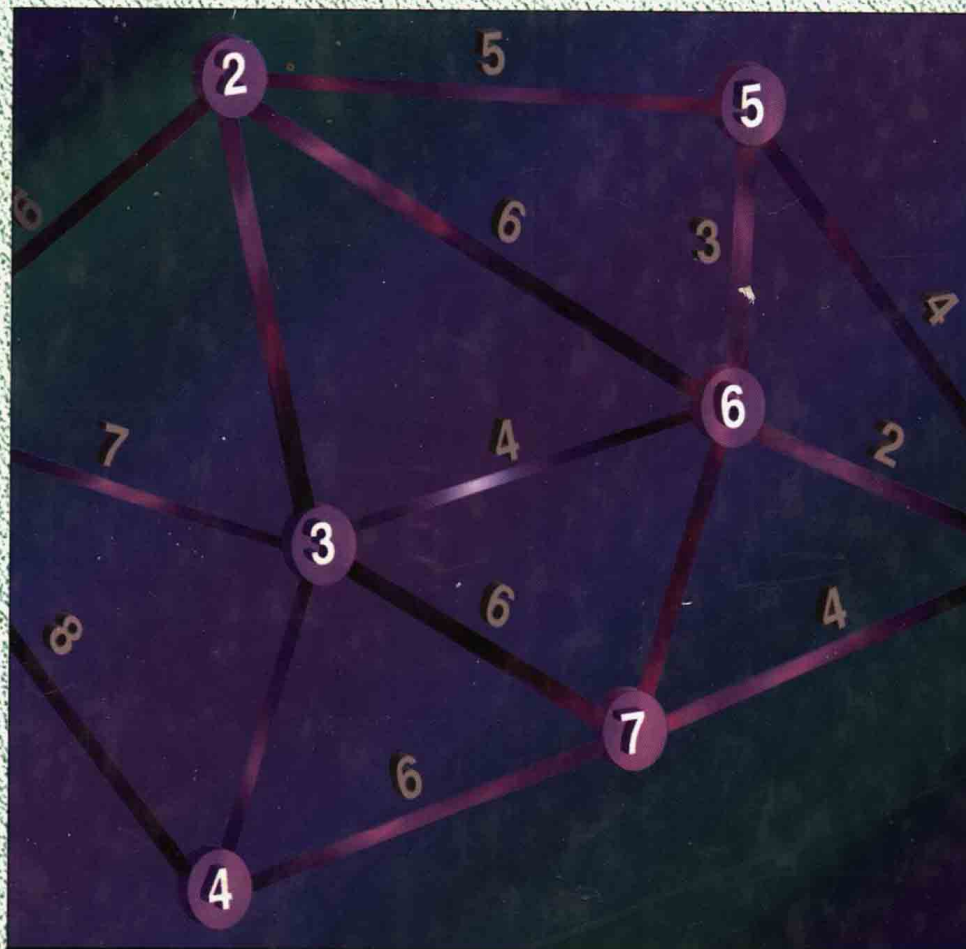


AN INTRODUCTION TO

Management Science

Quantitative Approaches
to Decision Making



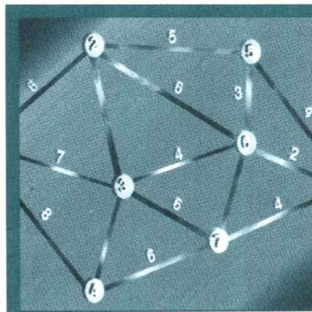
SEVENTH EDITION

Anderson • Sweeney • Williams

AN INTRODUCTION TO
Management Science

Quantitative Approaches
to Decision Making

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University of Cincinnati

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West Publishing Company

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Professor Anderson has coauthored six textbooks in the areas of statistics, management science, linear programming, and production and operations management. He is an active consultant in the field of sampling and statistical methods.

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Preface

Approximately 20 years ago, the three of us were assistant professors in the Department of Quantitative Analysis at the University of Cincinnati. Our graduate educations and experiences had convinced us of the valuable potential for management science and operations research techniques in business administration and related fields. We were committed to the challenge of writing a textbook that would help make the mathematical and technical concepts of management science understandable and useful to nonmathematicians. Judging from the responses from our teaching colleagues and thousands of students, we have successfully met that challenge. Thus, 20 years later, assisted by the helpful comments and suggestions of many users, we are pleased to offer the seventh edition of *An Introduction to Management Science*.

Our purpose continues to be to provide students with a sound conceptual understanding of the role that management science plays in the decision-making process. Written with the needs of the nonmathematician in mind, the text is applications oriented. As each new concept is introduced, a problem scenario or application is presented that helps motivate the topic; we then illustrate how management science assists in solving the problem. Using this style throughout the text, we describe the many quantitative methods that have been developed over the years, explain how they work, and show how they can be applied and interpreted. We have found that this approach helps to motivate the student by demonstrating not only how the procedure works, but also how it can contribute to the decision-making process.

Changes in the Seventh Edition

In preparing the seventh edition, we have been careful to maintain the overall format and approach of the previous editions. However, based on our own classroom experience and suggestions from users of previous editions, a number of changes have been made to enhance the content, managerial orientation, and readability of the text.

New Management Science in Practice Applications End-of-chapter application sections provided by practitioners continue to be a feature of the text. We are pleased to be able to add recent management science applications from Eastman Kodak (Chapter 3), Electronic Data Systems (Chapter 9), and the Upjohn Company (Chapter 13) to the seventh edition. These applications provide information about the company, the role of management science within the company, and an overview of a management science application that relates to the material the student has covered in the chapter. A total of 15 management science in practice applications now appear in the text.

Linear Programming Some significant changes have been made to the material on linear programming in Chapters 2–6. Graphical sensitivity analysis has been moved to Chapter 2 so that this chapter provides a complete treatment of graphical solution and interpretation. Guidelines for linear programming model formulation have been expanded and are now presented in Chapter 3. This chapter includes additional examples of model formulation and provides an improved discussion of the interpretation of computer solutions to linear programming models. Both LINDO and The Management Scientist software packages are discussed.

Chapter 4, which continues to emphasize the broad range of linear programming applications, includes a new production management model on cross-training and work force allocation to departments. A significant revision of the presentation on duality now appears in Chapter 6. Finally, the problems at the end of the linear programming chapters have been reorganized to more closely follow the order of the material presented in the chapter. Generally, basic concepts are treated in the initial problems with the more challenging problems appearing at the end of the problem set.

Transshipment Problem Expanded The treatment of the transportation, assignment, and transshipment problems were unified around the notion of a network flow model in the previous edition. In the new edition, the material on the transshipment model has been expanded to include the more complex situation where shipments occur between warehouses and between customers, as well as directly from plants to customers.

New Case Problems Case problems appear at the end of most chapters. In general, the case problems expose the student to larger problems that require more judgment and some user flexibility in both approach and analysis. A managerial report is required for each case problem. New case problems on truck-leasing strategy (Chapter 3), investment asset allocation (Chapter 4), and distribution system design (Chapter 7) have been added to this edition.

Self-Test Problems New to the edition are self test problems for the students. As students progress through each chapter, marginal notes will refer the students to specific end-of-chapter problems they should be able to solve at that point. Worked-out solutions to the self test problems are provided in Appendix H of the text so that each student may immediately evaluate his or her ability to handle the material. We recommend that instructors assign all self-test problems for the material covered in the course. There are an ample number of end-of-chapter problems available for additional homework assignments.

Other Changes A variety of other changes have been made throughout the text. All of the changes cannot be listed here, but examples include the statement of assumptions for the economic order quantity model accompanied by annotations that state how other inventory models in the chapter are based on variations of the EOQ model. In addition, the example computer simulation program in Chapter 13 has been modernized. The BASIC language variable names should enable the student to easily follow the programming logic used to simulate the system under study.

Prerequisite The mathematical prerequisite for this text is a course in algebra. An introductory knowledge of probability and statistics would be desirable, but not necessary, for Chapters 10–14, 16, and 17. Only Chapter 19, which discusses calculus-based solution procedures and which we consider optional, requires a knowledge of differential calculus.

Throughout the text, we have utilized generally accepted notation for the topic being covered. Thus, students who pursue study beyond the level of this text should find the difficulties of reading more advanced material minimized. To assist in further study, a bibliography is included in the backmatter of the book.

Course Outline Flexibility

The text has been designed to enhance the instructor's flexibility in selecting topics to meet specific course needs. The single-quarter and single-semester outlines that follow are a sampling of the many options available.

A one-quarter outline stressing linear programming, model development, and applications:

- Introduction (Chapter 1)
- Introduction to Linear Programming and Computer Solution (Chapters 2 and 3)
- Linear Programming Applications (selected portions of Chapters 4 and 7)
- Project Management: PERT/CPM (Chapter 10)
- Waiting Lines (Chapter 12)
- Computer Simulation (Chapter 13)
- Decision Analysis (Chapter 14)

The instructor in a one-semester course who wants to focus on model development and other applications could either spend more time on the applications in Chapter 4 or cover additional topics. One possible outline, stressing linear programming, model development, and applications, would be

- Introduction (Chapter 1)
- Introduction to Linear Programming (Chapters 2 and 3)
- Linear Programming Applications (Chapter 4)
- Simplex Method (Chapters 5 and 6)
- Transportation, Assignment, and Transshipment Models (Chapter 7)
- Integer Programming (Chapter 8)
- Project Management: PERT/CPM (Chapter 10)
- Inventory Models (Chapter 11)
- Waiting Lines (Chapter 12)
- Computer Simulation (Chapter 13)
- Decision Analysis (Chapter 14)
- Multicriteria Decision Making (Chapter 15)

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Our associates from organizations who supplied the Management Science in Practice applications made a major contribution to the text. These individuals are cited in a credit line on the first page of each application.

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David R. Anderson

Dennis J. Sweeney

Thomas A. Williams

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