

Introduction to Management Science

THIRTEENTH EDITION

Bernard W. Taylor III



Introduction to Management Science

Introduction to Management Science, Global Edition

Table of Contents

Cover

Title Page

Copyright Page

Brief Contents

Contents

Preface

1 Management Science

The Management Science Approach to Problem Solving

Time Out: for Pioneers in Management Science

Management Science Application: Room Pricing with Management Science and Analytics at Marriott

Management Science and Business Analytics

Model Building: BreakEven Analysis

Computer Solution

Management Science Modeling Techniques

Management Science Application: Management Science and Analytics

Business Usage of Management Science Techniques

Management Science Application: Management Science in Health Care

Management Science Models in Decision Support Systems

Summary

Problems

Case Problem

2 Linear Programming: Model Formulation and Graphical Solution

Model Formulation

A Maximization Model Example



Time Out: for George B. Dantzig

Management Science Application: Allocating Seat Capacity on Indian Railways Using Linear Programming

Graphical Solutions of Linear Programming Models

Management Science Application: Renewable Energy Investment Decisions at GE Energy

A Minimization Model Example

Management Science Application: Determining Optimal Fertilizer Mixes at Soquimich (South America)

Irregular Types of Linear Programming Problems

Characteristics of Linear Programming Problems

Summary

Example Problem Solutions

Problems

Case Problem

3 Linear Programming: Computer Solution and Sensitivity Analysis

Computer Solution

Management Science Application: Scheduling Air Ambulance Service in Ontario (Canada)

Management Science Application: Improving Profitability at Norske Skog with Linear Programming

Sensitivity Analysis

Summary

Example Problem Solutions

Problems

Case Problem

4 Linear Programming: Modeling Examples

A Product Mix Example

Time Out: for George B. Dantzig

A Diet Example

An Investment Example

A Marketing Example



Management Science Application: Scheduling Radio Ads with Analytics and Linear Programming

A Transportation Example

A Blend Example

A Multiperiod Scheduling Example

Management Science Application: Linear Programming Blending Applications in the Petroleum Industry

Management Science Application: Employee Scheduling with Management Science

A Data Envelopment Analysis Example

Management Science Application: Evaluating American Red Cross Chapters Using DEA

Summary

Example Problem Solutions

Problems

Case Problem

5 Integer Programming

Integer Programming Models

Management Science Application: Selecting Volunteer Teams at Eli Lilly to Serve in Impoverished Communities

Integer Programming Graphical Solution

Computer Solution of Integer Programming Problems with Excel and QM for Windows

Time Out: for Ralph E. Gomory

Management Science Application: Scheduling Appeals Court Sessions in Virginia with Integer Programming

Management Science Application: Forming Business Case Student Teams at Indiana University

01 Integer Programming Modeling Examples

Management Science Application: A Set Covering Model for Determining Fire Station Locations in Istanbul

Summary

Example Problem Solution

Problems



_	_		
Case	D	. L	
1.200	210	n 1	ш

6 Transportation, Transshipment, and Assignment Problems

The Transportation Model

Time Out: for Frank L. Hitchcock and Tjalling C. Koopmans

Management Science Application: Reducing Transportation Costs in the California Cut Flower Industry

Computer Solution of a Transportation Problem

Management Science Application: Analyzing Container Traffic Potential at the Port of Davisville (RI)

The Assignment Model

Computer Solution of an Assignment Problem

Management Science Application: Supplying Empty Freight Cars at Union Pacific Railroad

Management Science Application: Assigning Umpire Crews at Professional Tennis
Tournaments

Summary

Example Problem Solution

Problems

Case Problem

7 Network Flow Models

Network Components

The Shortest Route Problem

The Minimal Spanning Tree Problem

Management Science Application: Determining Optimal Milk Collection Routes in Italy

The Maximal Flow Problem

Time Out: for E. W. Dijkstra, L. R. Ford, Jr., and D. R. Fulkerson

Management Science Application: Distributing Railway Cars to Customers at CSX

Summary

Example Problem Solution

Problems

Case Problem



8 Project Management

The Elements of Project Management

Management Science Application: The Panama Canal Expansion Project

Time Out: for Henry Gantt

Mangement Science Application: Transportation Construction Projects

CPM/PERT

Time Out: for Morgan R. Walker, James E. Kelley, Jr., and D. G. Malcolm

Probabilistic Activity Times

Management Science Application: Salvaging the Costa Concordia Cruise Ship

Microsoft Project

Project Crashing and Time-Cost TradeOff

Management Science Application: Reconstructing the Pentagon after 9/11

Formulating the CPM/PERT Network as a Linear Programming Model

Summary

Example Problem Solution

Problems

Case Problem

9 Multicriteria Decision Making

Goal Programming

Graphical Interpretation of Goal Programming

Computer Solution of Goal Programming Problems with QM for Windows and Excel

Management Science Application: Workforce Planning for the U.S. Army Medical Department with Goal Programming

Time Out: for Abraham Charnes and William W. Cooper

The Analytical Hierarchy Process

Management Science Application: Selecting Sustainable Transportation Routes Across the Pyrenees Using AHP

Management Science Application: Ranking TwentiethCentury Army Generals Using AHP

Scoring Models

Management Science Application: A Scoring Model for Determining U.S. Army



Installation Regions

Summary

Example Problem Solutions

Problems

Case Problem

10 Nonlinear Programming

Nonlinear Profit Analysis

Constrained Optimization

Solution of Nonlinear Programming Problems with Excel

A Nonlinear Programming Model with Multiple Constraints

Management Science Application: Making Solar Power Decisions at Lockheed Martin with Nonlinear Programming

Nonlinear Model Examples

Summary

Example Problem Solution

Problems

Case Problem

11 Probability and Statistics

Types of Probability

Fundamentals of Probability

Management Science Application: Treasure Hunting with Probability and Statistics

Statistical Independence and Dependence

Expected Value

Management Science Application: A Probability Model for Analyzing Coast Guard Patrol Effectiveness

The Normal Distribution

Summary

Example Problem Solution

Problems

Case Problem

12 Decision Analysis



Components of Decision Making

Decision Making Without Probabilities

Management Science Application: Planning for Terrorist Attacks and Epidemics in Los Angeles County with Decision Analysis

Decision Making with Probabilities

Decision Analysis With Additional Information

Utility

Summary

Example Problem Solutions

Problems

Case Problem

13 Queuing Analysis

Elements of Waiting Line Analysis

The SingleServer Waiting Line System

Time Out: for Agner Krarup Erlang

Management Science Application: Using Queuing Analysis to Design Health Centers in Abu Dhabi

Undefined and Constant Service Times

Finite Queue Length

Management Science Application: Providing Telephone Order Service in the Retail Catalog Business

Finite Calling Population

The MultipleServer Waiting Line

Management Science Application: Making Sure 911 Calls Get Through at AT&T

Additional Types of Queuing Systems

Summary

Example Problem Solutions

Problems

Case Problem

14 Simulation

The Monte Carlo Process



Time Out: for John Von Neumann

Computer Simulation with Excel Spreadsheets

Simulation of a Queuing System

Management Science Application: Planning for Catastrophic Disease Outbreaks Using Simulation

Continuous Probability Distributions

Statistical Analysis of Simulation Results

Management Science Application: Predicting Somalian Pirate Attacks Using Simulation

Crystal Ball

Verification of the Simulation Model

Areas of Simulation Application

Summary

Example Problem Solution

Problems

Case Problem

15 Forecasting

Forecasting Components

Management Science Application: Forecasting Advertising Demand at NBC

Time Series Methods

Management Science Application: Forecasting Empty Shipping Containers at CSAV (Chile)

Management Science Application Forecasting Trends for Denim Jeans

Forecast Accuracy

Time Series Forecasting Using Excel

Management Science Application: Demand Forecasting at Zara

Regression Methods

Management Science Application: An Airline Passenger Forecasting Model

Data Mining

Summary

Example Problem Solutions

Problems



Case Problem

16 Inventory Management

Elements of Inventory Management

Management Science Application: Inventory Optimization at Procter & Gamble

Inventory Control Systems

Time Out: for Ford Harris

Economic Order Quantity Models

The Basic EOQ Model

The EOQ Model with Noninstantaneous Receipt

The EOQ Model with Shortages

Management Science Application: Inventory Management at Zara

EOQ Analysis with QM for Windows

EOQ Analysis with Excel and Excel QM

Quantity Discounts

Management Science Application: Quantity Discount Orders at Mars

Reorder Point

Determining Safety Stock by Using Service Levels

Order Quantity for a Periodic Inventory System

Summary

Example Problem Solution

Problems

Case Problem

Appendix A Normal and ChiSquare Tables

Appendix B Setting Up and Editing a Spreadsheet

Appendix C The Poisson and Exponential Distributions

Solutions to Selected OddNumbered Problems

Glossary

Index

