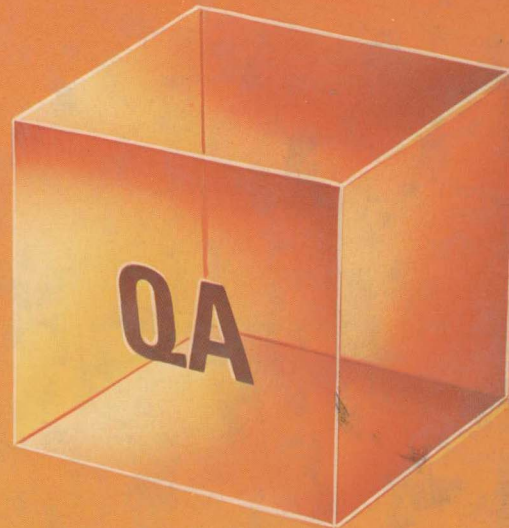
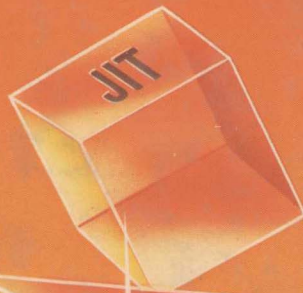
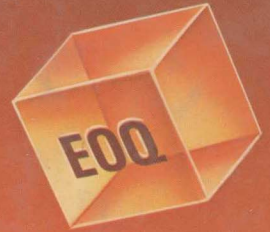


2ND EDITION

Production/Operations Management

WILLIAM J. STEVENSON



Production / Operations Management

WILLIAM J. STEVENSON

College of Business
Rochester Institute of Technology

Second Edition 1986

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Preface

The material in this book is intended as an introduction to the field of production and operations management. It is suitable for both undergraduate and graduate students.

The subject matter is somewhat technical in parts. It represents a blend of concepts from industrial engineering, cost accounting, general management, quantitative methods, and statistics. Even so, readers should find the material interesting and informative. Production and operations activities, such as forecasting, choosing a location for an office or plant, allocating resources, designing products and services, scheduling activities, and assuring quality are core activities of most business organizations. Very often, the majority of employees and assets of an organization are controlled by the production/operations function. Some of you are—or will be—employed directly in a production/operations capacity, while others will have jobs that are indirectly related to this area. So whether this is your field of study or not, this field will probably have an impact on your work.

Historically, production and operations management (POM) techniques developed in manufacturing organizations. However, as time went on, it became more and more apparent that nonmanufacturing organizations have to contend with problems similar to those encountered in manufacturing settings. Consequently, the scope of POM has been expanded to cover both manufacturing and service organizations. Moreover, many of the techniques can be directly applied to both areas without modification.

Since the first edition was published, new techniques and technological advances have emerged, necessitating this revised edition. Among the new or updated material are the following topics:

1. Japanese manufacturing methods.
2. Just-in-time production.
3. Cellular manufacturing.

4. Group technology.
5. Flexible manufacturing systems.
6. Robotics.
7. Computer-aided design and manufacturing.
8. MRP II.
9. Quality circles.

In addition, there are some new examples and solved problems, and approximately 40 percent of the problems are new or revised. Also, there are several new cases and readings, and several chapters have undergone major revision.

This second edition continues with many of the features of the first edition, such as:

1. Each chapter begins with an outline of topics covered and a set of learning objectives.
2. Concepts and techniques are presented in such a way that they are both interesting and fairly easy to grasp.
3. This book offers more examples, solved problems, and end-of-chapter problems than most other books. Students seem to benefit greatly from being able to review the solved problems.
4. The answers to most problems are given—but not solutions.
5. Materials and problems have been thoroughly class-tested and revised accordingly.
6. Many chapters have a short reading or a case suitable either for class discussion or for homework assignments.
7. There is a great deal of flexibility permitted in terms of depth and order of coverage of topics.
8. Manufacturing and service are integrated rather than separated.
9. Forecasting is covered early in the text (Chapter 3).
10. Productivity and quality assurance are emphasized.

The text contains more material than one could normally hope to cover in a one-semester course. Rather than relying on the author's personal bias, each instructor can choose those topics most suited to his or her own proclivities. Those who prefer quantitative emphasis, for example, will be quite comfortable with the abundance of student problems. Those who prefer a more qualitative approach will welcome the fact that some of the more quantitative material is placed in chapter supplements. Moreover, some of the chapter problems are less quantitative than others, and the cases and readings tend to be qualitative. Obviously, there are many possibilities between these two extremes.

I have gained a great deal in revising this book. I was fortunate

again to have an excellent panel of reviewers who contributed significantly to the final product.

I want to thank these reviewers of this second edition for their help: Patrick Spagon, formerly of San Francisco State University, now at Frac Corporation; Ralph D. Badinelli, Virginia Polytechnic Institute and State University; Paul G. Marlin, University of Missouri–St. Louis; J. Donald Phillips, University of Alabama; Mildred Golden Pryor, Stephen F. Austin State University; Herbert Blake, California State University of Sacramento; Jack Wimer, Baylor University; Mitchell O. Locks, Oklahoma State University; and Stan Stockton, University of Indiana. In addition, several of my colleagues at Rochester Institute of Technology offered suggestions for improvement, and I want to thank them: George Johnson, Erhan Mergen, Paul Van Ness, and Bob Wilferth.

I also want to mention the original set of reviewers of the first edition, and all the helpful suggestions they offered. They helped build the foundation: Suresh Chand, Purdue University; Stephen Goodman, Florida State University; Chan Hahn, Bowling Green State University; Dennis McLeavey, University of Rhode Island; Jugoslav Milutinovich, Temple University; Richard Newman, Indiana University Northwest; Hilbert Schultz, University of Wisconsin, Oshkosh; Edward Thode, New Mexico State University; Mathew Tuite, Northwestern University; Walter Warrick, Drake University; Paul Van Ness, Rochester Institute of Technology; and Eitan Zemel, Northwestern University. I also want to thank Professor Robert Fetter for his comments and encouragement. Many students also offered comments and suggestions, and many others are to be commended for suffering through revisions of problems and solutions and text material. Derek deSa of the University of Alabama did a great job in checking the accuracy of all the examples and problems.

William J. Stevenson

Note to the Student

The material in this text is part of the core knowledge in your education. Consequently, you will derive considerable benefit from your study of operations management, *regardless of your major*. Practically speaking, production and operations is a course in *management*.

After reading each chapter or supplement in the text, attending related classroom lectures, and completing assigned questions and problems, you should be able to do each of the following:

1. *Identify the key features* of that material.
2. *Define and use terminology*.
3. *Solve typical problems*.
4. *Recognize applications* of the concepts and techniques covered.
5. *Discuss the assumptions and limitations* which underlie each model or technique covered.

You will encounter a number of chapter supplements. Check with your instructor to determine whether or not to study them.

This book places an emphasis on problem solving. There are many examples throughout the text illustrating solutions. In addition, at the end of most chapters and supplements you will find a group of solved problems. The examples within the chapter itself serve to illustrate concepts and techniques. Too much detail at those points would be detrimental to learning. However, later on, when you begin to solve the end-of-chapter problems, you will find the *solved problems* quite helpful. Moreover, those solved problems usually illustrate more and different details than the problems within the chapter.

I suggest the following approach for studying and problem solving:

1. Look over the chapter outline and learning objectives.
2. Read the chapter summary.
3. Read the chapter and reread the summary.
4. Look over and try to answer the discussion and review questions.
5. Solve the problems, referring to the solved problems and chapter examples as needed.

Note that the answers to many problems are given at the end of the book. Try to solve each problem before turning to the answer. Remember—tests don't usually come with answers.

A study guide is now available. If your bookstore does not stock it, you can ask them to order it for you.

Good luck!

W. J. S.

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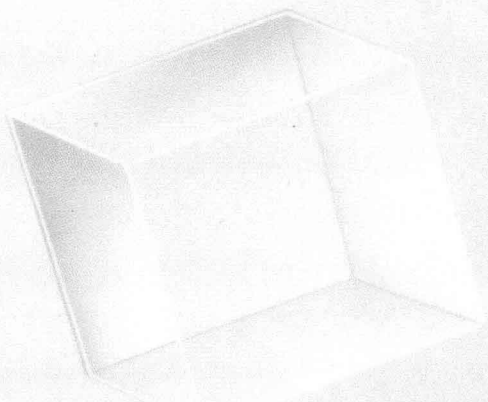
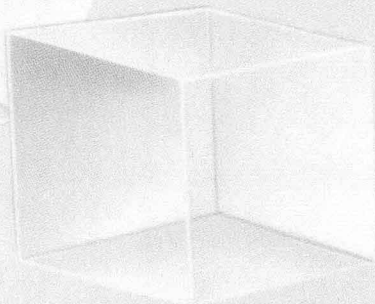
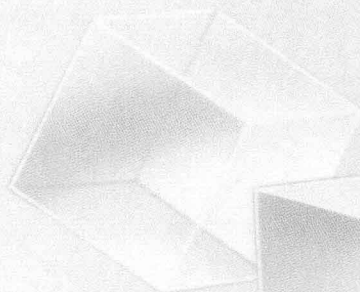
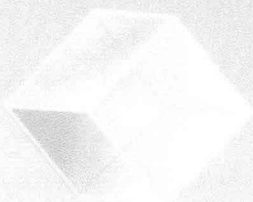
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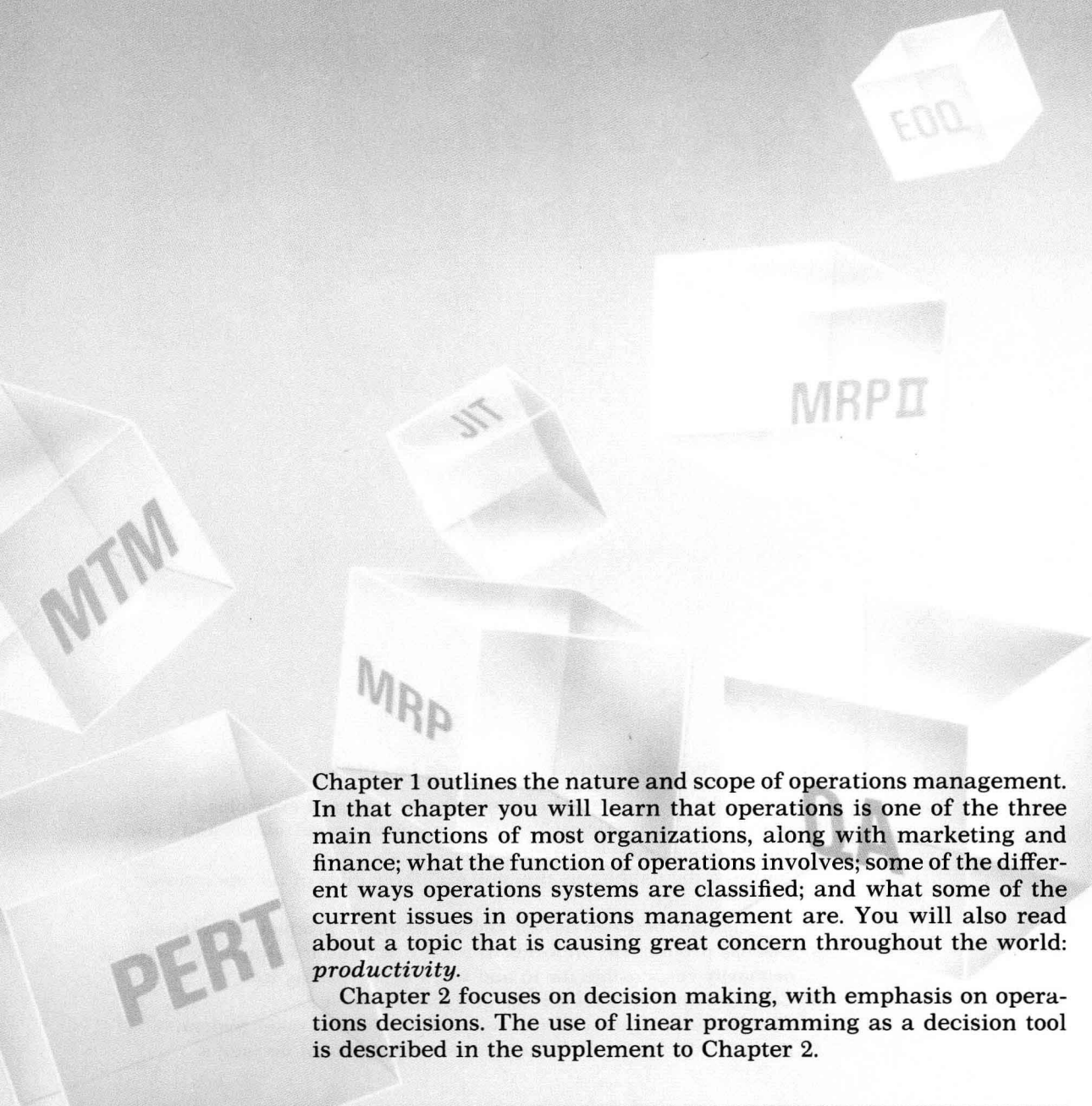
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***Production / Operations
Management***

Part I

Introduction





Chapter 1 outlines the nature and scope of operations management. In that chapter you will learn that operations is one of the three main functions of most organizations, along with marketing and finance; what the function of operations involves; some of the different ways operations systems are classified; and what some of the current issues in operations management are. You will also read about a topic that is causing great concern throughout the world: *productivity*.

Chapter 2 focuses on decision making, with emphasis on operations decisions. The use of linear programming as a decision tool is described in the supplement to Chapter 2.