

SECTION ONE

STRATEGY, PRODUCTS, AND CAPACITY

1. Introduction
2. Strategy
3. Design of Products and Services
4. Project Management
5. Strategic Capacity Management
6. Learning Curves

TWENTY-FIRST-CENTURY OPERATIONS AND SUPPLY CHAIN MANAGEMENT

Managing a modern supply chain involves specialists in manufacturing, purchasing, and distribution, of course. However, today it is also vital to the work of chief financial officers, chief information officers, operations and customer service executives, and chief executives. Changes in operations and supply management have been truly revolutionary, and the pace of progress shows no sign of moderating.

In the first section of *Operations and Supply Chain Management*, we lay a foundation for understanding the dynamic field of operations and

supply management. This book is about designing and operating processes that deliver a firm's goods and services in a manner that matches customers' expectations. Really successful firms have a clear and unambiguous idea of how they intend to make money. Be it high-end products or services that are custom-tailored to the needs of a single customer or generic inexpensive commodities that are bought largely on the basis of cost, competitively producing and distributing these products is a great challenge.

1

INTRODUCTION

Learning Objectives

- LO1-1** Identify the elements of operations and supply chain management (OSCM).
- LO1-2** Know the potential career opportunities in operations and supply chain management.
- LO1-3** Recognize the major concepts that define the operations and supply chain management field.
- LO1-4** Evaluate the efficiency of a firm.

UPS—WE LOVE LOGISTICS

We are sure you have seen the television commercials for United Parcel Service (UPS), the U.S. package delivery company. UPS serves an essential segment of the supply chain: the

part that moves goods from one point to another. Moving material in the supply chain is referred to as logistics, the theme of the jingle that is played in UPS commercials.

Being successful in the logistics business requires amazing attention to the details of how things are done. For example, the company requires drivers to walk at a fast 2.5 paces a second when moving from the truck to the customer's front door. The company is also installing digital remote control so drivers can quickly lock and unlock the truck's overhead door and even turn on and off the engine's ignition, all while on the run. The chief operating officer reported that the new \$70 million wireless system will save 1.75 seconds per stop, or 6.5 minutes per driver per day, while reducing motion and fatigue. The company does everything possible to make the process of



QR Code—UPS “We Love Logistics”

www.youtube.com/watch?v=mRAHa_Po0Kg



UPS DRIVER IN LUXEMBOURG.

delivering packages as quick as possible. Each truck is even equipped with a computer that shows details of idle time, how often it backs up, whether the driver is wearing a seatbelt, or even if the driver seems to be going out of his/her way

for lunch. This information is used to shape new procedures.

Source: Adapted from Jennifer Levitz, "Delivery Drivers to Pick Up Pace by Surrendering Keys," *The Wall Street Journal*, September 16, 2011, p. B6.

INTRODUCTION

In the context of major business functions, operations and supply chain management involves specialists in product design, purchasing, manufacturing, service operations, logistics, and distribution. These specialists are mixed and matched in many different ways depending on the product or service. For a firm that sells televisions, like Sony, these are the functions responsible for designing televisions, acquiring materials, coordinating equipment resources to convert material to products, moving the product, and exchanging the final product with the customer. Some firms are focused on services, such as a hospital. Here the context involves managing resources, including the operating rooms, labs, and hospital beds that are used to nurse patients back to health. In this context, acquiring materials, moving patients, and coordinating resource use are keys to success. Other firms are more specialized, such as Amazon. Here purchasing, website services, logistics, and distribution need to be carefully coordinated for success. In our increasingly interconnected and interdependent global economy, the process of delivering finished goods, services, and supplies from one place to another is accomplished by means of mind-boggling technological innovation, clever new applications of old ideas, seemingly magical mathematics, powerful software, and old-fashioned concrete, steel, and muscle.

This book is about doing this at low cost while meeting the requirements of demanding customers. Success involves the clever integration of a great operations-related *strategy*, *processes* that can deliver the products and services, and *analytics* that support the ongoing decisions needed to manage the firm. Our goal in this book is to introduce students to basic operations and supply chain concepts so they understand how things should be done and the importance of these functions to the success of the firm.

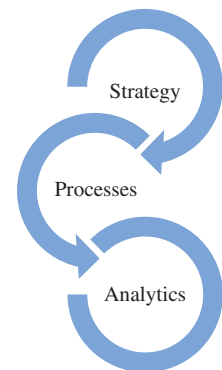
No matter what your major is in business, understanding operations and supply chain management is critical to your success. If you are interested in the study of finance you will find that all of the concepts are directly applicable. Just convert all of those widgets to their value in the currency of your choice and you will realize that this is all about dollars and cents moving, being stored, and appreciating in value due to exchanges. What you study in finance class is exactly the same, but we look at things in very different ways due to the physical nature of goods and the intangible features of services. If you are interested in studying marketing, you will realize that the topics presented here are critical to your success. If the product or service cannot be delivered to the customer at an acceptable cost, then no matter how good your marketing program is, no one may buy it. And finally, for the accountants who keep score, the operations and supply chain processes generate most of the transactions that are used to track the financial health of the firm. Understanding why these processes operate the way they do is important to understanding the financial statements of the firm.

What Is Operations and Supply Chain Management?

Operations and supply chain management (OSCM) is defined as the design, operation, and improvement of the systems that create and deliver the firm's primary products and services. Like marketing and finance, OSCM is a functional field of business with clear line management responsibilities. OSCM is concerned with the management of the entire system that produces a product or delivers a service. Producing a product such as the Men's Nylon Supplex Parka or providing a service, such as a cellular phone account, involves a complex series of transformation processes.

LO1-1

Identify the elements of operations and supply chain management (OSCM).



Operations and supply chain management (OSCM)

The design, operation, and improvement of the systems that create and deliver the firm's primary products and services.



Exhibit 1.1 shows a supply network for a Men's Nylon Supplex Parka sold on websites such as L.L. Bean or Land's End. We can understand the network by looking at the four color-coded paths. The blue path traces the activities needed to produce the Polartec insulation material used in the parkas. Polartec insulation is purchased in bulk, processed to get the proper finish, and then dyed prior to being checked for consistency—or grading—and color. It is then stored in a warehouse. The red path traces the production of the nylon, Supplex, used in the parkas. Using petroleum-based polymer, the nylon is extruded and drawn into a yarn-like material. From here the green path traces the many steps required to fabricate the clothlike Supplex used to make the parkas. The yellow path shows the Supplex and Polartec material coming together and used to assemble the lightweight and warm parkas. The completed parkas are sent to a warehouse and then on to the retailer's distribution center. The parkas are then picked and packed for shipment to individual customers. Think of the supply network as a pipeline through which material and information flow. There are key locations in the pipeline where material and information are stored for future use: Polartec is stored near the end of the blue pipeline; Supplex is stored near the end of the red pipeline. In

both cases, fabric is cut prior to merging with the yellow pipeline. At the beginning of the yellow path, bundles of Supplex and Polartec are stored prior to their use in the fabrication of the parkas. At the end of the yellow path are the distribution steps which involve storing to await orders, picking according to actual customer order, packing, and finally shipping to the customer.

Networks such as this can be constructed for any product or service. Typically each part of the network is controlled by different companies, including the nylon Supplex producer, the Polartec producer, the parka manufacturer, and the catalog sales retailer. All of the material is moved using transportation providers, in this case ships and trucks. The network also has a global dimension, with each entity potentially located in a different country. For a successful transaction, all of these steps need to be coordinated and operated to keep costs low and to minimize waste. OSCM manages all of these individual processes as effectively as possible.



KEY IDEA

A good starting point for understanding a supply chain is to sketch out the network from start to finish.



KEY IDEA

Things are made using operations processes. Things are moved and stored using supply chain processes. Supply chain management is the integrated management of operations and supply chain processes.

Distinguishing Operations versus Supply Chain Processes

Success in today's global markets requires a business strategy that matches the preferences of customers with the realities imposed by complex supply networks. A sustainable strategy that meets the needs of shareholders and employees and preserves the environment is critical. Concepts related to developing and analyzing this type of strategy are the topic of Section I (see Exhibit 1.2).

In the context of our discussion, the terms *operations* and *supply chain* take on special meaning. *Operations* refers to manufacturing and service processes that are used to transform the resources employed by a firm into products desired by customers. These processes are covered in Section II. For example, a manufacturing process would produce some type of physical product, such as an automobile or a computer. A service process would produce an intangible product, such as a call center that provides information to customers stranded on the highway or a hospital that treats accident victims in an emergency room. Planning the use of these processes involves analyzing capacity, labor, and material needs over time. Ensuring quality and making ongoing improvements to these processes are needed to manage these processes. Concepts related to this are included in Section II of the book as well.

Supply chain refers to processes that move information and material to and from the manufacturing and service processes of the firm. These include the logistics processes that physically move product and the warehousing and storage processes that position products for quick delivery to the customer. Supply chain in this context refers to

exhibit 1.1

Process Steps for Men's Nylon Supplex Parkas

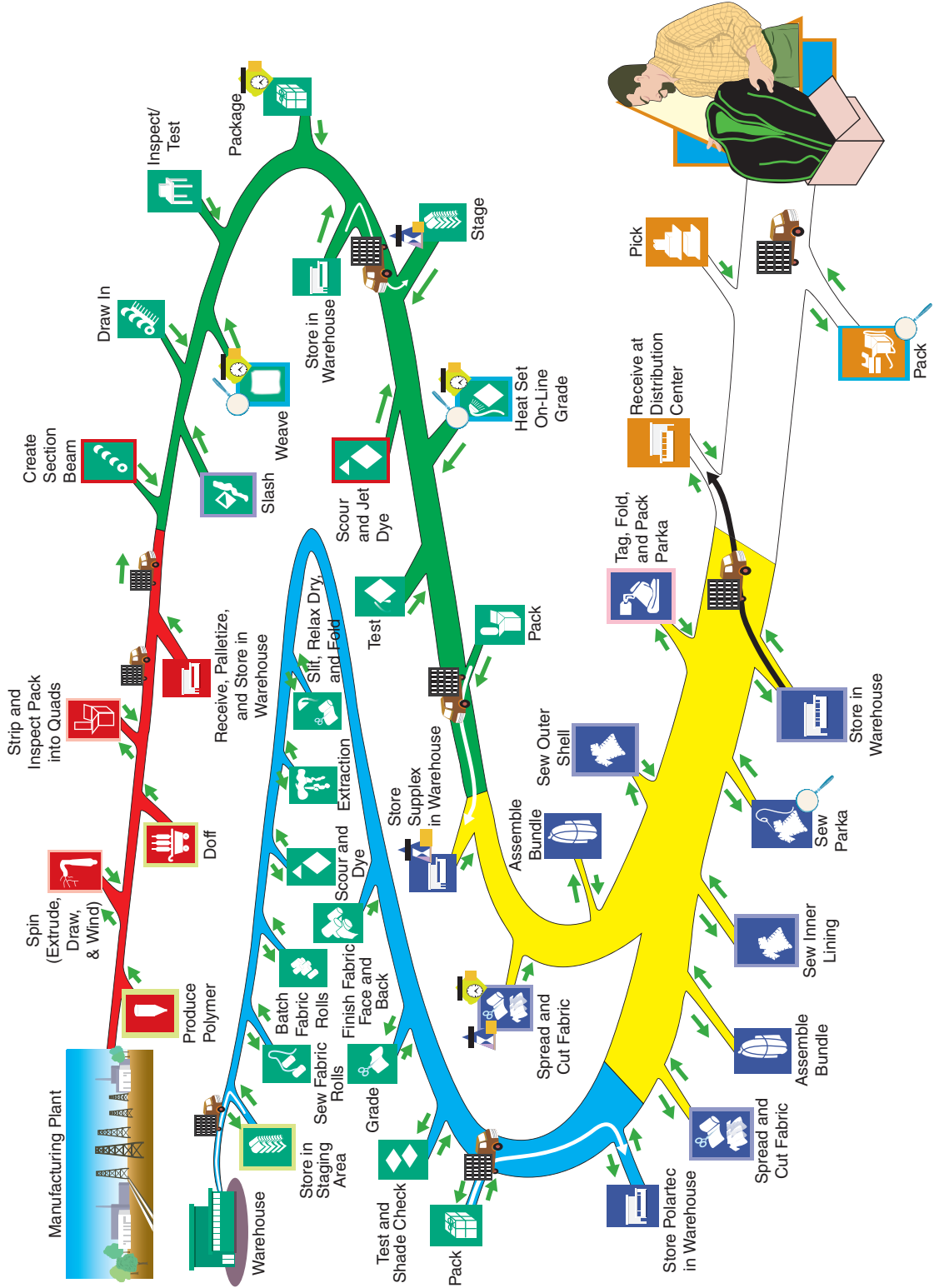
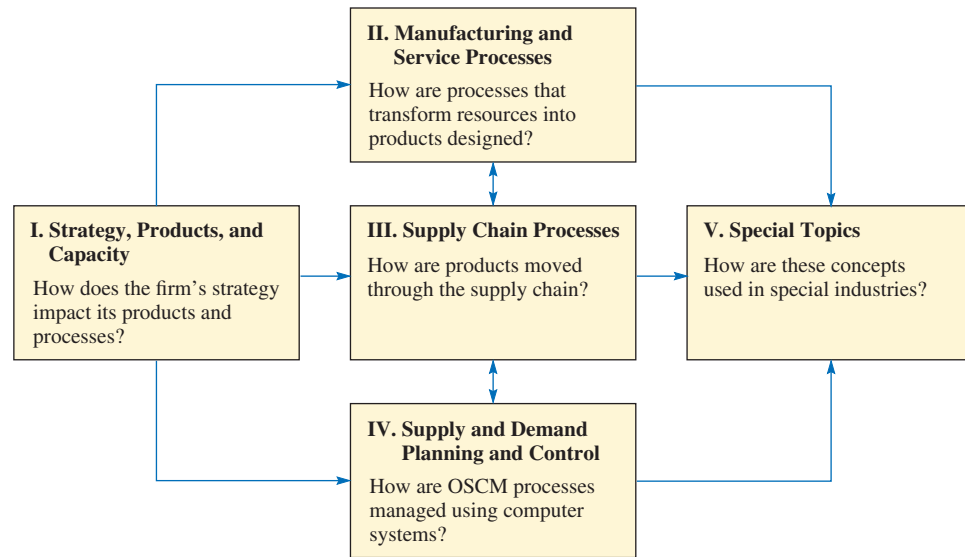


exhibit 1.2

Questions Answered in each Section of OSCM



providing products and service to plants and warehouses at the input end and also to the supply of products and service to the customer on the output end of the supply chain. Details concerning how these supply chain processes work and are analyzed are covered in Section III.

Section IV of the book is about planning the use of operations and supply chain resources. Starting with a forecast of demand, resources are planned in increasingly shorter increments of time to match supply inputs with the demand-driven outputs of the firm. These planning activities are completed using integrated computer systems that capture the activities and current status of a firm's resources.

The final section of the book shows how these concepts are applied in more specialized types of businesses such as health care and consulting. Part of understanding this material is seeing how the concepts can be directly applied to business processes that are not specifically covered. In the book, in a relatively generic way, manufacturing, service, sourcing and logistics processes are studied. How these ideas are applied in the context of a few specific businesses is the motivation of this section.

All managers should understand the basic principles that guide the design of transformation processes. This includes understanding how different types of processes are organized, how to determine the capacity of a process, how long it should take a process to make a unit, how the quality of a process is monitored, and how information is used to make decisions related to the design and operation of these processes.

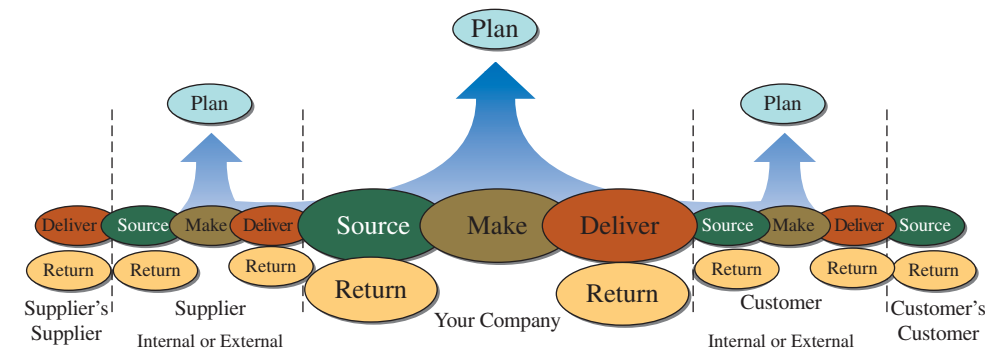
The field of operations and supply chain management is ever changing due to the dynamic nature of competing in global business and the constant evolution of information technology. So while many of the basic concepts have been around for years, their application in new and innovative ways is exciting. Internet technology has made the sharing of reliable real-time information inexpensive. Capturing information directly from the source through such systems as point-of-sale, radio-frequency identification tags, bar-code scanners, and automatic recognition has shifted the focus to understanding both what all the information is saying and also how good the decisions that can be made using it are.

Process

One or more activities that transform inputs into outputs.

Categorizing Operations and Supply Chain Processes

Operations and supply chain **processes** can be conveniently categorized, particularly from the view of a producer of consumer products and services, as planning, sourcing, making,

Supply Chain Processes **exhibit 1.3**

Source: Supply-Chain Council (www.supply-chain.org).

delivering, and returning. Exhibit 1.3 depicts where the processes are used in different parts of a supply chain. The following describes the work involved in each type of process.

1. **Planning** consists of the processes needed to operate an existing supply chain strategically. Here a firm must determine how anticipated demand will be met with available resources. A major aspect of planning is developing a set of metrics to monitor the supply chain so that it is efficient and delivers high quality and value to customers.
2. **Sourcing** involves the selection of suppliers that will deliver the goods and services needed to create the firm's product. A set of pricing, delivery, and payment processes are needed together with metrics for monitoring and improving the relationships between partners of the firm. These processes include receiving shipment, verifying them, transferring them to manufacturing facilities, and authorizing supplier payments.
3. **Making** is where the major product is produced or the service provided. The step requires scheduling processes for workers and the coordination of material and other critical resources such as equipment to support producing or providing the service. Metrics that measure speed, quality, and worker productivity are used to monitor these processes.
4. **Delivering** is also referred to as logistics processes. Carriers are picked to move products to warehouses and customers, coordinate and schedule the movement of goods and information through the supply network, develop and operate a network of warehouses, and run the information systems that manage the receipt of orders from customers and the invoicing systems that collect payments from customers.
5. **Returning** involves processes for receiving worn-out, defective, and excess products back from customers and support for customers who have problems with delivered products. In the case of services, this may involve all types of follow-up activities that are required for after-sales support.

To understand the topic, it is important to consider the many different players that need to coordinate work in a typical supply chain. The aforementioned steps of planning, sourcing, making, delivering, and returning are fine for manufacturing and can also be used for the many processes that do not involve the discrete movement and production of parts. In the case of a service firm such as a hospital, for example, supplies are typically delivered on a daily basis from drug and health care suppliers and require coordination between drug companies, local warehouse operations, local delivery services, and hospital receiving. Patients need to be scheduled into the services provided by the hospital, such as operations and blood tests. Other areas, such as the emergency room, need to be staffed to provide service on demand. The orchestration of all of these activities is critical to providing quality service at a reasonable cost.

KEY IDEA



Companies are positioned in different places in the supply chain. Within the context of their position, they all require planning, sourcing, making, delivering, and returning processes.



KEY IDEA

The things produced by a service are intangible. Service processes tend to be highly variable and time dependent compared to goods-producing processes.

Differences Between Services and Goods

There are five essential differences between services and goods. The first is that a service is an *intangible* process that cannot be weighed or measured, whereas a good is a tangible output of a process that has physical dimensions. This distinction has important business implications since a service innovation, unlike a product innovation, cannot be patented. Thus, a company with a new concept must expand rapidly before competitors copy its procedures. Service intangibility also presents a problem for customers since, unlike with a physical product, customers cannot try it out and test it before purchase.

The second is that a service requires some degree of *interaction with the customer* for it to be a service. The interaction may be brief, but it must exist for the service to be complete. Where face-to-face service is required, the service facility must be designed to handle the customer's presence. Goods, on the other hand, are generally produced in a facility separate from the customer. They can be made according to a production schedule that is efficient for the company.

The third difference is that services, with the big exception of hard technologies such as ATMs and information technologies such as answering machines and automated Internet exchanges, are inherently *heterogeneous*—they vary from day to day and even hour by hour as a function of the attitudes of the customer and the servers. Thus, even highly scripted work, such as found in call centers, can produce unpredictable outcomes. Goods, in contrast, can be produced to meet very tight specifications day-in and day-out with essentially zero variability. In those cases where a defective good is produced, it can be reworked or scrapped.

The fourth is that services as a process are *perishable and time dependent*, and unlike goods, they can't be stored. You cannot “come back last week” for an air flight or a day on campus.

And fifth, the specifications of a service are defined and evaluated as a *package of features* that affect the five senses. These features are:

- Supporting facility (location, decoration, layout, architectural appropriateness, supporting equipment)
- Facilitating goods (variety, consistency, quantity of the physical goods that go with the service; for example, the food items that accompany a meal service)
- Explicit services (training of service personnel, consistency of service performance, availability and access to the service, and comprehensiveness of the service)
- Implicit services (attitude of the servers, atmosphere, waiting time, status, privacy and security, and convenience)

The Goods–Services Continuum

Almost any product offering is a combination of goods and services. In Exhibit 1.4, we show this arrayed along a continuum of “pure goods” to “pure services.” The continuum captures the main focus of the business and spans from firms that just produce products to those that only provide services. Pure goods industries have become low-margin commodity businesses, and in order to differentiate, they are often adding some services. Some examples are providing help with logistical aspects of stocking items, maintaining extensive information databases, and providing consulting advice.

exhibit 1.4

The Goods–Services Continuum

| Pure Goods | Core Goods | Core Services | Pure Services |
|-----------------|----------------------|----------------------------|----------------------|
| Food products | Appliances | Hotels | Teaching |
| Chemicals | Data storage systems | Airlines | Medical advice |
| Book publishing | Automobiles | Internet service providers | Financial consulting |

Goods ← ————— → Services

Source: Anders Gustafsson and Michael D. Johnson, *Competing in a Service Economy* (San Francisco: Jossey-Bass, 2003), p. 7. Copyright © 2003 Jossey-Bass. Reproduced with permission of John Wiley & Sons, Inc.

Core goods providers already provide a significant service component as part of their businesses. For example, automobile manufacturers provide extensive spare parts distribution services to support repair centers at dealers.

Core service providers must integrate tangible goods. For example, your cable television company must provide cable hookup and repair services and also high-definition cable boxes. Pure services, such as may be offered by a financial consulting firm, may need little in the way of facilitating goods, but what they do use—such as textbooks, professional references, and spreadsheets—are critical to their performance.

Product-Service Bundling

Product-service bundling refers to a company building service activities into its product offerings for its customers. Such services include maintenance, spare part provisioning, training, and, in some cases, total systems design and R&D. A well-known pioneer in this area is IBM, which treats its business as a service business and views physical goods as a small part of the “business solutions” it provides its customers. Companies that are most successful in implementing this strategy start by drawing together the service aspects of the business under one roof in order to create a consolidated service organization. The service evolves from a focus on enhancing the product’s performance to developing systems and product modifications that support the company’s move up the “value stream” into new markets. This type of strategy might not be the best approach for all product companies, however. A recent study found that while firms that offer product-service bundles generate higher revenues, they tend to generate lower profits as a percent of revenues when compared to focused firms. This is because they are often unable to generate revenues or margins high enough to cover the additional investment required to cover service-related costs.

Product-service bundling

When a firm builds service activities into its product offerings to create additional value for the customer.

CAREERS IN OPERATIONS AND SUPPLY CHAIN MANAGEMENT

So what do people who pursue careers in OSCM do? Quite simply, they specialize in managing the production and distribution of goods and services. Jobs abound for people who can do this well since every organization is dependent on effective performance of this fundamental activity for its long-term success.

It is interesting to contrast entry-level jobs in OSCM to marketing and finance jobs. Many marketing entry-level jobs focus on actually selling products or managing the sales of products. These individuals are out on the front line trying to push product to potential customers. Often a significant part of their income will depend on commissions from these sales. Entry-level finance (and accounting) jobs are often in large public accounting firms. These jobs involve working at a desk auditing transactions to ensure the accuracy of financial statements. Other assignments involve the analysis of transactions to better understand the costs associated with the business.

Contrast the marketing and finance jobs to OSCM jobs. The operations and supply chain manager is out working with people to figure out the best way to deliver the goods and services of the firm. Sure, they work with the marketing folks, but rather than being on the selling side, they are on the buying side: trying to select the best materials and hiring the greatest talent. They will use the data generated by the finance people and analyze processes to figure out how to deliver that good or service. OSCM jobs are hands-on, working with people and figuring out the best way to do things.

The following are some typical entry-level and staff jobs in OSCM:

- Plant manager—Oversees the workforce and physical resources (inventory, equipment, and information technology) required to produce the organization’s product.
- Hospital administrator—Oversees human resource management, staffing, supplies, and finances at a health care facility.

LO1–2

Know the potential career opportunities in operations and supply chain management.

KEY IDEA



OSCM jobs focus on delivering the goods on-time and at low cost.



KEY IDEA

OSCM jobs are hands-on, people-oriented jobs.

- Branch manager (bank)—Oversees all aspects of financial transactions at a branch.
- Department store manager—Oversees all aspects of staffing and customer service at a store.
- Call center manager—Oversees staffing and customer service activities at a call center.
- Supply chain manager—Negotiates contracts with vendors and coordinates the flow of material inputs to the production process and the shipping of finished products to customers.
- Purchasing manager—Manages the day-to-day aspects of purchasing, such as invoicing and follow-up.
- Logistics manager—Oversees the movement of goods throughout the supply chain.
- Warehouse/distribution manager—Oversees all aspects of running a warehouse, including replenishment, customer order fulfillment, and staffing.
- Business process improvement analyst—Applies the tools of lean production to reduce cycle time and eliminate waste in a process.
- Quality control manager—Applies techniques of statistical quality control, such as acceptance sampling and control charts, to the firm's products.
- Lean improvement manager—Trains organizational members in lean production and continuous improvement methods.
- Project manager—Plans and coordinates staff activities, such as new-product development, new-technology deployment, and new-facility location.
- Production control analyst—Plans and schedules day-to-day production.
- Facilities manager—Ensures that the building facility design, layout, furniture, and other equipment are operating at peak efficiency.

Chief Operating Officer

So how far can you go in a career in OSCM? One goal would be to become the chief operating officer of a company. The chief operating officer (COO) works with the CEO and company president to determine the company's competitive strategy. The COO's ideas are filtered down through the rest of the company. COOs determine an organization's location, its facilities, which vendors to use, and the implementation of the hiring policy. Once the key decisions are made, lower-level operations personnel carry them out. Operations personnel work to find solutions and then set about fixing the problems.

Managing the supply chain, service, and support are particularly challenging aspects of a chief operating officer's job. Career opportunities in OSCM are plentiful today as companies strive to improve profitability by improving quality and productivity and reducing costs. The hands-on work of managing people is combined with great opportunities to leverage the latest technologies in getting the job done at companies around the world. No matter what you might do for a final career, your knowledge of OSCM will prove to be a great asset.

OSCM AT WORK

Operations and Supply Chain Management Professional Societies

If you are interested in career opportunities in operations and supply chain management, you can learn more about the field through the following professional societies. These groups provide industry-recognized certification programs and ongoing training for those seeking to work in the field.

APICS, the Association for Operations Management, www.apics.org.

Council of Supply Chain Management Professionals (CSCMP), www.cscmp.org.

Institute for Supply Management (ISM), www.ism.ws.

The Project Management Institute (PMI), www.pmi.org.

HISTORICAL DEVELOPMENT OF OPERATIONS AND SUPPLY CHAIN MANAGEMENT

Our purpose in this section is not to go through all the details of the history of OSCM; that would require us to recount the entire Industrial Revolution. Rather, the focus is on the major operations-related concepts that have been popular since the 1980s. Exhibit 1.5 will help clarify the dates as you read about the concepts. Where appropriate, how a supposedly new idea relates to an older idea is discussed. (We seem to keep rediscovering the past.)

Manufacturing Strategy Paradigm The late 1970s and early 1980s saw the development of the manufacturing strategy paradigm by researchers at Harvard Business School. This work by professors William Abernathy, Kim Clark, Robert Hayes, and Steven Wheelwright (built on earlier efforts by Wickham Skinner) emphasized how manufacturing executives could use their factories' capabilities as strategic competitive weapons. Central to their thinking was the notion of factory focus and manufacturing trade-offs. They argued that because a factory cannot excel on all performance measures, its management must devise a focused strategy, creating a focused factory that performs a limited set of tasks extremely well. This requires trade-offs among such performance measures as low cost, high quality, and high flexibility in designing and managing factories. Ford seems to have realized this about 60 years before the Harvard professors.

Lean Manufacturing, JIT, and TQC The 1980s saw a revolution in the management philosophies and technologies by which production is carried out. Just-in-time (JIT) production was the major breakthrough in manufacturing philosophy. Pioneered by the Japanese, JIT is an integrated set of activities designed to achieve high-volume production using minimal inventories of parts that arrive at the workstation exactly when they are needed. The philosophy—coupled with total quality control (TQC), which aggressively seeks to eliminate causes of production defects—is now a cornerstone in many manufacturers' production practices, and the term *lean manufacturing* is used to refer to the set of concepts.

LO1-3

Recognize the major concepts that define the operations and supply chain management field.

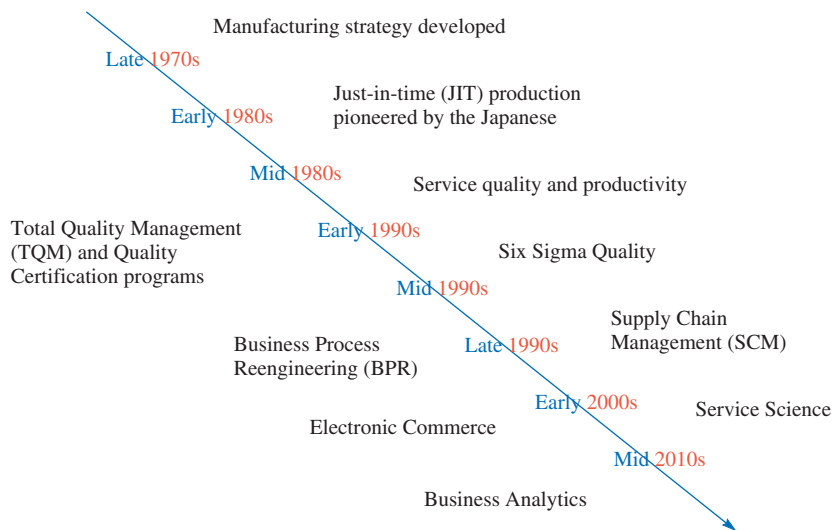


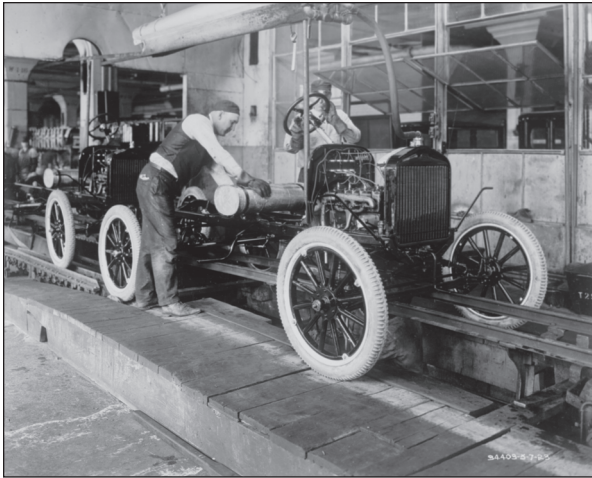
Strategy



Process

Time Line Depicting When Major OSCM Concepts Became Popular **exhibit 1.5**





Of course, the Japanese were not the first to develop a highly integrated, efficient production system. In 1913, Henry Ford developed an assembly line to make the Model-T automobile. Ford developed a system for making the Model-T that was constrained only by the capabilities of the workforce and existing technology. Quality was a critical prerequisite for Ford: The line could not run steadily at speed without consistently good components. On-time delivery was also critical for Ford; the desire to keep workers and machines busy with materials flowing constantly made scheduling critical. Product, processes, materials, logistics, and people were well integrated and balanced in the design and operation of the plant.¹

Service Quality and Productivity The great diversity of service industries—ranging from airlines to zoos, with many different types in between—precludes

identifying any single pioneer or developer that has made a major impact in these areas. However, McDonald's unique approach to quality and productivity has been so successful that it stands as a reference point in thinking about how to deliver high-volume standardized services.



Process

Total Quality Management and Quality Certification Another major development was the focus on total quality management (TQM) in the late 1980s and 1990s. All operations executives are aware of the quality message put forth by the so-called quality gurus: W. Edwards Deming, Joseph M. Juran, and Philip Crosby. It's interesting that these individuals were students of Shewhart, Dodge, and Romig in the 1930s (sometimes it takes a generation for things to catch on). Helping the quality movement along is the Baldrige National Quality Award, which was started in 1987 under the direction of the National Institute of Standards and Technology. The Baldrige Award recognizes companies each year for outstanding quality management systems.

The ISO 9000 certification standards, created by the International Organization for Standardization, now play a major role in setting quality standards for global manufacturers. Many companies require that their vendors meet these standards as a condition for obtaining contracts.

Business Process Reengineering The need to become lean to remain competitive in the global economic recession in the 1990s pushed companies to seek innovations in the processes by which they run their operations. The theme of business process reengineering (BPR) is conveyed in the title of Michael Hammer's influential article in *Harvard Business Review*: "Reengineering Work: Don't Automate, Obliterate." The approach seeks to make revolutionary changes as opposed to evolutionary changes (which are commonly advocated in TQM). It does this by taking a fresh look at what the organization is trying to do in all its business processes, and then eliminating non-value-added steps and computerizing the remaining ones to achieve the desired outcome.

Hammer actually was not the first consultant to advocate eliminating non-value-added steps and reengineering processes. In the early 1900s, Frederick W. Taylor developed principles of scientific management that applied scientific analysis to eliminating wasted effort from manual labor. Around the same time, Frank and Lillian Gilbreth used the new technology of the time, motion pictures, to analyze such diverse operations as bricklaying and medical surgery procedures. Many of the innovations this husband-and-wife team developed, such as time and motion study, are widely used today.

Six Sigma Quality Originally developed in the 1980s as part of total quality management, Six Sigma quality in the 1990s saw a dramatic expansion as an extensive set of diagnostic tools was developed. These tools have been taught to managers as part of Green and Black Belt Programs at many corporations. The tools are now applied not only to the well-known manufacturing applications, but also to nonmanufacturing processes such as accounts

receivable, sales, and research and development. Six Sigma has been applied to environmental, health, and safety services at companies and is now being applied to research and development, finance, information systems, legal, marketing, public affairs, and human resources processes.

Supply Chain Management The central idea of supply chain management is to apply a total system approach to managing the flow of information, materials, and services from raw material suppliers through factories and warehouses to the end customer. Trends such as outsourcing and **mass customization** are forcing companies to find flexible ways to meet customer demand. The focus is on optimizing core activities to maximize the speed of response to changes in customer expectations.

Electronic Commerce The quick adoption of the Internet and the World Wide Web during the late 1990s was remarkable. The term *electronic commerce* refers to the use of the Internet as an essential element of business activity. The Internet is an outgrowth of a government network called ARPANET, which was created in 1969 by the Defense Department of the U.S. government. The use of web pages, forms, and interactive search engines has changed the way people collect information, shop, and communicate. It has changed the way operations managers coordinate and execute production and distribution functions.

Service Science A direct response to the growth of services is the development of a major industry and university program called Service Science Management and Engineering (SSME). SSME aims to apply the latest concepts in information technology to continue to improve service productivity of technology-based organizations. An interesting question raised by Jim Spohrer, leader of the IBM team that started the effort, is where will the labor go once productivity improves in the service sector? “The short answer is new service sector industries and business—recall the service sector is very diverse and becoming more so every day. Consider the growth of retail (franchises, ecommerce, Amazon, eBay), communication (telephones, T-Mobile, Skype), transportation (airlines, FedEx), financial (discount e-brokers, Schwab), as well as information (television, CNN, Google) services, not to mention all the new services in developing nations of the world. The creative capacity of the service sector for new industries and business has scarcely been tapped.”²

Business Analytics **Business analytics** involves the analysis of data to better solve business problems. Not that this is something new: Data has always been used to solve business problems. What is new is the reality that so much more data is now captured and available for decision-making analysis than was available in the past. In addition, mathematical tools are now readily available that can be used to support the decision-making process.

In the past, most analysis involved the generation of standard and ad hoc reports that summarized the current state of the firm. Software allowed querying and “drill down” analysis to the level of the individual transaction, useful features for understanding what happened in the past. Decision making was typically left to the decision maker based on judgment or simple alerting rules. The new “analytics” movement takes this to a new level using statistical analysis, forecasting to extrapolate what to expect in the future, and even optimization, possibly in real time, to support decisions. These mathematical results can be used either to support the decision maker or to automate decision making.

Take, for example, an airline manager presented with the task of setting price points for tickets on a flight. Real-time demand data, historic demand patterns, and powerful mathematical models can now be applied to setting price points for different classes of tickets. As it is



Process

Mass customization

The ability to produce a unique product exactly to a particular customer's requirements.



Analytics

Business analytics

The use of current business data to solve business problems using mathematical analysis.



AIR TRAFFIC CONTROLLERS MANAGE THE MOVEMENTS OF AIRCRAFTS ALONG CIVIL AIRWAYS INCLUDING THE COORDINATION OF ARRIVALS AND DEPARTURES.

closer to the time of departure for a particular flight, these price points can be adjusted based on how sales are going. These decisions have a major impact on the utilization of aircraft capacity, which impacts both revenue and costs for the airlines. These decisions can even be made using criteria related to weather conditions, fuel prices, crew schedules, and other flights to maximize the profit of the firm.

Current Issues in Operations and Supply Chain Management

OSCM is a dynamic field, and issues arising in global enterprise present exciting new challenges for operations managers. Looking forward to the future, we believe the major challenges in the field will be as follows:



Strategy



Process

1. **Coordinating the relationships between mutually supportive but separate organizations.** Recently there has been a dramatic surge in the outsourcing of parts, and outsourcing parts and services is common as companies seek to minimize costs. Many companies now even outsource major corporate functions, such as information systems, product development and design, engineering services, and distribution. The ability to coordinate these activities is a significant challenge for today's operations and supply chain manager.
2. **Optimizing global supplier, production, and distribution networks.** The implementation of global enterprise resource planning systems, now common in large companies, has challenged managers to use all of this information. Operations and supply chain *analytics* involves leveraging this information for making decisions related to resources such as inventory, transportation, and production.
3. **Managing customer touch points.** As companies strive to cut costs, they often scrimp on the customer support personnel (and training) required to effectively staff service departments, help lines, and checkout counters. This leads to the frustrations we have all experienced, such as being placed in call center limbo seemingly for hours, getting bad advice when finally interacting with a company rep, and so on. The issue here is to recognize that making resource utilization decisions must capture the implicit costs of lost customers as well as the direct costs of staffing.
4. **Raising senior management awareness of OSCM as a significant competitive weapon.** Many senior executives entered the organization through finance, strategy, or marketing, built their reputations on work in these areas, and as a result often take OSCM for granted. As we will demonstrate in this book, this can be a critical mistake when we realize how profitable companies such as Amazon, Apple, Taco Bell, and Southwest Airlines are. These are companies where executives have creatively used OSCM for competitive advantage.
5. **Sustainability and the triple bottom line.** **Sustainability** is the ability to maintain balance in a system. Management must now consider the mandates related to the ongoing economic, employee, and environmental viability of the firm (the triple bottom line). Economically the firm must be profitable. Employee job security, positive working conditions, and development opportunities are essential. The need for nonpolluting and non-resource-depleting products and processes presents new challenges to operations and supply managers.

Sustainability

The ability to meet current resource needs without compromising the ability of future generations to meet their needs.

Triple bottom line

A business strategy that includes social, economic, and environmental criteria.

EFFICIENCY, EFFECTIVENESS, AND VALUE

LO1-4

Evaluate the efficiency of a firm.

Compared with most of the other ways managers try to stimulate growth—technology investments, acquisitions, and major market campaigns, for example—innovations in operations are relatively reliable and low cost. As a business student, you are perfectly positioned to come up with innovative operations-related ideas. You understand the big picture of all the processes that generate the costs and support the cash flow essential to the firm's long-term viability.

OSCM AT WORK

Efficiency: It's the Details That Count

Getting passengers on a plane quickly can greatly affect an airline's costs. Southwest says that if its boarding times increased by 10 minutes per flight, it would need 40 more planes at a cost of \$40 million each to run the same number of flights it does currently.

Not all the innovation in the airline industry is from Southwest. U.S. Airways, working with researchers at Arizona State University, studied different systems for boarding passengers. One system is called the "reverse pyramid" where the first economy-class passengers to get on the plane are those with window seats in the middle and rear of the plane. Then passengers gradually fill in the plane, giving priority to those with window or rear seats, until it finally boards those seated along aisles in the front. This is in contrast to the approach used by many airlines of just boarding all seats starting from the back of the plane and working forward.

The time it takes for passengers to board has more than doubled since 1970, according to studies by Boeing Co. A study in the mid-1960s found that 20 passengers boarded the plane per minute. Today that figure is down to nine per minute as passengers bring along heftier carry-on luggage. Both Boeing and Airbus, the two top commercial-aircraft makers, are

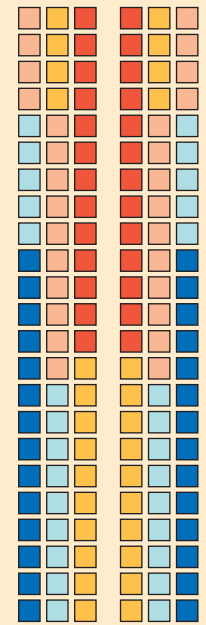
Creating Order

US Airways' reverse pyramid system boards coach-class passengers in back-row window seats first.

Order of boarding



 First Last



Adaptation of the figure from M.H.L. van den Briel et al., "America West Airlines develops efficient boarding strategies," *Interfaces*, 35(3), May/June 2005, p. 194. Copyright © 2005 The Institute for Operations Research and the Management Sciences, 7240 Parkway Drive, Suite 300, Hanover, Maryland 21076.

working on improving boarding time as a selling point to airlines.

Through this book, you will become aware of the concepts and tools now being employed by companies around the world as they craft efficient and effective operations. **Efficiency** means doing something at the lowest possible cost. Later in the book we define this more thoroughly, but roughly speaking the goal of an efficient process is to produce a good or provide a service by using the smallest input of resources. In general, these resources are the material, labor, equipment, and facilities used in the OSCM processes.

Effectiveness means doing the right things to create the most value for the company. For example, to be effective at a grocery store it is important to have plenty of operating check-out lines even though they may often stand idle. This is a recognition that the customer's time is valuable and that they do not like waiting to be served in the check-out line. Often maximizing effectiveness and efficiency at the same time creates conflict between the two goals. We see this trade-off every day in our lives. At the check-out lines, being efficient means using the fewest people possible heading the lines. Being effective, though, means minimizing the amount of time customers need to wait in line.

Related to efficiency and effectiveness is the concept of **value**, which can be abstractly defined as quality divided by price. Here quality is the attractiveness of the product, considering its features and durability. If you can provide the customer with a better car without changing price, value has gone up. If you can give the customer a better car at a *lower* price, value goes way up. A major objective of this book is to show how smart management can achieve high levels of value.

How Does Wall Street Evaluate Efficiency?

Comparing firms from an operations and supply chain view is important to investors since the relative cost of providing a good or service is essential to high earnings growth. When you think about it, earnings growth is largely a function of the firm's profitability, and profit can be

Efficiency

Doing something at the lowest possible cost.

Effectiveness

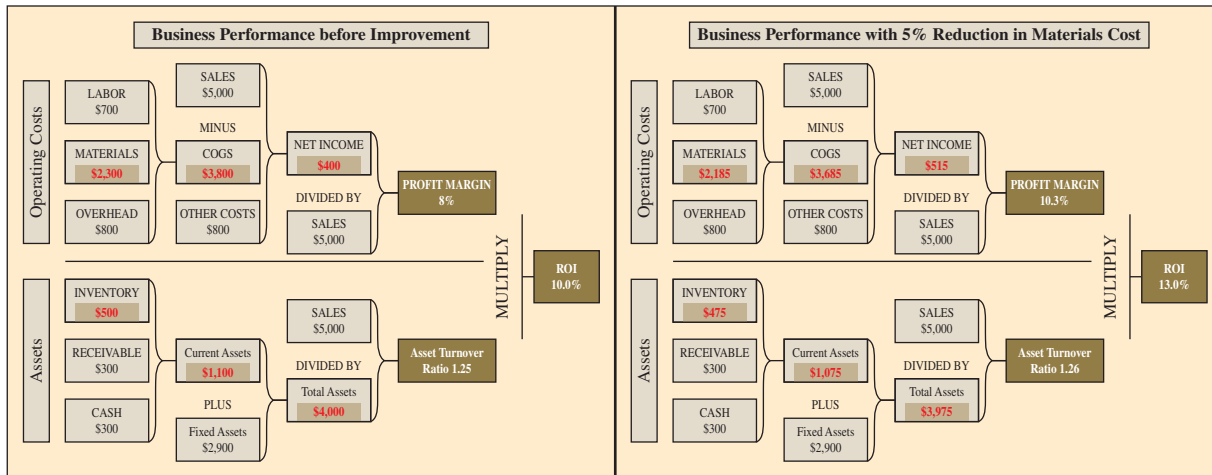
Doing the things that will create the most value for the customer.

Value

The attractiveness of a product relative to its price.

exhibit 1.6

The Impact of Reducing Raw Material Cost



increased through higher sales and/or reduced cost. Highly efficient firms usually shine when demand drops during recession periods since they often can continue to make a profit due to their low-cost structure. These operations-savvy firms may even see a recession as an opportunity to gain market share as their less-efficient competitors struggle to remain in business.

An interesting relationship between the costs related to OSCM functions and profit is the direct impact of a reduction of cost in one of these functions on the profit margin of the firm. In Exhibit 1.6 we show data from a company’s balance sheet. The balance sheet on the left shows the return on investment (ROI) for the company prior to a reduction in raw material cost. The balance sheet on the right shows the same data, but with a reduction of 5 percent in the cost of raw materials. The cost of raw materials affects the values throughout the supply chain, including the cost of goods sold, inventory value, and total value of assets; therefore, reducing raw material costs by 5 percent leads to nearly a 29 percent increase in profit margins and a 30 percent increase in the company’s ROI. Thus, there is an almost 6:1 leverage on every dollar saved by reducing raw materials costs.

A common set of financial indicators that Wall Street tracks to benchmark companies are called management efficiency ratios. **Benchmarking** is a process in which one company studies the processes of another company (or industry) to identify best practices. You probably discussed these measures in one of your accounting classes. It is not our purpose to do an in-depth review of this material, but it is important to recognize the significant impact the operations and supply chain processes have on these ratios. A comparison of a few automobile companies using the ratios is shown in Exhibit 1.7.

The following is a brief review of these ratios. Starting from basic financial data for the firm, the simplest efficiency-related measures relate to the productivity of labor employed by the firm. There are two of these ratios:

- Net income per employee
- Revenue (or sales) per employee

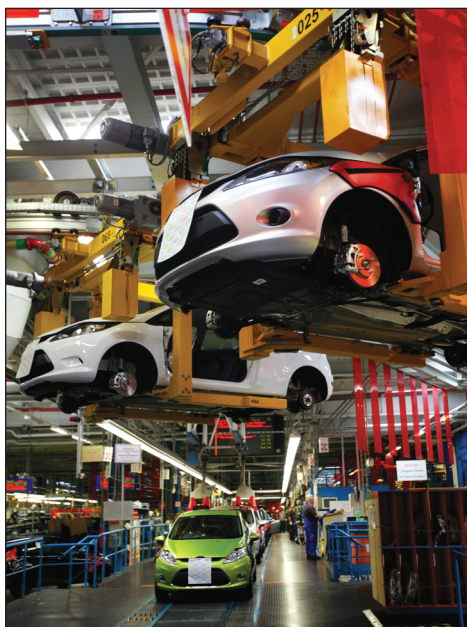
These labor productivity measures are fairly crude since many employees are not directly employed in operations and supply chain-related functions. Also, it is important to recognize that the concepts described in this book are certainly applicable to the other functions in the firm.

A third efficiency ratio measures the number of times receivables are collected, on average, during the fiscal year. This ratio is called the receivables turnover ratio, and it is calculated as follows:

$$\text{Receivable Turnover} = \frac{\text{Annual Credit Sales}}{\text{Average Account Receivable}} \quad [1.1]$$

Benchmarking

When one company studies the processes of another company to identify best practices.



FORD FIESTAS ON THE ASSEMBLY LINE AT THE FORD FACTORY IN COLOGNE, GERMANY.

Management Efficiency Measures Used by Wall Street

exhibit 1.7

| A COMPARISON OF AUTOMOBILE COMPANIES | | | | |
|--------------------------------------|-------------|---------------------|-----------|-----------|
| EFFICIENCY MEASURE | TOYOTA (TM) | GENERAL MOTORS (GM) | FORD (F) | INDUSTRY |
| Income per employee | \$13,694 | \$25,075 | \$39,982 | \$17,545 |
| Revenue (or sales) per employee | \$756,669 | \$671,248 | \$786,305 | \$550,751 |
| Receivables turnover | 12.8 | 16.7 | 17.7 | 10.8 |
| Inventory turnover | 12.2 | 10.7 | 19.9 | 9.5 |
| Asset turnover | 0.7 | 1.0 | 0.7 | 0.8 |



The receivables turnover ratio measures a company's efficiency in collecting its sales on credit. Accounts receivable represent the indirect interest-free loans that the company is providing to its clients. A higher receivables ratio implies either that the company operates on a cash basis or that its extension of credit and collection methods are efficient. Also, a high ratio reflects a short lapse of time between sales and the collection of cash, while a low number means collection takes longer. The lower the ratio, the longer receivables are being held and the higher the risk of them not being collected.

A ratio that is low by industry standards will generally indicate that the business needs to improve its credit policies and collection procedures. If the ratio is going up, either collection efforts are improving, sales are rising, or receivables are being reduced. From an operations and supply chain perspective, the firm may be able to impact this ratio by such things as the speed of delivery of products, accuracy in filling orders, and amount of inspection the customer needs to do. Factors such as the outgoing quality of the product and how customer orders are taken, together with other order-processing activities, may have a huge impact on the receivables turnover ratio. This is particularly true when Internet catalogues are the main interface between the customer and the firm.

Another efficiency ratio is inventory turnover. It measures the average number of times inventory is sold and replaced during the fiscal year. The inventory turnover ratio formula is:

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory Value}} \quad [1.2]$$

This ratio measures the company's efficiency in turning its inventory into sales. Its purpose is to measure the liquidity or speed of inventory usage. This ratio is generally compared against industry averages. A low inventory turnover ratio is a signal of inefficiency, since inventory ties up capital that could be used for other purposes. It might imply either poor sales or excess inventory relative to sales. A low turnover ratio can indicate poor liquidity, possible overstocking, and obsolescence, but it may also reflect a planned inventory buildup in the case of material shortages or in anticipation of rapidly rising prices. A high inventory turnover ratio implies either strong sales or ineffective buying (the firm may be buying too often and in small quantities, driving up the buying price). A high inventory turnover ratio can indicate better liquidity, but it can also indicate shortage or inadequate inventory levels, which may lead to a loss in business. Generally, a high inventory turnover ratio when compared to competitors' is good. This ratio is controlled to a great extent by operations and supply chain processes. Factors such as order lead times, purchasing practices, the number of items being stocked, and production and order quantities have a direct impact on the ratio.

The final efficiency ratio considered here is asset turnover. This is the amount of sales generated for every dollar's worth of assets. The formula for the ratio is:

$$\text{Asset Turnover} = \frac{\text{Revenue (or Sales)}}{\text{Total Assets}} \quad [1.3]$$

Asset turnover measures a firm's efficiency at using its assets in generating sales revenue—the higher the number the better. It also indicates pricing strategy: Companies with low profit margins tend to have high asset turnover, while those with high profit margins have low asset turnover. This ratio varies significantly by industry, so comparisons between unrelated businesses are not

useful. To a great extent, the asset turnover ratio is similar to the receivables turnover and the inventory turnover ratio since all three involve the investment in assets. Asset turnover is more general and includes the plants, warehouses, equipment, and other assets owned by the firm. Since many of these facilities are needed to support the operations and supply chain activities, the ratio can be significantly impacted by investments in technology and outsourcing, for example.

These ratios can be calculated from data in a firm's annual financial statements and are readily available on the Internet from websites such as MSN Money (<http://money.msn.com/>).

EXAMPLE 1.1: Comparing the Management Efficiency of Companies in the Same Industry Using Wall Street Measures

Building on the data in Exhibit 1.7, compare the Japanese automobile manufacturer Nissan to Toyota, General Motors, and Ford. Specifically address the following questions:

1. How does Nissan (stock symbol NSANF) differ relative to income per employee, revenue per employee, receivables turnover, inventory turnover, and asset turnover?
2. Speculate on why Nissan's Wall Street efficiency measures are different from the other automobile companies'. Be sure to consider the fact that Nissan is a smaller company compared to the others.

SOLUTION

The first step is to get comparable data on Nissan. One website that has this data is <http://money.msn.com/>. Hyperlink to this site using your browser and then enter NSANY in the "Get Quote" block on the top of the page. Then from the menu on the left under "Fundamentals," select "Key Ratios," and finally "Mgmt Efficiency." Check to see that you have the correct data. The industry comparison column should be the same for all the companies you are comparing. The actual industry description is given on the Fundamentals, Company Report page. Checking this ensures you are making a fair comparison.

Comparable data for Nissan is as follows:

| | |
|----------------------|-----------|
| Income per employee | \$4,044 |
| Revenue per employee | \$607,044 |
| Receivable turnover | 2.4 |
| Inventory turnover | 7.9 |
| Asset turnover | 0.7 |

Next, we need to try to understand the data. It is probably good to start with asset turnover, since this is the most comprehensive measure. Notice that, except for GM, asset turnover is about the same for all four firms, indicating that the revenue generated for the assets employed is comparable across the group. Recall that GM recently went bankrupt and was recapitalized, which could explain the higher asset turnover. Nissan, though, is fine compared to the industry average on this measure.

The major difference is in relative efficiency, the cost of generating this revenue. The income (net profit) for Nissan is much lower than that of the other companies and of the industry. There is a major difference in the relative profitability of Nissan compared to the other companies. The very low receivable turnover ratio indicates that Nissan needs to much more quickly convert sales to cash. Much of this may relate to the amount of credit it is giving customers in order to sell vehicles. Financing this debt burden may be costing Nissan. Nissan should study its credit policies to better understand why it is not able to collect from customers. Are there major quality problems with its products? Are the lead times to process these transactions much slower than those of the other companies? It may be just that it is financing many of these purchases, which may be dragging down its profits. The low inventory turnover figure indicates that the supply chain and operations processes need to be improved. This number is a function of the purchasing and raw material processes, the production function, and logistics and distribution. An analysis of details related to the various inventories could be done to pinpoint the problem. Clearly at this time of data collection, Nissan is in a financially more difficult position compared to the other companies.



For a step-by-step walkthrough of this example, visit www.mhhe.com/jacobs14e_sbs_ch01.

CONCEPT CONNECTIONS

L01–1 Identify the elements of operations and supply chain management (OSCM).

Summary

OSCM involves the integration of strategy processes to implement the strategy, and analytics to support the ongoing decisions needed to manage the firm.

Key Terms

Operations and supply chain management (OSCM), 3

Process, 6

Product-service bundling, 9

L01–2 Know the potential career opportunities in operations and supply chain management.

Summary

OSCM people specialize in managing the production of goods and services. OSCM jobs are hands-on, and require working with others and figuring out the best way to do things. The chief operating officer (COO) works with the CEO and company president to determine the company's competitive strategy. COOs determine an organization's location, its facilities, which vendors to use, and how the hiring policy will be implemented.

L01–3 Recognize the major concepts that define the operations and supply chain management field.

Summary

Many of the concepts that form the OSCM field have their origins in the Industrial Revolution in the 1800s. The focus of this book is on popular concepts developed since the 1980s. These concepts include just-in-time production, total quality management, Six Sigma quality, business process reengineering, supply chain management, and electronic commerce. One of the important current issues that challenge operations managers is the ability to balance the economic, employee, and environmental viability of the business.

Key Terms

Mass customization, 13
Business analytics, 13

Sustainability, 14

Triple bottom line, 14

L01–4 Evaluate the efficiency of a firm.

Summary

This book is full of information about concepts and tools that are now being employed by companies to craft ways to better serve customers. Criteria that relate to how well the firm is doing are the firm's efficiency, its effectiveness, and the value created in its products and services.

Key Terms

Effectiveness, 15
Efficiency, 15

Value, 15

Benchmarking, 16

Formula Review

$$[1.1] \quad \text{Receivable Turnover} = \frac{\text{Annual Credit Sales}}{\text{Average Account Receivable}}$$

$$[1.2] \quad \text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory Value}}$$

$$[1.3] \quad \text{Asset Turnover} = \frac{\text{Revenue (or Sales)}}{\text{Total Assets}}$$

Discussion Questions

L01-1

- Using Exhibit 1.3 as a model, describe the source-make-deliver-return relationships in the following systems:
 - An airline
 - An automobile manufacturer
 - A hospital
 - An insurance company
- Define the service package of your college or university. What is its strongest element? Its weakest one?
- What service industry has impressed you the most with its innovativeness?
- What is product-service bundling, and what are the benefits to customers?
- What is the difference between a service and a good?

L01-2

- Look at the job postings at www.apics.org and evaluate the opportunities for an OSCM major with several years of experience.

L01-3

- Recent outsourcing of parts and services that had previously been produced internally is addressed by which current issue facing operation management today?
- What factors account for the resurgence of interest in OSCM today?
- As the field of OSCM has advanced, new concepts have been applied to help companies compete in a number of ways, including the advertisement of the firm's products or services. One recent concept to gain the attention of companies is promoting *sustainability*. Discuss how you have seen the idea of sustainability used by companies to advertise their goods or services.

L01-4

- Some people tend to use the terms *effectiveness* and *efficiency* interchangeably, though we've seen they are different concepts. But is there any relationship at all between them? Can a firm be effective but inefficient? Very efficient but essentially ineffective? Both? Neither?
- Two of the efficiency ratios mentioned in the chapter are the *receivable turnover ratio* and the *inventory turnover ratio*. While they are two completely separate measures, they are very similar in one way. What is the common thread between these two?

Objective Questions

L01-1

- What are the three elements that require integration to be successful in operations and supply chain management?
- Operations and supply chain management is concerned with the design and management of the entire system that has what function?

L01-2

- Match the following OSCM job titles with the appropriate duties and responsibilities.

| | |
|--|---|
| _____ Plant manager | A. Plans and coordinates staff activities such as new product development and new facility location. |
| _____ Supply chain manager | B. Oversees the movement of goods throughout the supply chain. |
| _____ Project manager | C. Oversees the workforce and resources required to produce the firm's products. |
| _____ Business process improvement analyst | D. Negotiates contracts with vendors and coordinates the flow of material inputs to the production process. |
| _____ Logistics manager | E. Applies the tools of lean production to reduce cycle time and eliminate waste in a process. |

4. What high-level position manager is responsible for working with the CEO and company president to determine the company's competitive strategy?

L01-3

5. Order the following major concepts that have helped define the OSCM field on a time line. Use 1 for the earliest concept to be introduced, and 5 for the most recent.

- _____ Supply chain management
- _____ Manufacturing strategy
- _____ Business analytics
- _____ Total quality management
- _____ Electronic commerce

6. Which major OSCM concept can be described as an integrated set of activities designed to achieve high-volume production using minimal inventories of parts that arrive at workstations exactly when they are needed?
7. Operations and supply chain _____ leverage the vast amount of data in enterprise resource planning systems to make decisions related to managing resources.
8. Which current issue in OSCM relates to the ability of a firm to maintain balance in a system, considering the ongoing economic, employee, and environmental viability of the firm?

L01-4

9. Consider the following financial data from the past year for Midwest Outdoor Equipment Corporation.

| | |
|---------------------|--------------|
| Gross income | \$25,240,000 |
| Total sales | 24,324,000 |
| Total credit sales | 18,785,000 |
| Net income | 2,975,000 |
| Cost of goods sold | 12,600,000 |
| Total assets | 10,550,000 |
| Average inventory | 2,875,000 |
| Average receivables | 3,445,000 |

- a. Compute the *receivable turnover ratio*.
 - b. Compute the *inventory turnover ratio*.
 - c. Compute the *asset turnover ratio*.
10. A manufacturing company has entered into a new contract with a major supplier of raw materials used in the manufacturing process. Under the new arrangement, called *vendor managed inventory*, the supplier manages its raw material inventory inside the manufacturer's plant, and only bills the manufacturer when the manufacturer consumes the raw material. How is this likely to affect the manufacturer's inventory turnover ratio?
11. What is the name of the process in which one company studies the processes of another firm in order to identify best practices?
12. A company has recently implemented an automated online billing and payment processing system for orders it ships to customers. As a result, it has reduced the average number of days between billing a customer and receiving payment by 10 days. How will this affect the receivables turnover ratio?

Analytics Exercise: Comparing Companies Using Wall Street Efficiency Measures (LO1-4)

The idea behind this exercise is for the class to generate data comparing companies in many different industries. This data will be used to compare these industries from an Operations and Supply Chain view to better understand

differences. Be prepared for a lively class discussion for this session.

Step 1: Pick an industry that you find interesting. This may be driven by a company by which you would like to

be employed or by some other factor. Within the industry, identify three companies that compete with one another. In order to ensure comparability, go to <http://money.msn.com>, find and enter the company stock symbol, and then go to Fundamentals, Company Report. The industry is in the first column, under Company Information. Find three companies that are in the same industry.

Step 2: Collect data related to each company. At a minimum, find the income per employee, revenue per employee, receivable turnover, inventory turnover, and asset turnover for each company. This data is available under “Fundamentals,” “Key Ratios,” and “Mgmt Efficiency” on the website. You might also find it useful to review the “Company

Report” for each firm. Here read the description of each company to better understand how they do business.

Step 3: Compare the companies based on what you have found. Which company appears to have the most productive employees? Which company has the best operations and supply chain processes? Which company is most efficient in its use of credit? Which company makes the best use of its facility and equipment assets?

Step 4: What insights can you draw from your analysis? *Benchmarking* is a process where one company studies the processes of another company (or industry) to identify best practices. What could your companies learn from benchmarking each other?

Practice Exam

1. The pipelinelike movement of the materials and information needed to produce a good or service.
2. A strategy that meets the needs of shareholders and employees and that preserves the environment.
3. The processes needed to determine the set of future actions required to operate an existing supply chain.
4. The selection of suppliers.
5. A type of process where the major product is produced or service provided.
6. A type of process that moves products to warehouses or customers.
7. Processes that involve the receiving of worn-out, defective, and excess products back from customers and support for customers who have problems.
8. A type of business where the major product is intangible, meaning it cannot be weighed or measured.
9. Refers to when a company builds service activities into its product offerings.
10. Means doing something at the lowest possible cost.
11. Means doing the right things to create the most value for the company.
12. Abstractly defined as quality divided by price.
13. A philosophy that aggressively seeks to eliminate causes of production defects.
14. An approach that seeks to make revolutionary changes as opposed to evolutionary changes (which is advocated by total quality management).
15. An approach that combines TQM and JIT.
16. Tools that are taught to managers in “Green and Black Belt Programs.”
17. A program to apply the latest concepts in information technology to improve service productivity.

1. Supply (chain) network 2. Triple bottom line strategy 3. Planning 4. Sourcing 5. Making 6. Delivery 7. Returning 8. Service 9. Product-service bundling 10. Efficiency 11. Effectiveness 12. Value 13. Total quality management 14. Business process reengineering 15. Lean manufacturing 16. Six Sigma quality 17. Service science management and engineering

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Footnotes

1. See J. Wilson, “Henry Ford: A Just-in-Time Pioneer,” *Production & Inventory Management Journal* 37 (1996), pp. 26–31.

2. Jim Spohrer, “Service Science, Management, and Engineering (SSME): A Next Frontier in Education, Employment, Innovation, and Economic Growth,” IBM India, teleconference to India from Santa Clara, CA, December 2006.