Successful Decision-making

A Systematic Approach to Complex Problems

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Translated from German by
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With 100 Figures

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Preface

The executives of companies, non-profit organisations and governmental departments are regularly confronted with important decision problems. These problems are typically highly complex and therefore difficult to resolve.

The aim of this book is to support the management in successfully solving complex problems. At the center of the book is a procedure for approaching any complex decision problem. The procedure consists of steps which are explained in detail and illustrated with examples.

This book could not have been produced without the effort and the considerable talents of Anthony Clark and Clare O'Dea who translated the text from German into English. The authors address their great thanks to the two translators for their excellent work. Phuong Tu Le deserves special thanks for her effort in putting together the book by typing the manuscript and designing the figures.

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Introduction

In today's rapidly changing environment, management personnel, whether in companies, in non-profit organizations or within governmental departments, are constantly confronted with decision problems with far-reaching consequences. Survival and long-term success will often depend on finding the right solution.

This is confirmed by research carried out in Great Britain. In the study, 270 executives were interviewed from organisations reporting a total annual revenue of more than £200,000,000 each in the three sectors "Financial services", "Central and local government" and "Manufacturing and retail". "Almost eight of ten respondents...felt organisational decisiveness had impact on overall business agility". This evaluation of the great importance of decision-making is confirmed by the fact that the average value of the financial impact of a decision is approximately £167,000 (Capgemini, 2004).

To take the right decision is typically not a simple matter, as most decision problems are highly complex in nature. This complexity is due to a number of factors:

- The problem may have numerous dimensions, many of which can only be described in qualitative terms.
- Relationships between the different dimensions may be unclear so that the structure of the problem is obscured.
- The problem may involve more than one division or department of the company or organization.
- The problem may have a large number of possible alternative solutions.
- Future developments in the relevant environment may be uncertain.

This book focuses precisely on such complex decision problems. The aim is to provide support to management for their successful solution.

The book is divided into three parts:

- Part One provides an introduction to problem-solving methods. It first defines decision problems and then shows how such problems can be "discovered". It also discusses what is meant by rational

problem-solving. Part One ends with an overview of the various decision-making procedures.

- Part Two introduces a procedure for problem solving which is suitable for approaching any complex decision problem. We begin with an overview of the whole procedure and then examine each step in detail. Part Two concludes with a wide-ranging case study which illustrates how the suggested procedure can be used.
- Part Three looks at two special issues. The first is the question of how to determine whether new information should be collected before taking a particular decision or whether the decision should be based on existing information. The second issue is collective decision-making; the particular problems in collective decision-making are discussed and suitable approaches are put forward.

A number of well-known texts on problem-solving exist which deal predominantly with the assessment of different alternative solutions. This book goes beyond this and includes consideration of equally important issues in problem-solving: problem discovery and analysis, the development of options, and the assessment of the consequences of the different options. Mathematical approaches are not seen as central in these first steps of problem-solving: the complexity of a problem typically arises from an initial lack of transparency in its structure, and mathematical models demand well-structured problems. Such approaches can therefore only be applied once the problem has been correctly structured - which is after much of the complexity has been overcome.

This book is intended for decision-makers in companies, non-profit organisations and government agencies. It is intended as a practical working tool to help them resolve complex problems. The book will also be useful to students studying complex decision problems and is suitable as teaching material in executive courses.

To be an effective practical working tool, this book must take complexity seriously and will therefore not attempt to cloak difficulty with simplifications and a lightness of style. Working through this book will sometimes require effort, although we have tried to be as reader-friendly as possible:

- Each of the three main parts is preceded by a short introduction which sets out the content and provides an overview for the reader.
- Technical terms are explained when they are first introduced. The same terms are then used systematically; in addition, when discussing the contributions of other authors we use the terms introduced here, even if the writers themselves use a different terminology.
- The book has an extensive index of key terms and concepts.
- We use a large number of diagrams to support the text.
- We have included numerous examples and the whole of Chapter Nine is devoted to the application of our problem-solving procedure to a real-life problem in order to illustrate the methodological recommendations.
- We have been careful to remove from the main text those sections which, while interesting, are not absolutely necessary for the comprehension of the recommended methodology. These sections are presented as insets; those who have an interest can read them and will also find references for further reading.

We trust that these measures will help to overcome the difficulty imposed by the demands of the subject and that our recommendations in this book will prove of genuine practical use.

Part One: Decision problems and decision-making procedures

Part One introduces decision-making. After working through Part One you will be able to answer the following questions:

- What is a decision problem and what types of decision problems are there?
- What are goal systems and problem discovery systems? How do they contribute to the solving of decision problems?
- What are the characteristics of a rational decision?
- What is a decision-making procedure and what types of these procedures exist?

There are four chapters:

- Chapter One introduces decision problems. First, decision problems are defined and then four basic approaches to solving such problems are presented. Of these we highlight the systematic and rational approach. The chapter ends with an overview of different types of decision problems.
- Chapter Two focuses on goal systems and problem discovery systems. The chapter begins by explaining why these systems are important in the discovery of decision problems. Next the various dimensions of goals and goal systems are presented. Finally the chapter explains problem discovery systems and the different types of such systems. A number of examples are given.
- Chapter Three looks at the characteristics of rational decisions. The chapter begins with an example, describing the course of a particular case of decision making. On the basis of this example, the chapter shows the requirements that must be fulfilled if a decision is to be regarded as rational. The final part of this chapter discusses the support that the science of management can provide to managers to help them to make rational decisions.
- Chapter Four, the last in Part One, discusses procedures for decision-making. It begins by explaining the most important terms in decision-making methodology and by defining what is meant by a decision-making procedure. The chapter then presents the different types of decision-making procedure and explains them with examples.

1 Decision problems

1.1 The decision problem

There are no decision problems in paradise! Paradise offers a happy, but aimless life. Decision problems can only emerge if a person or group of people - both referred to as "the actor" in decision methodology - develops a conscious idea of a desirable state. This state is often different from the current situation or may become different in the future. The actor is therefore required to act. He must change the current situation to the target situation or make sure that in the long term the target situation will be achieved.

The discrepancy between the current and the target situation does not in itself constitute a decision problem. A decision problem only arises if there are different ways in which the discrepancy between the situations can be overcome. The actor is then faced with the problem of devising and assessing different courses of action. It frequently happens that on first examination only one possible course of action is identified to address the discrepancy between the current and target situations. But in almost all situations there is more than one option. It is therefore better not to be satisfied with an initially identified course of action but to look systematically for options and to choose the best of them. In this way, the quality of the solution to the problem is usually significantly improved.

This means a decision problem has the following characteristics:

- A discrepancy between the current situation and the target situation
- At least two options for action to achieve the target

1.2 Ways of solving decision problems

A decision problem is present when the discrepancy between the current situation and the target situation can be reduced and/or overcome through different courses of action. There are a number of very

different ways in which we can determine which course of action should be taken. The decision can be approached:

- purely intuitively without careful reflection about the problem
- through routine recourse to procedures used in the past
- by adopting unquestioningly the solutions suggested by experts
- by choosing at random
- on the basis of systematic rational thought supported by relevant information

All of the above occur in practice. They are of interest to business management researchers for the purposes of describing and explaining entrepreneurial decisions. This is known as descriptive decision theory (Gäfgen, 1974, p. 50 ff.). This book puts forward suggestions for the improvement of decision-making in practical problem situations rather than focusing on descriptions of decision processes of the past. Our book is therefore concerned with prescriptive decision theory (Gäfgen, 1974, p. 50 ff.).

Inset 1.1 gives additional clarification of prescriptive and descriptive decision theory and compares these two approaches to a third type of decision theory - decision logic.

Inset 1.1: Descriptive decision theory, prescriptive decision theory and decision logic

As Gäfgen (1974, p. 50 f.) shows, models of rational choice can be developed without considering real problems. These models are only thinking experiments, logical derivations from postulated assumptions, whose results are true purely in logical terms. If standards of logic are strictly observed, there is absolute certainty that new propositions derived from given axioms are correct (Gäfgen, 1974, p. 50 f.).

One can use a model of this kind to make the implications of a given assumption clear, in our case the assumption of rational choice. From the point of view of logic, these implications are self-evident, but they are often difficult to arrive at and psychologically new. A scientist will normally only abandon an assumption once he or she understands all that is - sometimes surprisingly - implied by

it. Decision models show what individual rational behaviour is like and where in everyday experience rationality and irrationality can occur. (Gäfgen, 1974, p. 1 f.)

However, in addition to showing what individual rational behaviour is like, decision logic can also serve as a basis for exploring in an empirical way how decisions are made in practice. In this case we can speak of descriptive decision theory (Gäfgen, 1974, p. 52).

Decision logic can also be used as a basis for the development of prescriptive decision models. These contain instructions for action for rational decisions and fall under the heading of prescriptive decision theory (Gäfgen, 1974, p. 52).

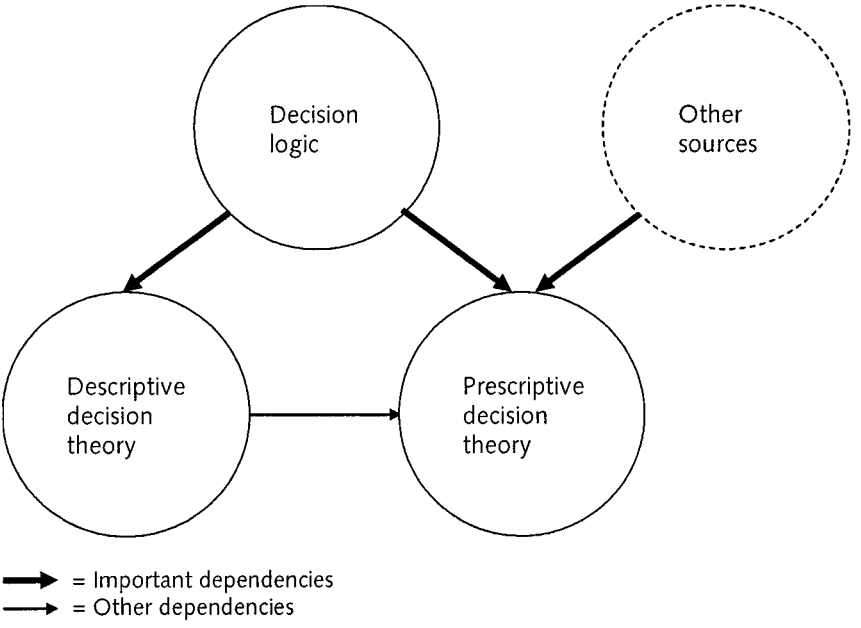

Figure 1.1: The different types of decision research and their dependencies

Decision logic undoubtedly represents an important basis for prescriptive decision methodology. But it is not the only basis for it. To develop usable decision-making procedures, a sound knowledge of

heuristic principles is required (see inset 5.1) along with practical experience of problem-solving processes. Information relevant to the development of prescriptive decision models can also be found in descriptive decision theory.

Figure 1.1 shows the dependencies between the different types of decision research.

This book concentrates exclusively on prescriptive decision theory. Since a theory is generally understood to be an explanation of a part of reality and since prescriptive decision theory contains recommendations for shaping actions rather than explanations, the word "theory" is perhaps not ideal. Decision methodology seems a more appropriate expression.

Prescriptive decision methodology focuses on systematic rational decisions. This does not mean that the authors regard executives' intuition and experience as irrelevant. Even when proceeding rationally, incomplete information on some aspects of the situation and more particularly lack of certainty over the effects of the possible courses of action, mean that the decision-maker has to fall back on experience and intuition. If - as is often the case in practice - a decision must be made under pressure, it becomes even more important to compensate for missing information with judgements based on intuition and personal experience. Sometimes it is wise to integrate purely intuitively discovered solutions in the decision-making process and to compare them with courses of action worked out systematically. This puts the search for a solution on a wider basis. Rational action on the one hand and intuitive experience-supported action on the other should therefore not be seen as opposites; they complement each other when problem-solutions are developed in real-life. The methodological suggestions introduced in this book are based on the authors' conviction that the solution of decision problems must in practice incorporate sensible use of intuition and experience.

1.3 Types of decision problem

A number of criteria can be used to distinguish between different types of decision problem (see Rühli, 1988, p. 186 ff.). Below we present the criteria and characteristics to which we will return later in the book.

Figure 1.2 gives an overview of the most important parameters and values of decision problems.

According to the degree of difficulty of the problem (parameter 1 in Figure 1.2), we distinguish between simple and complex decision problems. A complex decision problem is present if one or more of the following conditions simultaneously apply:

- The problem has many facets, some of which can only be described in qualitative terms.
- The different problem parameters are interdependent. This leads to an unclear structure of the problem.
- More than one department in the company is involved in the problem.
- A large number of possible solution-options exist.
- Environmental developments are uncertain.

If none of the above characteristics applies, the problem is a simple decision problem.

As the title states, this book deals with complex decision problems. The distinction between simple and complex decision problems is thus important in defining the topic of the book.

The classification into well-structured and ill-structured decision problems (parameter 2 in Figure 1.2) comes from Simon and Newell (1958, p. 4 f.). A problem can be termed well-structured if its solution can be found using an analytical decision-making process. Where this is not the case, we have an ill-structured problem. A more precise definition of well-structured and ill-structured is not possible here, as the conceptual basis for this has not yet been introduced. We return to the issue in Chapter 4, Inset 4.2.