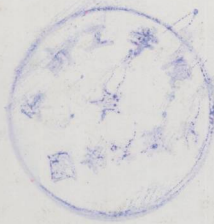


Sang M. Lee



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INTRODUCTION TO MANAGEMENT SCIENCE

Sang M. Lee
University of Nebraska



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PREFACE

Management science is concerned with the application of scientific approaches to improve management performance. In management science, special emphasis is placed on the systematic analysis of the nature of the problem, decision environment, objectives of the organization, judgment of the decision maker, and available decision alternatives. Thus, the field of management science encompasses a host of quantitative methodologies as well as behavioral aspects of decision making. The purpose of this text is to provide the student with a comprehensive coverage of how management science concepts and approaches can be applied to improve management decision making.

Management science is no longer a new field of study. Today, such terms as *cost/benefit analysis*, *simulation*, *system optimization*, *modeling*, and *data base management* are accepted as standard vocabulary. Management science concepts are widely known not only to businessmen and management scientists, but also to government planners, military analysts, space scientists, regional planners, health care administrators, and many other professionals. As the use of management science becomes broader, there is a greater need for a good introductory text. This book is such a text. It explains, in a simple manner with a minimum amount of mathematics, how to formulate management decision problems as models, how to solve them by using management science techniques, and then how to implement the solution results in the actual problem situation.

As managerial problems become more complex, management science tools are becoming more sophisticated. Consequently, great emphasis has been placed on the model solution, as if the modeling work is the end product in itself. An overwhelming emphasis on solution techniques often results in the neglect of other important issues such as the decision environment, the nature of the problem, the multiple organizational objectives, the decision maker's judgment, and the implementation of the model results. This book provides a comprehensive discussion of all of the major factors necessary for successful management science implementation. The emphasis throughout this book, is placed on the managerial perspective—improving the organizational performance through systematic analysis.

This book is directed toward the undergraduate student of business administration and the social sciences who has had no previous exposure to management science. A unique feature of the book is that it provides a highly readable yet comprehensive introduction to the standard topics of the first course in quantitative techniques, a course required in most schools of business.

The emphasis of the book is on the translation of mathematical modeling concepts into a presentation that is palatable to the undergraduate student of business with a minimum of mathematical background. Many topics are introduced by presenting realistic, practical examples in the form of cassettes (small cases). Difficult techniques are presented within the framework of working examples, stressing an intuitive understanding of concepts rather than mathematical proofs.

In summary, *Introduction to Management Science* is all of the following:

1. A comprehensive yet easily readable presentation of various management science techniques.
2. An application orientation to realistic problems through the emphasis of the model formulation aspect of management science. Most chapters present interesting and realistic cassettes as a means of demonstrating the model formulation, the solution process, and the interpretation of model results.
3. An up-to-date presentation of multiple objective decision making concepts.
4. A guide to the analysis of complex problems through the inclusion of cassettes, computer-based solutions, numerous exercise problems, and a comprehensive *Study Guide*.
5. A managerial perspective of management science—problem formulation, analysis of the decision environment, multiple organizational objectives, and issues involved in implementation of model results.

A Note to the Student

Numerous books have been published in the area of management science, operations research, and quantitative methods. Most of these books, including several by this author, can be classified into two broad categories: (1) basic surveys that present a cookbook approach of management science techniques, and (2) comprehensive theoretical texts that represent the mathematical foundations of various quantitative tools. Few books have presented a comprehensive, introductory, application-oriented, fun-to-read, and up-to-date treatment of management science concepts. This book is intended to be such a book.

A major objective of this text is to avoid overwhelming you with mathematics. Rather, the purpose is to provide you with an opportunity to familiarize yourself with a wide variety of model building situations so that you come away from the introductory course with an ability to conceptualize the modeling approach in a managerial perspective. I attempt to achieve this purpose through a sound but interesting presentation of the underlying concepts through realistic cassettes (small cases) and stories. I try to make the learning a fun experience for you.

Management science is not simply a collection of quantitative tools. It is a way of thinking and a philosophy of logical problem solving in any decision environment. By no means, after studying this book, should you come away with the idea that you

now have a set of tools that can be simply plugged into the appropriate situations without carefully considering the assumptions of the models and the realities of the decision environments.

All of the techniques presented in this text are selected on the basis of their track record of real-world applications. Although most of the examples and cassettes presented are relatively simple as compared to real-world problems, once you master these examples you will be much better prepared to tackle complex problems. Many real-world application examples are provided in the text to give you a general idea about the types of problems in which different techniques can be applied. The most important purpose of this book is to help you sharpen your conceptual skills in dealing with any decision problem. These skills will be invaluable throughout your career, whatever it may eventually be.

A Note to the Instructor

In writing this text, I had three basic objectives: (1) an emphasis on the managerial perspective—the basic role of management science is to improve organizational performance, (2) a comprehensive and interesting discussion of various management science topics through cassettes, and (3) an application-oriented text presenting many real-world application examples and discussing the factors that are important for successful implementation of management science.

On the basis of two criteria, I selected those topics that are most appropriate for an introductory course in management science: (1) the current track record of the particular technique for solving real-world problems, and (2) the capacity of the technique for exposing the student to a variety of different modeling situations. The central theme of the book, which is carried through all of the chapters, stresses the concept of modeling in general. Thus, each chapter presents the identification of the model objective, the decision variables, the model parameters, the underlying assumptions of the model, the decision environment, the implementation of the solution, and real-world applications.

This book is organized so that the most frequently covered topics (most popular topics), such as linear programming and related topics, are presented first. Although most of the chapters present topics that are independent of other chapters, the topic of linear programming is presented in three chapters, ranging from introductory to more advanced material. Each chapter has the following aids to the student:

1. A brief introduction stating the purpose of the chapter.
2. A list of the learning objectives for the chapter.
3. Marginal terms to indicate key concepts and topics.
4. A brief summary of the topics covered in the chapter.

This text has over 50 cassettes in the text and over 400 assignment problems at the ends of chapters. In addition, over 160 other problems and cases are presented in

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the *Study Guide* and the *Instructor's Manual*. Also, the text presents summaries of 17 real-world applications of management science. The *Study Guide* presents a list of suggestions for studying management science, a summary of the important concepts in each chapter, solutions to all of the odd-numbered assignment problems, additional problems and cases to prepare for tests, and a list of journals that are useful in studying the actual applications of management science. The *Instructor's Manual* presents solutions to all of the assignment problems, a suggested examination format with problems, discussion of some advanced topics that are not included in the text, suggested syllabi of the course at different levels, and the interactive linear programming and goal programming programs, as well as solutions of selected problems by the microcomputer. The Transparency Master for various figures and tables presented in the text will also be available from the publisher. The text and these accompanying materials present a comprehensive instructional support package for an introductory management science course.

Acknowledgments

In writing this book, I have relied heavily on the suggestions and criticisms of my colleagues and students. I have benefited greatly from discussion with my friends Fred Luthans, Lester Digman, and Gary Schwendiman at the University of Nebraska. I would like to thank my colleagues Eugene Kaczka (Clarkson), Patrick G. McKeown (University of Georgia), Spyros Economides (California State University—Hayward), James H. Patterson (University of Missouri), Bruce K. Blaylock (Virginia Polytechnique Institute), Charles J. Campbell (Memphis State University), A. Ravindran (University of Oklahoma), David L. Olson (Texas A&M), C. S. Kim (Kansas State University), and J. P. Shim (University of Wisconsin—La Crosse), who reviewed the entire manuscript several times. Special thanks go to my students S. H. Lee, Bruce Speck, A. Abdolhossein, Lucinda Galusha, and M. Abdel-Wahab at the University of Nebraska. They were indispensable in polishing the book through revisions and in preparing the *Instructor's Manual* and *Study Guide*. I am very grateful to my office staff: Joyce Anderson, Jane Chrastil, Cindy LeGrande, and Angela Sullivan for their expert word-processing skills. A tremendous thanks is expressed to the real professionals at The Dryden Press: Anne E. Smith, Senior Editor, Paul Psilos, Developmental Editor of this book and a good friend, Kathy Gleason, Project Editor, and Mary Englehart, Copy Editor, for their superb editorial work. Also, I express my thanks to Ada Chen at Boardworks for her beautiful art work. Finally, I could never have completed this book without the support of my family. I dedicate this book to my daughters Tosca and Amy, who made this book late by only several months.

Sang M. Lee

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