美国商学院原版教材精选系列

PEARSON

运营管理

流程与价值链

（第9版）

Operations Management

Processes and Supply Chains

Ninth Edition

李·J.克拉耶夫斯基（Lee J. Krajewski）

[美] 拉里·P.里茨曼（Larry P. Ritzman） 著

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本书作者是国际非常知名的运营管理专家。本书是国际上的一本权威教材，被众多院校采用，被翻译成多种语言，深受广大师生欢迎。

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2013 年 8 月

英/双语教学的成功路径与商科英文原版教材的效用

（代序）

在我国高校，用英语或双语教授专业课程（以下简称：英/双语教学）始于改革开放引进热潮，历经30年，虽发展不快，仍在缓慢推进。20世纪80年代，改革开放后留学归来的教育界学者们不仅引进了各学科先进的研究成果，也随之引进了西方高校的教材。以清华大学出版社为领军的国内出版社适时地引进了西方优秀教材的影印版，推动了一些高校开始在专业课程中开展英/双语教学。2007年以来，国家教育质量工程专设的“国家高校双语教学示范课程建设点”的评定项目被视为政府教育发展的政策风向标，正有力地推动着高校英/双语教学的发展。

但对英/双语教学的必要性，我国高校内部一直争议不断。争议首先围绕着中国人用英语教学的必要性。在公认英语是目前世界通用语言的前提下，英/双语教学的必要性取决于我国高校师生是否有必要及时汲取世界最新的知识和研究成果。答案是不言而喻的。况且英/双语教学省却了翻译过程，可以避免常见的信息减损和曲解问题。不过，信息发布者——教师的英语演讲能力和信息接收者——学生的英语解读能力不足又成为开展英/双语教学的障碍。因而常见的反对意见是，开展英/双语教学，课堂教学内容就会缩水，因为讲授者和听众都得花费精力和时间解译内容。如此看来，我国开展英/双语教学的高校教师必须应对挑战，洞察在我国现有条件下用英文原版教材开展英/双语教学的利和弊，并找到可行的扬长避短的路径。

在经济开放和全球化的大趋势推动下，我国中小学英语教学分量加重，英语普及程度逐年提高，高校新生的英语基础愈益扎实；教师的英语能力也随着师资的新陈代谢而日见增强。这一趋势无疑在为英/双语教学营造越来越有利的条件。尽管如此，不同于以英语为主要语言或官方语言的一些国家，英语在我国的普及率仍较低。在青少年中，英语的普及程度和英语应用能力还仅处于初级水平；高校中能用英语演讲的教师尚属少数，且熟练程度还有待大幅提高。这样的师生英语基础，使得英/双语教学面临巨大的挑战。

同时，在多数的中国高校课堂里，教学任务多被视为逐章讲解某本教材的内容。本土中文教材通常是400～500页的32开本，含理论框架、主要知识点、计算方法和习题，但案例和故事不在其中，多由教师在讲解时添加，以演示和诠释理论要点。迄今仍然普遍盛行的“填鸭式”、“满堂灌”的传统教学法侧重于传授知识，从多数评教指标可见，只要学生感觉教师讲得精彩、有条理、能解惑，就算教学成功。

而引进的国外教材篇幅通常较长，16开大本，500～800页。习惯于上述传统教学法和评价标准的人们自然会产生一个疑问：在有限的课时内，这么厚的教材，怎么讲得完？其实，发达国家多数高校对学生阅读量的要求远远大于我国高校（即使是中文课本和资料），名校更是如此。它们的教材不仅涵盖理论框架和基本概念，而且富含长短不一、详简各异的演示性案例、故事和大量习题，总之它便于学生自学。课堂讲解只占一半课时，其余课时常被用于师生讨论和互动。于是，教师的讲解主要是勾勒理论框架，阐释重点和难点，还需针对事先布置的阅读资料和讨论题，引导学生展开讨论。可见，大厚本的教材适合于能力培训教学法。两者相辅相成，致力于调动学生

的主动性：他们必须大量阅读和思考，才能在课堂上有上好的表现，真正成为学习的主人。结果，他们的能力获得了必要和切实的磨炼。

由此可见，英/双语教学不只是教学语言的改变，它可以达到三重效用：传授专业知识；传授英语知识；同时训练专业方法和英语的应用技能。也因此，一些非英语国家的高校不惜成本，开展英/双语教学，使用与之相配的教材。对我国高校来说，要想成功开展英/双语教学，恐怕首先需要改变传统的教育思想和教学方法。换言之，如果高校想要使教育、教学接近世界先进水准，用英文原版影印教材开展英/双语教学是有效的途径。

迄今为止，原版英文教材的缺点也很明显。鉴于发达国家的作者是以其母国为背景，多数教材不涉及中国国情。教师必须在教学中紧密结合中国国情，提供相关案例、资料和思考讨论题，适时引导师生思辨现有理论的普适性，激励师生发现和创作适合我国国情的经济学、管理学、营销学规律。在我国作者编写和出版足量的优质英文教材之前，这些额外的工作必须由开展英/双语教学的教师来承担。

古今中外，成才之士都乐于阅读和探索，而这种氛围却在当今我国的大学校园里愈见淡化。加之中国学生相对薄弱的英语基础，目前英/双语教学仍面临很大的挑战："填鸭式"的讲授与之相悖；仅靠课堂讲授和互动也很难奏效。但如能培养学生阅读和探索真理的兴趣，并营造一个全方位的孵化温床或生态环境，英/双语教学是有望成功的。根据能力培育过程的所需，这个生态环境包含师生对教育、教学的共识，好学求知的校风，富有挑战和师生互动的课堂教学，从课外讲座、项目操作到校园竞赛等第二课堂活动，便于师生交流的校园互联网等。

要做到这些，教师亟待与时俱进。随着师资的年轻化和高学历化，如今年轻教师的英语基础更好。但逆水行舟，不进则退。英语能力的进退取决于使用频率的多寡，其实英/双语教学过程既是加强英语使用、提高英语能力，也是汲取世界新知的最佳机会。不过，这一过程通常比用汉语教学的付出大得多，且因学生也需成倍地付出，英/双语教学的课程不容易像汉语教学课程那样容易在短期内获得学生的好评。因此给予英/双语教学的教师足够的激励成为生态环境的首要组成部分；缺乏对教师的足够激励，上述英/双语教学的生态环境就无法营造。

诚然，在教育体制和环境不够理想的情况下，教师和学生仍然有个人自训和奋斗的条件。英语原版教材影印版在我国的出版和更新就是对英/双语教学的及时支持。清华大学出版社近期又有一批英文原版影印教材出版，相信必将更进一步推动英/双语教学的发展。如今，已有一些本土高校的教师与英语国家的教师合著英文教材；在可见的将来，还会有中国教师编写发行到世界各地的英文教材。总之，及时用好英文原版影印教材，编写优质的英文教材是我国高校教师的历史责任。

愿英/双语教学的师资队伍愈益壮大，愿英/双语教学更加有力地推动我国教学方法与国际接轨，愿我国高校各级学生在英/双语教学中受益良多，茁壮成长！

对外经济贸易大学
傅慧芬

About the Authors

Lee J. Krajewski is Professor Emeritus at The Ohio State University and Professor Emeritus at the University of Notre Dame. While at The Ohio State University, he received the University Alumni Distinguished Teaching Award and the College of Business Outstanding Faculty Research Award. He initiated the Center for Excellence in Manufacturing Management and served as its director for 4 years. In addition, he received the National President's Award and the National Award of Merit of the American Production and Inventory Control Society. He served as president of the Decision Sciences Institute and was elected a fellow of the institute in 1988. He received the Distinguished Service Award in 2003.

Lee received his PhD from the University of Wisconsin. Over the years, he has designed and taught courses at both graduate and undergraduate levels on topics such as operations strategy, introduction to operations management, operations design, project management, and manufacturing planning and control systems.

Lee served as the editor of *Decision Sciences*, was the founding editor of the *Journal of Operations Management*, and has served on several editorial boards. Widely published himself, Lee has contributed numerous articles to such journals as *Decision Sciences*, *Journal of Operations Management*, *Management Science*, *Production and Operations Management*, *International Journal of Production Research*, *Harvard Business Review*, and *Interfaces*, to name just a few. He has received five best-paper awards. Lee's areas of specialization include operations strategy, manufacturing planning and control systems, supply chain management, and master production scheduling.

Larry P. Ritzman is Professor Emeritus at The Ohio State University and Professor Emeritus at Boston College. While at The Ohio State University, he served as department chairman and received several awards for both teaching and research, including the Pace Setters' Club Award for Outstanding Research. While at Boston College, he held the Thomas J. Galligan, Jr. chair and received the Distinguished Service Award from the School of Management. He received his doctorate at Michigan State University, having had prior industrial experience at the Babcock and Wilcox Company. Over the years, he has been privileged to teach and learn more about operations management with numerous students at all levels—undergraduate, MBA, executive MBA, and doctorate.

Particularly active in the Decision Sciences Institute, Larry has served as council coordinator, publications committee chair, track chair, vice president, board member, executive committee member, doctoral consortium coordinator, and president. He was elected a fellow of the institute in 1987 and earned the Distinguished Service Award in 1996. He has received three best-paper awards. He has been a frequent reviewer, discussant, and session chair for several other professional organizations.

Larry's areas of particular expertise are service processes, operations strategy, production and inventory systems, forecasting, multistage manufacturing, and layout. An active researcher, Larry's publications have appeared in such journals as *Decision Sciences*, *Journal of Operations Management*, *Production and Operations Management*, *Harvard Business Review*, and *Management Science*. He has served in various editorial capacities for several journals.

Manoj K. Malhotra is the Jeff B. Bates Professor in the Moore School of Business, and has served as the chairman of the Management Science Department at the University of South Carolina (USC), Columbia, since 2000. He is the founding director of the Center for Global Supply Chain and Process Management (GSCPM), which has been in operation since 2005. He earned an engineering undergraduate degree from the Indian Institute of Technology (IIT), Kanpur, India, in 1983, and a PhD in operations management from The Ohio State University in 1990. He is a fellow of the Decision Sciences Institute and is certified as a fellow of the American Production and Inventory Management Society (CFPIM). Manoj has conducted seminars and consulted with firms such as John Deere, Metso Paper, Phelps Dodge, Sonoco, UCB Chemicals, Verizon, and Westinghouse Nuclear Fuels Division, among others.

Apart from teaching operations management, supply chain management, and global business issues at USC, Manoj has also taught at the Terry School of Business, University of Georgia; Wirtschaftsuniversität Wien in Austria; and the Graduate School of Management at Macquarie University, Australia. His research has thematically focused on the deployment of flexible resources in manufacturing and service firms, and on the interface between operations and supply chain management and other functional areas of business. His work on these and related issues has been published in refereed journals such as *Decision Sciences*, *European Journal of Operational Research*, *IIE Transactions*, *International Journal of Production Research*, *Journal of Operations Management*, *OMEGA*, and *Production and Operations Management Journal*. He is a recipient of the Decision Sciences Institute's Outstanding Achievement Award for the best application paper in 1990, and the Stan Hardy Award in 2002 and 2006 for the best paper published in the field of operations management. In 2007, his co-authored study on the evolution of manufacturing planning systems was a finalist for the best paper award in the *Journal of Operations Management*. In 2007, Manoj won the University of South Carolina Educational Foundation Award for Professional Schools, which is the university's most prestigious annual prize for innovative research, scholarship, and creative achievement.

Manoj has won several teaching awards, including the Michael J. Mungo Outstanding Graduate Teaching Award in 2006 from the University of South Carolina and the Alfred G. Smith Jr. Excellence in Teaching Award in 1995 from the Moore School of Business. He was voted by the students as an outstanding professor in the international MBA program by the classes of 1997, 1998, 1999, 2000, 2005, and 2008; and as the outstanding professor in the IMBA-Vienna program by the classes of 1998 and 2004. He was designated as one of the first "Master Teachers" in the Moore School of Business in 1998, and has been listed in "Who's Who among America's Teachers" in 1996 and 2000.

Manoj is an associate editor of *Decision Sciences* and *Journal of Operations Management*, past area editor of *POMS Journal* (2000–2003), and an editorial review board member of *Journal of Managerial Decision-Making*. He is an active referee for several other journals in the field, and has served as the co-editor for special focus issues of *Decision Sciences* (1999) and *Journal of Operations Management* (2002). He was the program chair for the 36th International Meeting of the Decision Sciences Institute (DSI) in San Francisco in 2005, and has also served as an associate program chair for the POMS national meeting. He has been involved in the Mid-Carolina chapter of APICS as its past president, executive board member, and as an instructor of professional level CPIM certification courses. He is a founding board member of Shingo Prize for Lean Excellence in South Carolina.

PREFACE

CREATING VALUE THROUGH OPERATIONS MANAGEMENT

Operations management is a vital topic that every business student needs to understand because it is at the heart of the creation of wealth for businesses and the improvement in the living standard of citizens of all countries. Operations managers are responsible for the production of services and products in an ethical and environmentally responsible way while being responsive to the market. Sound like a challenge? Add to it the need to manage supply chains of materials, information, and funds reaching to all areas of the world. While challenging, there are concepts, tools and methods that managers use to deal with operating problems in a global environment. The mission of this text is to provide you with a comprehensive framework for addressing operational and supply chain issues. We accomplish this mission by using a systemized approach while focusing on issues of current interest to you. It is important to be efficient and capable with respect to internal processes; however, it is critical for organizations to be able to link those processes to those of their customers and their suppliers to provide a competitive supply chain. This text is unique in that it builds the concept of a supply chain from the ground up. Starting with the analysis of business processes and how they relate to the overall operational goals of a firm, our text proceeds to show how these processes are integrated to form supply chains and how they can be managed to obtain efficient flows of materials, information, and funds. This approach reinforces the concept that supply chains are only as good as the processes within and across each firm in the supply chain.

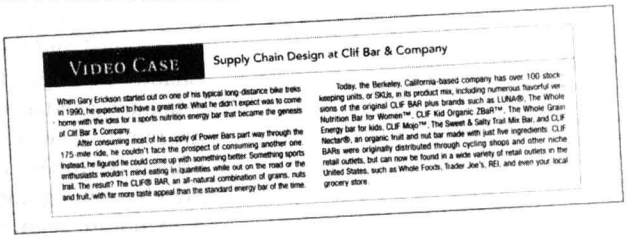
This text has been thoroughly revised to meet your needs regardless of your major. Any manager needs to know the global implications of supply chains and how to make decisions in a dynamic environment. We address these contemporary issues of interest through opening vignettes and managerial practices in each chapter. We show you the essential tools you will need to improve process performance. Irrespective of the industry in which you are seeking a career, processes and supply chains are analyzed from the perspective of service as well as manufacturing firms. Our philosophy is that you will learn by doing; consequently, the text has ample opportunities for you to experience the role of a manager with challenging problems, cases, a library of videos customized to the individual chapters, simulations, experiential exercises, and tightly integrated online computer resources. With this text, you will develop the capability to analyze problems and support managerial decisions.

WHAT'S NEW IN THE NINTH EDITION?

Since the introduction of the successful *eighth* edition, we have been hard at work to make the *ninth* edition even better. We have more figures, photos, company examples, cases, videos, and problems to test your understanding of the material. Here are some of the highlights of the many changes:

NEW! Supply Chain Management Orientation: Beginning in Chapter 1 and continuing throughout the text, we demonstrate the role that operations managers play in the design and execution of effective supply chains for service firms as well as manufacturing firms. As pointed out earlier, our philosophy is that the best supply chains begin with effective internal processes, which are then linked to processes in other firms. The flow of the material in this edition supports that philosophy. To punctuate the new focus on supply chains, we have added a second chapter on how to integrate supply chains that contains added tools for decision making and shows how firms are changing their supply chains to be environmentally responsible.

NEW! Video Cases: We have added five new video cases, which consist of case material supported by video footage, to show how operations management can be used to solve real-world problems. Two cases show how Southwest Airlines copes with gate turnaround operations and the passenger boarding process. We also showcase Autoliv for lean systems, Clif Bar & Company for supply chain design and sustainability, and Deckers Outdoor Corporation for forecasting and related supply chain issues. These cases are added to our growing video library of Starwood Hotels and other leading companies. Adding these videos means that the video library offers 23 videos, with at least one available for each chapter.


VIDEO CASE Supply Chain Design at Clif Bar & Company

When Gary Erickson started out on one of his typical long-distance bike treks in 1990, he expected to have a great ride. What he didn't expect was to come home with the idea for a sports nutrition energy bar that became the genesis of Clif Bar & Company.

After consuming most of his supply of Power Bars part way through the 175-mile ride, he couldn't face the prospect of consuming another one. Instead, he figured he could come up with something better. Something sports enthusiasts wouldn't mind eating in quantities while out on the road or the trail. The result? The CLIF® BAR, an all-natural combination of grains, nuts and fruit, with far more taste appeal than the standard energy bar of the time.

Today, the Berkeley, California-based company has over 100 stock keeping units, or SKUs, in its product mix, including numerous flavorful versions of the original CLIF BAR plus brands such as LUNA®, The Whole Nutrition Bar for Women™, CLIF Kid Organic ZBar™, The Whole Grain Energy bar for kids, CLIF Mojo™, The Sweet & Salty Trail Mix Bar, and CLIF Nectar®, an organic fruit and nut bar made with just five ingredients. CLIF BARs were originally distributed through cycling shops and other niche retail outlets, but can now be found in a wide variety of retail outlets in the United States, such as Whole Foods, Trader Joe's, REI, and even your local grocery store.

NEW! Streamlined Presentation: The *ninth* edition has fewer chapters, fewer pages, and enhanced clarity so that you can engage each topic as efficiently and effectively as possible. We have added figures and photos to improve the presentation of key concepts and techniques. Chapters have been trimmed to "bite-sized" modules to improve retention. All of these changes have been accomplished without sacrificing the content you need to be an effective manager in a dynamic global environment. Substantive changes have been made in almost every chapter and supplement, without losing the main themes that have been valued in past editions. For example:

- **Chapter Count:** Relative to the *eighth* edition, we have cut 3 chapters and incorporated the essential information in other chapters, and added 2 new chapters, for a total of only 15 chapters. A central figure in the margin of each chapter shows how each chapter fits into our general theme of processes to supply chains.
- **Part 1: Using Operations to Compete** – The first part of the text lays the foundation for why operations management is a strategic weapon. Chapter 1, "Competing with Operations," defines operations management and supply chain management. In the *ninth* edition, it now includes material on operations strategy and shows how operations decisions must be consistent with a firm's market strategy. Chapter 2, "Project Management," opens with the product development story of Xbox 360 and shows how you can manage the projects needed to achieve efficient processes and supply chains.
- **Part 2: Managing Processes** – The second part of the text shows how you can design and manage the internal processes of a firm. Chapter 3, "Process Strategy," after being reorganized and trimmed for clarity, focuses on the major process strategy decisions managers make to achieve a firm's strategy. Chapter 4, "Process Analysis," now with a section on work measurement, shows how to assess and improve the performance of processes. Chapter 5, "Quality and Performance," with additional material on ethics, Six Sigma, and acceptance sampling, provides the essential statistical tools for identifying the onset of process performance problems. Chapter 6, "Capacity Planning," is new to the *ninth* edition and focuses on the long-term capacity decisions that define the process capacities of the firm to do business in the future. Chapter 7, "Constraint Management," now with material on line balancing, shows how you can get the best output rates within the process capacities you have to work with. Chapter 8, "Lean Systems," which reveals the methods you can use to improve the system performance, now introduces the concept of "House of Toyota," and has many more photos and additional material on eight types of waste, lean system characteristics, and hybrid layouts.
- **Part 3: Managing Supply Chains** – The third part of the text provides the tools and perspectives you will need to manage the flow of materials, information, and funds between your suppliers, your firm, and your customers. Chapter 9, "Supply Chain Design," has been completely revised to focus on the importance of supply chains and their connection to major financial measures, the role of inventory in supply chains, and how to decide whether or not to outsource. Chapter 10, "Supply Chain Integration," is a new chapter that focuses on the importance of integrating processes along the supply chain, how to choose a supplier, how to determine the capacity of a logistics system, and how to design supply chains that are environmentally responsible. Chapter 11, "Location," now greatly streamlined and simplified, provides guidelines and tools for finding the

USING OPERATIONS TO COMPETE

Competing with Operations
Project Management

MANAGING PROCESSES

Process Strategy
Process Analysis
Quality and Performance
Capacity Planning
Constraint Management
Lean Systems

MANAGING SUPPLY CHAINS

Supply Chain Design
Supply Chain Integration
Location
Inventory Management
Forecasting
Operations Planning and Scheduling
Resource Planning

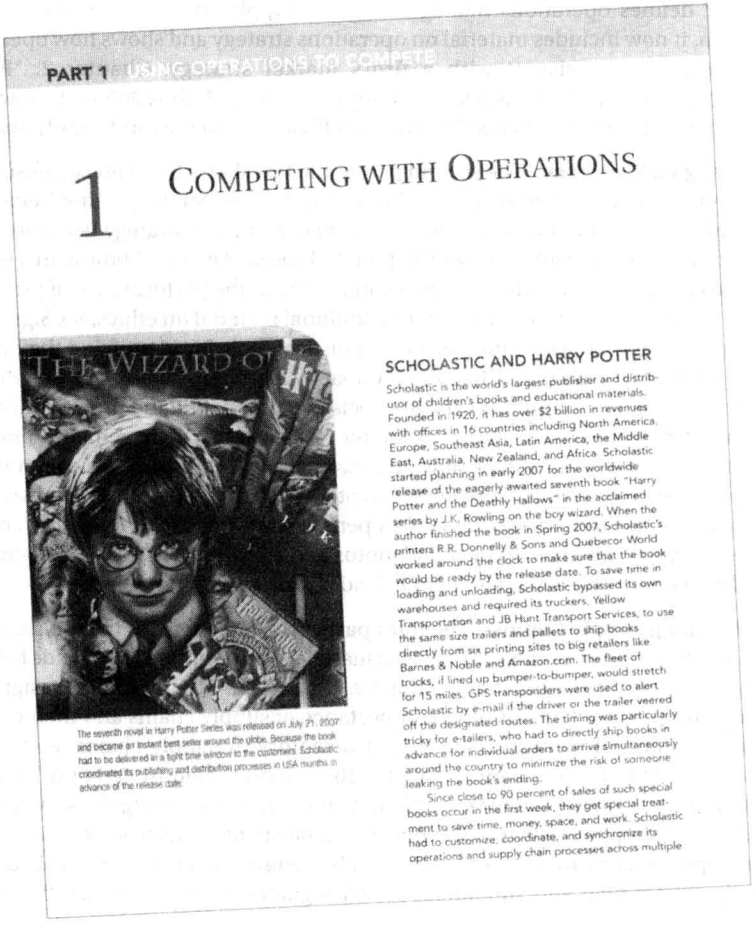
best location for single or multiple facilities in a supply chain. Chapter 12, "Inventory Management," revised for simplicity and clarity, focuses on the design of inventory systems that firms use up and down the supply chain. Chapter 13, "Forecasting," has been streamlined and includes a new experiential exercise to test your skills in forecasting. Chapter 14, "Operations Planning and Scheduling," offers new material on operations scheduling and an added emphasis on revenue management. It has been significantly revised to show how operations planning and scheduling provides a link between a firm, its suppliers, and its customers to create a capability that lies at the core of supply chain integration. Chapter 15, "Resource Planning," focuses on translating the demands for services and products to requirements for the resources to produce them. The book also offers five supplements that dig deeper on technical topics, and another five online supplements.

HELPING YOU LEARN

Key Features

Several new additions and changes have been made to the book to retain and enhance its theme of processes and supply chains and to expand these themes through new content, Managerial Practices, Examples, and End-of-Chapter Problems and Cases. Several key features designed to help aid in the learning process are highlighted next:

Chapter Opening Vignettes engage and stimulate student interest by profiling how real companies apply specific operational issues addressed in each chapter.



PART 1 USING OPERATIONS TO COMPETE

1 COMPETING WITH OPERATIONS

The seventh novel in Harry Potter Series was released on July 21, 2007 and became an instant best seller around the globe. Because the book had to be delivered in a tight time window to the customers, Scholastic coordinated its publishing and distribution processes in USA months in advance of the release date.

SCHOLASTIC AND HARRY POTTER

Scholastic is the world's largest publisher and distributor of children's books and educational materials. Founded in 1920, it has over $2 billion in revenues with offices in 16 countries including North America, Europe, Southeast Asia, Latin America, the Middle East, Australia, New Zealand, and Africa. Scholastic started planning in early 2007 for the worldwide release of the eagerly awaited seventh book "Harry Potter and the Deathly Hallows" in the acclaimed series by J.K. Rowling on the boy wizard. When the author finished the book in Spring 2007, Scholastic's printers R.R. Donnelly & Sons and Quebecor World worked around the clock to make sure that the book would be ready by the release date. To save time in loading and unloading, Scholastic bypassed its own warehouses and required its truckers, Yellow Transportation and JB Hunt Transport Services, to use the same size trailers and pallets to ship books directly from six printing sites to big retailers like Barnes & Noble and Amazon.com. The fleet of trucks, if lined up bumper-to-bumper, would stretch for 15 miles. GPS transponders were used to alert Scholastic by e-mail if the driver or the trailer veered off the designated routes. The timing was particularly tricky for e-tailers, who had to directly ship books in advance for individual orders to arrive simultaneously around the country to minimize the risk of someone leaking the book's ending.

Since close to 90 percent of sales of such special books occur in the first week, they get special treatment to save time, money, space, and work. Scholastic had to customize, coordinate, and synchronize its operations and supply chain processes across multiple

Managerial Practices provide current examples of how companies deal—either successfully or unsuccessfully—with process and supply chain issues facing them as they run their operations.

LEAN SYSTEMS CHAPTER 8 311

MANAGERIAL PRACTICE 8.3 Lean Systems at the University of Pittsburgh Medical Center Shadyside

The University of Pittsburgh Medical Center (UPMC), comprising of 20 hospitals, serves more than 4 million people every year with 48,000 employees. UPMC at Shadyside, a part of the UPMC system, is a 486-bed advanced-care hospital with a medical staff of more than 600 primary care physicians and specialists. Always seeking to improve, UPMC first applied principles of the Toyota Production System in 2001 in a 40-bed surgical unit and then systematized the concepts into a lean approach called the Clinical Design initiative (CDI). This approach focuses on determining the root cause of a problem through direct observation, and then eliminating it by designing solutions that are visual, simple, and unambiguous. These solutions are then tested in a small area and improved until the desired clinical and cost outcomes, along with enhanced patient and staff satisfaction, are achieved. Once perfected, the improved process is rolled out to other areas of the hospital.

UPMC used the CDI methodology to speed up turnaround time in the pathology lab. The layout and work flows of the lab were based on a batch-and-queue push system that led to long lead times, complexity in tracking and moving large lots, delays in discovering quality problems, and high storage costs. Before making the transition to the lean system, UPMC ran a workshop on lean concepts for the staff members of the lab and followed it with a 5S exercise to better organize the department. Counter spaces were cleared so that the lab's equipment could be rearranged. Unneeded items were identified with red tags and removed. Visual controls were used to arrange the remaining items in a neat and easy-to-use manner.

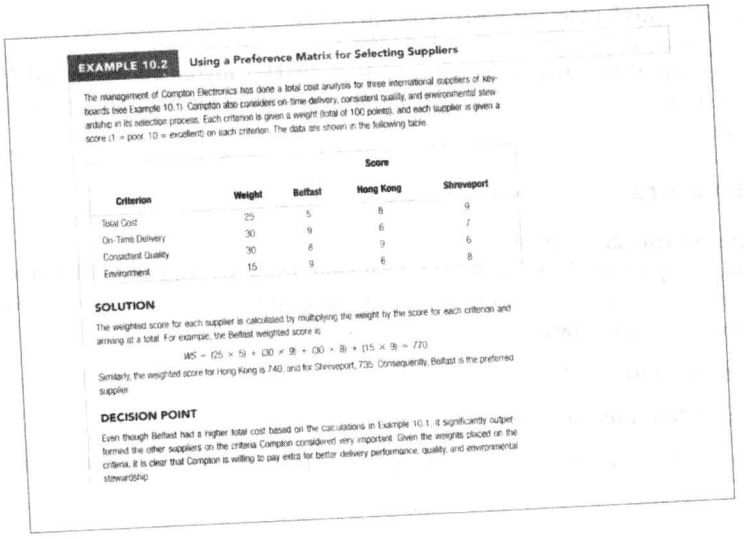
The 5S exercise of cleaning house boosted staff morale. Kanban cards with reordering information were then attached to most items. Reordering supplies now takes only a few minutes a day. Stockouts and expensive rush orders have been eliminated and the overall inventory level of supplies has been reduced by 50 percent to 60 percent.

To move to a system based on line flows, equipment was moved around in the lab to create a cellular layout. The new arrangement allows tissue samples being processed to move through the lab cell from embedding, to cutting, to the oven, and slide staining. The samples move more quickly, and few or no samples end up waiting between steps. As a result, the overall time needed to prepare and analyze tissue samples fell from one or two days to less than a day. The reduction in turnaround time means doctors get pathology results quicker, which in turn speeds up diagnosis and leads to shorter stays for patients. Moreover, the lab does the same amount of work with 25 percent fewer people, and fewer errors because quality mistakes are discovered immediately.

After the pathology lab at the University of Pittsburgh Medical Center adopted a lean operations approach based on a line system versus a batch-and-queue system, the time it took to process samples dropped from days to just hours. Diagnoses were made more quickly as a result, and patients' stays at the hospital were shortened.

Source: "The Anatomy of Innovation," Lean Enterprise Institute, www.lean.org, http://www.upmc.com, August 2008.

Examples demonstrate how to apply what students have learned and walk them through the solution process modeling good problem-solving techniques. These examples always close with a unique feature called **Decision Point**, which focuses students on the decision implications for managers.



EXAMPLE 10.2 Using a Preference Matrix for Selecting Suppliers

The management of Compton Electronics has done a total cost analysis for three international suppliers of keyboards (see Example 10.1). Compton also considers on-time delivery, consistent quality, and environmental stewardship in its selection process. Each criterion is given a weight (total of 100 points), and each supplier is given a score (1 = poor, 10 = excellent) on each criterion. The data are shown in the following table.

		Score		
Criterion	Weight	Belfast	Hong Kong	Shreveport
Total Cost	25	5	8	9
On-Time Delivery	30	9	6	7
Consistent Quality	30	8	9	6
Environment	15	9	6	8

SOLUTION

The weighted score for each supplier is calculated by multiplying the weight by the score for each criterion and arriving at a total. For example, the Belfast weighted score is

$$WS = (25 \times 5) + (30 \times 9) + (30 \times 8) + (15 \times 9) = 770$$

Similarly, the weighted score for Hong Kong is 740, and for Shreveport, 735. Consequently, Belfast is the preferred supplier.

DECISION POINT

Even though Belfast had a higher total cost based on the calculations in Example 10.1, it significantly outperformed the other suppliers on the criteria Compton considered very important. Given the weights placed on the criteria, it is clear that Compton is willing to pay extra for better delivery performance, quality, and environmental stewardship.

End of Chapter Resources

- **Key Equations** for review purposes.
- **Key Terms** for review highlight where the concept was first discussed.
- **Solved Problems** reinforce and help students prepare their homework assignments by detailing how to solve model problems with the appropriate techniques presented in the chapter.
- **Discussion Questions** test student comprehension of the concepts through the use of short scenarios.
- **Problems** sharpen students' quantitative skills by providing a bridge between chapter materials with a wide selection of homework material. Advanced problems are also included to increase the level of difficulty. Most of the homework problems can be done manually, or students can utilize a variety of software tools through my**om**lab, which is discussed in a later section.
- **Active Model Exercises** enable students to use pre-created spreadsheets to do "what-if" analysis of examples presented in the text to see what would happen if certain parameters were changed.
- **Video Cases** provide a summary of content covered in a series of on-location video profiles of real-world service and manufacturing companies and challenges they face in their operations. Questions are included for classroom discussion or assignment purposes.
- **Cases** challenge students to grapple with a capstone problem that can be used as an in-class exercise or a homework assignment or team project.
- A **Video Library** of 23 cases (including 3 tutorials) offers at least one video customized for each chapter, which make for excellent class discussion and learning.

TEACHING AND LEARNING SUPPORT

PEARSON myomlab

myomlab A key capability of my**om**lab is as an online homework and assessment tool designed to help students practice operations management problems and improve their understanding of course concepts, and to give their instructors feedback on their performance. This online product lets professors assign homework that is automatically graded, but also serves as a tutorial experience for students.

My**om**lab lets you teach your course your way. Use my**om**lab as an out-of-the-box resource for students who need extra help, or take full advantage of its advanced customization options.

For Instructors

Instructor's Resource Center

These password-protected resources are accessible from **www.pearsonhighered.com** for Krajewski/Ritzman/Malhotra, *Operations Management, 9th edition.* Downloadable resources include the following:

- Instructor's Solutions Manual
- Instructor's Resource Manual
- Image Library—Access most of the images and illustrations featured in the text

- PowerPoint lecture slides by Jeff Heyl in chapter-by-chapter files for classroom presentation purposes
- TestGen EQ—A computerized test item file

Instructor's Solutions Manual (0-13-606546-5)—Prepared by Lee Krajewski, Larry Ritzman, and Manoj Malhotra, this resource provides solutions and answers to end-of-chapter questions, problems, and cases.

Instructor's Resource Manual (0-13-606578-3)—Prepared by Pedro Reyes of Baylor University, this resource offers a course outline, chapter outlines, teaching notes, sample course syllabi, and video case notes.

Test Item File (0-13-606579-1)—Prepared by Larry Zimmer and Paul Yazel of the University of South Carolina, this resource offers an array of questions and problems ranging from easy to difficult. This resource includes true/false, multiple choice, short answer, and essay questions.

For Students

Besides having access to study plans and tutorial resources in myomlab, students can utilize the following additional course resources within myomlab:

OM Explorer – a text-specific software tool consisting of Excel worksheets and including tutors, additional exercises, and solvers.

- **Tutors** provide coaching for more than 60 analytical techniques presented in the text. The tutors also provide additional examples for learning and practice.
- **Additional Exercises** pose questions and can be answered with one or more of the tutor applications.
- **Solvers** provide general purpose routines often encountered in practice. These are great for experiential exercises and homework problems.

POM for Windows an easy-to-use software program that covers over 25 common OM techniques.

Active Models include 29 spreadsheets requiring students to evaluate different situations based on problem scenarios.

Companion Web site offers access to additional student resources such as data files and virtual tours.

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简明目录