

PREFACE

When Jerry Lieberman and I started working on the first edition of this book 50 years ago, our goal was to develop a pathbreaking textbook that would help establish the future direction of education in what was then the emerging field of operations research. Following publication, it was unclear how well this particular goal was met, but what did become clear was that the demand for the book was far larger than either of us had anticipated. Neither of us could have imagined that this extensive worldwide demand would continue at such a high level for such an extended period of time.

The enthusiastic response to our first nine editions has been most gratifying. It was a particular pleasure to have the field's leading professional society, the international Institute for Operations Research and the Management Sciences (INFORMS), award the 6th edition honorable mention for the 1995 INFORMS Lanchester Prize (the prize awarded for the year's most outstanding English-language publication of any kind in the field of operations research).

Then, just after the publication of the eighth edition, it was especially gratifying to be the recipient of the prestigious 2004 INFORMS Expository Writing Award for this book, including receiving the following citation:

Over 37 years, successive editions of this book have introduced more than one-half million students to the field and have attracted many people to enter the field for academic activity and professional practice. Many leaders in the field and many current instructors first learned about the field via an edition of this book. The extensive use of international student editions and translations into 15 other languages has contributed to spreading the field around the world. The book remains preeminent even after 37 years. Although the eighth edition just appeared, the seventh edition had 46 percent of the market for books of its kind, and it ranked second in international sales among all McGraw-Hill publications in engineering.

Two features account for this success. First, the editions have been outstanding from students' points of view due to excellent motivation, clear and intuitive explanations, good examples of professional practice, excellent organization of material, very useful supporting software, and appropriate but not excessive mathematics. Second, the editions have been attractive from instructors' points of view because they repeatedly infuse state-of-the-art material with remarkable lucidity and plain language. For example, a wonderful chapter on metaheuristics was created for the eighth edition.

When we began work on the book 50 years ago, Jerry already was a prominent member of the field, a successful textbook writer, and the chairman of a renowned operations research program at Stanford University. I was a very young assistant professor just starting my career. It was a wonderful opportunity for me to work with and to learn from the master. I will be forever indebted to Jerry for giving me this opportunity.

Now, sadly, Jerry is no longer with us. During the progressive illness that led to his death 14 years ago, I resolved that I would pick up the torch and devote myself to subsequent editions of this book, maintaining a standard that would fully honor Jerry. Therefore, I took early retirement from my faculty responsibilities at Stanford in order to work full time on textbook writing for the foreseeable future. This has enabled me to spend far more than the usual amount of time in preparing each new edition. It also has enabled me to closely monitor new trends and developments in the field in order to bring this edition completely up to date. This monitoring has led to the choice of the major additions to the new edition outlined next.

■ WHAT'S NEW IN THIS EDITION

- **Analytic Solver Platform for Education.** This edition continues to provide the option of using Excel and its Solver (a product of Frontline Systems, Inc.) to formulate and solve some operations research (OR) models. Frontline Systems also has developed some advanced Excel-based software packages. One recently released package, Analytic Solver Platform, is particularly exciting because of its tremendous versatility. It provides strong capability for dealing with the types of OR models considered in most of the chapters considered in this book, including linear programming, integer programming, nonlinear programming, decision analysis, simulation, and forecasting. Rather than requiring the use of a collection of Excel add-ins to deal with all of these areas (as in the preceding edition), Analytic Solver Platform provides an all-in-one package for formulating and solving many OR models in spreadsheets. We are delighted to have integrated the student version of this package, Analytic Solver Platform for Education (ASPE), into this new edition. A special arrangement has been made with Frontline Systems to provide students with a free 140-day license for ASPE.

At the same time, we have integrated ASPE in such a way that it can readily be skipped over without loss of continuity for those who do not wish to use spreadsheets. A number of other attractive software options continue to be provided in this edition (as described later). In addition, a relatively brief introduction to spreadsheet modeling can also be obtained by only using Excel's standard Solver. However, we believe that many instructors and students will welcome the great power and versatility of ASPE.

- **A New Section on Robust Optimization.** OR models typically are formulated to help select some future course of action, so the values of the model parameters need to be based on a prediction of future conditions. This sometimes results in having a significant amount of uncertainty about what the parameter values actually will turn out to be when the optimal solution from the model is implemented. For problems where there is no latitude for violating the constraints even a little bit, a relatively new technique called *robust optimization* provides a way of obtaining a solution that is virtually guaranteed to be feasible and nearly optimal regardless of reasonable deviations of the parameter values from their estimated values. The new Section 7.4 introduces the robust optimization approach when dealing with linear programming problems.
- **A New Section on Chance Constraints.** The new Section 7.5 continues the discussion in Section 7.4 by turning to the case where there is some latitude for violating some constraints a little bit without very serious complications. This leads to the option of using *chance constraints*, where each chance constraint modifies an original constraint by only requiring that there be some very high probability that the original constraint will be satisfied. When the original problem is a linear programming problem, each of these chance constraints can be converted into a deterministic equivalent that still is a linear programming constraint. Section 7.5 describes how this important idea is implemented.
- **A New Section on Stochastic Programming with Recourse.** Stochastic programming provides still another way of reformulating a linear programming model (or another type of model) where there is some uncertainty about what the values of the parameters will turn out to be. This approach is particularly valuable for those problems where the decisions will be made in two (or more) stages, so the decisions in stage 2 can help compensate for any stage 1 decisions that do not turn out as well as hoped because of errors in estimating some parameter values. The new Section 7.6 describes *stochastic programming with recourse* for dealing with such problems.
- **A New Chapter on Linear Programming under Uncertainty That Includes These New Sections.** One of the key assumptions of linear programming (as for many other OR models) is the *certainty assumption*, which says that the value assigned to each parameter

of a linear programming model is assumed to be a *known constant*. This is a convenient assumption, but it seldom is satisfied precisely. One of the most important concepts to get across in an introductory OR course is that (1) although it usually is necessary to make some simplifying assumptions when formulating a model of a problem, (2) it then is very important after solving the model to explore the impact of these simplifying assumptions. This concept can be most readily conveyed in the context of linear programming because of all the methodology that now has been developed for dealing with linear programming under uncertainty. One key technique of this type is sensitivity analysis, but some other relatively elementary techniques now have also been well developed, including particularly the ones presented in the three new sections described above. Therefore, the old Chapter 6 (*Duality Theory and Sensitivity Analysis*) now has been divided into two new chapters—Chapter 6 (*Duality Theory*) and Chapter 7 (*Linear Programming under Uncertainty*). The new Chapter 7 includes the three sections on sensitivity analysis in the old Chapter 6 but also adds the three new sections described above.

- **A New Section on the Rise of Analytics Together with Operations Research.** A particularly dramatic development in the field of operations research over the last several years has been the great buzz throughout the business world about something called *analytics* (or business analytics) and the importance of incorporating analytics into managerial decision making. As it turns out, the discipline of analytics is closely related to the discipline of operations research, although there are some differences in emphases. OR can be thought of as focusing mainly on advanced analytics whereas analytics professionals might get more involved with less advanced aspects of the study. Some fads come and go, but this appears to be a permanent shift in the direction of OR in the coming years. In fact, we could even find *analytics* eventually replacing *operations research* as the common name for this integrated discipline. Because of this close and growing tie between the two disciplines, it has become important to describe this relationship and to put it into perspective in an introductory OR course. This has been done in the new Section 1.3.
- **Many New or Revised Problems.** A significant number of new problems have been added to support the new topics and application vignettes. In addition, many of the problems from the ninth edition have been revised. Therefore, an instructor who does not wish to assign problems that were assigned in previous classes has a substantial number from which to choose.
- **A Reorganization to Reduce the Size of the Book.** An unfortunate trend with early editions of this book was that each new edition was significantly larger than the previous one. This continued until the seventh edition had become considerably larger than is desirable for an introductory survey textbook. Therefore, I worked hard to substantially reduce the size of the eighth edition and then further reduced the size of the ninth edition slightly. I also adopted the goal of avoiding any growth in subsequent editions. Indeed, this edition is 35 pages shorter than the ninth edition. This was accomplished through a variety of means. One was being careful not to add too much new material. Another was deleting certain low-priority material, including the presentation of parametric linear programming in conjunction with sensitivity analysis (it already is covered later in Section 8.2) and a complicated dynamic programming example (the Wyndor problem with three state variables) that can be solved much more easily in other ways. Finally, and most importantly, 50 pages were saved by shifting two little-used items (the chapter on Markov chains and the last two major sections on Markov decision processes) to the supplements on the book's website. Markov chains are a central topic of probability theory and stochastic processes that have been borrowed as a tool of operations research, so this chapter better fits as a reference in the supplements.
- **Updating to Reflect the Current State of the Art.** A special effort has been made to keep the book completely up to date. This included adding relatively new developments (the four new sections mentioned above) that now warrant consideration in an

introductory survey course, as well as making sure that all the material in the ninth edition has been brought up to date. It also included carefully updating both the application vignettes and selected references for each chapter.

■ OTHER SPECIAL FEATURES OF THIS BOOK

- **An Emphasis on Real Applications.** The field of operations research is continuing to have a dramatic impact on the success of numerous companies and organizations around the world. Therefore, one of the goals of this book is to tell this story clearly and thereby excite students about the great relevance of the material they are studying. This goal is pursued in four ways. One is the inclusion of many application vignettes scattered throughout the book that describe in a few paragraphs how an actual application of operations research had a powerful impact on a company or organization by using techniques like those studied in that portion of the book. For each application vignette, a problem also is included in the problems section of that chapter that requires the student to read the full article describing the application and then answer some questions. Second, real applications also are briefly described (especially in Chapters 2 and 12) as part of the presentation of some OR technique to illustrate its use. Third, many cases patterned after real applications are included at the end of chapters and on the book's website. Fourth, many selected references of award winning OR applications are given at the end of some of the chapters. Once again, problems are included at the end of these chapters that require reading one or more of the articles describing these applications. The next bullet point describes how students have immediate access to these articles.
- **Links to Many Articles Describing Dramatic OR Applications.** We are excited about a partnership with The Institute for Operations Research and the Management Sciences (INFORMS), our field's preeminent professional society, to provide a link on this book's website to approximately 100 articles describing award winning OR applications, including the ones described in all of the application vignettes. (Information about INFORMS journals, meetings, job bank, scholarships, awards, and teaching materials is at www.informs.org.) These articles and the corresponding end-of-chapter problems provide instructors with the option of having their students delve into real applications that dramatically demonstrate the relevance of the material being covered in the lectures. It would even be possible to devote significant course time to discussing real applications.
- **A Wealth of Supplementary Chapters and Sections on the Website.** In addition to the approximately 1,000 pages in this book, another several hundred pages of supplementary material also are provided on this book's website (as outlined in the table of contents). This includes nine complete chapters and a considerable number of supplements to chapters in the book, as well as a substantial number of additional cases. All of the supplementary chapters include problems and selected references. Most of the supplements to chapters also have problems. Today, when students think nothing of accessing material electronically, instructors should feel free to include some of this supplementary material in their courses.
- **Many Additional Examples Are Available.** An especially important learning aid on the book's website is a set of Solved Examples for almost every chapter in the book. We believe that most students will find the examples in the book fully adequate but that others will feel the need to go through additional examples. These solved examples on the website will provide the latter category of students the needed help, but without interrupting the flow of the material in the book on those many occasions when most students don't need to see an additional example. Many students also might find these additional examples helpful when preparing for an examination. We recommend to instructors that they point out this important learning aid to their students.

- **Great Flexibility for What to Emphasize.** We have found that there is great variability in what instructors want to emphasize in an introductory OR survey course. They might want to emphasize the mathematics and algorithms of operations research. Others will emphasize model formulation with little concern for the details of the algorithms needed to solve these models. Others want an even more applied course, with emphasis on applications and the role of OR in managerial decision making. Some instructors will focus on the deterministic models of OR, while others will emphasize stochastic models. There also are great differences in the kind of software (if any) that instructors want their students to use. All of this helps to explain why the book is a relatively large one. We believe that we have provided enough material to meet the needs of all of these kinds of instructors. Furthermore, the book is organized in such a way that it is relatively easy to pick and choose the desired material without loss of continuity. It even is possible to provide great flexibility on the kind of software (if any) that instructors want their students to use, as described below in the section on software options.
- **A Customizable Version of the Text Also is Available.** Because the text provides great flexibility for what to emphasize, an instructor can easily pick and choose just certain portions of the book to cover. Rather than covering nearly all of the 1,000 pages in the book, perhaps you wish to use only a much smaller portion of the text. Fortunately, McGraw-Hill provides an option for using a considerably smaller and less expensive version of the book that is customized to meet your needs. With McGraw-Hill Create™, you can include only the chapters you want to cover. You also can easily rearrange chapters, combine material from other content sources, and quickly upload content you have written, like your course syllabus or teaching notes. If desired, you can use Create to search for useful supplementary material in various other leading McGraw-Hill textbooks. For example, if you wish to emphasize spreadsheet modeling and applications, we would recommend including some chapters from the Hillier-Hillier textbook, *Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets*. Arrange your book to fit your teaching style. Create even allows you to personalize your book's appearance by selecting the cover and adding your name, school, and course information. Order a Create book and you'll receive a complimentary print review copy in 3–5 business days or a complimentary electronic review copy (eComp) via e-mail in minutes. You can go to www.mcgrawhillcreate.com and register to experience how McGraw-Hill Create empowers you to teach your students your way.

■ A WEALTH OF SOFTWARE OPTIONS

A wealth of software options is provided on the book's website www.mhhe.com/hillier as outlined below:

- Excel spreadsheets: state-of-the-art spreadsheet formulations in Excel files for all relevant examples throughout the book. The standard Excel Solver can solve most of these examples.
- As described earlier, the powerful Analytic Solver Platform for Education (ASPE) to formulate and solve a wide variety of OR models in an Excel environment.
- A number of Excel templates for solving basic models.
- Student versions of LINDO (a traditional optimizer) and LINGO (a popular algebraic modeling language), along with formulations and solutions for all relevant examples throughout the book.
- Student versions of MPL (a leading algebraic modeling language) along with an MPL Tutorial and MPL formulations and solutions for all relevant examples throughout the book.
- Student versions of several elite MPL solvers for linear programming, integer programming, convex programming, global optimization, etc.
- Queueing Simulator (for the simulation of queueing systems).

- OR Tutor for illustrating various algorithms in action.
- Interactive Operations Research (IOR) Tutorial for efficiently learning and executing algorithms interactively, implemented in Java 2 in order to be platform independent.

Numerous students have found OR Tutor and IOR Tutorial very helpful for learning algorithms of operations research. When moving to the next stage of solving OR models automatically, surveys have found instructors almost equally split in preferring one of the following options for their students' use: (1) Excel spreadsheets, including Excel's Solver (and now ASPE), (2) convenient traditional software (LINDO and LINGO), and (3) state-of-the-art OR software (MPL and its elite solvers). For this edition, therefore, I have retained the philosophy of the last few editions of providing enough introduction in the book to enable the basic use of any of the three options without distracting those using another, while also providing ample supporting material for each option on the book's website.

Because of the power and versatility of ASPE, we no longer include a number of Excel-based software packages (Crystal Ball, Premium Solver for Education, TreePlan, SensIt, RiskSim, and Solver Table) that were bundled with recent editions. ASPE alone matches or exceeds the capabilities of all these previous packages.

Additional Online Resources

- A *glossary* for every book chapter.
- *Data files* for various cases to enable students to focus on analysis rather than inputting large data sets.
- A *test bank* featuring moderately difficult questions that require students to show their work is being provided to instructors. Many of the questions in this test bank have previously been used successfully as test questions by the authors. The test bank for this new edition has been greatly expanded from the one for the 9th edition, so many new test questions now are available to instructors.
- A *solutions manual* and *image files* for instructors.

POWERFUL NEW ONLINE RESOURCES

CourseSmart Provides an eBook Version of This Text

This text is available as an eBook at www.CourseSmart.com. At CourseSmart you can take advantage of significant savings off the cost of a print textbook, reduce their impact on the environment, and gain access to powerful web tools for learning. CourseSmart eBooks can be viewed online or downloaded to a computer. The eBooks allow readers to do full text searches, add highlighting and notes, and share notes with others. CourseSmart has the largest selection of eBooks available anywhere. Visit www.CourseSmart.com to learn more and to try a sample chapter.

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The online resources for this edition include McGraw-Hill Connect, a web-based assignment and assessment platform that can help students to perform better in their coursework and to master important concepts. With Connect, instructors can deliver assignments, quizzes, and tests easily online. Students can practice important skills at their own pace and on their own schedule. Ask your McGraw-Hill Representative for more detail and check it out at www.mcgrawhillconnect.com/engineering.

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McGraw-Hill LearnSmart® is an adaptive learning system designed to help students learn faster, study more efficiently, and retain more knowledge for greater success. Through a

series of adaptive questions, LearnSmart pinpoints concepts the student does not understand and maps out a personalized study plan for success. It also lets instructors see exactly what students have accomplished, and it features a built-in assessment tool for graded assignments. Ask your McGraw-Hill Representative for more information, and visit www.mhlearnsmart.com for a demonstration.

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Powered by the intelligent and adaptive LearnSmart engine, SmartBook is the first and only continuously adaptive reading experience available today. Distinguishing what students know from what they don't, and honing in on concepts they are most likely to forget, SmartBook personalizes content for each student. Reading is no longer a passive and linear experience but an engaging and dynamic one, where students are more likely to master and retain important concepts, coming to class better prepared. SmartBook includes powerful reports that identify specific topics and learning objectives students need to study. These valuable reports also provide instructors insight into how students are progressing through textbook content and are useful for identifying class trends, focusing precious class time, providing personalized feedback to students, and tailoring assessment. How does SmartBook work? Each SmartBook contains four components: Preview, Read, Practice, and Recharge. Starting with an initial preview of each chapter and key learning objectives, students read the material and are guided to topics for which they need the most practice based on their responses to a continuously adapting diagnostic. Read and practice continue until SmartBook directs students to recharge important material they are most likely to forget to ensure concept mastery and retention.

■ THE USE OF THE BOOK

The overall thrust of all the revision efforts has been to build upon the strengths of previous editions to more fully meet the needs of today's students. These revisions make the book even more suitable for use in a modern course that reflects contemporary practice in the field. The use of software is integral to the practice of operations research, so the wealth of software options accompanying the book provides great flexibility to the instructor in choosing the preferred types of software for student use. All the educational resources accompanying the book further enhance the learning experience. Therefore, the book and its website should fit a course where the instructor wants the students to have a single self-contained textbook that complements and supports what happens in the classroom.

The McGraw-Hill editorial team and I think that the net effect of the revision has been to make this edition even more of a "student's book"—clear, interesting, and well-organized with lots of helpful examples and illustrations, good motivation and perspective, easy-to-find important material, and enjoyable homework, without too much notation, terminology, and dense mathematics. We believe and trust that the numerous instructors who have used previous editions will agree that this is the best edition yet.

The prerequisites for a course using this book can be relatively modest. As with previous editions, the mathematics has been kept at a relatively elementary level. Most of Chaps. 1 to 15 (introduction, linear programming, and mathematical programming) require no mathematics beyond high school algebra. Calculus is used only in Chap. 13 (Nonlinear Programming) and in one example in Chap. 11 (Dynamic Programming). Matrix notation is used in Chap. 5 (The Theory of the Simplex Method), Chap. 6 (Duality Theory), Chap. 7 (Linear Programming under Uncertainty), Sec. 8.4 (An Interior-Point Algorithm), and Chap. 13, but the only background needed for this is presented in Appendix 4. For Chaps. 16 to 20 (probabilistic models), a previous introduction to probability theory is assumed, and calculus is used in a few places. In general terms, the mathematical maturity that a student achieves through taking an elementary calculus course is useful throughout Chaps. 16 to 20 and for the more advanced material in the preceding chapters.

The content of the book is aimed largely at the upper-division undergraduate level (including well-prepared sophomores) and at first-year (master's level) graduate students. Because of the book's great flexibility, there are many ways to package the material into a course. Chapters 1 and 2 give an introduction to the subject of operations research. Chapters 3 to 15 (on linear programming and mathematical programming) may essentially be covered independently of Chaps. 16 to 20 (on probabilistic models), and vice-versa. Furthermore, the individual chapters among Chaps. 3 to 15 are almost independent, except that they all use basic material presented in Chap. 3 and perhaps in Chap. 4. Chapters 6 and 7 and Sec. 8.2 also draw upon Chap. 5. Sections 8.1 and 8.2 use parts of Chaps. 6 and 7. Section 10.6 assumes an acquaintance with the problem formulations in Secs. 9.1 and 9.3, while prior exposure to Secs. 8.3 and 9.2 is helpful (but not essential) in Sec. 10.7. Within Chaps. 16 to 20, there is considerable flexibility of coverage, although some integration of the material is available.

An elementary survey course covering linear programming, mathematical programming, and some probabilistic models can be presented in a quarter (40 hours) or semester by selectively drawing from material throughout the book. For example, a good survey of the field can be obtained from Chaps. 1, 2, 3, 4, 16, 17, 18, and 20, along with parts of Chaps. 10 to 14. A more extensive elementary survey course can be completed in two quarters (60 to 80 hours) by excluding just a few chapters, for example, Chaps. 8, 15, and 19. Chapters 1 to 9 (and perhaps part of Chap. 10) form an excellent basis for a (one-quarter) course in linear programming. The material in Chaps. 10 to 15 covers topics for another (one-quarter) course in other deterministic models. Finally, the material in Chaps. 16 to 20 covers the probabilistic (stochastic) models of operations research suitable for presentation in a (one-quarter) course. In fact, these latter three courses (the material in the entire text) can be viewed as a basic one-year sequence in the techniques of operations research, forming the core of a master's degree program. Each course outlined has been presented at either the undergraduate or graduate level at Stanford University, and this text has been used in basically the manner suggested.

The book's website will provide updates about the book, including an errata. To access this site, visit www.mhhe.com/hillier.

■ ACKNOWLEDGMENTS

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In addition, thanks go to those instructors and students who sent email messages to provide their feedback on the 9th edition.

This edition was very much of a team effort. Our case writers, Karl Schmedders and Molly Stephens (both graduates of our department), wrote 24 elaborate cases for the 7th edition, and all of these cases continue to accompany this new edition. One of our department's former PhD students, Michael O'Sullivan, developed OR Tutor for the 7th edition (and continued here), based on part of the software that my son Mark Hillier had developed

for the 5th and 6th editions. Mark (who was born the same year as the first edition, earned his PhD at Stanford, and now is a tenured Associate Professor of Quantitative Methods at the University of Washington) provided both the spreadsheets and the Excel files (including many Excel templates) once again for this edition, as well as the Queueing Simulator. He also gave important help on the textual material involving ASPE and contributed greatly to Chaps. 21 and 28 on the book's website. In addition, he updated the 10th edition version of the solutions manual. Earlier editions of this solutions manual were prepared in an exemplary manner by a long sequence of PhD students from our department, including Che-Lin Su for the 8th edition and Pelin Canbolat for the 9th edition. Che-Lin and Pelin did outstanding work that nicely paved the way for Mark's work on the solutions manual. Last, but definitely not least, my dear wife, Ann Hillier (another Stanford graduate with a minor in operations research), provided me with important help on an almost daily basis. All the individuals named above were vital members of the team.

I also owe a great debt of gratitude to four individuals and their companies for providing the special software and related information for the book. Another Stanford PhD graduate, William Sun (CEO of the software company Accelet Corporation), and his team did a brilliant job of starting with much of Mark Hillier's earlier software and implementing it anew in Java 2 as IOR Tutorial for the 7th edition, as well as further enhancing IOR Tutorial for the subsequent editions. Linus Schrage of the University of Chicago and LINDO Systems (and who took an introductory operations research course from me 50 years ago) provided LINGO and LINDO for the book's website. He also supervised the further development of LINGO/LINDO files for the various chapters as well as providing tutorial material for the book's website. Another long-time friend, Bjarni Kristjansson (who heads Maximal Software), did the same thing for the MPL/Solvers files and MPL tutorial material, as well as arranging to provide a student version of MPL and various elite solvers for the book's website. Still another friend, Daniel Flystra (head of Frontline Systems), has arranged to provide users of this book with a free 140-day license to use a student version of his company's exciting new software package, Analytic Solver Platform. These four individuals and their companies—Accelet Corporation, LINDO Systems, Maximal Software, and Frontline Systems—have made an invaluable contribution to this book.

I also am excited about the partnership with INFORMS that began with the 9th edition. Students can benefit greatly by reading about top-quality applications of operations research. This preeminent professional OR society is enabling this by providing a link to the articles in *Interfaces* that describe the applications of OR that are summarized in the application vignettes and other selected references of award winning OR applications provided in the book.

It was a real pleasure working with McGraw-Hill's thoroughly professional editorial and production staff, including Raghu Srinivasan (Global Publisher), Kathryn Neubauer Carney (the Developmental Editor during most of the development of this edition), Vincent Bradshaw (the Developmental Editor for the completion of this edition), and Mary Jane Lampe (Content Project Manager).

Just as so many individuals made important contributions to this edition, I would like to invite each of you to start contributing to the next edition by using my email address below to send me your comments, suggestions, and errata to help me improve the book in the future. In giving my email address, let me also assure instructors that I will continue to follow the policy of not providing solutions to problems and cases in the book to anybody (including your students) who contacts me.

Enjoy the book.

Frederick S. Hillier
Stanford University (fhillier@stanford.edu)

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