

LARRY P. RITZMAN • LEE J. KRAJEWSKI • MANOJ K. MALHOTRA • ROBERT D. KLASSEN



FOUNDATIONS OF OPERATIONS MANAGEMENT

fourth canadian edition



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fourth canadian edition

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10 9 8 7 6 5 4 3 2 1 [RRD-W]

Library and Archives Canada Cataloguing in Publication

Ritzman, Larry P., author

Foundations of operations management / Larry P. Ritzman (Professor Emeritus at the Ohio State University and Boston College), Lee J. Krajewski (University of Notre Dame), Manoj K. Malhotra (University of South Carolina), Robert D. Klassen (University of Western Ontario). — Fourth Canadian edition.

Revision of: Foundations of operations management / Larry P. Ritzman ... [et al.]. — 3rd Canadian ed. — Don Mills, Ont.: Pearson Canada, 2012. Includes bibliographical references and index.
ISBN 978-0-13-325166-1 (pbk.)

1. Production management—Textbooks. I. Krajewski, Lee J., author II. Malhotra, Manoj K. (Manoj Kumar), 1960-, author III. Klassen, Robert D. (Robert David), 1963-, author IV. Title.

TS155.R58 2015 658.5 C2015-901246-5

PEARSON

ISBN 978-0-13-325166-1

Dedicated with love to our families.

Barbara Ritzman

*Karen and Matt; Kristin and Alayna
Todd; Cody, Cole, Taylor, and Clayton
Kathryn and Paul
Mildred and Ray*

Judie Krajewski

*Gary and Christine; Gabrielle
Lori and Dan; Aubrey, Madeline, Amelia, and Marianna
Carrie and Jon; Jordanne, Alaina and Bradley
Selena and Jeff; Alex
Virginia and Jerry
Virginia and Larry*

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*Vivek, Pooja, and Neha
Santosh and Ramesh Malhotra
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Aruna and Harsha Dabholkar; Aditee
Mangala and Pradeep Gandhi; Priya and Medha*

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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.

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*.

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Preface

NEW TO THE FOURTH CANADIAN EDITION

As this fourth Canadian edition was developed, my primary emphasis was to expand and further refine two critical themes for operations management: the critical role that operations managers play in the design and execution of competitive supply chains, and the pivotal importance of operations in the creation of customer value. Moreover, this edition also better captures and reinforces the importance of effective processes for service firms. Finally, to sharpen student study, Learning Objectives are summarized at the outset of each chapter, along with corresponding entries within each chapter.

More specifically, highlights of new sections and changes to the fourth Canadian edition include the following:

- Chapter 1, “Creating Value Through Operations,” includes several updated Canadian examples, and better illustrates the match of six competitive priorities to four core supply chain processes, including customer relationship, order fulfillment, supplier relationship process, and new service development. Finally, a revised conceptual model is presented to better emphasize both the importance of process execution, and the linkage among chapters in the book.
- Chapter 2, “Supply Chain Management,” continues to be placed at the front of the book to emphasize the central and critical role of supply chains for many firms. To reflect the international nature of many supply chains, a new vignette has been developed that highlights the complexity of a familiar brand name: Nikon. This chapter has also been restructured to flow from a strategic understanding, to measures of supply chain performance, and finally, to details of enhancing supplier relationships and then customer relationships. Finally, two new tools are presented: supplier preference matrix, and breakeven analysis for make-or-buy decisions.
- Chapter 3, “(More) Sustainable Supply Chains and Humanitarian Logistics,” is brand new to this edition, and explores a topic of growing importance to operations managers. The opening vignette explores the responses of Canadian retail firms in the garment industry to challenges in Bangladesh. In addition to the social aspects of supply chains, this chapter considers environmental performance, including reverse supply chains and energy-efficient routing. Finally, the chapter closes with a description of how operations managers can design humanitarian logistics to respond to natural and human-made disasters.
- Chapter 4, “Process Configuration,” introduces a new visual tool, “Swim Lane Flowchart,” to clarify the important interconnections between dependent but separate processes. In addition, importance of developing a robust process is now explicitly emphasized in the section “Developing a Better Process.”
- Chapter 5, “Capacity,” uses an entirely new process illustration—the familiar situation of issuing student ID cards—to illustrate the definition and measurement of capacity as well as how dependent process steps interact to limit process output. The key concepts of process bottlenecks are also refined to consider different operational scenarios.
- Chapter 6, “Inventory Management,” now opens with a vignette about a cruise ship to illustrate the broad relevance of inventory to service firms. This chapter

also provides a clearer, step-by-step process for arriving at a reorder point for an inventory control systems where demand is uncertain. (This expansion is consistent with the book’s overall emphasis on managing the challenges induced by system variability.)

- Chapter 7, “Quality and Process Improvement,” is now slightly shorter, with the focus on moving students more quickly from underlying philosophies of quality on to the key tools that enable process improvement. As reflected in the opening vignette, attention is often directed to service examples, such as health care or insurance, to emphasize the critical importance of quality in all processes. Last, the discussion of multiple forms of certification has been brought up to date.
- Chapter 8, “Lean Systems,” now emphasizes that linkages between a just-in-time philosophy and kaizen are central to operate leaner processes. Leaner supply chains are shown to be a logical extension of leaner internal processes.
- Chapter 9, “Managing Projects,” now includes a section of new service and product development, as many firms treat these processes as projects. The sections on project risk and monitoring and controlling projects also have been modified to highlight the importance of managing variability in projects.
- Chapter 10, “Location and Layout,” begins by noting the challenges that Canadian firms such as Canadian Tire and Tim Hortons face when identifying future locations. While GIS remains important, its discussion has been streamlined, and break-even between alternative locations has been dropped to tighten the range of topics covered.
- Chapter 11, “Managing Demand and Forecasting,” now explicitly integrates the use of Excel spreadsheets to develop a regression-based forecast of demand. Excel formulas are used for causal forecasts and projecting a trend in demand.
- New student problems. Many of the end-of-chapter assignment problems from the third edition have been replaced, with over 50 percent being new, compared to the previous edition.
- *The companion website.* This online resource continues to evolve to reflect the connected needs of our students. As in the previous edition, a key focus is the streamlined presentation of chapter-specific materials, such as video cases, assignment problems, full-colour supplements, and commercial software.

MOTIVATION AND OBJECTIVES

As with previous Canadian editions, this book continues to focus on meeting the need in many educational settings for a shorter book that has strong coverage of critical concepts *and* retains a rich set of pedagogical features. Most students who take an operations management course are pursuing a business degree in functional areas other than operations or are seeking to develop a general management perspective.

Business students—who will develop into our future managerial leaders—need to understand the interrelated processes of a firm, which connect operations with all other functional areas of an organization. Just as importantly, it is also critical that they understand that supply chains represent the complex interconnection of processes of multiple firms. For courses that prefer a strong pedagogical structure, a number of instructional features clarify and reinforce student learning (learning objectives; clear, short definitions; step-by-step examples of quantitative techniques; numerous solved problems; and end-of-chapter assignment problems).

This relatively concise textbook conveys the essential ideas and techniques without the encyclopedic volume of information found in many others. Yet the book is written to simultaneously fit the perspectives, strengths, and pedagogical approaches of individual faculty. Consequently, many advanced concepts, tools, and topics that faculty may wish to explore in greater detail are included as full-length, full-colour supplements in the companion website, along with experiential exercises, discussion questions, and cases.

As a starting point, this edition of *Foundations of Operations Management* draws much from the newly updated U.S. tenth edition. However, several shifts in emphasis and development are notable. First, the linkages between customer value and operations management are more strongly stressed and developed, beginning with Chapter 1, and then carried throughout. Operations management creates value through the effective and efficient management of processes, including services, products, and process design. The book presents a remarkable array of interesting Canadian companies that leverage their operations as an important competitive weapon as they battle in the global arena.

Second, the central emphasis on process management now focuses on services. This is a clear message behind the use of service vignettes in many chapters, as well as more detailed aspects such as service productivity, capacity measurement, customer involvement, or process improvement. To support this broader emphasis, supply chain management and four core processes are emphasized in the first two chapters. The notion is frequently reinforced that operations management involves coordination across the firm and the supply chain, and quantitative tools can be used to help managers make better operating decisions.

Of critical importance, the process management triangle in Chapter 5 conceptually links the three critical factors of capacity, customer queues/inventory, and variability. The configuration of service and manufacturing processes—whether a project, batch, line, or continuous process—implicitly combines these factors to deliver customer value. However, it is the last factor, namely variability, that is most often overlooked by (and not intuitive for) managers seeking to control and improve processes. As a result, the book returns to this idea repeatedly in chapters and supplements when considering topics such as quality, lean systems, waiting lines, project management.

Finally, the central role of operations in creating a more environmentally and socially sustainable organization is a recurring theme throughout the book. Environmental and social concerns are not unique to one region, one industry, or one type of firm; instead, these issues cut across the entire supply chain. For example, concerns about hazardous materials in products, large volumes of used products and waste in both developing and developed countries, supplier working conditions, and sizeable carbon footprints are but a few of the issues that have attracted media scrutiny, and, more recently, managerial attention. Framed around the environmental and social bottom lines, a stronger emphasis has been created in this edition by developing an expanded chapter that treats these aspects in a unified manner.

CHAPTER OVERVIEW

The text is organized so that several basic strategic issues are covered before delving deeper into a range of operational decisions.

Chapter 1, “**Creating Value Through Operations**,” sets the tone for the text. Organizations comprise many processes, and operations principles and techniques are particularly well suited for their management and analysis. The central message—the contribution of operations management and effective processes to value—is

emphasized. This perspective, which is carried forward throughout the text, appeals to students regardless of their academic major. This chapter also establishes the basic principles of operations strategy and four core processes that tie together all functions (and the broader supply chain), their primary purpose being the creation of customer value.

Chapter 2, “**Supply Chain Management**,” extends the consideration of operations beyond a single site or firm to operational linkages between firms. Both efficient and responsive supply chains are covered. Next, measures for supply chain performance also are summarized. Reiterating the importance of processes, this chapter delves deeper into operationalizing the four core processes, namely those that manage supplier relationships, order fulfillment, customer relationships, and service or product improvement.

Chapter 3, “**(More) Sustainable Supply Chains and Humanitarian Logistics**,” explores how operations can contribute to the environmental and social bottom lines that every firm must manage. Whether considering workforce practices at suppliers, recycling of used products from customers, or reducing the energy consumed in operational processes, management must actively employ operational concepts. In addition, operations is critical to delivering humanitarian supplies to areas ravaged by natural or human-made disasters.

Chapter 4, “**Process Configuration**,” provides more insight into the management and fundamental structure of processes. Four key decision areas, specifically customer involvement, process structure, capital intensity, and flexibility, are used as a starting point to process configuration. Decisions about customer interaction are particularly critical for service processes. And just as important, the linkages among these four areas are stressed. The chapter closes with a systematic approach to improving processes and with linkages to greener processes.

Chapter 5, “**Capacity**,” begins our integrative development of critical process levers that every manager must understand. The process management triangle serves as the conceptual framework that links capacity, variability, and queues/inventory, which are covered in greater detail in this chapter and the two that follow. Process bottlenecks, economies and diseconomies of scale, capacity strategies, theory of constraints, and a systematic approach to capacity planning are also highlighted. At the end of this chapter, Supplement 5S “Waiting Lines,” bolsters the discussion on variability by specifically considering waiting lines. If desired by individual faculty, several related supplements are available online in the companion website to deepen student understanding of related topics such as financial analysis, work measurement, and learning curves.

Chapter 6, “**Inventory Management**,” identifies the functions, costs, and managerial actions that can be taken to effectively use or reduce inventory. Basic inventory models and control systems are covered, and a number of quantitative examples walk students through the application of these concepts. More advanced inventory models are treated in the supplements available online in the companion website.

Chapter 7, “**Quality and Process Improvement**,” begins with a quick overview of quality management through the lenses of three quality gurus and underscores the multifaceted definition of quality as an aspect of customer value. Quality includes both high performance design and conformance, which, when coupled with tight tolerances, yields services and products with low variability. Under the conceptual umbrella of total quality management, statistical process control techniques and a number of quality improvement tools are detailed. More advanced students can study acceptance sampling using the supplement available online in the companion website.

Chapter 8, “**Lean Systems**,” draws together and reinforces concepts discussed in preceding chapters and re-emphasizes the central importance of the process management

triangle from the fifth chapter. Quality at the source, elimination of waste, small lot sizes, pull flow of materials, process visibility, and continuous improvement are linked and illustrated in both manufacturing and service settings. The overarching message is one of integrating mutually supportive elements to implement highly efficient methods for processes, firms, and supply chains.

Chapter 9, “**Managing Projects**,” has substantial managerial material regarding project management. The material follows the introduction to projects as one type of process in the chapter about process configuration. However, as is noted in Chapter 1, projects are important for both developing and implementing operations strategy. Here, the basic aspects of project management are considered, both qualitative and quantitative. New service and product development processes are also considered, as many are managed as projects. An understanding of these issues by students is important regardless of their functional major, and project management tools will undoubtedly be used by many throughout their careers.

Chapter 10, “**Location and Layout**,” continues the book’s study of decisions that require long-term commitments about the process. Students can use both qualitative approaches and quantitative tools to make important decisions about the location of new facilities, as well as how to organize processes within a facility. Faculty also can encourage their students to explore the managerial insights from global positioning systems for making location decisions (using MapPoint software available online in the companion website). In addition, related quantitative topics such as linear programming and simulation are addressed in supplements in the companion website.

Chapter 11, “**Managing Demand and Forecasting**,” begins with an overview of multiple options available to managers to adjust or shift customer demand. From there, the remainder of the chapter considers a wide variety of forecasting approaches, including some use of spreadsheet tools. While forecasting can be used for strategic planning and tactical decisions, the primary emphasis here is on the latter. This chapter also includes information on combination forecasts.

Chapter 12, “**Operations Planning and Scheduling**,” brings together planning for workforce levels across multiple service and product processes and, where possible, inventory holdings. The planning process is explored using straightforward spreadsheet tools. Scheduling in small-batch processes, flow shops, and service operations are each treated in turn. This approach allows students to understand the whole continuum of planning levels of output and workforce levels over time. The chapter closes with a brief discussion of priority rules for scheduling and performance measurement.

Chapter 13, “**Resource Planning**,” begins with an overview of enterprise resource planning systems, given their importance to practice. Moving one level lower, materials requirements planning is detailed, followed by an extension of these concepts to a bill of resources for service firms and virtual organizations. These final sections also address resources such as financial assets, human resources, equipment, and inventories. If desired, the topic of master production scheduling can be further explored using an online supplement in the companion website.

SPECIAL FEATURES OF THE BOOK

Many features are included to stress foundational concepts and to support the overall philosophy of any operations management course.

- **Central Role of Processes.** The book focuses on processes—the fundamental unit of work in all organizations. It is all about processes! This unifying theme for service and manufacturing organizations builds bridges between chapters and opens up the topics in operations to all students, regardless of their

majors or planned career paths. Simultaneously, the focus on processes can create better “buy-in” for a course in operations management because students understand that processes underlie activities throughout the organization, not just in one functional area.

- **Learning Objectives.** Each chapter begins by highlighting a small number of key points that the students will explore in detail. Later in the chapter, each learning objective is tied to a particular subsection of the material presented to reinforce the major take-aways.
- **Streamlined.** The textbook is designed to have just 13 chapters that can be effectively covered in a single term. Supplemental materials such as short cases and experiential exercises, as well as commercial software, are available online in the companion website.
- **A Balanced Perspective.** An effective operations management textbook should address both the “big picture” strategic issues and also the analytic tools that facilitate decision making. It is not just about “concepts” or just about “numbers”—it’s about both dimensions. This edition continues the expansion of services as the basis for many process examples.
- **Integration of Sustainability, including both environmental and social issues, into the strategy underlying operations as well as the management of processes.** Humanitarian logistics is also introduced as a brand new topic. Overall, these rapidly emerging areas resonate with our students, and can be linked to customer value.
- **Chapter-Opening Vignettes and Managerial Practices.** To help stimulate student interest, each chapter opens by profiling how real, world-class companies apply specific process issues. A second example illustrates how companies deal—either successfully or unsuccessfully—with operations issues as they run their operations. Collectively, these highlight strong examples of best practices from notable Canadian and international firms.
- **Pedagogical Structure.** Colourful and instructive formatting is used throughout the book and online in the companion website. Full-colour figures, clear explanations, step-by-step examples of quantitative techniques, solved problems, and numerous homework exercises assist students with identifying key concepts, understanding the linkages among concepts, solving problems, and using powerful decision-making tools.
- **Examples.** Numerous examples throughout each chapter are a popular feature and are designed to help students understand the quantitative material presented. Each concludes with a “Decision Point,” which focuses on the decision implications for managers.
- **Across the Organization.** Each chapter begins with a brief listing of how the topics that follow are important to professionals throughout the organization, including linkages to accounting, finance, human resources, and marketing.
- **Margin Items and End-of-Chapter Formulas.** Margin items have been simplified to focus on key definitions for quick student reference, and all of the important quantitative formulas are summarized in one section.
- **Solved Problems.** At the end of each chapter, detailed solutions demonstrate how to solve problems with the techniques presented in the chapter. The solved problems reinforce basic concepts and serve as models for students to refer to when doing the other problems that follow.

TEACHING AND LEARNING SUPPORT

Companion Website—www.pearson.ca/ritzman

The book's companion website offers a considerable amount of additional assistance to students.

- **Video cases.** Cases and video footage show how operations management can be used to solve real-world problems. For example, one case demonstrates how Southwest Airlines copes with gate turnaround operations and the passenger boarding process. Other examples include Autoliv for lean systems, and Clif Bar & Company for supply chain design and sustainability.
- **Cases.** A wide range of cases can either serve as a basis for classroom instruction or provide an important capstone problem to each chapter. These challenge students to grapple with the issues presented in a chapter in a less structured and more comprehensive way. A number of these cases can be used as in-class exercises without prior student preparation.
- **Experiential learning exercises.** Exercises are offered for most chapters, including Supply Chain Management (Sonic Distributors), Capacity (Min-Yo Garment Company), Inventory Management (Swift Electronic Supply), and Quality and Process Improvement (SPC with a Coin Catapult). Each of these actively involves students, has been thoroughly tested in class, and has proven to be a valuable learning tool.

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- Glossary Flashcards
- Powerpoints
- Equation Summaries
- Discussion Questions
- Cases
- Tours

- Videos
- Experiential Exercises
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ACKNOWLEDGMENTS

I wish to thank the many people at Pearson Canada who inspired this project and made up the publishing team. My deeply felt thanks to Megan Farrell, who supervised the overall project, and Patti Sayle, who kept me moving forward on the manuscript revisions with many helpful suggestions and feedback. Thanks also to Kimberly Blakey for her work in coordinating the production of this text.

I also wish to thank my Canadian colleagues who provided very useful feedback and guidance for this edition. They include the following:

- Mohammed Fazle Baki, University of Windsor
- Kalinga Jagoda, Mount Royal University
- Mats Gerschman, University of British Columbia
- Neil Bishop, Fanshawe College
- Paul Callaghan, Acadia University

I am much indebted to my colleagues at the University of Western Ontario, who have greatly influenced and developed my thinking on the teaching of operations management to business students. In particular, Fraser Johnson, Larry Menor, Dave Sparling, Stephan Vachon and David Wood have provided much-needed discussion and feedback to help me further refine this edition.

Finally, I thank my family for their patience during the many long hours preparing this book. My wife, Lorraine, provided the love and encouragement that I needed to complete this edition.

Robert D. Klassen
Ivey Business School
Western University

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Learning Objectives

After reading this chapter, you will be able to:

- L01** describe operations and supply chains in terms of inputs, processes, outputs, information flows, suppliers, and customers.
- L02** explain how operations strategy is a pattern of decisions about processes and supply chains that achieves specific competitive priorities.
- L03** define how operations can contribute to customer value.
- L04** explain how to link marketing strategy to operations strategy through the use of competitive priorities.
- L05** give examples of how operations can be used as a competitive weapon.

Creating Value Through Operations

Across the Organization

Competitive operations is important to:

- **marketing**, which helps create the demand that operations must satisfy, links customer demand with staffing and production plans, and keeps the operations function focused on satisfying customers' needs.
- **human resources**, which hires and trains employees to match process needs, location decisions, and planned production levels.
- **accounting**, which prepares financial and cost-accounting information that aids operations managers in designing and operating production systems.
- **finance**, which manages the cash flows and capital investment requirements that are created by the operations function.
- **operations**, which designs and operates processes to give the firm a sustainable competitive advantage.

AutoShare is a car-sharing service that leverages an integrated network of locations, people, and Web-enabled technology to provide greater mobility to customers. Customer value is based on the simple premise that many people living in large cities don't drive enough to justify the expense and hassles of owning a car but still need to occasionally drive a car for appointments, shopping, or other short excursions. The chairman of Ford once remarked, "If you live in a city, you don't need to own a car."

In principle, car-sharing is straightforward: have a car parked nearby that can be shared among several people using a simple reservation system. But in practice, processes have to be worked out to manage access to keys and cars, negotiate convenient parking locations, organize reservations, collect fees from users, respond to customer accidents, and provide routine vehicle maintenance, among other tasks. Operations are based on a self-serve model: Walk to one of the parking locations scattered around the city, unlock your car with a smart card or a key from a lockbox, and off you go. And don't forget to clean up the car before you return it, if you make a mess. Cars can be rented for as briefly as 30 minutes, adding to the complexity of delivering reliable service.

Adapting a European car-sharing model that originated in the 1990s, AutoShare started its operations in 1998. The president, Kevin McLaughlin, launched his business with a mission to reduce car pollution, promote environmental consciousness, and provide low-cost mobility to the masses. However, he found that having a green, socially responsible message was not enough. He reflected, "It took us years to figure out that the green part is not the reason people were joining. People were joining because car-sharing was convenient and saved them money."

The company has been profitable since 2006, while continuing to underpin operations with

a green dimension. At this point, 10 percent of AutoShare's fleet is hybrid vehicles, and car-sharing firms are expected to be at the forefront of adopting plug-in electric cars. Industry research indicates that car-sharing operations reduce greenhouse gas emissions and congestion in large cities, with each fuel-efficient, shared car replacing multiple private cars. Over 40 percent of members end up selling at least one of their cars within a year of joining.

More than 12 000 members of AutoShare now enjoy convenient, 24/7 access to vehicles at about 150 locations in Toronto and Mississauga. Pressure for growth continues, as operating costs can be spread across more customers and more locations can be developed. Management's goal is to have a vehicle within a

five-minute walk of anywhere in the city, and at every subway station.

Auto manufacturers also have shown an interest in a similar service as a way to interest future buyers, test new technologies, and generate some green marketing. To that end, Daimler launched Car2Go service with its Smart car about five years ago. Technology further enhances service; customers need not return cars to the original location, as they are tracked in real time using GPS technology. Using smart cards also simplifies operations to unlock vehicles, refuel cars, and access dedicated parking at busy city locations. Initial operations in Ulm, Germany, have grown to 16 locations in Europe and North America, including Calgary, Toronto, and Vancouver. Other manufacturers are considering a similar expansion into such services, which potentially could build long-term relationships with customers.

The demand for car-sharing services will continue to expand in variety and location. Growth is very strong because, according to McLaughlin, people's relationships with cars are changing.¹



AutoShare members get convenient, self-serve access to vehicles at about 150 locations in Toronto and Mississauga.

operations management

The systematic design, direction, and control of processes that transform inputs into services and products for internal or external customers.

supply chain An interrelated series of processes within and across firms that produces a service or good to the satisfaction of customers.

supply chain management

The synchronization of a firm's processes with those of its suppliers and customers to match the flow of materials, services, and information with customer demand.

L01 Describe operations and supply chains in terms of inputs, processes, outputs, information flows, suppliers, and customers.

process Any activity or group of activities that takes one or more inputs, transforms and adds value to them, and provides one or more outputs for its customers.

external customers End users or intermediaries, such as manufacturers, wholesalers, or retailers, who buy a firm's products and services.

Managing operations is about creating customer value through the effective and efficient management of processes that provide goods and services that people use every day. In essence, **operations management** refers to the systematic design, direction, and control of processes that transform inputs into services and products for internal, as well as external, customers. Processes are the fundamental activities that organizations use to do work and achieve their goals. Every organization, whether public or private, manufacturer or service provider, must manage processes and the operations where these processes are performed.

Processes of multiple firms can be linked together to form a **supply chain**, which is the interconnected network of processes across different firms that produce a service or good to the satisfaction of customers. A firm can have multiple supply chains, which vary by the particular service or good being delivered to customers. **Supply chain management** is the synchronization of a firm's processes with those of its suppliers and customers to match the flow of materials, services, and information with customer demand.

The growing business developed by AutoShare provides one example of designing processes that generate customer value. Processes must be created for each step of the customer experience at an affordable price. In some areas, managers automated processes, for example, reservations and invoicing. In other areas, such as expanding the number of locations and identifying the mix of cars offered, managers focused on specific attributes. However, all of these processes involved coordination across all functional areas of the firm.

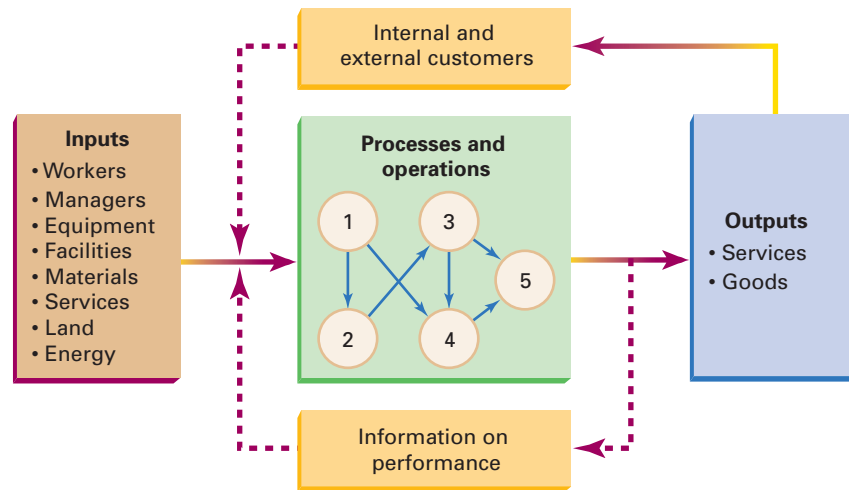
Throughout this book, we explore with you the role of managing processes within the total organization. We explain what managers of processes do, the decisions they make, and some of the tools and concepts that they can use. By developing a sound operations strategy and using appropriate techniques, managers can design and operate processes to give companies a competitive edge. Helping you understand how operations creates customer value and can be a competitive weapon begins with this chapter and continues throughout the book.

PROCESS VIEW

An organization is only as effective as its processes. A **process** is any activity or group of activities that takes one or more inputs, transforms and adds value, and generates one or more outputs for its customers. The types of processes can vary significantly. For example, a primary process in a factory could be a physical or chemical change of raw materials, like wood and leather, into physical products, such as furniture. But there also are many service and support processes at a factory, such as order fulfillment, making due-date promises to customers, and inventory control. In contrast, the primary process for an airline would be the movement of passengers and their luggage from one location to another. Here, too, processes are needed for making reservations, checking in passengers, serving meals, and scheduling crews.

As Figure 1.1 illustrates, processes have inputs and customer outputs. Inputs include human resources (workers and managers), capital (equipment and facilities), energy, and purchased materials and services, including information. The numbered circles represent operations through which services, products, and customers pass and where activities are performed. The arrows represent flows and can cross because one customer can have different requirements (and thus, a different flow pattern) from another customer. Processes provide outputs—often services, which can take the form of information—to their “customers.”

Both manufacturing and service organizations now realize that every process and every person in an organization has customers. Some are **external customers**, who may

FIGURE 1.1 *Processes and Operations*

internal customers One or more employees who use outputs from earlier, upstream processes to perform processes in the next office, shop, or department.

be either end users or intermediaries (such as manufacturers, wholesalers, or retailers) buying the firm's finished products and services. Others are **internal customers**, who may be one or more other employees who rely on inputs from earlier processes in order to perform processes in the next office, shop, or department. Either way, processes must be managed with the right customer in mind.

Figure 1.1 can represent a whole firm, a department or small group, or even a single individual. Each one has inputs and uses processes at various operations to provide outputs. The dashed lines represent two special types of input: participation by customers and information on performance from both internal and external sources. Participation by customers occurs not only when they receive outputs, but also when they take an active part in the processes, such as when students participate in a class discussion. Information on performance includes internal reports on customer service or inventory levels, and external information from market research, government reports, or telephone calls from suppliers. Managers need all types of information to manage processes most effectively.

HOW PROCESSES WORK

Let's take a look at what happens at an ad agency. Suppose a client contacts her account executive (AE) about her need for a memorable ad campaign for the upcoming National Hockey League (NHL) Stanley Cup series. The AE gathers the pertinent information and passes it along to a creative design team and a media planning team that prepares an ad layout and a media exposure plan acceptable to the client. The AE also gives the information to the accounting department, which prepares an account for billing purposes. The creative design team passes the layout design to a production team, which prepares the final layout for publication and delivers it to the selected media outlets according to the schedule developed by the media team and approved by the client. The design team, media team, and production team send their billable hours and expense items to the accounting department, which prepares an invoice that is approved by the AE and then sent to the client for payment.

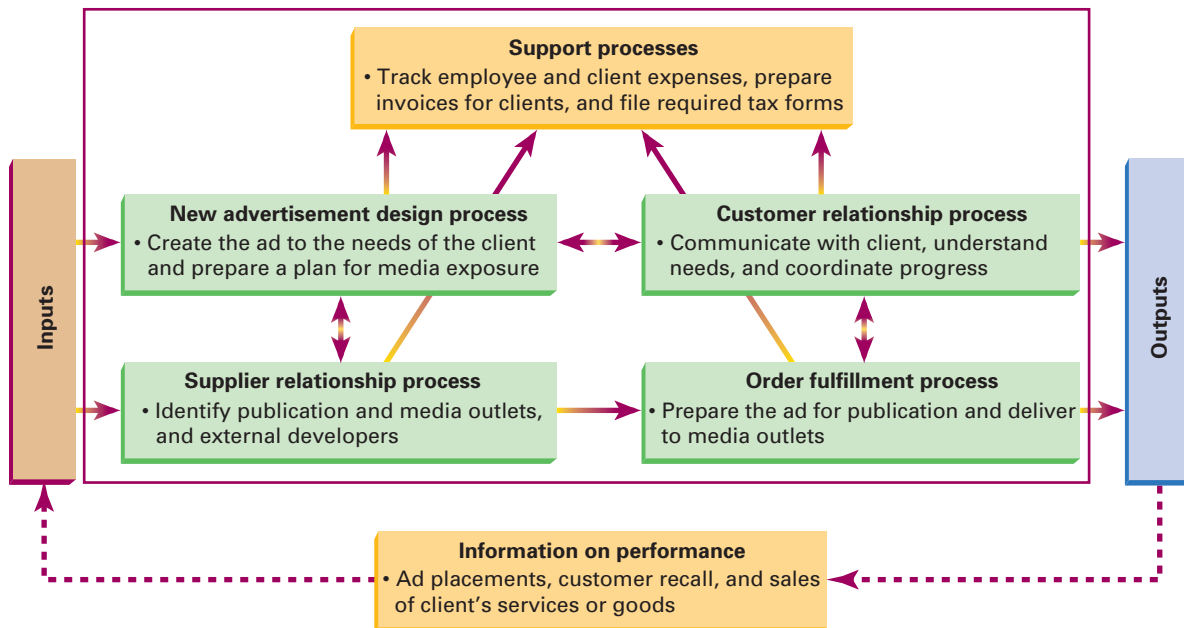
FIGURE 1.2 *Process View of an Ad Agency*

Figure 1.2 shows a process view of the ad agency at two levels. The red-outlined box represents the ad agency as an aggregate process. Viewed at this level, the ad agency requires inputs from external sources and produces outputs, which are advertisements for external clients. The inputs from external sources are resources used by the ad agency's processes and include employees, managers, money, equipment, facilities, materials, services, land, and energy. The output is the NHL ad campaign for the client. However, inside the red box we see a more detailed process view: the client interface process includes the AE and her interactions with the client. The advertisement design and planning process creates the ad and plans its exposure during the Stanley Cup series. The production process acquires the actors, prepares the production set and props, coordinates the schedules of all involved in the production of the ad, films the content, prepares a video, and delivers the ad to the media outlets on time. The arrows in the diagram indicate information and work flows between the processes, along with feedback on performance.

NESTED PROCESSES

Processes can be broken down into subprocesses, which can in turn be broken down into still more subprocesses. We refer to this concept of a process within a process as a **nested process**. One part of a process can be separated from another for several reasons. One person or one department may be unable to do all parts of the process, or different segments in the process may require different skills. Some segments of the process may be standardized for all customers, making high-volume operations possible. Other segments may be customized, requiring processes best suited to flexible, low-volume operations.

If we peel away a few more layers of our process view of the ad agency, we can focus on the advertisement design and planning process. The creative design process

nested process A process within a process.

starts with a work order from the AE, after which the creative design director assembles the team. The work order includes the ad's objective, the overall message, the evidence supporting the claims, and the intended audience. The design team comes up with several designs, gets feedback from the AE, prepares a final design, gets feedback from the client through the client interface process, and revises the design as needed.

SERVICE AND MANUFACTURING PROCESSES

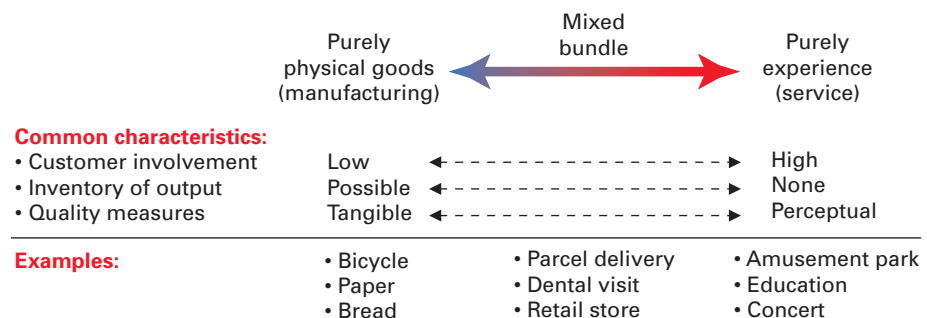
At a simple level, processes are often classified as services or manufacturing (i.e., goods) based on the primary output of the process. Service processes pervade the business world and have a prominent place in our discussion of operations management. Manufacturing processes are also important; without them, the products we that enjoy as part of our daily lives would not exist. In addition, manufacturing gives rise to service opportunities.

DIFFERENCES. Why do we distinguish between service and manufacturing processes? The answer lies at the heart of the design of competitive processes. While Figure 1.3 shows several distinctions between service and manufacturing processes along a continuum, three characteristics tend to differentiate goods-producing processes from service-producing processes. First, customers tend to be highly involved in the operations process for services, particularly those that are experience-based, such as an amusement park. Although tangible facilities might be part of that experience, the output of the process is the enjoyment and memories of the customer.

Second, manufacturing outputs are physical goods that often can be produced in advance, and then held in inventory until needed by the customer. In contrast, because service processes usually require the customer to be directly involved, they cannot be produced in advance to insulate the process from erratic customer demands. For example, the output from the auto loan process of a bank would be a car loan, and an output of the order fulfillment process of Purolator Courier is the delivery of your package.

Third, the quality of goods can often be monitored using physical measures of specific characteristics, with little ambiguity. However, the outputs of many service operations tend to have perceptual characteristics, such as whether a movie was “exciting.” Distinctions between manufacturing and service outputs must be reflected in the operations strategies chosen by an organization.

FIGURE 1.3 *Continuum of Service and Manufacturing Process Outputs*



SIMILARITIES. Today, few firms put themselves at either end of the continuum, with manufacturing firms moving into service offerings, and services selling physical goods. For example, some manufacturing firms, such as Lexus, are strongly committed to outstanding after-sales service support through its dealer network. Moving in the opposite direction, Disney produces and licenses an increasing number of goods related to its cast of characters. As a result, firms must explicitly design and manage a set of processes that bundle both goods and services with strong, convincing customer value.

Further, even though service processes do not keep finished goods inventories, they do inventory their inputs. For example, hospitals keep inventories of medical supplies and materials needed for day-to-day operations. Some manufacturing processes, on the other hand, do not inventory their outputs because they are too costly. Such would be the case with low-volume customized products (e.g., tailored suits) or products with short shelf lives (e.g., daily newspapers).

When you look at what is being done at the process level, it is much easier to see whether the process is providing a service or manufacturing a product. However, this clarity is lost when the whole company is classified as either a manufacturer or a service provider, because it often performs both types of processes. For example, the process of making a doughnut at Tim Hortons is a manufacturing process, because it changes the food's physical properties. However, most of the other processes visible or invisible to customers are service processes.

SUPPLY CHAIN VIEW

As noted earlier, most services or goods are produced through a series of interrelated business activities. Each activity in a process should add value to the preceding activities; waste and unnecessary cost should be eliminated. Our process view of a firm is helpful for understanding how services or products are produced and why cross-functional coordination is important, but it does not shed any light on the strategic benefits of the processes. The critical strategic insight is that processes must add value for every customer along the supply chain. The concept of supply chains reinforces the link between processes and performance and points to two main types of processes, namely core processes and support processes.

CORE PROCESSES

A **core process** is a set of activities that delivers value to external customers. Managers of these processes and their employees interact with external customers and build relationships with them, develop new services and products, interact with external suppliers, and produce the service or product for the external customer. Examples include a hotel's reservation handling, new car design for an auto manufacturer, or Web-based purchasing for an online retailer like Chapters.Indigo.ca. Of course, each of the core processes has subprocesses nested within it. In this text, we focus on four core processes:

1. *Supplier relationship process.* Employees select the suppliers of services, materials, and information, and facilitate the timely and efficient flow of these items into the firm. Working effectively with suppliers can add significant customer value. For example, negotiating fair prices, scheduling on-time deliveries, and gaining ideas and insights from critical suppliers are just a few of the ways to create value.
2. *Order fulfillment process.* The order fulfillment process includes the activities required to produce and deliver the service or product to the external customer.

core process A set of activities that delivers value to external customers.

3. *Customer relationship process.* Sometimes referred to as *customer relationship management*. Employees involved in the customer relationship process identify, attract, and build relationships with external customers, and facilitate the placement of orders by customers.
4. *New service or product development process.* Employees use a process to design, develop, and launch new services or goods. The services or goods may be developed to external customer specifications or conceived from inputs received from the market in general.

support process A process that provides vital resources and inputs to the core processes and therefore is essential to the management of the business.

L02 Explain how operations strategy is a pattern of decisions about processes and supply chains that achieves specific competitive priorities.

operations strategy The pattern of decisions and investments in products, services, and processes used to implement an organization's corporate strategy and to create customer value.

SUPPORT PROCESSES

A **support process** provides vital resources and inputs to the core processes and is essential to the management of the business. Firms have many support processes. Examples include accounting, budgeting, recruiting, and scheduling (see Figure 1.2). Support processes provide key resources, capabilities, or other inputs that allow the core processes to function.

OPERATIONS STRATEGY

Operations strategy specifies the means by which operations implements corporate strategy and helps to direct processes toward creating customer value. It links long-term and short-term operations decisions to corporate strategy, and develops the capabilities the firm needs to be competitive. It is at the heart of managing processes and supply chains. A firm's internal processes are only building blocks: they need to be organized to ultimately be effective in a competitive setting. Operations strategy is the linchpin that brings these processes together to form supply chains that extend beyond the walls of the firm, encompassing suppliers as well as customers. Because customer segments evolve and new opportunities arise, the firm's operations strategy must be strongly linked to the needs of its customers. We will return to these important ideas at the end of the chapter.

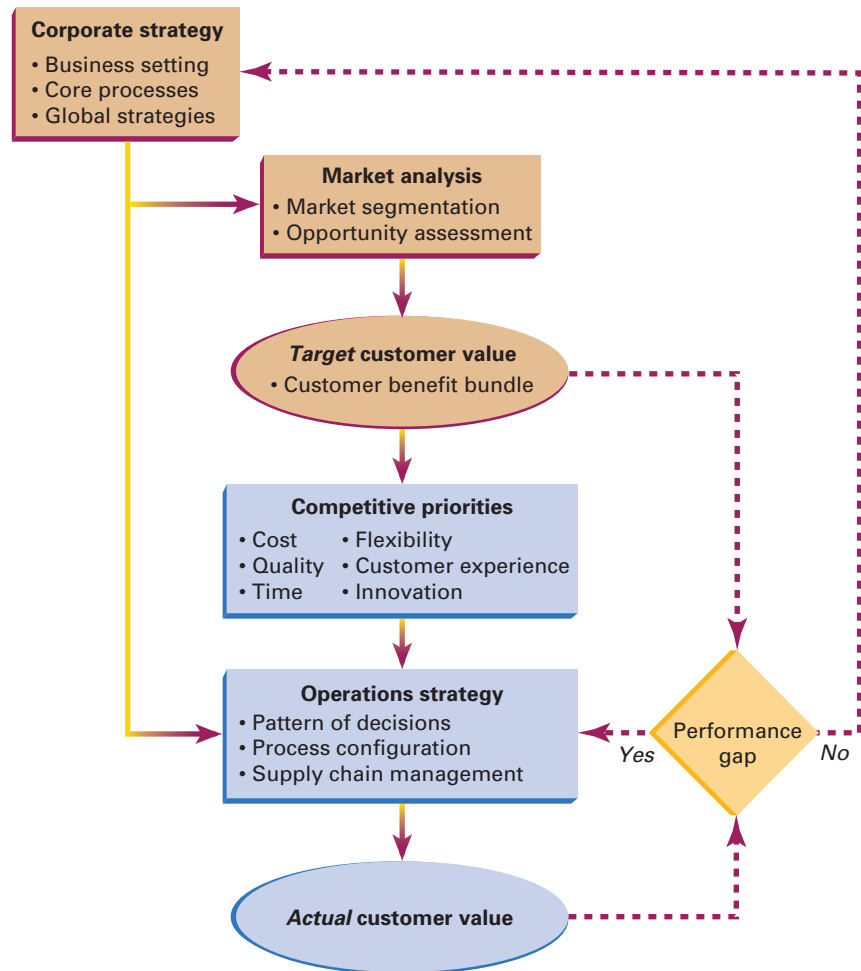
Developing an operations strategy that delivers customer value begins with a corporate strategy, as shown in Figure 1.4, that establishes the firm's overall goals with its core processes. It determines the markets that are served and how the firm responds to changes in the business setting. The corporate strategy also provides the resources to develop the firm's core processes, and identifies how the firm will be positioned in international markets. Based on corporate strategy, a market analysis categorizes the firm's customers, identifies opportunities, and assesses competitors' strengths. This information is used to target customer value and specify competitive priorities. Competitive priorities encompass six key dimensions, and are a central driver for the firm's operations strategy. However, an operations strategy is not static; improvement opportunities and gaps in performance must be addressed through iterative development.

CORPORATE STRATEGY

Corporate strategy provides an overall direction that serves as the framework for carrying out all the organization's functions. It specifies the business or businesses the company will pursue, isolates new opportunities and threats in the environment, and identifies growth objectives.

From an operations perspective, a corporate strategy involves three considerations: (1) monitoring and adjusting to changes in the business setting, (2) targeting resources to develop a firm's core processes, and (3) developing the firm's operations with a global perspective.

FIGURE 1.4 *Customer Value is the Critical Link Between Corporate Strategy, Competitive Priorities, and Operations Strategy*



BUSINESS SETTING. The competitive and regulatory situation in which a firm finds itself frequently changes, and it needs to adapt accordingly. Adaptation begins with scanning of the business setting, whereby managers monitor trends in the industry, marketplace, and society in general. A crucial reason for monitoring is to stay ahead of the competition. Competitors may be gaining an edge by broadening service or product lines, improving quality, or lowering costs. New entrants into the market or competitors that offer substitutes for a firm's service or product may threaten continued profitability. For example, car manufacturers recognize that dwindling oil reserves will eventually require alternative fuels for their cars. Consequently, several are beginning to introduce new cars based on hybrid or electric power systems. Other important environmental concerns are economic trends, technological changes, political conditions, social changes (such as attitudes toward work), the availability of vital resources, and the collective power of customers or suppliers.