



Roger G. Schroeder

Operations Management

Contemporary Concepts and Cases

Third Edition

Roger G. Schroeder

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Carlson School of Management*



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To: My parents, Angela and Martin Schroeder;
my wife, Marlene; and my children, Kristen
and Bethany

—Roger G. Schroeder

Preface

FEATURES

Operations management is an exciting and vital field in today's complex business world. Therefore, students in both MBA and undergraduate courses have an urgent need to understand operations—an essential function in every business.

This textbook on operations management addresses the impact of operations decisions on the firm and emphasizes cross-functional decision making. The text provides materials of interest to general business students and operations management majors. By stressing cross-functional decision making, the text provides a unique and current business perspective for all students. This is the first text to incorporate cross-functional decision making in every chapter.

A unified decision framework organizes the material by grouping decisions into four major categories: process, quality, capacity, and inventory. This framework is intended to make it easy for students to understand the decision role and responsibilities of operations in relation to other functions such as marketing and finance. The text also provides a balanced treatment of both service and manufacturing firms.

The latest content is incorporated, including global operations, supply chain management, virtual operations, e-operations, service blueprinting, competency-based strategy, agile manufacturing, and mass customization. Complete coverage is also provided on traditional topics, including process design, service systems, quality management, JIT, ERP, and inventory control and scheduling.

While covering the concepts of operations management in 17 chapters, the book also provides 20 case studies. The cases are intended to strengthen problem formulation skills and illustrate the concepts presented in the text. Long and short case studies are included. The cases are not just large problems or examples; rather, they are substantial management case studies, including some from the Harvard Business School and Darden School case collections.

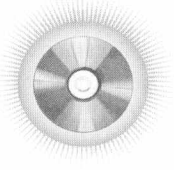
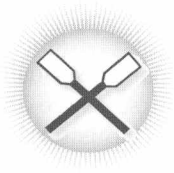
This softcover edition with fewer pages than most introductory books is economical for students. It covers all the essentials students need to know about operations, leaving out only superfluous and tangential topics. By limiting the size of the book, I have condensed the material to the basics.

This book is ideal for regular operations management courses and also case courses and modular courses. It is particularly useful for those who desire a cross-functional decision-making perspective. Instructors can easily supplement the text with their own cases, readings, or course materials as desired.

Each copy of the text includes a student CD-ROM containing 21 Excel templates designed to assist in solving problems at the end of chapters and the case studies. The CD-ROM also contains additional technical notes on linear programming, simulation, transportation method, financial analysis, and queuing, which can be assigned by the instructor, if desired. Finally, the CD-ROM contains PowerPoint slides, video clips, and Web links to companies cited in the Student Internet Exercises in the text. A Web site for this textbook (<http://www.mhhe.com/schroeder3e>) is also linked to the McGraw-Hill operations Web site (<http://www.mhhe.com/pom/>).

A number of pedagogical features are contained in this book.

- Operations Leader boxes are included in each chapter to illustrate the latest practices being implemented by leading firms.



- Each chapter contains at least three Student Internet Exercises. These exercises generally allow for extended learning about concepts that have already been discussed in the text.
- Points of cross-functional emphasis are noted in each chapter by a special symbol. This highlights the cross-functional nature of this book.
- Solved problems are included at the end of quantitative chapters to provide additional examples for students.
- Excel spreadsheets are keyed to specific problems at the end of chapters. One of these spreadsheets is illustrated in the text for each chapter that contains Excel problems.
- The student CD-ROM can be used to extend students' learning of the basic ideas covered in the text. CD includes technical chapters, video clips, Excel templates, PowerPoint slides, and Web links.

KEY CHANGES TO THE THIRD EDITION

1. *The process view of operations is emphasized in every chapter in addition to the cross-functional approach used in the earlier editions.*
2. *New or expanded sections are added to the various chapters to provide extensive coverage of the following topics:*
 - Operations competence as a basis for competitive advantage.
 - Service quality measurement including SERVQUAL.
 - Illustrations of different types of processes.
 - Technology choice by managers.
 - Measuring process flows (Little's Law, capacity, flow rate, throughput, inventory, and bottlenecks).
 - Six Sigma.
 - Supply chain strategies.
 - Collaborative Planning, Forecasting, and Replenishment.
 - Theory of Constraints.
 - Sales and Operations Planning.
 - PERT method.
 - Lean thinking.
3. *Many new examples are included throughout to illustrate major points:*
 - 3M example of process improvement outside operations.
 - The process view in General Electric.
 - Zara as an example of fast replenishment.
 - General Mills example of new cereal design.
 - Concurrent engineering at the Centers for Disease Control.
 - Modular design at Dell Computer.
 - Project management at Boeing.
 - TRW legal department's use of Six Sigma.
 - Cisco's supply chain management problems.
 - Wal-Mart and Whirlpool's use of CPFR.
 - Intel investment in Ireland.

- Syngenta's use of S&OP.
 - Odessa Texas Police Department uses Theory of Constraints.
 - MRP at Coca Cola.
 - Health care example of lean thinking.
4. *Service operations coverage is expanded throughout the text:*
- The service chapter has been updated and expanded to provide more complete coverage of the cycle of service at SAS, the profit chain at Harrah, service recovery in car repair, and service design at a ski resort.
 - Service examples have been added in every chapter.
 - Concepts in the text have been illustrated with both manufacturing and service examples.
5. *Student Internet Exercises:*
- About 60 student Internet assignments with new and updated exercises have been added to the third edition.
6. *Case Studies:*
- 20 case studies have been included. They have been updated and two new cases added:
 The "mi adidas" Mass Customization Initiative
 Southwest Airlines: Singin' the (JET) Blues
 - Recent cases have been carried over from the second edition:
 Customer-Driven Learning at Radisson Hotels Worldwide
 Six Sigma at 3M, Inc.
 Ford Motor Company: Supply Chain Strategy

Summary of Chapter by Chapter Revisions

Chapter 1: The Operations Function

Changed focus from "systems" to "process" throughout chapter.

Increased references of service companies:

- GE Capital, Wal-Mart, Nordstrom, Starbucks, Amazon.com., Fed Ex, Citigroup.

Chapter 2: Operations and Supply Chain Strategy

Added new Wal-Mart example of distinctive competence.

Included new Zara (Spanish retailer) example of replenishment.

Moved Section 2.4, "Focused Operations," to Chapter 4.

Added Section 2.4, "Operations Competence," which includes the following:

- Wal-Mart versus Nordstrom order winner example.
- Dell Computer example of distinctive competence.

Chapter 3: Product Design

Revised introduction to product design.

Included new General Mills cereal example for product design.

Added new example of concurrent engineering techniques at the National Center for Disease Control Institute for Occupational Safety and Health.

Added new Dell computer example of modular design.

Chapter 4: Process Selection

Revised Line Flow figure and explanation for Figure 4.1.

Revised Figure 4.2, batch flow, and explanation.

Revised the graphic comparison between MTS, MTO, and ATO.

Included new project examples: Boeing, furniture making, and services, including catering and fund-raising.

Moved Section 4.5, "Focused Operations," from Chapter 2.

Chapter 5: Service Process Design

Revised Table 5.1 on the difference between manufacturing and services for clarity.

Added ski resort service example/exercise.

Provided car repair example regarding service recovery.

Included new service guarantee examples in Table 5.2.

Added SAS business traveler example—moment of truth.

Provided new application of service-profit chain at Harrah's casino.

Chapter 6: Choice of Technology

Deleted old section, "Technology and the Manager."

Revised the introduction on technology choice.

Revised and clarified the section on group technology layout.

Provided new example of Changen auto manufacturing to illustrate ERP.

Heavily revised the "Technology Choice" section.

Chapter 7: Process-Flow Analysis

Added new section 7.3, "Measuring Process Flows," including

- New Little's Law material.
- Pizza parlor example.

Revised figures for clarity.

Condensed section on using process-flow analysis and deleted the material on sociotechnical problems.

Added new solved problems.

Chapter 8: Managing Quality

Added the new section 8.2, "Service Quality," which now includes coverage of SERVQUAL.

Updated Baldrige Award criteria.

Revised TQM costs of quality material.

Chapter 9: Quality Control and Improvement

Revised the explanation of attribute control.

Clarified the discussion of variable measurement use.

Added control chart uses—manufacturing and services explanation.

Added new Six Sigma material:

- TRW Legal Department example.
- Additional discussion of the seven tools of quality.

Chapter 10: Supply Chain Management

- Added introduction using Cisco as an example.
- Added new discussion of business cycle time and flexibility using Dell as an example.
- Provided new time measurement presentation.
- Revised the supply chain costs discussion.
- Added section 10.5, "Supply Chain Strategies," including new examples: Sport Obermeyer and General Mills.

Chapter 11: Forecasting

- Clarified that forecasting should provide a mean and variance.
- Added section 11.10, "Collaborative Planning, Forecasting, and Replenishment," with the new Whirlpool example.

Chapter 12: Facilities and Aggregate Planning

- Included a definition of nominal capacity.
- Updated the Operations Leader box, Intel Irish Operations.
- Deleted material comparing cumulative demand and production.
- Added Syngenta example of sales and operations planning.

Chapter 13: Scheduling Operations

- Included service example (drawn from a hospital) for batch scheduling.
- Heavily revised the section on bottleneck and Theory of Constraint.
- Revised Priority Dispatching Rules and included new examples on capacity/TOC.
- Provided new explanations of Figures 13.4 and 13.5, infinite capacity loading.

Chapter 14: Project Planning and Scheduling

- Replaced Figure 14.1 Gantt Chart and provided a new example.
- Revised construction of a simple network and network representation.
- Heavily revised the section on constant-time networks.
- Added a new PERT section.
- Deleted PDM from section 14.7.
- Added new example, Cadbury Schweppes.
- Added new Solved Problems.

Chapter 15: Independent-Demand Inventory

- Added new material discussing inventories in the supply chain.
- Revised Figure 15.6, the total cost curve.
- Added an EOQ example, Hewlett Packard.
- Clarified the definition of a periodic review system.
- Added a list of service-oriented independent demand inventories.

Chapter 16: Materials Requirements Planning

- Explained how the master schedule is driven by the aggregate plan.
- Added explanation of MRP as part of ERP.
- Added Coca-Cola as an example of MRP.

Chapter 17: Just-in-Time Systems and Lean Thinking

- Added material introducing the concept of lean thinking.
- Added the new section "Beyond JIT to Lean Thinking."

The author would also like to thank the staff at McGraw-Hill/Irwin who had a direct hand in the editing and production of the text. Brent Gordon, editorial director, encouraged the development of this book from the beginning and supported the concept throughout. Scott Isenberg, executive editor, provided unwavering editorial support for many of the key features and concepts incorporated into the text. My thanks go to Christina Sanders, developmental editor, who ensured that the book faithfully adhered to its concept and coordinated the editing and review process. Gina DiMartino, project manager, was diligent in getting the book through the production process.

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Roger G. Schroeder

BOOK SUPPLEMENTS

Book supplements available to instructors include the instructor's Resource CD-ROM with instructor's manual, PowerPoint slides, Web links, Excel templates, additional video clips, technical notes, and a test bank.

- **McGraw-Hill/Irwin video series** is available to book adopters. These videos include 12 volumes containing over 36 segments varying in length from 9 to 25 minutes. The videos provide actual plant and service tours, and students can hear from real operations managers. The topics include concepts such as lean production, quality, manufacturing processes, CIM, inventory management, services, supply chain management, improving operations methods, layout improvements, supplier development, reengineering, value-driven production, scheduling, product and process design, JIT, and international logistics.

McGraw-Hill/Irwin has the following products available for purchase or shrinkwrapped with the text at a discounted price:

- **Interactive Cases for Operations Management and Supply Chain Management** by Byron Finch: This collection of 24 dynamic cases features scenarios utilizing interactive Java applets included on a CD-ROM with the casebook. These innovative case studies require students to utilize the Java-based applets to solve operations and supply chain management problems with an interactive graphical tool, on topics such as production line simulation, variance analysis, overbooking, x-bar and r-charts, waiting lines, forecasting, bullwhip effect, inventory, Kanban, aggregate planning, constraint management, facility layout, and learning curves.
- **HOM Operations Management Software for Windows** by Moses, Seshadri, and Yakir offers powerful Windows-based programs for solving real-world operating problems such as forecasting, process analysis, waiting line design and analysis, project management, MRP and inventory management, and capacity planning. HOM imports and exports files to and from Excel, and each module has a detailed, step-by-step "how-to-solve" dialog box.
- **Mike's Bikes Business Simulation on CD** provides an opportunity to run Mike's Bikes, a bicycle manufacturing company. Through this simulation students apply their knowledge of the functional areas of business, such as marketing, operations, finance, and accounting, to a real business.

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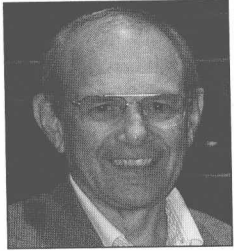
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