and learn from good and, especially, from bad experiences. Apply the techniques together, team up, if possible, and learn from one another's different approaches, ideas and results.

This book guides you in lending a helping hand to a diverse group of people, all with different objectives, but ultimately with the same goal of deciding how to solve a problem. This always concerns different people, different problems, different technologies, different cultures, and different domains. However, one thing will always remain constant, and that is using the same set of relatively simple yet powerful techniques. We encourage you to apply these methods in the situations you encounter, and see where they take you in the process of complex problem solving. Good luck!