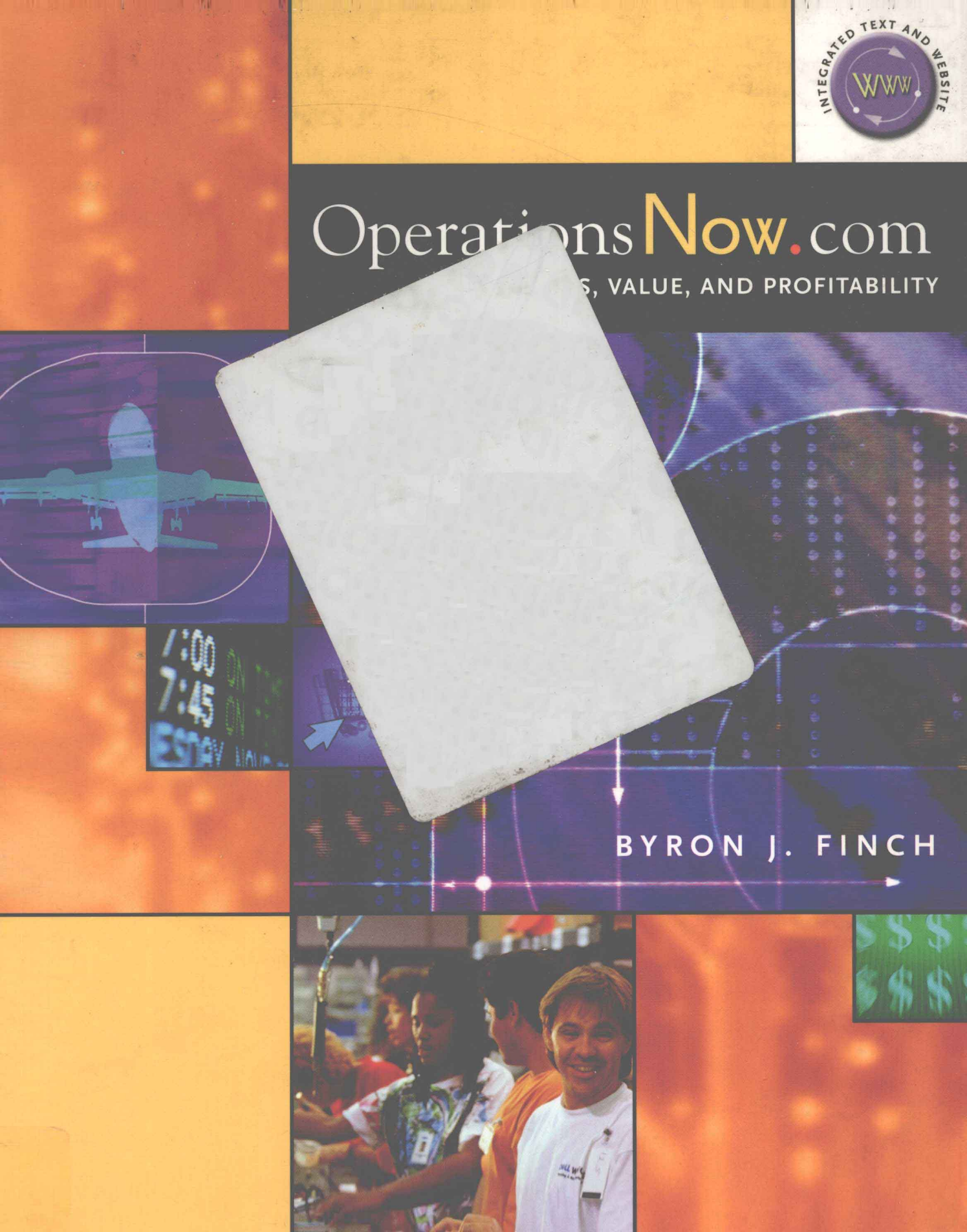
INTEGRATED TEXT AND WEBSITE
WWW
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S, VALUE, AND PROFITABILITY
BYRON J. FINCH

OperationsNow.com

PROCESSES, VALUE, AND PROFITABILITY

BYRON J. FINCH
Miami University

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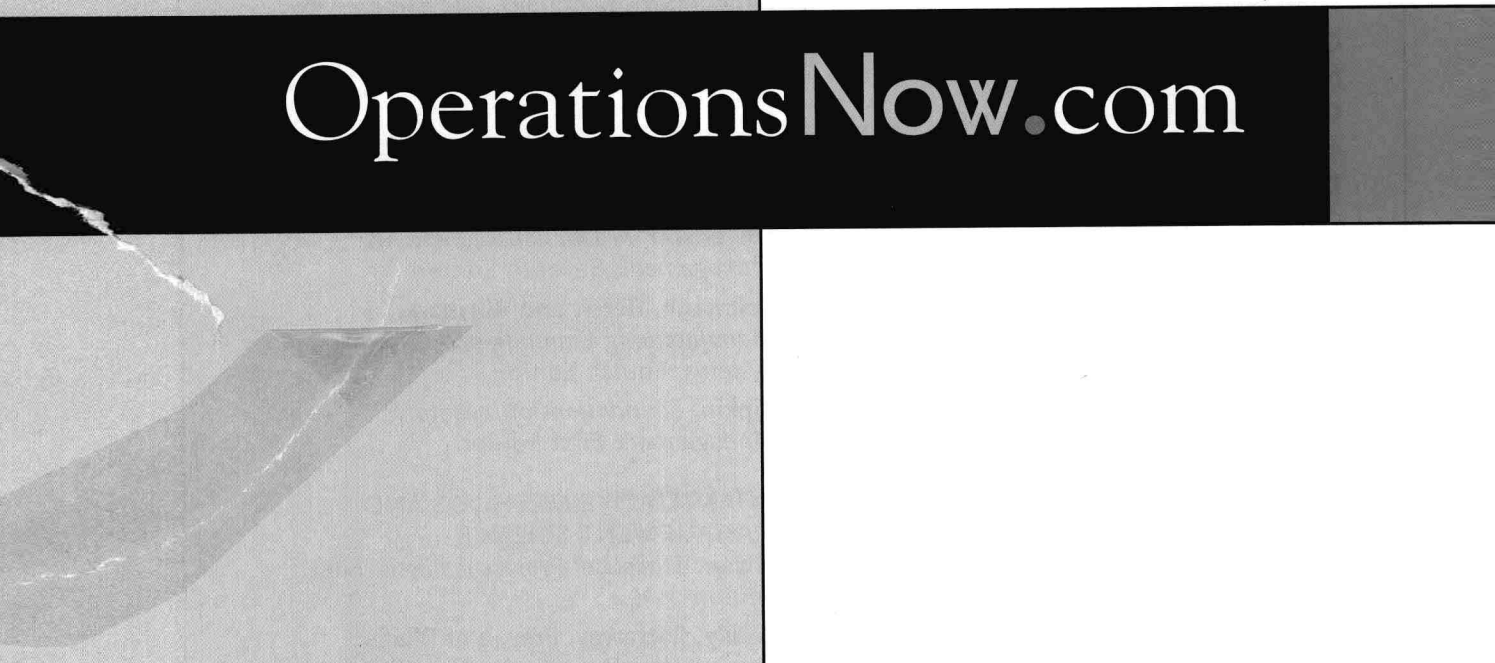
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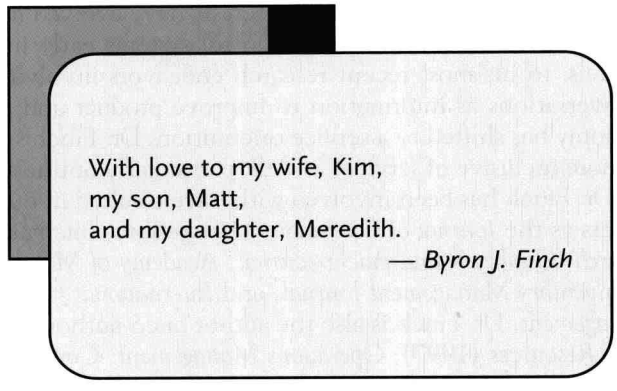
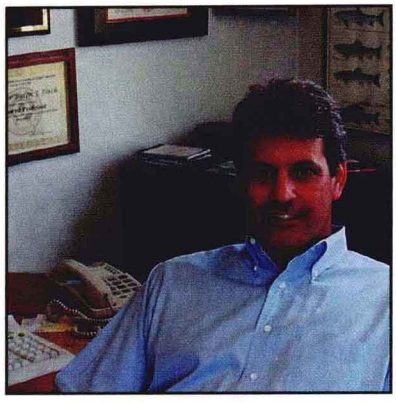

With love to my wife, Kim,
my son, Matt,
and my daughter, Meredith.
— Byron J. Finch



BYRON J. FINCH

Byron J. Finch is a Professor of Operations Management in the Richard T. Farmer School of Business Administration at Miami University, Oxford, Ohio. He earned his BS and MS degrees from Iowa State University and received his doctorate from the William Terry College of Business Administration at the University of Georgia in 1986. He began teaching and research responsibilities in 1987 at Miami University, where he has taught operations management courses at the undergraduate and graduate levels.

Dr. Finch's research interests have evolved from the topic of manufacturing planning and control systems early in his career, to spreadsheet models, to his most recent research endeavors involving the use of Internet-based conversations as information to improve product and service quality. As the U.S. economy has shifted to a service orientation, Dr. Finch's research interests have become more inclusive of services as well, particularly online services. Research projects that Dr. Finch has been involved with have resulted in numerous publications in such outlets as the *Journal of Operations Management*, *International Journal of Production Research*, *Quality Management Journal*, *Academy of Management Journal*, *Production and Inventory Management Journal*, and *International Journal of Quality and Reliability Management*. Dr. Finch is also the author or co-author of *The Management Guide to Internet Resources* (1997), *Operations Management: Competing in a Changing Environment* (1995), *Spreadsheet Applications for Production and Operations Management* (1990), and *Planning and Control System Design: Principles and Cases for Process Manufacturers* (1987). In addition to the traditional print publications, Dr. Finch has been the managing editor for the Operations Management Center website (http://www.mhhe.com/pom/) since 1998. Dr. Finch serves on the editorial boards of the *Journal of Operations Management* and the *Quality Management Journal*.

Dr. Finch has been actively involved in teaching innovation since beginning his academic career in 1986. He received the Southern Business Administration Innovative Teaching Award in 1987, the NCR Computer Innovation Award in 1990, and the Richard T. Farmer School of Business Teaching Award in 1996. Dr. Finch was nominated for the Miami University Associated Student Government Teaching Award in 2002.

Dr. Finch has held various offices in the Midwest Decision Sciences Institute, including president. He has also been involved in Decision Sciences Institute at the national level and is currently a vice president. Dr. Finch is also a member of the Production and Operations Management Society (POMS).

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BRIEF CONTENTS

In the years since I began studying and teaching operations management, dramatic changes have occurred both in the business environment that informs the operations management course and in the classroom where it is conducted. Certainly what we teach our students has changed over the years in ways that might have seemed inconceivable only a decade or two ago.

The discipline itself has changed in at least three fundamental ways. First, its focus is no longer limited to manufacturing concerns but, reflecting the direction in which our economy is moving, has broadened to include a focus on services as well. Second, the body of knowledge constituting "operations management" has expanded considerably in recent years. Lately such areas of study as supply chain management, project management, ebusiness and ecommerce, and ERP systems have found their way into the operations management curriculum. Finally—and this is perhaps the most critical change—it has become increasingly difficult to carry on a meaningful discussion of the operations function without discussing other functional areas of business. Regardless of the vantage point from which one begins the study of operations management, sooner or later one observes the operations function interacting with other business functions—intersecting with marketing here, nudging up against finance there. In short, it is no longer possible to view operations as less critical than, or in isolation from, other key functional areas of business. Well-designed, well-implemented operations, like a soundly devised and executed marketing plan, are vital to achieving and maintaining a company's competitive edge. This last observation is critical for students to understand.

Beyond the changes in our discipline, however, an even more fundamental change in our students has occurred. As primary beneficiaries of rapid advances in information technology, students today have easier and quicker access to more information than any previous generation of students. Such access has made them arguably more sophisticated than their counterparts of a decade earlier; but having access to such an abundance of information has just as often led to information overload. Students are exposed to more information, but, because of its sheer volume, are often discouraged from absorbing it. If their desire for or access to information is greater, their willingness to analyze and assess that information is not always evident. Students are indisputably more knowledgeable today than ever before, but is their ability to acquire knowledge matched by their ability to use it?

These are some of the fundamental issues that I found facing me as I began to write this book. How can I create a table of contents that accurately reflects the state of operations management today? How can I package this information in a way that will be both appealing and digestible to today's students—not just to operations management majors, but to all business students? Finally, how can I exploit the new information technology to produce better, more relevant instruction and learning materials?

OperationsNow.com is my attempt to answer these questions. I have tried to address both the changing field of operations management—hence the "Now" of the title—and the variety of media—suggested by the ".com" of the title—currently at our disposal that we can use to help improve the quality of the instruction we deliver. The ".com" of the title is also an acknowledgment of our changing economy and, hence, our changing view of operations. Finally, ".com" is meant to signal to students that this book not only recognizes the new frontier of cyberspace, but it makes use of it as well. Every attempt has been made to ensure that the website accompanying *OperationsNow.com* is a seamless extension of the text rather than simply an appen-

dix to it—that it is more than a repository for ancillaries that might just as effectively have been produced in print. From its conception, the website was intended to host those activities that are best carried out on the Internet and that could not be done, or could be done less effectively, in print. It is certainly possible to use the textbook independently of the website and the website independently of the text. But using the two together provides an infinitely richer and more rewarding learning experience for students.

Just as the website differs from others in its degree of integration with the printed text, the textbook itself is organized differently from other books written for the introductory operations management course. At the core of every business is the need to create products and services of value and sell them at a price that is greater than the cost of creating them. Operations management is the management of the processes used to create that value and the resources needed to make those processes possible. Business profitability—measured by profit margin, return on assets, and return on equity—depends on a firm's ability to generate sales of the products and services created, and to manage the associated costs, so that a margin of profit is attained. Because it falls within the scope of the operations function both to control the cost of resources required to create and manage the processes needed to produce the value that customers purchase, operations management has a significant impact on the profitability of a business, its ability to compete, and its ultimate success.

Advances made in product and service quality evolve from pressures that force businesses to differentiate themselves from their competition. New products and services often start with the idea of "building a better mousetrap." A different perspective on solving an old problem, combined with the availability of new technologies, is often all that is needed to form the impetus for a product or service that is truly different. It is precisely this series of events that resulted in *OperationsNow.com*, which takes a giant step forward that differentiates it from other operations management texts.

Because it dictates the financial productivity of a firm's assets, operations management is at the core of business success; yet operations is often viewed by business students as an inessential part of their business education. This misperception makes the course difficult to teach. More important, it can result in students entering the workforce who are insufficiently acquainted with operations management and the pivotal role it plays in the success of virtually any business. *OperationsNow.com* addresses this challenge by dramatically changing the context in which operations management is presented. *OperationsNow.com* places operations decisions and concepts into their real-world context—the financial performance of the firm—through the use of a unique organizational model: the resource/profit model. Introduced in detail in Chapter 1, this model places the content of the text within the context of financial performance and provides students with an intuitive organizational framework within which the operations function can be regarded. The model's financial foundation enables *OperationsNow.com* to present operations management concepts and tools in a way that will interest all students whose futures will include increasing business profitability.

Used in conjunction with the integrated website, *OperationsNow.com* makes a significant step forward in the delivery of operations management content. *OperationsNow.com* is an unconventional yet appropriate title for a textbook that is not a traditional text. It moves beyond the traditional framework by exploiting Internet technologies to provide a wealth of content and support that is accessible online at http://www.operationsnow.com. To maximize the effectiveness of both delivery channels, each is used for what it presents best. The text is used to deliver a basic narrative covering the fundamental concepts of operations management. The website, by contrast, is used to deliver what it is best at delivering: dynamic content, video, interactive

models, and resources maintained online by businesses. By using the resource/profit model as an organizational framework for the text and as a navigational framework for the website, *OperationsNow.com* provides an integrated "multichannel" learning/teaching environment that is greater than the sum of its components.

Using this text in their courses, students will learn that a fundamental prerequisite to the success of any business is its ability to combine resources to create value. It will become clear that in order to compete effectively, the value created must exceed that of competitors. The ownership of the resources is necessary but is not alone sufficient to ensure that enhanced levels of value are created. The firm must creatively combine resources into value-creating processes. Students using this text will further learn that for many businesses, enhancing product value by adding services has proven to be a very successful way to differentiate.

The same principle applies to this textbook in relation to its competitors. Like other innovative products and services, *OperationsNow.com* differentiates itself by combining traditional resources with exciting new pedagogical assets never before utilized in operations management education. It is ultimately not what *OperationsNow.com* offers but how its assets are used that will enhance the value of the class. The combination of the text "product" and cutting-edge online "services" creates a learning/teaching environment that is exciting, challenging, different, and—I believe—better equipped than traditional textbooks to serve the needs of today's students.

The resources—both text and web-based—designed to enhance *OperationsNow.com* are discussed in detail in the Guided Tour, which begins on page xx.

ACKNOWLEDGMENTS

The first edition of any book succeeds because of the combined efforts of a number of people who contribute in a variety of ways, and I owe all of those people my thanks. First of all, thanks to my family, Kim, Matt, and Meredith, for supporting and tolerating my work on this project and occasional need to be away from home. I would also like to thank my colleagues at the Richard T. Farmer School of Business Administration at Miami University for their support.

As in any large project, one person cannot contribute all of the content. I would like to thank Jaideep Motwani for his work on the test bank, Sean Lancaster for the end-of-chapter problems, and Joe Felan for accuracy checking. I would like to thank the following for reviewing and/or focus group participation: John Nicholas, Loyola University, Chicago; Joe Felan, Baylor University; Victor Sower, Sam Houston State University; Ken Klassen, California State University, Northridge; Brad Meyer, Drake University; Chwen Sheu, Kansas State University; Scott Dellana, East Carolina University; Tom Wilder, California State University, Chico; Gene Fliedner, Oakland University; Barb Flynn, Wake Forest University; Keith Willoughby, Bucknell University; Stella Hua, Oregon State University; Bill Tallon, Northern Illinois University; Rhonda Lummus, Iowa State University; Vijay Agrawal, University of Missouri at Kansas City; Bharatendu Srivastava, Marquette University; Donald A. Carpenter, University of Nebraska at Kearney; Paul Hong, University of Toledo; T. J. Wharton, Oakland University; Francis O. Pianki, Anderson University; Mehmet Barut, Witchita State University; Lawrence Fredendall, Clemson University; Britt Shirley, University of Tampa; Nancy Hyer, Vanderbilt University; Marilyn Smith, Winthrop University; Ann Marucheck, University of North Carolina, Chapel Hill; Richard Reid, University of New Mexico; Charles Petersen, Northern Illinois University; Zhimin Huang, Adelphi University; William Pinney, Alcorn State University; Daniel Krause, Arizona State University; Alan Khade, California State University, Turlock; Nael Aly, California State University, Turlock; Gilvan Souza, University of Maryland at College Park; Joel Wisner, University of Nevada at Las Vegas; Rajesh Srivastava, Florida Gulf Coast University; Henry Aigbedo, Oakland University; Bob Ash, Indiana University at New Albany; Christopher Craighead, University of North Carolina, Charlotte; Edie Schmidt, Purdue University; Mary J. Meixell, George Mason University; Vicente Vargas, Emory University; Madeline Pullman, Colorado State University; and Michael Mancuso, Purdue University.

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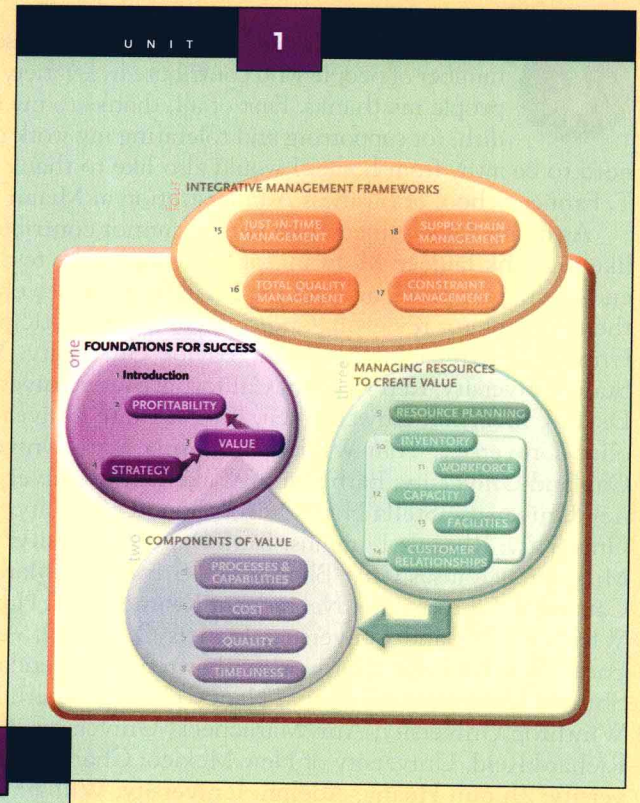
Guided Tour

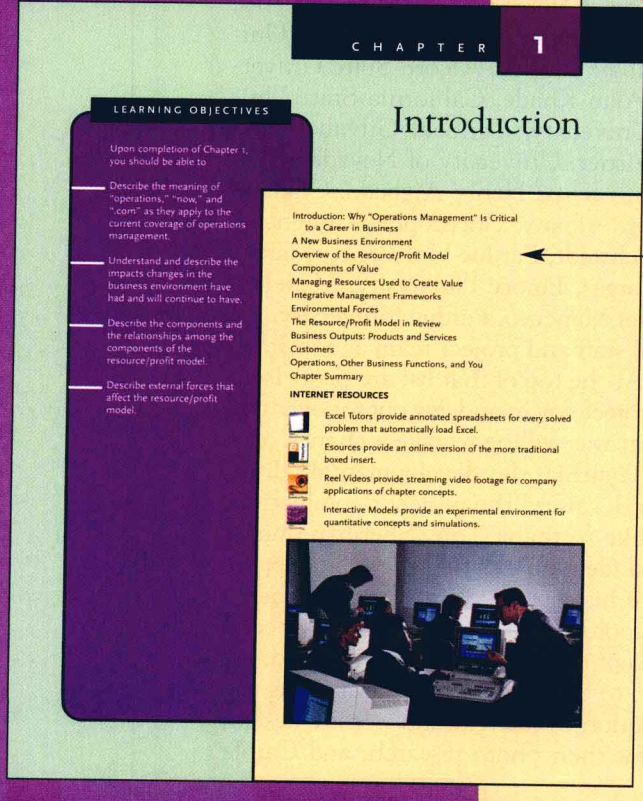
Text Resources

The resource/profit model is used as an organizational framework throughout the text. It appears on all unit and chapter openers, with the current unit or chapter highlighted, emphasizing the conceptual structure of the text. This content model also serves as the navigation tool to the website, further integrating the online and text resources.



Learning Objectives

This is a list of key points that should be understood when the student has finished reading the chapter.



Chapter Outline

The chapter outline pulls out the main topic headings with page numbers for easy reference.

Text Resources

Example 2.3 **Utilization Calculation**

A newly purchased welding robot has been monitored for the past week to provide information to be used for scheduling. The observations are noted in Exhibit 2.6. What was the total utilization of the robot? What impact on utilization did each category of downtime have?

EXHIBIT 2.6 **Utilization Calculations for Example 2.3**

Reason for Downtime	Minutes	Utilization Impact (%)
Operator/monitor not present	107	4.46
Preventive maintenance	149	6.21
Breakdown	40	1.67
Adjustments and programming	160	6.67
Material quality problems	46	1.92
Total downtime	502	20.92
Total uptime	1,898	
Total time available: 2,400		
Total utilization: 79.08%		

Solution

Total utilization can be calculated by dividing the minutes of total uptime by the total time available. The utilization impact of each category of downtime is determined by dividing the minutes of downtime for each category by the total available minutes. The results of these calculations are presented in Exhibit 2.6. Spreadsheet calculations to obtain utilization values are presented in Excel Tutor 2.3.

Examples

Throughout the chapters, problems are worked through and solved in examples, which give the student hard numbers to apply to realistic situations. The examples provide students with the quantitative tools they'll need to use in their careers and demonstrate their use. Each example in the text has an associated Excel Tutor available on the OperationsNow.com website, which solves the problem using the most common spreadsheet program in use. Excel Tutors are described in more detail in the Web Resources section of this Guided Tour.

OM on Site

These boxes call attention to and discuss real businesses that exemplify (for better or worse) the topic at hand in the text. They put a business that students will recognize into the context of the chapter, and also into the context of the resource/profit model, showing how operations management has affected that company's profits or creation of value.

Every company profiled in the chapter's OM on Site sidebars is linked to the OperationsNow.com website.

Adobe: Turning a Popular Product into a Profitable Product

In 1992, Adobe Systems demonstrated software that enables a document created on one computer to be opened, edited, and saved on another computer, even with different applications and operating systems. Despite the fact that this was three years before the introduction of the World Wide Web, it was lauded as the most significant technology at Comdex, an annual technology show. The concept of document sharing was new, it was viewed positively, but its importance was not really known.

In the years since its introduction, 320 million copies of the Adobe Acrobat Reader have been distributed. The Reader, however, is free. Since 1993, fewer than 6 million copies of the full program have been sold. Adobe products have a tradition of dominating their market segments. They are driven by the pledge to allow users to publish content wherever the user wants, whether it's a printer, web page, cell phone, handheld device, PC, or Internet appliance.

But in the early and mid-1990s, the concept of electronically sharing documents wasn't on anyone's radar screen. Over time, the number of Acrobat Reader users grew. By the end of 1997, some 11.7 million had been distributed. By the end of 1998 that figure had jumped to 57.4 million. During that time, however, the sale of the full program still represented less than 7 percent of Adobe's $894 million in revenues.

Increasing the sales of the complete program was critical to Acrobat's success, but Adobe was not successful at doing it. Finally, by building alliances with system integrators that are specific to certain industries (government, pharmaceutical companies, banks, and so on), Adobe began to educate potential users about the software's capabilities. The effect of this education has been dramatic. Sales for Adobe's ePaper Solutions, which is predominantly Acrobat, reached $129.3 million in 1999 and $207 million in 2000.

R&D efforts in fast-paced technology-driven organizations may create products and services that are ahead of their time. Patience and educating customers may be required to bring about profitability.

Source: "Adobe Had a Popular Product—Making It Profitable Took Some Work," *The Wall Street Journal*, October 15, 2001, pp. R18–R19; http://www.adobe.com/aboutadobe/pressroom/pressmaterials/networkpublishing/main.html.

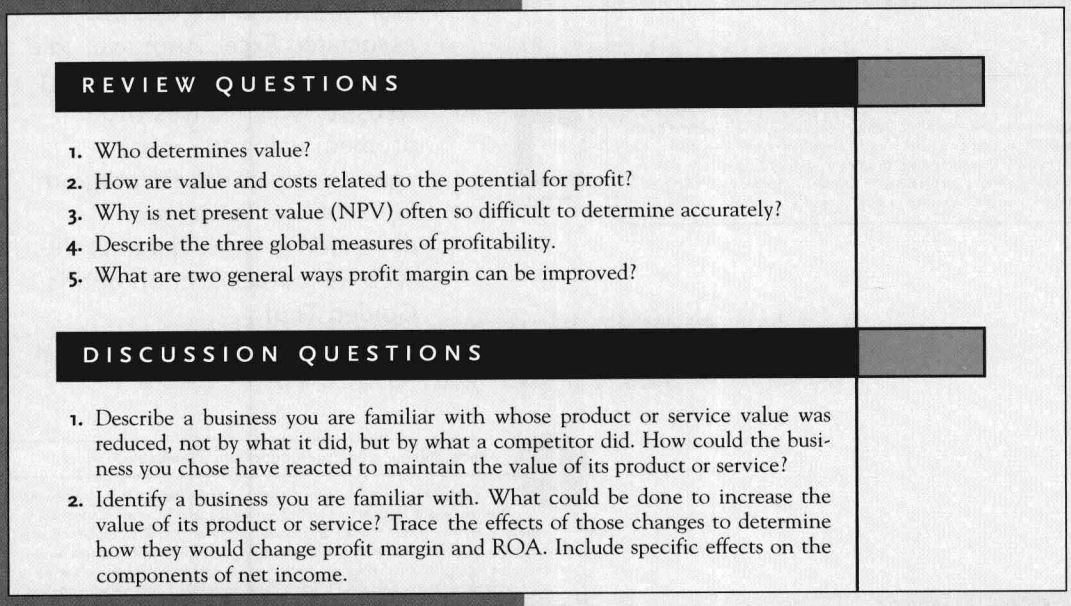
Guided Tour

Review Questions

Review questions test the student's knowledge of concepts—they reinforce the reading and are a great way for students to study for quizzes and tests. They can also be assigned as homework if the instructor so chooses.

Key Terms

A list of key terms at the end of each chapter presents the vocabulary a student will need to know to thoroughly understand the material. Each term is followed by the page on which it is introduced, and all terms are defined formally in the Glossary.



REVIEW QUESTIONS

1. Who determines value?
2. How are value and costs related to the potential for profit?
3. Why is net present value (NPV) often so difficult to determine accurately?
4. Describe the three global measures of profitability.
5. What are two general ways profit margin can be improved?

DISCUSSION QUESTIONS

1. Describe a business you are familiar with whose product or service value was reduced, not by what it did, but by what a competitor did. How could the business you chose have reacted to maintain the value of its product or service?
2. Identify a business you are familiar with. What could be done to increase the value of its product or service? Trace the effects of those changes to determine how they would change profit margin and ROA. Include specific effects on the components of net income.

Discussion Questions

Discussion questions are useful for student review or homework as well as for spurring class or group discussions. They are designed to require critical thinking and reasoning in situations that often lack a "right" answer.

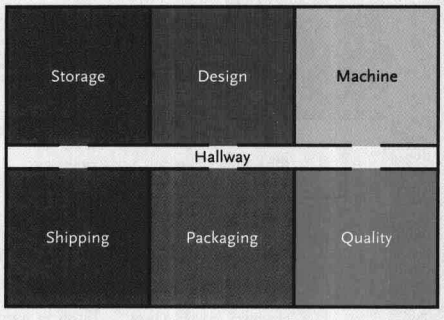
End of Chapter Materials

Problems

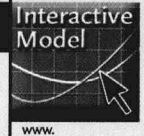
The end-of-chapter problems test the students' understanding of the quantitative material presented in the chapter. They require that the student perform calculations or analyses using the equations and other tools presented in the chapter. Again, these will be helpful for individual or group practice, in-class demonstration, or assignments.

PROBLEMS

1. Morris Machining's plant diagram is below. A distance of 20 feet separates departments that are next to each other. Departments across the center hall from each other are separated by 10 feet, and those that are diagonal from each other are separated by 30 feet. Use the trips matrix and the cut-and-try layout method to create a diagram that would reduce the total distance.



INTERACTIVE ANALYSIS 3.2



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THE PROCESS-ORIENTED LAYOUT INTERACTIVE MODEL

The Process-oriented Layout Interactive Model demonstrates how different arrangements in a process-oriented layout result in different costs for transporting material. The model is sited in Chapter 13, on page 490, and is used in Interactive Analysis 13.2 on page 508. A small production facility that produces three different products in a layout with 6 departments forms the basis for the model. The three products have different routings and demands. The demands can be changed, but not the routings. You can change the layout by dragging a department to a different "room."

Interactive Analysis

Each interactive analysis provides an experimental environment for using the interactive models available at www.operationsnow.com. For each interactive model available online, Interactive Analysis experiments guide the student through a step-by-step process that demonstrates the model and adds to the student's understanding of the concepts demonstrated in it. The interactive models are described in greater detail in the following section on Web Resources.