

OPERATIONS MANAGEMENT

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THIRD
EDITION



ROBERTA S. RUSSELL
BERNARD W. TAYLOR III

THIRD EDITION

OPERATIONS MANAGEMENT

Multimedia Version

Roberta S. Russell

Professor

Virginia Polytechnic Institute and State University

Bernard W. Taylor III

R. B. Pamplin Professor

Virginia Polytechnic Institute and State University

Prentice Hall, Inc.

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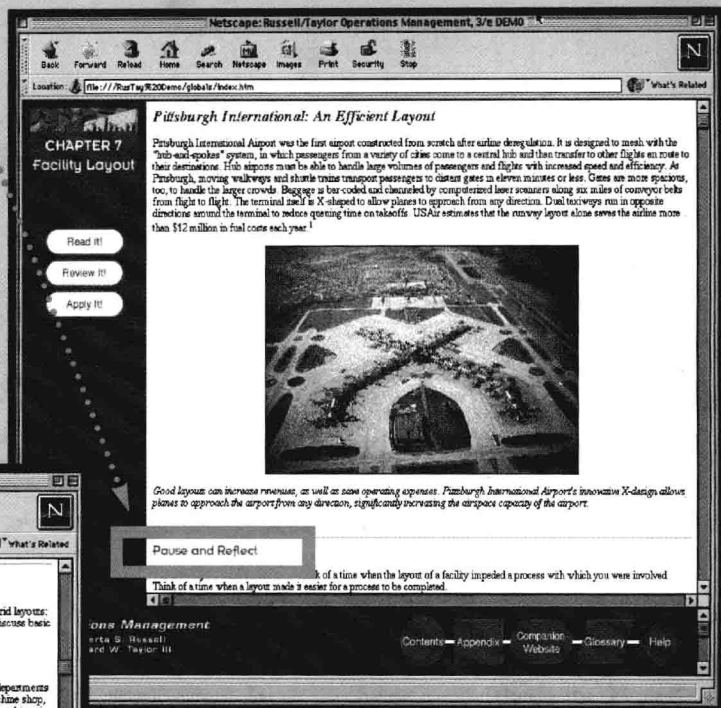
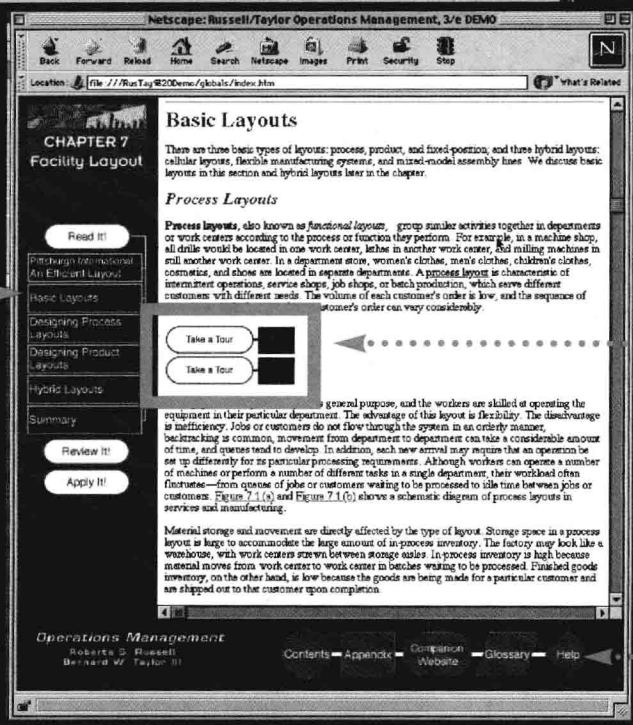
10 9 8 7 6 5 4 3

Read It

Allows students to scroll through each chapter section and simply point and click on highlighted topics to access definitions, applications, examples, photos, and related interactive elements.

Pause and Reflect

questions provide breaks in the reading and ask students to consider how they have experienced operations issues in their own lives.



Take a Tour

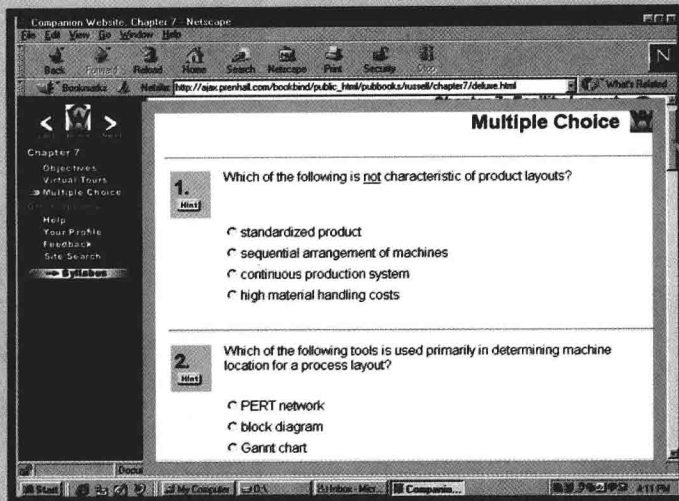
provides direct links to companies practicing concepts just discussed.

At the bottom, several icons provide direct links to a glossary, help menu, text appendices, and the custom Web site.

The CD-ROM format includes a menu on the left that enables the reader to directly access the same interactive features found within the scrolling text.

Review It

Enables students to access a variety of interactive elements so they can test their knowledge of the chapter material.



On-Line Quizzes

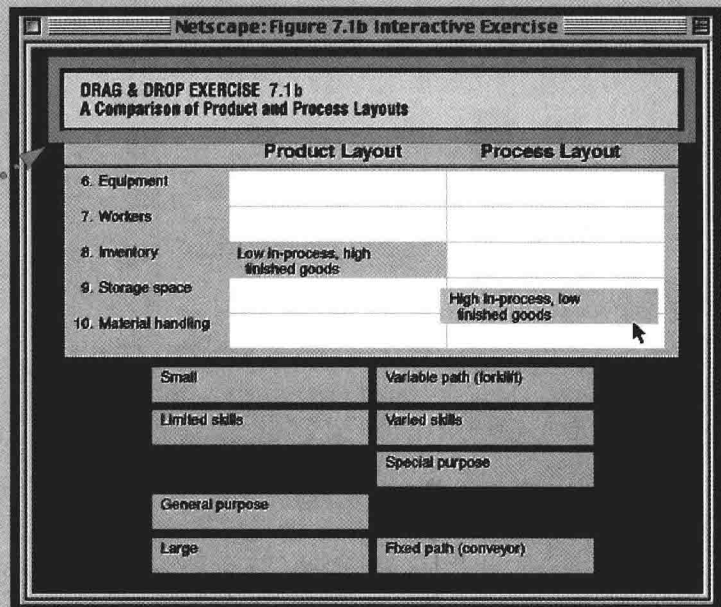
link to the text's Companion Web site, which contain multiple choice, true/false, matching, and labeling quiz questions. Quiz questions are graded and can serve as practice exams.

Drag & Drop Exercises

allows students to correctly answer questions by using their mouse to redraw figures or move objects around.

Review Questions

ask students to apply what they have learned from the chapter.



[Return to previous example](#)

[Return to previous example 7A](#)

Netscape: Russell/Taylor Operations M

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CHAPTER 7

Facility Layout

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[Apply It!](#)

EXAMPLE 7.1

Process Layout

View the animated example.

The layout solution department. The next move the space requirements around in or forward in order to fit window provide test (architect). Workstation job design, recombinant high water negot blocking in the worst final block diagram proposed shape of 11 rectangles, 12 display

Figure 7.3(a) above Figure 7.3(b) shows requested view of relative location of departments has been revised

Relationship Diagramming

The preceding solution procedure is appropriate as available. However, in situations for which adequately address the layout problem, the load from analysis or managers. Richard Heizer developed the relationship diagram, known as Muther's categories associated with the five vowels, A, E, I, O, U. The vowels match the first letters of U to each other. The diamond-shaped grid is used example, reading down the highlighted row in Figure 7.4, it is only if the letters are placed next to production, absolutely necessary that the locations be located next to production, importance that shipping and receiving be located next to production, and absolutely necessary that the locations be located next to production.

The information from Muther's grid can be used to construct a relationship diagram that evaluates existing or proposed layouts. Consider the relationship diagram shown in [Figure 7.5\(a\)](#). A schematic diagram of the six departments from Figure 7.5 is given in a 2 x 3 grid. Lines of different thicknesses are drawn from department to department. The thickest line (thick, four or five strands) identifies the closest pairing with the highest priority—that is, for which department is important, especially important, or absolutely necessary that they be located next to each other. The next thinnest line (medium, three strands) identifies the second-closest pairing, and so on.

Click on each Composite Movement to see it drawn.

Composite Movements

2 ↔ 3	200 loads
2 ↔ 4	150 loads
1 ↔ 3	110 loads
1 ↔ 2	100 loads
4 ↔ 5	60 loads
3 ↔ 5	50 loads
2 ↔ 5	50 loads
3 ↔ 4	40 loads
1 ↔ 4	0 loads
1 ↔ 5	0 loads

Lead Summary Chart

		To				
From	To	DEPARTMENT				
DEPARTMENT		1	2	3	4	5
1	2	—	100	50	50	—
2	3	60	—	200	50	40
3	4	40	100	50	—	50
4	5	50	50	—	—	—

Next, we evaluate the "goodness" of the layout by scoring it in terms of nonadjacent loads. The results are shown visually in Grid 1.

Nonadjacent Loads

1 ↔ 3	110
3 ↔ 4	40
	150

Example 7.1 Process Layout

Many chapters contain figures or graphs that come to life. Students can point and click to activate parts of the figure, and a voice-over explains the process while the animation is running.

Video Clips enable the reader to view operations in real companies.

allow students to review the full solutions to worked-out examples.

Netscape: Russell/Taylor Operations Management, 3/e DEMO

Back Forward Reload Home Search Netscape Images Print Security Stop

Location: <http://RussTay9620DEM/chap07/thead4.htm#v1n7.1> What's Related

CHAPTER 7 Facility Layout

[View photograph](#)

[View Video](#)

The advantages of cellular layouts are as follows:

- Reduced material handling and transit time.** Material movement is more direct. Less distance is traveled between operations. Material does not accumulate or wait long periods of time to be moved. Within a cell, the finished item from machine to machine has a characteristic of process layouts, where larger quantities are produced.
- Reduced setup time.** Since similar parts are produced in a cell, changeovers are required to set up a machine should not be the take that long to change over from one item to another frequently, and items can be produced a size.
- Reduced work-in-process inventory.** In a work cell, inventory is balanced so that no bottlenecks or signposts or machines. Less space is required for machines, and machines can be moved closer to increasing communication.
- Better use of human resources.** Typically, a worker is responsible for producing a completed part or self-managed team, in most cases more satisfied with the quality of their work. Labor resource. Workers in each cell are multifunctional within a cell or between cells as demand varies.
- Easier to control.** Items in the same part flow through the work cell. There is a significant reduction in material travel, such as where an operation has been performed, and the current status of a job. With fewer jobs processed through a cell, smaller batch sizes, and less distance to travel between operations, the progress of a job can be verified visually rather than by mounds of paperwork.
- Easier to automate.** Automation is expensive. Rarely can a company afford to automate an entire factory all at once. Cellular layouts can be automated one cell at a time. *Animated Figure 7.12* shows an automated cell with one robot in the center to load and unload material from several CNC machines and an incoming and outgoing conveyor. Automating a few workstations on an assembly line will make it difficult to balance the line and achieve the increases in productivity expected, handwriting.

[Read It!](#)

[Review It!](#)

Online Quiz

Drag & Drop Exercises

Solved Problems

Animations

- Example 7.1
- Figure 7.5
- Figure 7.12

Video Features

- Video 4.1
- Video 4.2

[Apply It!](#)

Operations Management

Roberta S. Russell
Bernard W. Taylor III

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Apply It

Extend Simulations

This exclusive student version allows users to build models and simulate operation processes. These simulations serve as visual interactive cases that allow students to develop new insights through observation and experiential learning.

Each simulation is based on a problem or case description and includes a fully operational model of the process described in the case. Students are first asked to run the initial model and make observations, and are then directed to make straightforward changes that encourage new insights.

CHAPTER 7
Facility Layout

Read It!
Review It!
Apply It!

Extend Simulation
Case Problems
• Case #1
• Case #2
Problems
Software Tools

THE COMPETITIVE EDGE

VW's Super Efficient Factory

Volkswagen build a \$250 million truck and bus plant in Resende, Brazil, that is likely to become the model for new-car factories around the world. Seven suppliers, each responsible for a single module, make components in the plant using their own equipment and attach the components to trucks and buses on the final assembly line. German manufacturer VDO Kassel, for example, is in charge of the truck cab. Marked off from other suppliers' workspaces by yellow lines on the floor, VDO workers install everything from cab seats to instrument panels. Then they attach the completed cab to the final chassis as it moves down the assembly line through VDO's section of the factory. Inventory costs are down because parts are made only on hour or so before they are needed and schedules are tightly coordinated.

In traditional automotive plants, suppliers deliver parts, assemblies, and modules to the final assembly line, but they never assemble them themselves. In plant runs, improvements by suppliers in final assembly have cut work hours by 12%. On-site supplier suggestions for improved designs are also expected to yield lower costs and improved quality.

The plant is run by a daily roundtable discussion between VW and its partners. "VW has to be part of the table, not its owner," says the plant manager. That's one big advantage of the new system—VW and its suppliers are all in it together. Individual capital investment is dramatically lowered with VW providing the building and assembly line conveyors, and the suppliers putting in their own tools and fixtures, and hiring their own workers. Only 200 of the 1,400 workers are VW employees. If sales of trucks and buses do not meet predictions, everyone takes a hit, not just VW.

Source: David Woodruff, "VW's Factory of the Future," *Business Week* (October 1, 1996): 52-56.

Exercises Using Extend!

This exercise uses the "Prov. basic.mcd", "Prov. 1.mcd", and "Prov. 2.mcd" models. Select File, then Open from the Extend menu. Navigate to the Extend directory on the CD, and locate the files.

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PROVINCIAL AUTOMOBILE LICENSE RENEWALS STUDENT SIMULATION EXPERIENCE

Questions to answer before exploring the Provincial Automobile License Renewals simulation.

1. Where is the bottleneck and ahead of which job are long lines likely to form?
2. What is your best guess about how long the lines will be over the lunch hour?
3. What is the average utilization for each of the four clerks? ...the photographer? ...the clerk?

Open the Basic simulation (*prov_basic.mcd*).

General description

To see the entire model, choose "Reduce to Fit" from the Model menu. As described in the case, the process comprises six jobs, all performed in sequence. Each job is depicted with labeled icon (transaction block), a queue block upstream, and a Release Resource block downstream. The queue block allows a line of customers to form ahead of each transaction and assigns a staff person to a customer as a staff person becomes available. The Release Resource block frees the staff person to be assigned to another customer after completing the transaction.

The flowchart illustrates the process:

```

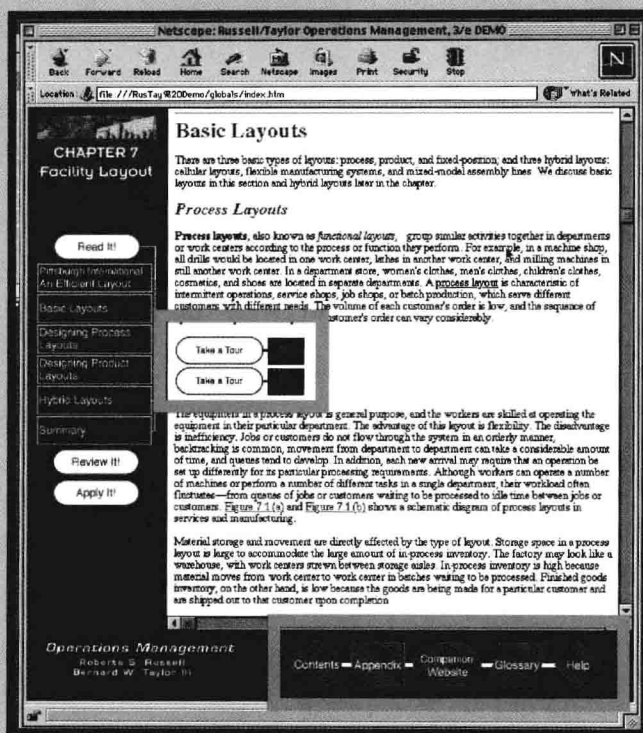
graph LR
    In[customer in] --> Clerk3[Clerk3]
    Clerk3 --> Payment[Payment]
    Payment --> Release[Release]
    Release --> Out[customer out]
  
```

The flowchart also includes a 'customer in' box and a 'customer out' box.

A. Simulate the basic process

The model is set to run for three 8.5-hour days (1530 minutes). From the Run menu, select Run Simulation.

Apply It



Take a Tour

provides direct links to companies practicing concepts just discussed. After touring a company's Web site, the student is asked questions that are directly related to the concepts discussed in that chapter.

Case Problems

Case studies, taken from the text, help students apply concepts learned from the chapter.

Software Tools

Included on the multimedia CD-ROM are two outstanding software tools, Excel OM and Extend. Excel OM allows students to use Excel to solve many of the text's problems; Extend enables students to build and simulate various models and processes.

*To my family
Tom, Travis, and Amy*

*To my parents
Jean V. Taylor and Bernard W. Taylor, Jr.
with love and appreciation.*

About the Authors



Bernard Taylor and Roberta Russell

Bernard W. Taylor, III, is the R. B. Pamplin Professor of Management Science and Head of the Department of Management Science and Information Technology in the Pamplin College of Business at Virginia Polytechnic Institute and State University. He received the Ph.D. and M.B.A. from the University of Georgia and B.I.E. from the Georgia Institute of Technology. He is the author of the book *Introduction to Management Science* (6th ed.) and co-author of *Management Science* (4th ed.), both published by Prentice-Hall. Dr. Taylor has published over eighty articles in such journals as *Operations Research*, *Management Science*, *Decision Sciences*, *IIE Transactions*, *Journal of the Operational Research Society*, *Computers and Operations Research*, *Omega*, and the *International Journal of Production Research* among others. His paper in *Decision Sciences* (with P. Y. Huang and L. P. Rees) on the Japanese kanban production system received the Stanley T. Hardy Award for its contribution to the field of production and operations management. He has served as President of the Decision Sciences Institute (DSI) as well as Associate Program Chair, Council Member, Vice President, Treasurer, and as the Editor of *Decision Line*, the newsletter of DSI. He is a Fellow of DSI and a recipient of their Distinguished Service Award. He is a former President, Vice-President, and Program Chair of the Southeast Decision Sciences Institute and a recipient of their Distinguished Service Award. He teaches management science and production and operations management courses at both the undergraduate and graduate level. He has received the University Certificate of Teaching Excellence on four occasions, the R. B. Pamplin College of Business Certificate of Teaching Excellence Award, and the R. B. Pamplin College of Business Ph.D. Teaching Excellence Award at Virginia Tech.

Roberta S. Russell is Professor of Management Science and Information Technology. She received the Ph.D. from Virginia Polytechnic Institute and State University, and M.B.A. from Old Dominion University, and a B.S. degree from Virginia Polytechnic Institute and State University. Dr. Russell's primary research and teaching interests are in the areas of production and operations management, service operations management, simulation, and quality. She has published in *Decision Sciences*, *IIE Transactions*, *The International Journal of Production Research*, *Material Flow*, *Business Horizons*, *Computers, Environment and Urban Systems*, *Computers and Operations Research* and others. She is also co-author of the Prentice-Hall text, *Service Operations Management*. Dr. Russell is a member of DSI, TIMS, ASQC, POMS and IIE, and a certified fellow of APICS. She is Past Vice President of POMS, Past President of the Southwest Virginia Chapter of APICS and has held numerous offices in Southeast DSI. She had received the R. B. Pamplin College of Business Certificate of Teaching Excellence, the University Certificate of Teaching Excellence, and the MBA Association's Outstanding Professor Award. She is also listed in Outstanding Young Women of America and is a recipient of the Virginia Tech Outstanding Young Alumna Award.

Preface

In the original first edition of this text we wanted to create a textbook in operations management that was very readable for the student—clear, concise, and organized. We also wanted to include lots of special features and examples to make the topics interesting. We wanted the concepts we described to be logical and easy to understand. Most importantly, we wanted the student to feel excited about operations management because we live in an exciting time with many new, unique, and interesting changes occurring in manufacturing and service operations around the world. With each subsequent edition, including this third edition, we have attempted to maintain these original goals and to keep our text current and completely attuned to new innovations. As such, a major thrust of this new edition is to reflect the changes in operations management resulting from the advances in new computer technologies and information technology.

No other innovation has affected operations management in the past few years as much as computer technology and the Internet, and this is no less true in the publishing industry. Thus, much of the material we have added to this third edition focuses on how these new computer technologies affect operations in a general sense. However, we also make full use of this technology as a learning and teaching medium in our text presentation. In fact, the major feature of this third edition is the inclusion of new multimedia technologies and the Internet via a CD-ROM that accompanies the text.

This unique CD contains a multimedia version of the text that enables students and instructors to read an animated, interactive version of the text directly from the computer screen. The user can access visual, instructional, and review materials; and apply what is learned with easily assessable computer applications and exercises. We believe this provides a unique, innovative approach to operations management instruction. It provides both students and instructors with an alternative instructional medium that they have become increasingly used to and comfortable with—the computer. The “medium” is literally the “message” in this new third edition.

Multimedia Version

The multimedia CD version of the third edition includes the same complete text as the print version as well as many unique, interactive, instructional features not available in the print version. These features include animated figures and graphs, video clips, interactive applications and exercises, direct links to Internet sources and resources, custom-built simulations, review exercises, and online quizzes. These unique, interactive elements more actively involve the student in the learning process.

The CD provides a format that enables users to move easily and quickly among topics, chapters, text features, the new interactive resources, and the Internet. As they scroll through the text, readers can simply point and click on highlighted topics or features within the text to access related topics, definitions, applications, examples, photos, and the interactive features. In addition to a scrolling text, the CD format includes a sidebar that enables the reader to access the same interactive features more directly from the menu on the sidebar. The sidebar menu includes two additional modules, referred to as “Review It” and “Apply It.” The “Review It” module enables users to link to on-line quizzes, “drag ‘n’ drop” exercises, solved example problems, anima-

tions, and video clips. The “Apply It” module allows students to apply concepts with exercises based on custom-built simulations, text cases, Internet cases and plant tours. The multimedia CD version with these unique, interactive features provides a robust and fun approach to the study of operations management.

Extend Simulation Package

Included on the multimedia CD is a limited version of Extend + Manufacturing 4.0, the simulation software developed by Imagine That, Inc. Extend is a powerful simulation package suitable for modeling or reengineering almost any process. The limited version included with this text is a very rich package complete with tutorial, on-line manuals, a variety of libraries (model components), and save and print capabilities. It allows users to build models of up to 75 blocks. This limited version of Extend is useful for modeling small but meaningful problems and can be used for classroom demonstration, homework, and class projects. It is an excellent package for demonstrating operations processes and teaching simulation.

Simulation Exercises

Also on the multimedia CD are several simulations prepared specifically for this text and designed to run on the version of Extend included here. These simulations, developed by Robert Klassen at the University of Western Ontario, serve as “visual interactive cases” that allow students to develop new insights through observation and experiential learning. Each simulation is based on a problem or case description and a fully operational model of the process described in the case. Students are asked to run the initial model and make observations and then are directed to make straightforward changes that encourage critical thinking.

Major Text Themes

We have sought to make this new edition of our text contemporary and comprehensive. We want to make sure that the many new and important changes taking place in operations today are conspicuously integrated with the more traditional topics in operations management. That is why we focus a lot of attention on contemporary topics such as quality, competitiveness, and strategy. Although the text chapters are organized around functional topics such as product and service design, total quality management, facility layout, process planning, scheduling and supply chain management, we always attempt to explain and show how these topics are interrelated within common themes such as quality, competitiveness, and strategy.

Although most firms express their goals in terms of customer satisfaction or level of quality, their underlying objective is to beat out their competitors. One way in which companies can gain a competitive edge is by deploying the basic functions of operations management in a more effective manner than their rivals. In each chapter we give numerous examples of how companies deploy specific operations functions in a way that has provided them with a competitive edge and made them successful. We begin our discussion of competitiveness in Chapter 1 and continue throughout the text with “Competitive Edge” boxes describing how successful companies have gained a competitive edge through operations.

A company’s battle plan for achieving a competitive edge is its strategy. The success of a strategic plan is determined by how well a company coordinates all of its internal processes, including operations, and brings them to bear on its goals. Throughout the

text we try to show how the functions and processes described in each chapter fit into a company's strategic plan. In each chapter we emphasize the need for considering the overall strategic implications of particular operating decisions. For example, in Chapter 3 on quality management we discuss the strategic implications of TQM, in Chapter 9 on supply chain management we emphasize that supply chain design is a strategic issue, and in Chapter 11 we discuss capacity planning as a long-term strategic decision.

Services and Manufacturing

We have attempted to strike a balance between manufacturing and service operations in our text. Traditionally operations management was thought of almost exclusively in a manufacturing context. However, in the United States and other industrialized nations, there has been a perceptible shift toward service industries and away from manufacturing. Thus, managing service operations has become equally as important as managing manufacturing operations. In many cases, operations management techniques and processes are indistinguishable between service and manufacturing. However, in many other instances, service operations present unique situations and problems that require focused attention and unique solutions. We have tried to reflect the uniqueness of service operations in our text by providing numerous examples that address service situations and by providing focused discussions on service operations when there is a clear distinction between operations in a service environment and in a manufacturing environment. For example, in Chapter 3 on quality management we specifically address the unique conditions of TQM in service companies; in Chapter 5 on product and service design we emphasize the differences in design considerations between manufacturing and services; and in Chapter 11 we discuss aggregate planning in services.

Quantitative versus Qualitative Processes

We have also attempted to strike a balance between the quantitative aspects of operations management and the qualitative (or behavioral) aspects. Often in the past, operations management texts have presented themselves as a loose compilation of different quantitative techniques applied to various functional topics. In the contemporary world of operations management, the quantitative and technological aspects are probably more important than ever. However, the ability to manage people and resources effectively, to motivate, organize, control, evaluate, and particularly adapt to change, have become critical to competing in today's international markets. Thus, throughout this text we seek to explain and demonstrate how the successful operations manager manages, and when quantitative techniques and technology are applicable; how they are used to help manage and make decisions.

| *Changes to this Edition*

In an effort to keep our book current and abreast of contemporary trends in operations management, we have altered or made significant additions to many of the chapters in this edition.

Chapter 1 introduces the concept of value chains, adds a new section on services, updates our section on globalization, and discusses new trends like Internet commerce and supply chains.

Many of the changes we have made to this new edition reflect the increasing importance of viewing operations as a group of interrelated and dependent *processes*. As such, throughout the text we emphasize the understanding of processes as an important

aspect of understanding and managing operations. For example, in Chapter 2 on operations strategy, we expand our discussion of processes with the addition of a new section on “Process Centered Strategies.” In Chapter 3 on quality management, we have included a new section on “Process Improvement” and additional discussion of process improvement teams. Chapter 6 has a new title, “Process Planning, Analysis, and Reengineering,” and includes expanded sections on “Process Analysis” and “Process Reengineering.” The use of SAP as an example of a process approach is also included in this revised chapter.

Another increasingly important change in operations is the growth of *services* and service industries. Although our previous editions emphasized service operations management, in this new edition we have expanded our discussion of services even more. Chapter 4 on statistical quality control includes an additional service example. Chapter 5 on product and service design includes an expanded discussion of service design. Chapter 15 on just-in-time systems has an expanded discussion of JIT in services. Many of the chapters include new examples and applications (located in the Competitive Edge boxes) that focus on services.

One of the most important innovations in operations management in the past few years has been the increased use of enterprise resource planning (ERP) systems for global operations management produced by such software firms as SAP, Oracle, and PeopleSoft. As a result in Chapter 9 on supply chain management we have added a new section on “Supply Chain Linkages” that includes discussions of ERP and SAP, as well as a new section on the Internet and the Supply Chain. Chapter 13 on material requirements planning includes new sections on ERP and SAP. As we previously mentioned, Chapter 6 on process planning, analysis, and reengineering includes the use of SAP as an example of a process approach.

We have also made several other major changes in this edition to reflect new technologies and trends. As a result of the increasing use of spreadsheets (and specifically Excel) as an operations management tool, in Chapter 10 on forecasting we added the sections “Time Series Forecasting Using Excel and Excel OM,” and “Regression and Multiple Regression Forecasting with Excel.” The Chapter 12 Supplement is completely new and now focuses on simulation using Excel. Chapter 6 on process planning, analysis, and reengineering includes an expanded section on “Technology Decisions” (with additional discussion of information technology). Chapter 11 on capacity planning and aggregate production planning includes an expanded discussion of demand management.

Learning Features

This edition includes many features, which we hope will help sustain and accelerate the student’s learning of the material. Many of these features remain from the first two editions, but others are new to this edition. We have already described the most prominent new learning feature—the addition of the multimedia CD version of the text with its many visual learning aids. In the following sections we summarize some of the other learning features in the text.

Text Organization

One of our most important objectives is to have a well-organized text that flows smoothly, follows a logical progression of topics, and places the different functions of operations management in proper perspective. We have organized this new edition of our text into three groupings. The first four chapters focus on The Strategy of Produc-

tive Systems. These chapters seek to place operations management in a proper perspective and emphasize the importance of strategy and quality for competing in today's highly competitive global marketplace. Chapters 5 through 10 constitute a group we refer to as Designing Productive Systems, and Chapters 11 through 17 focus on Operating Productive Systems. Thus a logical flow is created from strategically establishing the operating environment and defining a quality program, to designing the operations function to meet the company's strategic goals, and finally to producing the product or service that will achieve the strategic goals and enable a company to compete in a global market.

The “Competitive Edge” Application Boxes

The “Competitive Edge” boxes are located in every chapter in the text. They describe how a company, organization, or agency uses the particular management technique or function being discussed in the chapter to compete in a global environment. There are more than 50 of these boxes throughout the text, and they encompass a broad range of service and manufacturing operations, foreign and domestic. In the multimedia CD version these boxes can be accessed from sidebar links.

Chapter Introductory Applications

Each chapter begins with a description relating the subject of the chapter to an actual application in a company. These applications are provided first to give the reader a realistic perspective of the topic before embarking on its discussion.

Photos

The text includes a variety of color photographs that enhance and complement the presentation of the written textual material. These photos accompany the introductory application that starts off each chapter, as well as various other points of interest within the body of the chapters. Each photo is accompanied by an extensive descriptive caption that complements the text material. Photos are designated by icons in the multimedia CD version, which can be accessed by clicking on the icon.

Operational Decision-Making Tools Supplements

The text includes four quantitative chapter supplements that address some of the more traditional and mathematically rigorous quantitative techniques used in operations management: decision analysis, linear programming, transportation solution methods, and simulation. These topics have been segregated from the normal chapters because in many instances students already will have studied them in a separate quantitative methods course. In addition, their study can be time-consuming, and often the instructor will prefer not to take time from the coverage of other important operations management topics. Computer solutions of sample problems using software and Excel spreadsheets are demonstrated.

Marginal Notes

Notes that are included in the margins serve the same basic function as notes that students themselves might write in the margin. They highlight certain topics to make it easier for the student to locate them, summarize topics and important points, and provide brief definitions of key terms and concepts.

Examples

Examples are liberally inserted throughout the text, primarily to demonstrate quantitative techniques and to make them easier to understand. The examples illustrate how the results of the quantitative technique can be used to help the manager make decisions. The examples are organized into a problem statement and solution format. We also make frequent use of real world applications, often citing the experiences of companies as they relate to individual topics.

POM for Windows Computer Software

This text features illustrations from a computer software package, POM for Windows. A disk is packaged with each instructor's complimentary copy of this text. POM for Windows is very user-friendly software that solves problems in all the decision-making areas of operations management. It is easy to understand and use, requiring virtually no preliminary instruction except for the "help" screens that can be accessed directly from the program. POM for Windows is used frequently in the text to show how to solve sample problems on the computer. This software can be packaged—at a reasonable additional cost to students—with each copy of the text. If you wish to order this software with the text, please be sure to order ISBN 0-13-016050-4, as this will ensure that you get the software at a discounted price. For further details, contact your Prentice Hall sales representative or phone Prentice Hall at 800-526-0485.

Excel and Excel OM

Although POM for Windows can be used to solve almost any quantitative problem in the text, we also solve many of the quantitative examples in the text with Microsoft Excel. Spreadsheets have become an increasingly popular and convenient means for solving operational problems.

In this third edition we have expanded the use of Excel examples to solve quantitative problems and added a new spreadsheet tool, Excel OM. Excel OM is an Excel add-in that allows Excel to easily solve certain types of quantitative problems including decision analysis, queuing, transportation, forecasting, and inventory problems, thus reducing the setup time. Excel OM is much more versatile than Excel templates and much easier to use.

Excel and Excel OM examples are included in the print version of this edition. We have also written a new Chapter 12 Supplement on Simulation that uses Excel to simulate operational problems.

Excel OM is provided free on the multimedia CD packaged with this text. Excel and Excel OM examples from the text are also prepared in spreadsheet format and provided on the CD.

Web Sites and Home Page

This text is accompanied by a custom-designed Internet home page, which can be accessed at <http://www.prenhall.com/russell>. This home page contains many resources that help to enrich the course. In addition, there are many resources for the instructor to help in course preparation and management. Throughout the text **WWW** icons in the margins identify companies and topics, discussed in the text, that can be accessed on the Internet. If you are interested in accessing one of the highlighted Web sites, simply go to the appropriate text chapter on our home page and scroll down the Web site identified by the icon in the margin of the text and click on it. In addition to the Web site links provided for each chapter, students will be able to access Internet exercises,



virtual factory tours, chapter lectures, interactive chapter quizzes, and sample student projects. Faculty members will be able to access sample course outlines, annotated lecture slides, projects and special assignments, and in-depth background material not included in the text.

The multimedia CD version of the text has direct links to many of the resources on this Web site. Readers can click on the highlighted item to access the designated Web site via the Internet.

Lands' End Boxes and Videos

In ten of the chapters we illustrate various subjects and topics with brief descriptions of operations at Lands' End, the national catalog retailer. These boxes are similar to the "Competitive Edge" boxes used throughout the text. Taken together, they have the advantage of describing operations across the breadth of an entire company, and because it is a service company, they are particularly insightful. Seven of the Lands' End boxes are accompanied by video programs that accompany the text. The Lands' End boxes and videos are linked directly to the multimedia CD version of the text where they can be easily accessed.

Summary of Key Formulas

Following the summary at the end of each chapter is a "Summary of Key Formulas" that provides a list of the most important formulas derived in the presentation of any quantitative techniques introduced in the chapter. These enable the students to turn to a specific location to refresh their memories about a formula without having to search through the chapter. The formulas are also provided electronically in the faculty section of the Web page for easy reproduction for exams.

Summary of Key Terms

Following the "Summary of Key Formulas" at the end of each chapter is a "Summary of Key Terms." It provides a list of the most important terms for the chapter and their definitions. This list enables the students to refresh their memories about an important term without having to search through the chapter or marginal notes.

Solved Sample Problems

At the end of each chapter just prior to the homework questions and problems, there is a section with solved examples that serve as a guide for doing the homework problems. These examples are solved in a detailed, step-by-step fashion. These same examples are provided in an interactive mode on the multimedia CD in the "Apply It" module on the sidebar. The example solutions are provided step-by-step by clicking after each successive solution step.

Supplemental Items

The text is accompanied by a number of supplemental items that the instructor may wish to use in the course. These supplements include a set of videos that complement the textual presentation of material in a number of locations throughout the text. The videos include *Competitiveness and Continuous Improvement at Xerox*, *Teams and Employee Involvement at Hewlett-Packard*, *Statistical Process Control at Kurt Manufacturing*, *Process Strategy and Selection*, *Flexible Manufacturing Systems*, *Operations Strategy at Whirlpool*, *Product Design and Supplier Partnerships at Motorola*, *Service Quality*