



教育部高校工商管理类教学指导委员会双语教学推荐教材

工商管理经典教材·核心课系列

BUSINESS ADMINISTRATION CLASSICS

运作管理


英文版·第10版

杰伊·海泽 (Jay Heizer) 著
巴里·伦德尔 (Barry Render)

OPERATIONS MANAGEMENT

..... Tenth Edition



 中国人民大学出版社

全新版

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总 序

随着我国加入 WTO,越来越多的国内企业参与到国际竞争中来,用国际上通用的语言思考、工作、交流的能力也越来越受到重视。这样一种能力也成为我国各类人才参与竞争的一种有效工具。国家教育机构、各类院校以及一些主要的教材出版单位一直在思考,如何顺应这一发展潮流,推动各层次人员通过学习来获取这种能力。双语教学就是这种背景下的一种尝试。

双语教学在我国主要指汉语和国际通用的英语教学。事实上,双语教学在我国教育界已经不是一个陌生的词汇了,以双语教学为主的科研课题也已列入国家“十五”规划的重点课题。但从另一方面来看,双语教学从其诞生的那天起就被包围在人们的赞成与反对声中。如今,依然是有人赞成有人反对,但不论是赞成居多还是反对占上,双语教学的规模 and 影响都在原有的基础上不断扩大,且呈大发展之势。一些率先进行双语教学的院校在实践中积累了经验,不断加以改进;一些待进入者也在模仿中学习,并静待时机成熟时加入这一行列。由于我国长期缺乏讲第二语言(包括英语)的环境,开展双语教学面临特殊的困难,因此,选用合适的教材就成为双语教学成功与否的一个重要问题。我们认为,双语教学从一开始就应该使用原版的各类学科的教材,而不是由本土教师自编的教材,从而可以避免中国式英语问题,保证语言的原汁原味。各院校除应执行国家颁布的教学大纲和课程标准外,还应根据双语教学的特点和需要,适当调整教学课时的设置,合理选择优秀的、合适的双语教材。

顺应这样一种大的教育发展趋势,中国人民大学出版社同众多国际知名的大出版公司,如麦格劳-希尔出版公司、培生教育出版公司等合作,面向大学本科生层次,遴选了一批国外最优秀的管理类原版教材,涉及专业基础课,人力资源管理、市场营销及国际化管理等专业方向课,并广泛听取有着丰富的双语一线教学经验的教师的建议和意见,对原版教材进行了适当的改编,删减了一些不适合我国国情和不适合教学的内容;另一方面,根据教育部对双语教学教材篇幅合理、定价低的要求,我们更是努力区别于目前市场上形形色色的各类英文版、英文影印版的大部头,将目标受众锁定在大学本科生层次。本套教材尤其突出了以下一些特点:

- 保持英文原版教材的特色。本套双语教材根据国内教学实际需要,对原书进行了一定的改编,主要是删减了一些不适合教学以及不符合我国国情的内容,但在体系结构和内容特色方面都保持了原版教材的风貌。专家们的认真改编和审定,使本套教材既保持了学术上的完整性,又贴近中国实际;既方便教师教学,又方便学生理解和掌握。

● 突出管理类专业教材的实用性。本套教材既强调学术的基础性，又兼顾应用的广泛性；既侧重让学生掌握基本的理论知识、专业术语和专业表达方式，又考虑到教材和管理实践的紧密结合，有助于学生形成专业的思维能力，培养实际的管理技能。

● 体系经过精心组织。本套教材在体系架构上充分考虑到当前我国在本科教育阶段推广双语教学的进度安排，首先针对那些课程内容国际化程度较高的学科进行双语教材开发，在其专业模块内精心选择各专业教材。这种安排既有利于我国教师摸索双语教学的经验，使得双语教学贴近现实教学的需要；也有利于我们收集关于双语教学教材的建议，更好地推出后续的双语教材及教辅材料。

● 篇幅合理，价格相对较低。为适应国内双语教学内容和课时上的实际需要，本套教材进行了一定的删减和改编，使总体篇幅更为合理；而采取低定价，则充分考虑到学生实际的购买能力，从而使本套教材得以真正走近广大读者。

● 提供强大的教学支持。依托国际大出版公司的力量，本套教材为教师提供了配套的教辅材料，如教师手册、PowerPoint 讲义、试题库等，并配有内容极为丰富的网络资源，从而使教学更为便利。

本套教材是在双语教学教材出版方面的一种尝试。我们在选书、改编及出版的过程中得到了国内许多高校的专家、教师的支持和指导，在此深表谢意。同时，为使后续推出的教材更适于教学，我们也真诚地期待广大读者提出宝贵的意见和建议。需要说明的是，尽管我们在改编的过程中已加以注意，但由于各教材的作者所处的政治、经济和文化背景不同，书中内容仍可能有不妥之处，望读者在阅读时注意比较和甄别。

徐二明

中国人民大学商学院

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Preface

Welcome to your operations management (OM) course. In this book, we present a state-of-the-art view of the activities of the operations function. Operations is an exciting area of management that has a profound effect on the productivity of both manufacturing and services. Indeed, few other activities have as much impact on the quality of our lives. The goal of this text is to present a broad introduction to the field of operations in a realistic, practical manner. OM includes a blend of topics from accounting, industrial engineering, management, management science, and statistics. Even if you are not planning on a career in the operations area, you will likely be working with people who are. Therefore, having a solid understanding of the role of operations in an organization is of substantial benefit to you. This book will also help you understand how OM affects society and your life. Certainly, you will better understand what goes on behind the scenes when you purchase a bag of Frito-Lay potato chips; buy a meal at an Olive Garden, a Red Lobster, or a Hard Rock Cafe; place an order through Amazon.com; buy a customized Dell computer over the Internet; or enter Arnold Palmer Hospital for medical care.

Although many of our readers are not OM majors, we know that marketing, finance, accounting, and MIS students across the globe will find the material both interesting and useful as we develop a fundamental working knowledge of the operations side of the firm. More than 600,000 readers of our earlier editions seem to have endorsed this premise. We welcome comments by email from our North American readers, from students using the EU edition, the Indian edition, and our editions in Portuguese, Spanish, Turkish, Indonesian and Chinese. Our goal is to make this material useful and interesting to each of you.

NEW TO THIS EDITION

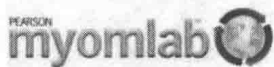
Rapid Reviews In our never-ending quest to make this the most student-friendly text in our field, we now include a two-page Rapid Review at the end of each chapter, supplement, and module. This detailed yet concise summary of the main points and equations in the chapter helps students prepare for homework, exams, and lectures by capturing the essence of the material. Each Rapid Review also includes a self-test, with questions linked to the learning objectives in that chapter. Key terms introduced in the chapter are part of the Rapid Review.

Chapter 4 *Rapid Review*

Main Heading	Review Material	myomlab
WHAT IS FORECASTING?	<ul style="list-style-type: none">■ Forecasting—The art and science of predicting future events.■ Economic forecasts—Planning indicators that are valuable in helping organizations prepare medium- to long-range forecasts.■ Technological forecasts—Long-term forecasts concerned with the rates of technological progress.■ Demand forecasts—Projections of a company's sales for each time period in the planning horizon.	
THE STRATEGIC IMPORTANCE OF FORECASTING	<i>The forecast is the only estimate of demand until actual demand becomes known. Forecasts of demand drive decisions in many areas, including: Human resources, Capacity, Supply-chain management.</i>	VIDEO 4.1 Forecasting at Hard Rock Cafe
SEVEN STEPS IN THE FORECASTING SYSTEM	Forecasting follows seven basic steps: 1. Determine the use of the forecast; 2. Select the items to be forecasted; 3. Determine the time horizon of the forecast; 4. Select the forecasting model(s); 5. Gather the data needed to make the forecast; 6. Make the forecast; 7. Validate and implement the results.	

4

Review



myomlab and the Learning Process This powerful tool ties together all elements in our book into an innovative learning tool, an exam tool, a homework tool, and an assessment center. myomlab's new version 2.0 accompanies this edition of the text. By using myomlab, instructors can assign thousands of problems from the text and/or problems/questions from the Test Item File for their students to take online, in any time frame determined by the instructor. With many options for randomizing the sequence, timing, and scoring, myomlab makes giving and grading homework and exams easy. Most problems have also been converted to an algorithmic form, meaning that there are numerous versions of each problem, with different data for each student. Solutions to each problem and its data set are available, if instructors wish, to students immediately after they complete each assignment. The program records grades into the instructor's grade book. For help, students can click directly to the relevant text page, watch the text authors solve a similar problem, walk through other sample problems, or seek other useful forms of help. This new and innovative feature is truly a wonderful teaching and learning aid. Visit www.myomlab.com for more information.

myomlab
Chapter 4 Forecasting
Parker Pupil
Overview

Problem 4.9
8 correct | 8 of 54 complete

Dell uses the CR5 chip in some of its laptop computers. The prices for the chip during the last 12 months were as follows:

Month	Price Per Chip	Month	Price Per Chip
January	\$1.80	July	\$1.80
February	\$1.67	August	\$1.83
March	\$1.70	September	\$1.70
April	\$1.56	October	\$1.65
May	\$1.70		\$1.70
June	\$1.75		\$1.75

Using a 2-month moving average, the forecast for the next month is _____ (your responses to two decimal places).

Month	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Forecast	\$1.74	1.69	1.78	1.88	1.89	1.84	1.82	1.77	1.68	1.68	1.73

Well done!

OK

Enter any number or expression in each of the edit fields, then click Check Answer.

4 parts remaining

Clear All Check Answer Close

Integration of Ethics Throughout the Book With this revision, we provide broad coverage of ethics as an OM consideration. The topic is addressed in most chapters and at the end of each chapter we present an *Ethical Dilemma* that can be used for classroom discussion or homework.

Sustainability as an OM Responsibility Sustainability is now highlighted in several chapters, especially Chapters 5 (“Design of Goods and Services”) and 7 (“Process Strategy and Sustainability”). Chapter 7 also has two new case studies on the topic as it relates to Frito-Lay and to Walmart.

Author Comments You will notice a new feature throughout every chapter that we call Author Comments. Here we point out why a section, a figure, or a table is so important. The comments are intended to be motivational to students, as well as educational.

TECHNOLOGY IN SERVICES

Just as we have seen rapid advances in technology in the manufacturing sector, so we also find dramatic changes in the service sector. These range from electronic diagnostic equipment at auto repair shops, to blood- and urine-testing equipment in hospitals, to retinal security scanners at airports and high-security facilities. The hospitality industry provides other examples, as discussed in the *OM in Action* box “Technology Changes the Hotel Industry.”

AUTHOR COMMENT
Although less dramatic than manufacturing, technology also improves quality and productivity in services.

Additional Homework Problems Our text already contains more homework problems than any other text in the discipline. We have also added hundreds more problems to our Web site for instructors who seek even more variety and freshness. These problems are available at www.myomlab.com. Solutions to these additional problems appear along with regular text problems in our *Instructor's Solution Manual*, which was created and proofed by the authors.

STUDENT RESOURCES

To liven up the course and help students learn the content material, we have made available the following resources:

- **Student Study Guide** (ISBN: 0-13-510725-3) created by Michael Donovan of Cedar Crest College. Study Guide is designed to help students understand the concepts and quantitative methods of operations management. Each chapter in the study guide consists nine basic components: Summary; Learning Objectives; Skills to Develop; Annotated Outline; Hints and Tips; Key Terms; Formulas; Self-test Questions; and Supplementary Materials.
- **Thirty-one exciting video cases** (Located on the Operations Management DVD Library, ISBN: 0-13-611981-6, and at www.myomlab.com.) These *Video Case Studies* feature real companies (Frito-Lay, Darden Restaurants, Regal Marine, Hard Rock Cafe, Ritz-Carlton, Wheeled Coach, and Arnold Palmer Hospital) and allow students to watch short videos, read about the key topics, and answer questions. These case studies can also be assigned without using class time to show the videos. Each of them was developed and written by the text authors to specifically supplement the book's content.
- **Virtual tours** (Located on the Companion Web site, at www.pearsonhighered.com/heizer.) These company tours provide direct links to companies—ranging from a hospital to an auto manufacturer—that practice key concepts. After touring each Web site, students are asked questions directly related to the concepts discussed in the chapter.
- **Self-study quizzes** (Located on the Companion Web site, www.pearsonhighered.com/heizer.) These quizzes allow students to test their understanding of each topic. These extensive quizzes contain a broad assortment of questions, 20–25 per chapter, including multiple-choice, true/false, and Internet essay questions. The quiz questions are graded and can be transmitted to the instructor for extra credit or serve as practice exams.
- **Active Models** The 28 Active Models appear in files at www.myomlab.com and the Companion Web site, www.pearsonhighered.com/heizer.
- **Excel OM data files** Examples in the text that can be solved with Excel OM appear on data files on myomlab and the Companion Web site, www.pearsonhighered.com/heizer. They are identified at the end of each example.
- **POM for Windows software** (Located at www.myomlab.com and the Companion Web site, www.pearsonhighered.com/heizer.) POM for Windows is a powerful tool for easily solving OM problems. Its 24 modules can be used to solve most of the homework problems in the text.
- **Excel OM problem-solving software** (Located at www.myomlab.com and the Companion Web site, www.pearsonhighered.com/heizer.) Excel OM is our exclusive user-friendly Excel add-in. Excel OM automatically creates worksheets to model and solve problems. Users select a topic from the pull-down menu and fill in the data, and then Excel will display and graph (where appropriate) the results. This software is great for student homework, what-if analysis and classroom demonstrations. This edition includes a new version of Excel OM that's compatible with Microsoft Excel 2007 as well as earlier versions of Excel.
- **Online Tutorial Chapters** (Located on myomlab and the Companion Web site, www.pearsonhighered.com/heizer.) *Statistical Tools for Managers*, *Acceptance Sampling*, *The Simplex Method of Linear Programming*, *The MODI and VAM Methods of Solving Transportation Problems*, and *Vehicle Routing and Scheduling* are provided as additional material.
- **Virtual office hours** (Located at www.myomlab.com.) Professors Heizer and Render appear on myomlab, walking students through 72 Solved Problems.

- **Additional practice problems** (Located at www.myomlab.com.) These problems provide problem-solving experience. They supplement the examples and solved problems found in each chapter.
- **Additional case studies** (Located at www.myomlab.com.) These additional case studies supplement the ones in the text. Detailed solutions appear in the Solutions Manual.
- **Microsoft Project 2007** (ISBN: 0-13-145421-8.) Microsoft Project, the most popular and powerful project management package, is now available on an additional student CD-ROM. This full version, documented in Chapter 3, is activated to work for 60 days.

INSTRUCTOR RESOURCES

Register, Redeem, Log in At www.pearsonhighered.com/irc instructors can register and access a variety of print, media, and presentation resources that are available with this text in downloadable digital format. For most texts, resources are also available for course management platforms such as Blackboard, WebCT, and Course Compass.

It Gets Better Once you register, you will not have additional forms to fill out or multiple usernames and passwords to remember to access new titles and/or editions. As a registered faculty member, you can log in directly to download resource files and receive immediate access and instructions for installing course management content to your campus server.

Need Help? Our dedicated technical support team is ready to answer instructors' questions about the media supplements that accompany this text. Visit <http://247.prenhall.com> for answers to frequently asked questions and toll-free user support phone numbers. The supplements are available to adopting instructors. Detailed descriptions are provided at the Instructor's Resource Center.

Instructor's Resource Manual The Instructor's Resource Manual, extensively updated by Professor Charles Munson of Washington State University, contains many useful resources for instructors—course outlines, video notes, learning techniques, Internet exercises and sample answers, case analysis ideas, additional teaching resources, and faculty notes. It also provides a snapshot of the PowerPoint lecture slides. Instructors can download the Instructor's Resource Manual from the Instructor's Resource Center, at www.pearsonhighered.com/heizer.

Instructor's Solutions Manual The Instructor's Solutions Manual, written by the authors (and extensively proofed by Professor Annie Puciloski), contains the answers to all of the discussion questions, *Ethical Dilemmas*, Active Models, and cases in the text, as well as worked-out solutions to all the end-of-chapter problems, Internet problems, and Internet cases. Instructors can download the Instructor's Solutions Manual from the Instructor's Resource Center, at www.pearsonhighered.com/heizer.

PowerPoint Presentations An extensive set of PowerPoint presentations, created by Professor Jeff Heyl of Lincoln University, is available for each chapter. Comprising well over 2,000 slides, this set has excellent color and clarity. These slides can also be downloaded from the Instructor's Resource Center, at www.pearsonhighered.com/heizer.

Test Item File The test item file, updated by Professor Greg Bier of University of Missouri–Columbia, contains a variety of true/false, multiple-choice, fill-in-the-blank, short-answer, and problem- and topic-integrating questions for each chapter. Instructors can download the test item file from the Instructor's Resource Center, at www.pearsonhighered.com/heizer.

TestGen The computerized TestGen package allows instructors to customize, save, and generate classroom tests. The test program permits instructors to edit, add, and delete questions from the test bank; edit existing graphics and create new graphics; analyze test results; and organize a database of test and student results. This software allows for extensive flexibility and ease of use. It provides many options for organizing and displaying tests, along with search and sort features. The software and the test banks can be downloaded from the Instructor's Resource Center, at www.pearsonhighered.com/heizer.

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1 Operations and Productivity

PART ONE

Introduction to Operations Management
(Chapters 1–4)

Chapter Outline

GLOBAL COMPANY PROFILE: HARD ROCK CAFE

What Is Operations Management?

Organizing to Produce Goods and Services

Why Study OM?

What Operations Managers Do

The Heritage of Operations Management

Operations in the Service Sector

Exciting New Trends in Operations Management

The Productivity Challenge

Ethics and Social Responsibility

10

OM Strategy Decisions

- ▶ **Design of Goods and Services**
- ▶ **Managing Quality**
- ▶ **Process Strategy**
- ▶ **Location Strategies**
- ▶ **Layout Strategies**
- ▶ **Human Resources**
- ▶ **Supply-Chain Management**
- ▶ **Inventory Management**
- ▶ **Scheduling**
- ▶ **Maintenance**

GLOBAL COMPANY PROFILE: HARD ROCK CAFE

OPERATIONS MANAGEMENT AT HARD ROCK CAFE

Operations managers throughout the world are producing products every day to provide for the well-being of society. These products take on a multitude of forms. They may be washing machines at Whirlpool, motion pictures at Dreamworks, rides at Disney World, or food at Hard Rock Cafe. These firms produce thousands of complex products every day—to be delivered as the customer ordered them, when the customers wants them, and where the customer wants them. Hard Rock does this for over 35 million guests worldwide every year. This is a challenging task, and the operations manager's job, whether at Whirlpool, Dreamworks, Disney, or Hard Rock, is demanding.

Orlando-based Hard Rock Cafe opened its first restaurant in London in 1971, making it over 39 years old and the granddaddy of theme restaurants. Although other theme restaurants have come and gone, Hard Rock is still going strong, with 129 restaurants in more than 40 countries—and new restaurants opening each year. Hard Rock made its name with rock music memorabilia, having started when Eric Clapton, a regular customer, marked his favorite bar stool by hanging his guitar on the wall in the London cafe. Now Hard Rock has millions of

dollars invested in memorabilia. To keep customers coming back time and again, Hard Rock creates value in the form of good food and entertainment.

The operations managers at Hard Rock Cafe at Universal Studios in Orlando provide more than 3,500 custom products, in this case meals, every day. These products are designed, tested, and then analyzed for cost of ingredients, labor requirements, and customer satisfaction. On approval, menu items are put into production—and then only if the ingredients are available from qualified suppliers. The production process, from receiving, to cold storage, to grilling or baking or frying, and a dozen other steps, is designed and maintained to yield a quality meal. Operations managers, using the best people they can recruit and train, also prepare effective employee schedules and design efficient layouts.

Managers who successfully design and deliver goods and services throughout the world understand operations. In this text, we look not only at how Hard Rock's managers create value but also how operations managers in other services, as well as in manufacturing, do so. Operations management is demanding, challenging, and exciting. It affects our lives every day. Ultimately, operations managers determine how well we live.

HARD ROCK CAFE ■

Chapter 1 Learning Objectives

LO1: Define operations management

LO2: Explain the distinction between goods and services

LO3: Explain the difference between production and productivity

LO4: Compute single-factor productivity

LO5: Compute multifactor productivity

LO6: Identify the critical variables in enhancing productivity

AUTHOR COMMENT
Let's begin by defining what this course is about.

WHAT IS OPERATIONS MANAGEMENT?

Operations management (OM) is a discipline that applies to restaurants like Hard Rock Cafe as well as to factories like Ford and Whirlpool. The techniques of OM apply throughout the world to virtually all productive enterprises. It doesn't matter if the application is in an office, a hospital, a restaurant, a department store, or a factory—the production of goods and services requires operations management. And the *efficient* production of goods and services requires effective

LO1: Define operations management

applications of the concepts, tools, and techniques of OM that we introduce in this book.

As we progress through this text, we will discover how to manage operations in a changing global economy. An array of informative examples, charts, text discussions, and pictures illustrates concepts and provides information. We will see how operations managers create the goods and services that enrich our lives.

In this chapter, we first define *operations management*, explaining its heritage and exploring the exciting role operations managers play in a huge variety of organizations. Then we discuss production and productivity in both goods- and service-producing firms. This is followed by a discussion of operations in the service sector and the challenge of managing an effective and efficient production system.

Production is the creation of goods and services. **Operations management (OM)** is the set of activities that creates value in the form of goods and services by transforming inputs into outputs. Activities creating goods and services take place in all organizations. In manufacturing firms, the production activities that create goods are usually quite obvious. In them, we can see the creation of a tangible product such as a Sony TV or a Harley-Davidson motorcycle.

In an organization that does not create a tangible good or product, the production function may be less obvious. We often call these activities *services*. The services may be “hidden” from the public and even from the customer. The product may take such forms as the transfer of funds from a savings account to a checking account, the transplant of a liver, the filling of an empty seat on an airplane, or the education of a student. Regardless of whether the end product is a good or service, the production activities that go on in the organization are often referred to as operations, or *operations management*.

VIDEO 1.1
Operations Management
at Hard Rock

VIDEO 1.2
Operations Management
at Frito-Lay

Production

The creation of goods and services.

Operations management (OM)

Activities that relate to the creation of goods and services through the transformation of inputs to outputs.

ORGANIZING TO PRODUCE GOODS AND SERVICES

To create goods and services, all organizations perform three functions (see Figure 1.1). These functions are the necessary ingredients not only for production but also for an organization’s survival. They are:

AUTHOR COMMENT
Operations is one of the three functions that every organization performs.

1. *Marketing*, which generates the demand, or at least takes the order for a product or service (nothing happens until there is a sale).
2. *Production/operations*, which creates the product.
3. *Finance/accounting*, which tracks how well the organization is doing, pays the bills, and collects the money.

Universities, churches or synagogues, and businesses all perform these functions. Even a volunteer group such as the Boy Scouts of America is organized to perform these three basic functions. Figure 1.1 shows how a bank, an airline, and a manufacturing firm organize themselves to perform these functions. The dark grey-shaded areas of Figure 1.1 show the operations functions in these firms.

WHY STUDY OM?

We study OM for four reasons:

AUTHOR COMMENT
Good OM managers are scarce and, as a result, career opportunities and pay are excellent.

1. OM is one of the three major functions of any organization, and it is integrally related to all the other business functions. All organizations market (sell), finance (account), and produce (operate), and it is important to know how the OM activity functions. Therefore, we study *how people organize themselves for productive enterprise*.
2. We study OM because we want to know *how goods and services are produced*. The production function is the segment of our society that creates the products and services we use.
3. We study OM to *understand what operations managers do*. Regardless of your job in an organization, you can perform better if you understand what operation managers do. In addition, understanding OM will help you explore the numerous and lucrative career opportunities in the field.
4. We study OM *because it is such a costly part of an organization*. A large percentage of the revenue of most firms is spent in the OM function. Indeed, OM provides a major opportu-

nity for an organization to improve its profitability and enhance its service to society. Example 1 considers how a firm might increase its profitability via the production function.

► **FIGURE 1.1**

Organization Charts for Two Service Organizations and One Manufacturing Organization

(A) A bank, (B) an airline, and (C) a manufacturing organization. The dark grey areas are OM activities.

AUTHOR COMMENT

The areas in dark grey indicate the significant role that OM plays in both manufacturing and service firms.

