INTRODUCTION AND READER’S GUIDE

This is a book about decision-making – about how people do make decisions, and about how they may improve their decision-making. To say this makes some assumptions, and, before we go on to show the reader how decision-making will be tackled in this book, as we will do in the rest of this introductory chapter, we will examine these assumptions.

First, can decision-making be studied? One of the authors, when discussing his research work with a senior (and traditionally minded) colleague, was asked what subject he studied. On replying that he studied decision-making, the response was “Is that a subject?” Many readers will not need our prompting to answer that question affirmatively, but it is as well to spell out the nature of our study. It is principally concerned with the determinants of decision – that is to say, what it is that makes us take one course of action rather than another. In some cultural and intellectual traditions there is an easy answer to this question. Extreme forms of Calvinism, for example, itself a particularly severe kind of Protestantism, deny that free will exists; nobody may make decisions, therefore, since everything is fore-ordained by God. Then, as Howard (1980) points out, in an excellent article on the philosophy of analyzing decisions, many Eastern philosophies will not see the study of decision-making as a fruitful endeavor, since in these philosophies one accepts the unfolding of life as it presents itself.

The idea of a “decision” is a quintessentially Western idea, an act of hubris to a believer in Eastern philosophy and a joke to the enlightened. (Can you imagine Buddha or Lao-tzu making a decision?) Howard 1980, p.5

We imagine, however, that most readers of this book will sit within the humanist tradition, the dominant world-view in the West since the Enlightenment. To such readers it will seem self-evident that we do make choices, and that we do have the freedom to decide to take one or another of several different avenues open to us. We can then properly ask what it is that makes us take one path rather than another. Psychologists who study human cognition have now been investigating this issue for many decades,
and we describe some of their findings in Chapter 4 of this book. The principal question addressed has been whether people make decisions in accordance with plausible models of what might be called coherent decision-making; the answers have been mainly negative! Nonetheless, these studies have been fruitful in exploring what drives decision-making; they indicate that decision-making is indeed a proper subject of study.

The second implicit supposition of our opening sentence is whether decision-making can be improved. At the intuitive level the reader’s response is likely to be that it clearly can, at least in some instances. We are ready to point the finger at many bad decisions, such as Napoleon’s decision to march on Moscow, or the investor who places all his savings in a company that goes bankrupt. If bad decisions can be made, so too, presumably, can good ones; and thus decision-making can be improved. But, if we investigate more closely what is meant by “good” and “bad” decision-making, we find the idea difficult to define. Is a decision good if it turns out to have led to the ideal outcome given the eventual circumstances? Or should we call a decision good only if the process which leads to it is satisfactory? We will discuss these issues in Chapter 2, where we will define a good decision as a rational one, and a rational one as one that conforms to freely chosen rules of behavior.

Assuming that the quality of decision-making can be improved, the next question to ask is how this may be done. Over the last half century an increasingly sophisticated theory has developed, idealizing how decisions might be made. This decision theory has its roots in economics, psychology, and mathematical logic. We give an account of it in Chapter 3. A general point that we may make here is that throughout this book our object will be to give readers an understanding of the key ideas, without dwelling on them at length. We do aim, however, to provide sufficient references to the literature for an interested reader to be able to pursue points of interest elsewhere. For example, in Chapter 3 we describe value theory, subjective probability theory, and utility theory in sufficient detail (we hope) for readers to grasp the essentials, but we give references to the original literature and to other more specialized textbooks where these topics are described in greater detail. There are other subjects that a book such as this might have covered but which we have left out in order not to make the text too unwieldy; for example, we considered including a presentation of the mathematics of probability, a working knowledge of which is necessary to get to grips with much of Chapter 3.

Chapter 3, then, presents a normative, but idealized, theory of decision-making. An idealized theory of what constitutes a good decision is very different, however, from a guide to making decisions better in practice. The art of applying decision theory to practical situations has had a more recent history, but since about 1960 considerable experience has been
developed in this applied art; the art has come to be called decision analysis. Here we should digress to explain the title of this book. So far as we are aware, the term decision synthesis has not been used previously to describe the craft of taking a decision-maker's problem and providing help in reaching a decision in conformity with the principles of decision theory. We have used it rather than the more traditional term (decision analysis) not only to provide a distinctive title for the book, but also because the craft involves first the identification of the component parts of the decision, and then the construction, or synthesis, of recommendations for action. Despite our title we will talk mostly of decision analysis (rather than synthesis) in this book, since this is the term which is now imbedded in the literature. We still feel, however, that decision synthesis is a better term for describing what the craft involves.

The next question the reader will ask is how we should do decision synthesis; how may an idealized normative theory be used to help real people with real problems? We give our account of the application of decision theory to real problems in Part II of this text. First, in Chapter 6 we describe different approaches to decision synthesis that have been successfully practiced. There are now many different people in the Western world with experience of applying decision theory. As one might expect in an applied subject which involves as much art as science, different schools of practice have emerged. We call them analytic strategies, and we hope that, by studying Chapter 6, readers will be able to gain an impression of the different flavors of decision analysis that are currently practiced. Secondly, in Chapter 7, we discuss some of the techniques that are available for carrying out an analysis effectively. These include: how to structure a problem, and to model that problem once structured; how to develop an analysis iteratively; and how to elicit numerical representations of subjective judgments from decision-makers. We refer to these as analytic tactics. Then we go on, in Chapter 8, to give examples of a number of successful applications of decision theory; it is here that readers will be able to judge for themselves whether decision synthesis can improve decision-making. We hope that they will agree with us that, if good decision-making is judged by its conformity to principles of consistency, its clarity of reasoning, and its ability satisfactorily to articulate goals, then decision synthesis, properly carried out, can improve decision-making.

A more detailed representation of the structure of this book is given in Figure 1.1. Notice that certain topics, such as the modeling of uncertainty, of risk preference, and of conflicting objectives, are discussed in most of the chapters. One way of using this book could be to concentrate on just one of these issues at a time, looking at first the normative theory (in Chapter 3), then the experimental evidence of whether that theory
Figure 1.1 Decision synthesis.
Introduction and reader’s guide

describes behavior (Chapter 4), then the way that issue is handled by different schools of practice (Chapter 6), next the practical approaches available for coping with the concept (Chapter 7), and finally how other analysts have put these ideas together (Chapter 8). We recommend this mode of study as a possibly more creative learning procedure than the usual one of reading through chapter by chapter.

We have not yet mentioned Chapters 5 and 9. Chapter 9 is a concluding statement, where we discuss, in the light of the rest of the book, why, and in what context, decision synthesis is a valid and useful procedure to adopt; we also give our view of the research topics that need to be addressed to render the approach of yet more value. Chapter 5, on the other hand, addresses a more substantial issue which affects the validity of many applications of decision analysis. Decision theory is a normative theory for how an individual decision-maker might think through his or her decisions and determine sensible actions; it does not set out to do the same for groups of people, or for corporations, or for public bodies. Yet decision analysis has been widely used in such contexts. What we do in Chapter 5 is first to give a brief review of what is known about decision-making in organizations, and an introduction to the literature here. Next we describe some of the normative approaches that have been developed for group decision-making, and discuss their limitations. Finally, however, we show why, and in what contexts, it is valid to apply decision theory to organizational decision problems. We describe the bounds for organizational decision synthesis.

The final topic we want to discuss in this introductory chapter is our motive for writing this book. So much has been written on decision theory and its applications that it behooves the authors of a new text to explain why they wish to add to that literature. Many excellent texts give a satisfactory account of decision theory; amongst these are Luce and Raiffa (1957), Raiffa (1968), Schlaifer (1969), Lindley (1973), Brown et al. (1974), Keeney and Raiffa (1976), Moore and Thomas (1976), Morris (1977), Behn and Vaupel (1982), Howard and Matheson (1984), Bunn (1984), and Bodily (1985). Other texts have put the theory into its psychological context (Lee 1971, Wright 1984, or von Winterfeldt and Edwards 1986) or its organizational setting (Clough 1984). Despite this existing coverage, we have not found a text that quite shares the emphasis that we have sought here; indeed the idea of writing this text came from one of us who had found no suitable single text available to support his teaching of decision analysis to final-year engineering undergraduates at Cambridge. What we feel is needed in a single book is an account of decision analysis that: (i) describes the nature of decision theory in a way that students with a quantitative background could find appealing; (ii) shows interested readers gateways into the literature, allowing them to
6 Introduction and reader’s guide

pursue topics more intensively if they so wish; (iii) gives to the readers interested in the practical utility of these ideas a handbook for ways to do decision analysis in practice; and (iv) gives an up-to-date account of the practice of decision synthesis. Readers must decide for themselves whether we have achieved these goals.
I

THEORY

After defining what we mean by rationality in decision-making in Chapter 2, we give an account of decision theory in Chapter 3. Chapter 4 consists of a review of psychological research in decision-making, and we discuss organizational decision-making in Chapter 5.
2

RATIONAL DECISION-MAKING

2.1 THE DIFFICULTIES OF DECISION-MAKING

In some ways we can describe decision-making as the most common human activity. Almost everything we do involves decisions. Whether we are driving a car, preparing a menu for a meal, working out what to say next in a piece of writing, or handling a difficult social situation, to give just a few examples, we have to make choices and decide to adopt one course of action rather than another. Since we are involved in so much decision-making, we might expect that the human species has evolved to be good at it. Viewed in one way this is indeed the case, in that we have developed many innate mechanisms for effective intuitive decision-making in our best interests. As babies, our unconscious decision to cry when hungry, or in pain, surely is the wisest way of improving our lot! As mature adults, our instinct to dodge a stone thrown at us is an intuitive decision that maximizes our welfare. These are at the unconscious level. At the conscious level, however, we have also developed ways of making decisions without much thought. Habits of driving, acting according to conventions of social behavior, following norms of hygiene or diet, all lead to good decision-making.

Are we to conclude, then, that human decision-making is as good as it can be, and that nothing is to be gained by studying how it is, or should be, done? Unfortunately, this is not so. In the rest of this section we will discuss why it is that some kinds of decision-making are difficult and give rise to the need to think through the process of decision-making. We usually think of decision-making as being good if it is rational. We discuss the key concept of rationality in Section 2.2. One expression of rationality that has emerged in the last forty years is in the methods of operational research or systems analysis. We give a brief history of these ideas in Section 2.3, together with an appreciation of the difficulties that some versions of this interpretation of rationality lead to. Then in Section 2.4 we argue for a different emphasis on the meaning of rationality – more subjective, and more related to perceptions. We hope that by reading...
through this chapter the reader will perceive the need for an expression of rationality that will provide a guide for decision-making; decision theory provides such an expression, and we turn to study it in Chapter 3.

Although, as we have observed above, there are many examples of decision-making behavior which are clearly sensible, and are in the best interests of the decider, we still speak of “bad” decision-making, as well as “good.” The decision-making that led to the Bay of Pigs incident has been described as bad; the decision of the British and French governments to support the manufacture of Concorde was widely felt to be a bad decision; the reader can probably add to this list from his own experience. In some ways criticisms of this kind can be unfair. It could be that, in the light of the information available to the decision-maker at the time, he made a wise decision, and only after the event did it become clear that some other action would have been better. We could argue, as indeed we will at a later stage in this book, that one should distinguish between the decision-making process and the outcomes that may result from the decision. It is quite possible for the outcomes resulting from a chosen alternative to be good, even though the decision-making process was bad, and vice versa. Clearly decisions can be made which are bad in both process and outcome.

What are the circumstances that lead to this phenomenon? Perhaps the most obvious is the complexity of a decision. Man has always faced decisions with far-reaching consequences, but it is only in recent times that the complex web of interactions in our world has reached the state of development that it has today. In deciding whether to launch a new product, the managers of a company are faced with a complex set of issues. What effect will the new product have on the rest of their product line? How will their competitors react? Will the reaction of some foreign competitors harm their market position in some overseas markets? Will it affect trade sanctions by foreign governments? How will it be made – using foreign labor, or local? Will there be adequate suppliers of components, or will parts have to be made by the company, and if so where? The list of questions can be extended almost indefinitely. As we shall see in Chapter 4, there appear to be rather important limitations on man’s ability to take all such factors into account at once. Bad decision-making may result from the decision-maker’s inability to incorporate all the important factors into his thinking, thus leaving himself open to a disaster caused by a factor that he did not consider.

Many of the questions above involve uncertainty, and decision-making is often difficult just because of the many uncertainties involved. A manufacturing company’s director might say: “If only I knew what my competitor intended, then I would see more clearly what to do; but because I am uncertain I find it difficult to decide.” Some authors have
Rational decision-making

seen uncertainty as the chief problem with decision-making, and it is surely a major aspect of nearly all important decision problems.

It may be, moreover, that not only are we unsure what will happen, or what the nature of the world is, but we are also unclear about how important the outcomes would be to us, even if we knew for sure what would happen. For example, the manufacturing director, in deciding where a new manufacturing plant should go, will want to trade off the low labor costs in some countries with the possibly poorer quality of goods and the stability of the economy in that country. The articulation of trade-off judgments is an important problem in decision-making, and when we find it difficult to make such trade-off judgments we may make the decision badly.

It is particularly difficult to come to any agreed solution on trade-offs if, as is usually the case, there are many different actors involved in a decision, with different views on the relative importance of the objectives. The increased size of organizations in the last fifty years has exacerbated this problem. Decision-making in such contexts is hard because of the differences of opinion that will emerge from different parts of the organization, all of which must be involved in reaching a conclusion.

In the face of complexity, uncertainty, conflicting objectives, and multiple decision-makers, the typical response, at least of Western man, is to attempt to be rational. We seek a rational framework to help us think through our decisions. Indeed, our intuition is that some decisions are good and some bad, so that it is worthwhile seeking to improve decision-making. The intuitive approach is to define a good decision as a rational one. To improve decision-making then is to make each decision conform to a norm of rationality. Rationality is a concept that we intuitively look for; it is, however, more difficult to define than might appear at first sight.

2.2 THE MEANING OF RATIONALITY

There are some concepts which we use in common speech whose meaning is rarely questioned, but which are in fact rather elusive. Rationality is one such concept (probability is another). Many philosophers have explored what it means to be rational, and indeed Simon (1983, p.vii) speaks of the study of human reason as being his “central preoccupation for nearly fifty years.” We do not have space here to explore this question in depth; what we will do, however, is to make passing reference to some entry points in the literature on rationality, before going on to a statement of what we take it to mean.

Apart from the major contributions of H. A. Simon to this subject (see, for example, Simon (1957b, 1969)), the reader is recommended to consult March (1978) for a discussion of theories of rationality. Both Diesing