

# Preface

This book presents what a multi-objective group decision-making problem is and how a decision support system can support reaching a solution in practice.

In this book, both fuzzy set theory and optimisation method are the key techniques to solve a multi-objective group decision-making problem under an uncertain environment. We offer several advantages here:

- It combines decision making theories, tools and applications effectively. For each issue of fuzzy multi-objective decision making, fuzzy multi-criteria decision making, fuzzy group decision making, multi-objective group decision-making, fuzzy multi-objective group decision-making presented in this book, we discuss their models and methods in great details with the related software systems and cases studies.
- It is designed as a unified whole in which each chapter relates its content to what went before and is, in turn, related to what will follow. Some case based examples such as product planning are discussed in different chapters for different decision situations, individual and group decision makers, and the use of different decision support systems to get desired solutions.
- It doesn't attempt to provide exhaustive coverage of every fact or research result that exists. It mainly reflects our last ten years research results in this field and what is more related, and also assumes about what the readers have already studied.
- As the technology is up-to-date throughout some results come from ours and other authors' recent publications.

Our potential readers could be organisational managers and practicing professionals, who can use the provided methods and software to solve their real decision problems; researchers in the areas of multi-objective decision making, multi-criteria decision making, group decision making,

fuzzy set applications and decision support systems; students at the advanced undergraduate or master's level in management or business administration programs; and students at the advanced undergraduate or master's level in information systems and application of computer science programs.

This book is organised as follows. The first part, from Chapters 1 to 5, covers concepts and frameworks of decision making, multi-objective and multi-attribute decision making, group decision making, decision support systems, and fuzzy systems in general. Readers will learn how to model a decision problem and go through all phases of decision making process as well as the characteristics of multi-objective decision making and the components of a decision support system. The second part of the book, from Chapters 6 to 8, presents fuzzy multi-objectives decision making, including its model, several methods, and an implemented decision support system. The third part, from Chapters 9 to 11, is about group decision making within an uncertain environment. The fourth part, from Chapters 12 to 13, covers the framework, methods and systems of fuzzy multi-objective group decision making, which applies the results developed in the first two parts of the book. The last part, from Chapters 14 to 16, focuses on applications of the decision methods and systems presented in previous chapters. These applications include power market, team situation awareness and logistic management.

Most of the chapters, from Part 2 to Part 5, have real case based examples and illustrate how to use the provided decision support techniques. Within five decision support systems presented in this book, a CD-ROM included in this book has two of them, called *fuzzy multi-objective decision support system (FMODSS)* and *fuzzy group decision support system (FGDSS)*. Examples illustrated in the book are mainly screenshots from using those two systems. Readers are encouraged to practice with the two systems with real world decision problems.

We wish to thank Australian Research Council (ARC) as the work presented in this book was partially supported under ARC discovery grants DP0211701, DP0557154 and DP0559213; co-workers who have advised and conducted some research results of this book with us; many researchers who have worked in multi-objective decision making, group decision making, fuzzy set application, decision support systems and

related areas over the past several decades, for which we have added their significant insight in the book and well-known publications in the reference list; the researchers and students at University of Technology Sydney (UTS) who suffered through several versions of the decision support systems shown in this book and whose comments improved it substantially; and Steven Patt, Editor at World Scientific, who helped us to ensure the book was as good as we were capable of making it.

Jie Lu, UTS, Sydney

Guangquan Zhang, UTS, Sydney

Da Ruan, SCK•CEN, Mol and UGent, Gent

Fengjie Wu, UTS, Sydney

December 2006