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运营与供应链管理

Operations & Supply Chain Management | 理论与实践

World Class Theory and Practice

(美) 索布提·维尔马 (Rohit Verma) 著
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出 版 说 明

为了适应经济全球化的发展趋势，满足国内广大读者了解、学习和借鉴国外先进的管理经验和掌握经济理论的前沿动态，清华大学出版社与国外著名出版公司合作影印出版一系列英文版经济管理方面的图书。我们所选择的图书，基本上是已再版多次、在国外深受欢迎、并被广泛采用的优秀教材，绝大部分是该领域中较具权威性的经典之作。在选书的过程中，我们得到了很多专家、学者的支持、帮助和鼓励，在此表示谢意！

结合我国的具体教学实践，我们在影印过程中删掉了第 8 章“项目管理”、第 9 章“优化与仿真建模”和第 12 章“精益企业”，望读者予以谅解。

由于原作者所处国家的政治、经济和文化背景等与我国不同，对书中所持观点，敬请广大读者在阅读过程中注意加以分析和鉴别。

我们期望这套影印书的出版对我国经济科学的发展能有所帮助，对我国经济管理专业的教学能有所促进。

欢迎广大读者给我们提出宝贵的意见和建议；同时也欢迎有关的专业人士向我们推荐您所接触到的国外优秀图书。

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总序

世纪之交，中国与世界的发展呈现最显著的两大趋势——以网络为代表的信息技术的突飞猛进，以及经济全球化的激烈挑战。无论是无远弗界的因特网，还是日益密切的政治、经济、文化等方面的国际合作，都标示着 21 世纪的中国是一个更加开放的中国，也面临着一个更加开放的世界。

教育，特别是管理教育总是扮演着学习与合作的先行者的角色。改革开放以来，尤其是 20 世纪 90 年代之后，为了探寻中国国情与国际上一切优秀的管理教育思想、方法和手段的完美结合，为了更好地培养高层次的“面向国际市场竞争、具备国际经营头脑”的管理者，我国的教育机构与美国、欧洲、澳洲以及亚洲一些国家和地区的大量的著名管理学院和顶尖跨国企业建立了长期密切的合作关系。以清华大学经济管理学院为例，2000 年，学院顾问委员会成立，并于 10 月举行了第一次会议，2001 年 4 月又举行了第二次会议。这个顾问委员会包括了世界上最大的一些跨国公司和几家顶尖企业的最高领导人，其阵容之大、层次之高，超过了世界上任何一所商学院。在这样高层次、多样化、重实效的管理教育国际合作中，教师和学生与国外的交流机会大幅度增加，越来越深刻地融入到全球性的教育、文化和思想观念的时代变革中，我们的管理教育工作者和经济管理学习者，更加真切地体验到这个世界正发生着深刻的变化，也更主动地探寻和把握着世界经济发展和跨国企业运作的脉搏。

我国管理教育的发展，闭关锁国、闭门造车是绝对不行的，必须同国际接轨，按照国际一流的水准来要求自己。正如朱镕基同志在清华大学经济管理学院成立十周年时所发的贺信中指出的那样：“建设有中国特色的社会主义，需要一大批掌握市场经济的一般规律，熟悉其运行规则，而又了解中国企业实情的经济管理人才。清华大学经济管理学院就要敢于借鉴、引进世界上一切优秀的经济管理学院的教学内容、方法和手段，结合中国的国情，办成世界第一流的经管学院。”作为达到世界一流的一个重要基础，朱镕基同志多次建议清华的 MBA 教育要加强英语教学。我体会，这不仅因为英语是当今世界交往中重要的语言工具，是连接中国与世界的重要桥梁和媒介，而且更是中国经济管理人才参与国际竞争，加强国际合作，实现中国企业的国际战略的基石。推动和实行英文教学并不是目的，真正的目的在于培养学生——这些未来的企业家——能够具备同国际竞争对手、合作

伙伴沟通和对抗的能力。按照这一要求，清华大学经济管理学院正在不断推动英语教学的步伐，使得英语不仅是一门需要学习的核心课程，而且渗透到各门专业课程的学习当中。

课堂讲授之外，课前课后的大量英文原版著作、案例的阅读对于提高学生的英文水平也是非常关键的。这不仅是积累相当的专业词汇的重要手段，而且是对学习者思维方式的有效训练。

我们知道，就阅读而言，学习和借鉴国外先进的管理经验和掌握经济理论动态，或是阅读翻译作品，或是阅读原著。前者属于间接阅读，后者属于直接阅读。直接阅读取决于读者的外文阅读能力，有较高外语水平的读者当然喜欢直接阅读原著，这样不仅可以避免因译者的疏忽或水平所限而造成的纰漏，同时也可以尽享原作者思想的真实表达。而对于那些有一定外语基础，但又不能完全独立阅读国外原著的读者来说，外文的阅读能力是需要加强培养和训练的，尤其是专业外语的阅读能力更是如此。如果一个人永远不接触专业外版图书，他在获得国外学术信息方面就永远会比别人差半年甚至一年的时间，他就会在无形中减弱自己的竞争能力。因此，我们认为，有一定外语基础的读者，都应该尝试一下阅读外文原版，只要努力并坚持，就一定能过了这道关，到那时就能体验到直接阅读的妙处了。

在掌握大量术语的同时，我们更看重读者在阅读英文原版著作时对于西方管理者或研究者的思维方式的学习和体会。我认为，原汁原味的世界级大师富有特色的表达方式背后，反映了思维习惯，反映了思想精髓，反映了文化特征，也反映了战略偏好。知己知彼，对于跨文化的管理思想、方法的学习，一定要熟悉这些思想、方法所孕育、成长的文化土壤，这样，有朝一日才能真正“具备国际战略头脑”。

以往，普通读者购买和阅读英文原版还有一个书价的障碍。一本外版书少则几十美元，多则上百美元，一般读者只能望书兴叹。随着全球经济合作步伐的加快，目前在出版行业有了一种新的合作出版的方式，即外文影印版，其价格几乎与国内同类图书持平。这样一来，读者可以不必再为书价发愁。清华大学出版社这些年在这方面一直以独特的优势领先于同行。早在1997年，清华大学出版社敢为人先，在国内最早推出一批优秀商学英文版教材，规模宏大，在企业界和管理教育界引起不小的轰动，更使国内莘莘学子受益良多。

为了配合清华大学经济管理学院推动英文授课的急需，也为了向全国更多的MBA试点院校和更多的经济管理学院教师和学生提供学习上的支持，清华大学出版社再次隆重推出与世界著名出版集团合作的英文原版影印商学教科书，也使广大工商界人士、经济管理类学生享用到最新最好质优价廉的国际教材。

祝愿我国的管理教育事业在社会各界的大力支持和关心下不断发展、日进日新；祝愿我国的经济建设在不断涌现的大批高层次的面向国际市场竞争、具备国际经营头脑的管理者的勉力经营下早日中兴。

赵纯均 教授

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康奈尔大学酒店管理学院服务运营管理副教授,同时在芝加哥 DePaul 大学、悉尼大学、挪威物流学院讲授 MBA 课程,在《运营管理》《决策科学》等杂志发表了 50 余篇学术论文。

Ken Boyer

俄亥俄州立大学费舍商学院运营管理著名教授,2000 - 2008 年间曾在密歇根州立大学 Broad 管理学院担任供应链管理教授。博耶博士同时是《运营管理》杂志主编,以及决策科学学会、生产与运营管理学会成员。

Preface

THE IMPORTANCE OF OPERATIONS/ SUPPLY CHAIN MANAGEMENT

WHAT is operations management, and why do we care? Consider a product or service that you have bought recently—a cell phone, perhaps. Why did you choose this particular product or service rather than a competitor's? Was it better quality? Less expensive? More convenient? More attractive? Whatever the reason, the company or organization that provided the product or service had numerous decisions to make before that product or service got to you—decisions regarding where and how to produce it, what it should include, how it should be delivered, and so on. Let's examine a few examples from a "typical" day for the reader of this book:

Breakfast: Whether you had a Kellogg's Eggo Waffle, a quick bagel from the corner bakery, or simply a piece of fruit, someone had to (1) grow the ingredients, (2) purchase and acquire the ingredients and packaging, (3) produce the product (bake the bagel or waffle), and (4) deliver the product to you, the store, or the restaurant . . .

Transportation: How did you get to school or work today? Someone had to design and produce the car, bike, or train you probably traveled on . . .

Clothing: Where did the clothing you are wearing come from? Did you sew it yourself? Did you buy it online or in a store? How was it made? Who chose the sizes it would be produced in? Who chose what styles and colors would be made?

These are the types of decisions and issues on which this text will focus.

Operations management consists of the processes that effectively produce, transform, and deliver a product or service. As Figure A.1 illustrates, every organization must transform inputs such as labor, materials, machinery, and equipment into outputs such as a car, a computer, a sandwich from a fast-food restaurant, or a medical diagnosis from a doctor. Let's consider an example. Budweiser sells many types of beer—in fact, its market share of all U.S. beer sales is approximately 50 percent. *Inputs* to make beer include materials such as water, barley, hops, and yeast, and also include the machinery and equipment used to produce the beer, such as the vats in which the beer is fermented and the machines that fill bottles or cans with beer. Human labor is involved in handling raw materials, maintaining equipment, moving the finished product, and so on. The *transformations* that Budweiser makes include not only the physical process of transforming raw materials into finished beer, but also the transportation of the beer from the manufacturing plant to the store where it is sold, the advertising and promotion for the beer, and other such actions. Finally, the *output* is both the bottle or can of beer and the choice of location where it is sold.

In general, operations management refers to processes within a single firm or organization, whereas **supply chain management (SCM)** refers to processes and exchanges across multiple organizations. Over the past 10 to 20 years, companies have increasingly integrated their operations and information flows with those of their suppliers, distributors, and customers. Leading proponents of a supply chain approach to managing value-added activities

● **Operations management** the processes that effectively produce, transform, and deliver a product or service

● **Supply chain management (SCM)** the organization of supply chain activities, including purchasing of raw materials and components from suppliers, distribution of parts and finished goods, and administration of the relationship with customers, in order to maximize customer value and maximize competitive advantage. SCM involves a coordinated effort by a group of organizations to manage the supply chain from raw material to finished product or service in the most efficient way possible.

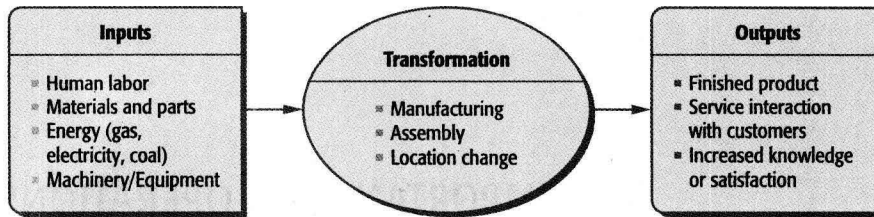


FIGURE A.1 Transformation Processes

across multiple organizations include companies such as Wal-Mart, Procter & Gamble, Cisco Systems, and Apple.¹ Supply chain management is the organization of supply chain activities, including purchasing of raw materials and components from suppliers, distribution of parts and finished goods, and administration of the relationship with customers, in order to maximize customer value and maximize competitive advantage. SCM involves a coordinated effort by a group of organizations to manage the supply chain from raw material to finished product or service in the most efficient way possible.

Every product or service involves some type of transformation, as illustrated in Figure A.1. Services such as FedEx or Deutsche Post may not physically transform a product, but instead change its location—i.e., picking the package up from your home or place of business and delivering it across the country or world to another location or person. A doctor's office also involves a transformation: from a sick, worried patient to a healthy, calm patient. Throughout the book, we will examine various transformation processes and the associated decisions regarding how to design them. For now, consider the following:

- ▶ Describe the types of inputs, transformations, and outputs that occur in manufacturing an airplane.
- ▶ Describe the types of inputs, transformations, and outputs that occur in producing a movie.
- ▶ Describe the types of inputs, transformations, and outputs that occur in building a large new building, such as a 90-floor skyscraper.
- ▶ How might the inputs, transformations, and outputs for producing beer differ if you were brewing small batches at home versus producing 3 million cases a year?

OUR PHILOSOPHY AND APPROACH

LEARNING and education form the foundations of the emerging knowledge-based society of the twenty-first century. Technology has revolutionized much of the way business is done around the world. One of us was recently talking to a colleague who said, "I remember teaching next to you back in 1994 and you were using this new thing called the Internet." We (the authors)

¹ AMR Research published an annual Value Chain Strategies Report titled "The AMR Research Supply Chain Top 25 for 2007" by Tony Friscia, Kevin O'Marah, Debra Hofman, and Joe Souza.

have each been teaching for approximately 15 years—the same length of time the Internet has been around. While we are relatively aware of the opportunities technology offers for education, we are not, nor will we ever be, as completely immersed in it as the generation of college students today that has grown up with Facebook and MySpace.

As teachers, we all use the Internet now for a huge variety of purposes—*but do we use it well?* There is a variety of learning styles as well as a variety of pedagogical approaches for teaching. We believe that there is some type of repository for standard, accepted knowledge central to all learning in an organized university-level course. We have been disappointed over the last decade by the relatively slow rate at which new technology has been embraced to revolutionize education. Thus, we embarked on a project to develop a new approach to teaching operations and supply chain management: an approach which places equal emphasis on technology and text. We view the tangible textbook as a necessary but insufficient component of the educational package. The accompanying online learning management system (CengageNow) and premium web site should be the order winner—the tool that really engages students and facilitates learning in a multi-dimensional, interactive manner that is far richer than a traditional textbook. As such, when we started this project three years ago, we started with a blank slate as opposed to many of the existing textbooks where the book preceded the web site/technology. What we offer here is a pull-based learning package—one that is developed to pull students in and encourage them to play and explore the core topics while using technology. This is in contrast to textbooks of the last 10 years, which have used a push approach—put enough content on the web and someone will use it. Thus, this text focuses on the following concepts, starting with a highly interactive web interface.

● Strategy

While much of operations and supply chain management is very tactical and detail oriented, there is an increasingly strategic aspect to it. Much of the rising interest in this area over the past decade is due to the ability to pursue different strategies to achieve success—think of a responsive organization such as Zara versus a low-cost organization such as Wal-Mart. The first chapter offers an overview of operations/supply chain management along with a strategic framework. This material is based on one of the authors' 15 plus years of teaching an elective in operations strategy and is presented in a manner so that it is broadly applicable to many situations. Strategy then serves as an overarching framework throughout the book for considering alternative approaches to specific challenges or decisions.

● Service Operations

Service operations are of increasing importance since well over 80 percent of jobs worldwide are in this sector. Even the biggest manufacturing companies these days have extensive customer support, product development, service activities, etc. In contrast to many existing textbooks, we're starting with a clean slate, bringing over 15 years of experience in both teaching and researching service operations to this book. Every chapter has service examples woven in as part of its foundation rather than as an add-on to what started as a manufacturing operations book 10-plus years ago. Our choice of American Express as one of our exemplary companies profiled throughout the book is intended to underscore the importance of and commitment to service operations management.

● Global Supply Chain

The past decade has seen an explosion in world trade and the outsourcing of many manufacturing and service activities to countries globally. It is fairly routine for major corporations to have both suppliers and customers in scores of countries. While the fundamental principles for managing operations and the broader supply chain have not changed radically due to this growth in global interconnectedness, the need to be aware of cultural and communication differences is of dramatic importance. To highlight the advantages and disadvantages of global supply chains, Chapter 14 (Global Supply Chain and Service Integration) is devoted solely to this topic. In addition, every chapter includes at least one example from a non-U.S. company or organization.

● Exemplary Companies

Three organizations—the Kellogg's Company, Sony, and American Express—represent excellent examples of what we consider to be “world class” operations and supply chain management. Each of these three organizations is examined thoroughly and from multiple perspectives throughout the book. Each is the subject of an opening case or featured example for every chapter—the goal being to illustrate how the principles discussed in the chapter are implemented in an actual company. These companies have been chosen because

- ▶ they are familiar to many readers.
- ▶ they illustrate the various supply chain principles we will be examining throughout the book.
- ▶ the companies are international in terms of the breadth of their operations and sale of their products.
- ▶ the cases provide examples of three different product/service mixes—Kellogg's is primarily a product-centric firm in that it sells very tangible products; Sony offers a mix of products and services; and American Express is primarily a service provider.
- ▶ these companies offer a fresh perspective from the typical examples of Wal-Mart, Toyota and Dell, all of which are often overused in many textbooks. We still refer to these when appropriate, but the use of Kellogg's, Sony, and American Express offers a fresher perspective.

● Technology Interface: The Online Learning Management System (CengageNow)

The optional textbook online learning management system is intended as a highly interactive, pull-based repository of OM knowledge. It has the usual push-oriented content: videos, PowerPoints, Excel spreadsheets, audio summaries and quizzes, and more. The order winner is that these features have been set up so that instructors can assign a percentage of their grade for students to utilize these technologies. Once an instructor assigns the homework, the system will automatically track student usage and scores for the various elements. These include watching videos (with questions asked to ensure that students watch the videos), working with spreadsheets, and completing homework (both from end-of-chapter content and unique content). In addition, some basic content can be found on the textbook companion web site. Beyond the basic companion web site, we offer the premium, protected web

site that contains a wealth of valuable student assets. The web site access code is free for all students purchasing a new textbook. We believe that leveraging the power of the Internet to allow students to interact online with the material and each other is a key to twenty-first-century learning, and it allows the instructor to teach groups of students as if teaching a course with an enrollment of one. Rather than explaining in great detail here—in a twentieth-century manner—we encourage you to go online and find out for yourself!

ORGANIZATION OF THE TEXT

OUR goal is to examine key tools, techniques, and practices in operations as they revolve around three themes: strategy, global supply chain, and service operations. Strategy is a key theme because, while there is a set of generally sound principles of operations, companies will make different decisions based on their operations strategy. As seen in Chapter 1, a low-cost-focused firm or supply chain will make fundamentally different choices than a company or supply chain focused on flexibility. We will examine strategy throughout the book as a driving force behind decision making. Second, global supply chain is a focus because of the growing interconnectedness of companies and customers around the world. As technology increasingly lowers barriers to communication and travel across the globe, so too are barriers for free trade lowered. As such, it is important to examine operations and supply chain in a global context. To that end, we try to present examples from companies from different regions of the world and companies that are truly worldwide in their operations. Finally, services are an increasing proportion of global output. The product service bundle must be managed carefully; thus, service operations are a central theme of the book.

In terms of organization, the book is divided into three parts: Strategic Operations Management, Tools and Tactical Issues, and The Extended Enterprise.

● Part I: Strategic Operations Management

The primary emphasis in Part I will be on how individual company operations (i.e., manufacturing, services, logistics, purchasing) contribute to a company's success or failure. Chapter 1 introduces operations strategy as a guide to positioning the organization. Supply chain is introduced as an important concept, but one that in many ways is an extension of operations management within a single firm. In other words, we focus on operationally managing a single organization but provide a quick introduction to the idea of linking multiple organizations in a broader supply chain. Thus, students will be expected to master internal operations as a primary goal, but develop an understanding of broader supply chain issues as a secondary goal. Quality and Six Sigma constitute the second chapter because they are the foundation of so much of business and form a key strategic component. In the third chapter, product and service innovation discussions provide a review of the challenges of developing and keeping products and services fresh.

Chapter 1: Operations and Supply Chain Strategy. This chapter introduces our three exemplary organizations: Kellogg's, Sony, and American Express. Operations strategy is presented as the foundation framework for understanding and linking together the numerous operational decisions any organization must make. The text illustrates how different strategies can be used to achieve success. Supply chain strategy is presented as an extension to operations strategy within a single firm.

Chapter 2: Quality Management. This chapter discusses the meaning of quality in both goods and services. The teachings of gurus including Deming, Crosby, Feigenbaum, and Juran are examined. ISO 9000, ISO 14000, and the Malcolm Baldrige Criteria are examined in depth. Six Sigma is described and calculation of sigma level is demonstrated.

Chapter 3: New Product Development. This chapter describes the new product development process, the product life cycle, and strategies and trade-offs in product innovation. This chapter includes a special emphasis on concepts such as enhancing the customer experience, mass customization, and virtual reality. Design techniques covered include customer choice analysis, product reliability analysis, and quality function deployment.

● Part II: Tools and Tactical Issues

Part II contains a series of chapters that provide in-depth discussion of various tools, techniques, and concepts necessary for day-to-day operations management. Each chapter provides basic concepts and necessary mathematical derivations, but the emphasis is on application/illustration of techniques for solving “real-world” OM problems. This part examines the core principles of operations, including process design and analysis, inventory management (including forecasting, independent demand, and dependent demand), project management, and quality improvement tools.

Chapter 4: Process Design and Analysis. This chapter leads off with the service-process matrix to emphasize service operations differences, before examining the product-process matrix for manufacturing. The text examines the interaction of strategy with process choice while highlighting the impact of technological evolution. Process analysis techniques including break-even, flowcharting, and bottleneck identification are presented, and several numerical examples are worked.

Chapter 5: Forecasting. This chapter examines the basic principles of forecasting. Specific methods covered include moving average, exponential smoothing with and without a trend, seasonal forecasting, and linear regression. Methods of assessing forecast accuracy including MAD, MAPE, and MSE are illustrated with numerical examples. A discussion of the broader supply chain and the ability to be responsive is offered.

Chapter 6: Independent Demand Inventory. This chapter covers the reasons for and against holding inventory. Basic inventory types including cycle, safety stock, anticipation, work-in-process, remanufactured/reconditioned, and pipeline are explained. Two basic inventory systems, continuous and periodic review, are explained in detail and illustrated with solved examples. Quantity discounts are discussed and a model presented. The role of technological applications—including ERP, RFID, and VMI—is discussed.

Chapter 7: Dependent Demand. This chapter explains the inputs and outputs of an MRP system. Single-level MRP records are discussed and the solution method illustrated. Multiple-level MRP records are then examined, and solved examples are presented. This chapter has numerous spreadsheet examples on the web that illustrate the dynamic nature of MRP and the linked nature of inventory transactions. The chapter concludes with a discussion of dependent demand in services and the role of technology, including a McDonald’s illustration.

Chapter 10: Capacity Planning. This chapter describes methods of measuring capacity, planning capacity, and calculating capacity utilization. Capacity strategy at an aggregate level is discussed and a methodological

approach to evaluating the need for capacity expansion/contraction is presented. Also included is an examination of several factors that impact capacity considerations (economies of scale and scope, experience curves, and complementary products). The chapter also includes a special section on factors unique to services and an examination of yield management.

Chapter 11: Quality Improvement Methods. This chapter discusses both qualitative and quantitative quality and process management techniques. The qualitative quality improvement tools discussed include brainstorming, affinity diagrams, interrelationship diagrams, tree diagrams, process decision program charts, flowcharts, cause-and-effect diagrams, failure modes and effects analysis, and mistake-proofing. The quantitative quality improvement tools include inspection and sampling, check sheets, Pareto analysis, histograms, scatter diagrams, process capability analysis, run charts, and statistical process control charts.

● Part III: The Extended Enterprise

Increasingly, competition is occurring across supply chains of multiple organizations. This is due to several factors, including lean production, technology, and increasing globalization. Part III examines these three factors as individual chapters. Lean production is examined as a philosophy and as a set of tools for not only reducing inventory and waste, but also for linking together separate organizations in a supply chain. Technology is examined both as a means of making operations more efficient, agile, or capable, and as a means of linking together organizations and providing visibility across the entire supply chain. The final chapter examines the challenges inherent in operating across borders, including global sourcing and international transportation.

Chapter 13: Technology and Integrated Supply Management. This chapter provides an overview and description of the role of technology in improving operations/supply chains. Key types of service and manufacturing technologies are discussed. Supply chain technologies that help link organizations are examined, with particular emphasis on methods of reducing the bullwhip effect.

Chapter 14: Global Supply Chain and Service Integration. This chapter discusses various issues related to the globalization of industries and its impact on operations and supply chain management. The chapter describes why firms globalize and establish production facilities. It also compares the positive and negative impacts of outsourcing and off-shoring production.

KEY FEATURES IN THE TEXT

THE text is formatted with some key features to underscore points of interest.

Learning Objectives. Every chapter starts with key objectives in a numbered list. These objectives are then matched to a summary explanation at the end of each chapter.

Opening Vignette. A company example, most often from one of our three exemplary companies, leads off each chapter. These vignettes provide a contextual illustration of several key principles of the chapter.

Key Terms. Every key term and definition is included in the margin. Key terms also appear in bold within the paragraphs.


Solved Examples. Within each chapter, problem statements, along with step-by-step illustrations for every key quantitative technique, are included.

Best Practices in Operations Management. These boxed inserts illustrate examples of companies employing practical and effective practices.

Technology in Operations Management. These boxed inserts highlight companies and organizations using technology applications and cover the associated people/work force decisions.

Case Studies. Every chapter includes a short closing case that can be used in the classroom as a discussion and application tool.

End-of-Chapter Problems. At the end of chapters with quantitative material, there are several problems with at least one of each type presented in the chapter. Additional problems are available on the text web site.

Web Site Material. Anywhere the  symbol appears signals that there is accompanying material on the online learning management system (CengageNow) and/or on the premium web site.

SUPPLEMENTS DESIGNED TO AID STUDENT SUCCESS

Web Sites. The companion textbook web site offers a plethora of assets, including flashcards, learning objectives, chapter outlines, and chapter summaries. The premium web site contains games, quizzes, Excel spreadsheets, and additional content referenced in the text. An access code comes free with each new text. Go to www.cengage.com/login to register your premium access code. If you have purchased a used text, you will not receive the access code free with your book. To purchase an access code, please visit www.ichapters.com.

SUPPLEMENTS DESIGNED TO AID INSTRUCTORS

Text Web Site. Key instructor ancillaries (Instructor's Manual, Test Bank, ExamView, PowerPoint slides, and Classroom Response System content) are provided at www.cengage.com/international, giving instructors the ultimate tool for customizing lectures and presentations.

- ▶ **Instructor's Manual.** Designed to provide support for instructors new to the course as well as innovative materials for experienced professors, the Instructor's Manual includes Learning Objectives, a Teaching Note for the Opening Vignette, a Detailed Lecture Outline, Notes on the Solved Problems and End-of-Chapter Problems, Suggested Answers to Case Questions, and Additional Exercises.
- ▶ **Test Bank.** Scrutinized for accuracy, the Test Bank includes over 1,000 questions. Question types include true/false, multiple choice, short answer, and problems. Page references are indicated for every question.
- ▶ **ExamView.** ExamView contains all of the questions in the printed Test

Bank. This program is easy-to-use test creation software compatible with Microsoft Windows. Instructors can add or edit questions, instructions, and answers, and they can select questions (randomly or numerically) by previewing them on the screen. Instructors can also create and administer quizzes online, whether over the Internet, a local area network (LAN), or a wide area network (WAN).

- ▶ **PowerPoint Lecture Presentation.** The PowerPoint Lecture Presentation enables instructors to customize their own multimedia classroom presentation. Containing approximately 500 slides, the package includes figures and tables from the text, as well as outside materials to supplement chapter concepts. Material is organized by chapter, and can be modified or expanded for individual classroom use. PowerPoint slides are also easily printed to create customized Transparency Masters.
- ▶ **Classroom Response System Content.** Using state-of-the-art wireless technology and text-specific content, a Classroom Response System (CRS) provides a convenient and inexpensive way to gauge student comprehension, deliver quizzes or exams, and provide “on-the-spot” assessment. Ideal for any classroom, a CRS is a customizable handheld response system that will complement any teaching style. Various answering modes, question types, and display options mean that a CRS is as functional as you want it to be. As a testing platform, as an assessment tool, or simply as a way to increase interactivity in the classroom, a CRS provides the technology you need to transform your lecture into a dynamic learning environment.

DVD Video Package. You can find exciting and engaging video clips for your students on this comprehensive DVD. Topics from the text are expanded upon to “show” rather than “tell” your students about the many complex operations management concepts.

SUPPLEMENTS DESIGNED TO AID STUDENTS AND INSTRUCTORS

CengageNow™. You envisioned it, we developed it. Designed by instructors and students for instructors and students, CengageNow for Verma/Boyer, *Operations & Supply Chain Management: World Class Theory and Practice* is the most reliable, flexible, and easy-to-use online suite of services and resources. With efficient and immediate paths to success, CengageNow delivers the results you expect.

- ▶ **Personalized learning plans.** For every chapter, personalized learning plans allow students to focus on what they still need to learn and to select the activities that best match their learning styles.
- ▶ **More study options.** Students can choose how they read the textbook—via integrated digital eBook or by reading the print version.

ACKNOWLEDGMENTS

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