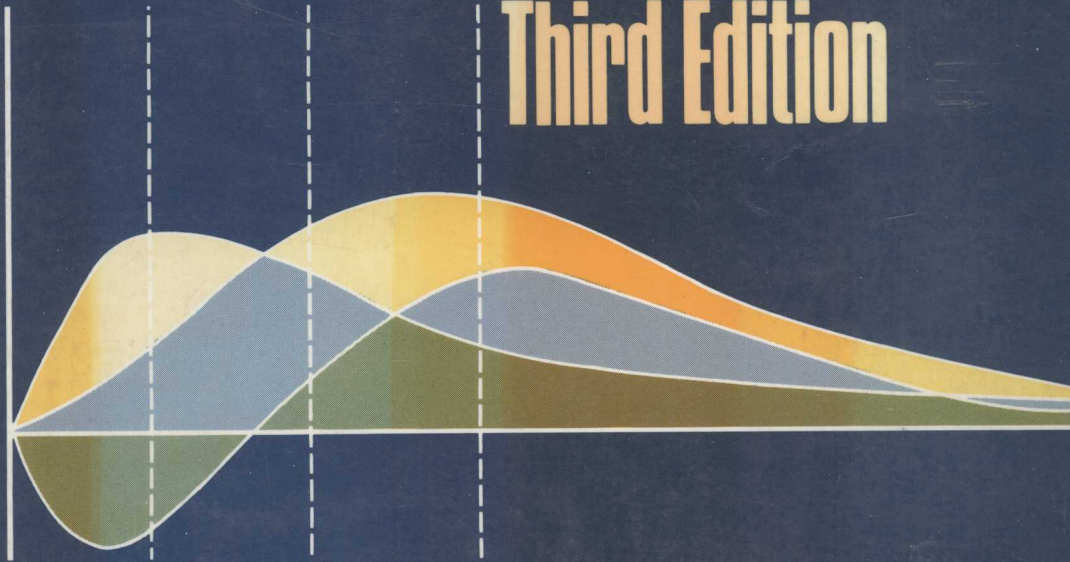


RALPH M. STAIR, JR.  
BARRY RENDER

# Production and Operations Management

## A Self-Correcting Approach

### Third Edition



SOFTWARE  
ENCLOSED

# **Production and Operations Management**

## ***A Self-Correcting Approach***

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**Third Edition**

**Ralph M. Stair, Jr.**  
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**Barry Render**  
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# **Production and Operations Management**

To Lila, Marty, and Harriet

# Preface

## How to Use *Production and Operations Management: A Self-Correcting Approach*

**To the Student:** This book has been designed to assist you in learning the concepts and techniques of production and operations management. The production-operations management course is an integral part of the curriculum in many colleges of business administration today. It is intended to provide you with an understanding of the kinds of problems found in managing a business, government, or nonprofit organization (be it production- or service-oriented). An additional purpose is to give you experience in tackling common production or operations problems by familiarizing you with the most important approaches to the design, operation, and control of productive systems.

Each of the units in this book contains a complete, straightforward explanation of the subject at hand, together with several carefully explained examples and self-correcting problems. The problems allow you to progress through the material at your own pace. A correct answer means that you have mastered the material and that you can proceed to new material. An incorrect answer alerts you to a misunderstood concept or a computational mistake. The self-correcting problems in this book will give you immediate feedback on your progress at any point. You will be able to move forward with confidence after each correct answer, and you will be able to pinpoint and correct any problems that you may encounter as a result of an incorrect answer.

Space has been provided in most cases for your calculations and answers. When appropriate, we have included graphs and tables to make it easier for you to lay out and solve the problems. In case you should need additional room, however, we suggest that you keep a pad of paper handy.

Whatever the order in which your class progresses through the units of this book, it will surprise you that the material is not nearly as complex or difficult as you may have imagined it would be. The problems of production and operations management are no more difficult than any other subject. Just proceed example by example, and problem by problem. This approach is a tried-and-true method by which many students before you have learned the concepts of production and operations management efficiently and effectively.

**To the Instructor:** *Production and Operations Management: A Self-Correcting Approach* is suitable for undergraduate- and graduate-level courses in production management, operations management, management science, and quantitative analysis. Although this book may be employed as a supplement to assist the student in mastering the concepts and techniques of production and operations management, it has also been used successfully as a problems-oriented text. The book is so complete and clear in coverage of major production and opera-

tions management topics that, when supplemented with other materials and resources (such as outside readings or cases and your own experience), it will more than suffice as a primary learning aid—and will fulfill the production management requirement of the American Assembly of Collegiate Schools of Business (AACSB). Financially, this option is very popular with students.

We have designed all of the material and problems to be straightforward and easy to learn, and we hope that our extensive student testing has rendered the book error free. You will find that the examples and self-correcting problems are comprehensive and realistic. In addition, the seventeen units and two supplements allow great flexibility in course design and presentation.

## New to the Third Edition

We have made a number of substantial changes to the third edition. The book is newly organized and available with operations management software and supplemental programs. Finally, most units have a section called *Other Factors to Consider*. These changes are discussed below.

The third edition has been completely reorganized to be more consistent with other texts in production and operations management. In addition, the units are divided into major modules or parts. These parts cover the fundamentals of operations and production management, design issues, and the operation and control of operations and production management systems.

Programs used with our *Microcomputer Software for Management Science and Operations Management* book are available from the publisher. These programs have help menus, data storage capabilities, data retrieval, error checking, data editing, and more. Each program uses the same type of format. The regular programs to be used in this book include

- Linear programming
- Transportation method
- Assignment method
- Forecasting
- Inventory control
- Simulation of inventory problems
- Expected monetary value
- Queuing models
- Program evaluation and review technique
- Aggregate planning
- Assembly line balancing
- Time studies

The regular programs are explained and demonstrated at the end of the appropriate units. Unit 1 also briefly introduces the programs and their usage.

About twenty new supplemental programs, in BASIC, have been written exclusively for the third edition. These programs include a help menu that provides information about each technique. All input is done through the keyboard, and the output is displayed on the screen. The supplemental programs include

- Break even analysis
- Payback
- Net present value

- Internal rate of return
- Depreciation
- Decision making under uncertainty
  - Minimax
  - Maximax
  - Maximin
  - Equally likely
- Material requirements planning (Note: This program is not a general program. It uses the structure of a problem in the book and allows students to make changes.)
- Capacity planning
- Production planning
  - Cycle time
  - Minimum number of work stations
  - Efficiency
- Work measurement
  - Average cycle time
  - Normal time
  - Standard time
- Work sampling—sample size
- Learning curves
- Reliability
- Maintenance—expected number of breakdowns
- Johnson's rule
- Critical ratio

The supplemental programs are presented in Appendix A, which contains instructions and sample keyboard inputs and screen outputs. Many examples and problems in the text can be solved by one of these supplemental programs, which are available from the publisher.

A new section appears at the end of most of the units called *Other Factors to Consider*. The major purpose of this section is to cover the nonquantitative factors that are so important to production and operations management. Some of the issues covered are

- Internationalism of POM
- The greater emphasis on services
- Current trends
- The Japanese influence
- Coverage of CAD CAM
- JIT and Kanban
- Assumptions of the models
- Model limitations and potential problems
- The relationship between a specific technique and other POM concepts and techniques
- The relationship between POM concepts and other functions within the organization
- Health and safety considerations
- Employee and customer considerations
- Discussions of additional or advanced topics and techniques beyond the scope of this book
- Commercial computer programs used with various techniques

**Acknowledgments:** We appreciate the support and advice of many instructors and students in the previous two editions. As always, we would like your comments and suggestions. Any comments can be sent to Allyn and Bacon or

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## PART I

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# Fundamentals: Tools and Techniques

Unit 1 **Production and Operations Management in Perspective**

Unit 2 **Cost-Volume Analysis**

Unit 3 **Financial Analysis**

Unit 4 **Decision Theory**

Part I contains many tools and techniques that can be used in a variety of settings. Because these tools and techniques are useful for many production and operations management topics, they have been included in the first part of the book.

Unit 1 gives an overview of the production and operations management field. Unit 2 discusses cost-volume analysis, and Unit 3 presents important financial analysis techniques. These techniques include present value, internal rate of return, and depreciation and tax considerations. Unit 4 discusses the fundamentals of decision theory.