

Introduction to Operations Management

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Chapter Overview

Many of you reading this book may think that you don't know what operations management (OM) is or that it is not something you are interested in. However, after reading this chapter you will realize that you already know quite a bit about operations management. You may even be working in an operations management capacity and have used certain operations management techniques. You will also realize that operations management is probably the most critical business function today. If you want to be on the frontier of business competition, you want to be in operations management.

Today companies are competing in a very different environment than they were only a few years ago. To survive, they must focus on customer relationships, innovation, quality, time-based competition, efficiency, diverse and international perspectives, and cost. Global competition, e-business, the Internet, and advances in technology require flexibility and responsiveness. Increased financial pressures require lean and agile organizations that are free of waste. This new focus has placed operations management in the business limelight because it is the function through which companies can achieve this type of competitiveness.

Consider some of today's most successful companies, such as Amazon, Walmart, Southwest Airlines, General Electric, Starbucks, Apple Computer, Toyota, FedEx, and Procter & Gamble. These companies have achieved world-class status in large part due to a strong focus on operations management. In this book you will learn specific tools and techniques of operations management that have helped these and other companies achieve their success.

The purpose of this book is to help prepare you to be successful in this new business environment. Operations management will give you an understanding of how to help your organization gain a competitive advantage in the marketplace. Regardless of whether your area of expertise is marketing, finance, MIS, or operations, the techniques and concepts in this book will help you in your business career. The material will teach you how your company can offer goods and services cheaper, better, and faster. You will also learn that operations management concepts are far-reaching, affecting every aspect of the organization and even everyday life.

CHAPTER OUTLINE

1. What Is Operations Management?
2. Differences between Manufacturing and Service Organizations
3. Operations Management Decisions
4. Historical Development
5. Today's OM Environment
6. Operations Management in Practice

LEARNING OBJECTIVES

After studying this chapter you should be able to

1. Define operations management.
2. Describe the difference between manufacturing and service organizations.
3. Describe decisions that operations managers make.
4. Identify major historical developments in operations management.
5. Identify current trends in operations management.
6. Describe the flow of information between operations management and other business functions.

What Is Operations Management?

LEARNING OBJECTIVE

Define operations management.

Every business is managed through three major functions: finance, marketing, and operations management. **Figure 1.1** illustrates this by showing that the vice presidents of each of these functions report directly to the president or CEO of the company. Other business functions—such as accounting, purchasing, human resources, and engineering—support these three major functions. Finance is the function responsible for managing cash flow, current assets, and capital investments. Marketing is responsible for sales, generating customer demand, and understanding customer wants and needs. Most of us have some idea of what finance and marketing are about, but what does operations management do?

Operations management (OM)

The business function responsible for planning, coordinating, and controlling the resources needed to produce a company’s goods and services.

Operations management (OM) is the business function that plans, organizes, coordinates, and controls the resources needed to produce a company’s goods and services. Operations management is a *management* function. It involves managing people, equipment, technology, information, and many other resources. Operations management is the central core function of every company. This is true whether the company is large or small, provides a physical good or a service, is for-profit or not-for-profit. Every company has an operations management function. Actually, all the other organizational functions are there primarily to support the operations function. Without operations, there would be no goods or services to sell. Consider a retailer such as The Gap, which sells casual apparel. The marketing function provides promotions for the merchandise, and the finance function provides the needed capital. It is the operations function, however, that plans and coordinates all the resources needed to design, produce, and deliver the merchandise to the various retail locations. Without operations, there would be no goods or services to sell to customers.

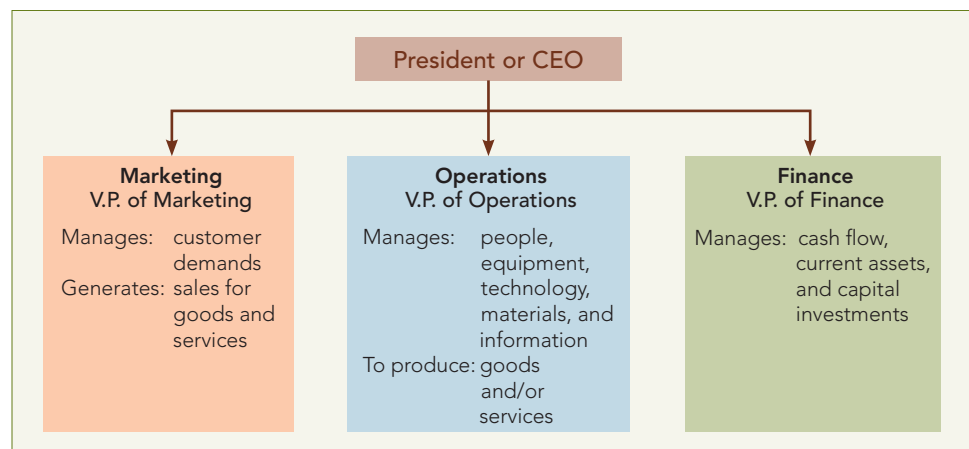
Role of operations management

To transform organizational inputs into outputs.

The **role of operations management** is to transform a company’s inputs into the finished goods or services. Inputs include human resources (such as workers and managers), facilities and processes (such as buildings and equipment), as well as materials, technology, and information. Outputs are the goods and services a company produces. **Figure 1.2** shows this *transformation process*. At a factory the transformation is the physical change of raw materials into products, such as transforming leather and rubber into sneakers, denim into jeans, or plastic into toys. At an airline it is the efficient movement of passengers and their luggage from one location to another. At a hospital it is organizing resources such as doctors, medical procedures, and medications to transform sick people into healthy ones.

Operations management is responsible for orchestrating all the resources needed to produce the final product. This includes designing the product; deciding what resources are needed; arranging schedules, equipment, and facilities; managing inventory; controlling quality; designing the jobs to make the product; and designing work methods. Basically,

FIGURE 1.1 Organizational chart showing the three major business functions



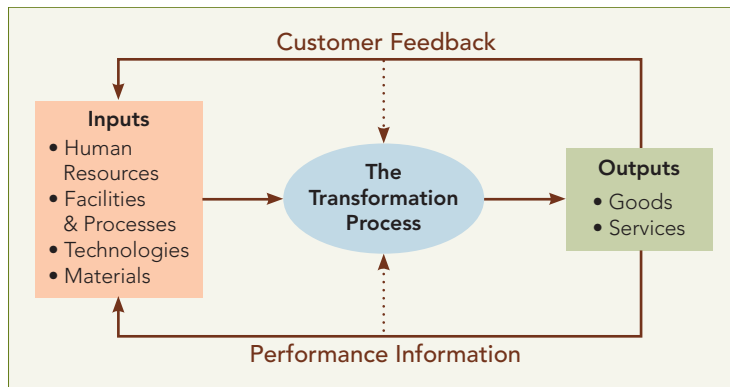


FIGURE 1.2 The transformation process

operations management is responsible for all aspects of the process of transforming inputs into outputs. Customer feedback and performance information are used to continually adjust the inputs, the transformation process, and the characteristics of the outputs. As shown in **Figure 1.2**, this transformation process is dynamic in order to adapt to changes in the environment.

Proper management of the operations function has led to success for many companies. For example, in 1994 Dell Computer Corporation was a second-rate computer maker that managed its operations similarly to others in the industry. Then Dell implemented a new business model that completely changed the role of its operations function. Dell developed new and innovative ways of managing the operations function that have become one of today's best practices. These changes enabled Dell to provide rapid product delivery of customized products to customers at a lower cost. The company has since expanded this model to use an analytics driven system. This has enabled Dell to identify certain models so common they could be stocked in preconfigured inventory. Ordered today the customer can have them tomorrow. Dell's model is one many have tried to emulate and is the key to its continued success. In 2019 the Digital Supply Chain Institute listed Dell as a top leader in their industry.

Just as proper management of operations can lead to company success, improper management of operations can lead to failure. This is illustrated by Kozmo.com, a Web-based home delivery company founded in 1997. Kozmo's mission was to deliver products to customers—everything from the latest video to ice cream—in less than an hour. Kozmo was technology enabled and rapidly became a huge success. The initial success gave rise to overly fast expansion. The company found it difficult to manage the operations needed in order to deliver the promises made on its website. The consequences were too much inventory, poor deliveries, and losses in profits. The company rapidly tried to change its operations, but it was too late. It had to close in April 2001. Kosmo, however, had a solid foundation and in 2018 it was back online with new owners and a fresh vision of its operations. Today Kosmo provides wholesale groceries at offerings lower than those of nearby retailers delivered within a two hour window.

The Web-based age has created a highly competitive world of online shopping that poses special challenges for operations management. The Web can be used for online purchasing of everything from books and groceries to prescription medications and automobiles. The Internet has given consumers flexibility; it has also created one of the biggest challenges for companies: delivering exactly what the customer ordered at the time promised. As we saw with the example of Kozmo.com, making promises on a website is one thing; delivering on those promises is yet another. Ensuring that orders are delivered from “mouse to house” is the job of operations and is much more complicated than it might seem. In the 1990s many dot-com companies discovered just how difficult this is. They were not able to generate a profit and went out of business. To ensure meeting promises, companies must forecast what customers want and maintain adequate inventories of goods, manage distribution centers and warehouses, operate fleets of trucks, and schedule deliveries, all while keeping costs low and customers satisfied. Many companies like Amazon.com manage almost all aspects of their operation. In fact, Amazon.com is launching its own delivery service called “Shipping with Amazon” (SWA) to compete with UPS and FedEx. Other companies hire outside



The e-tailers

www.Amazon.com
www.Barnesandnoble.com
www.alibaba.com

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firms for certain functions, such as outsourcing the management of inventories and deliveries to UPS. Competition among e-tailers has become intense as customers demand increasingly shorter delivery times and highly customized products. Same-day service has become common in metropolitan areas. For example, Barnesandnoble.com provides same-day delivery in Manhattan. Amazon.com has significantly expanded same-day delivery locations.

Understanding and managing the operations function of an online business has become essential in order to remain competitive.

For operations management to be successful, it must add value during the transformation process. We use the term **value added** to describe the net increase between the final value of a product and the value of all the inputs. The greater the value added, the more productive a business is. An obvious way to add value is to reduce the cost of activities in the transformation process. Activities that do not add value are considered a waste; these include certain jobs, equipment, and processes. In addition to value added, operations must be efficient. **Efficiency** means being able to perform activities well and at the lowest possible cost. An important role of operations is to analyze all activities, eliminate those that do not add value, and restructure processes and jobs to achieve greater efficiency. Because today's business environment is more competitive than ever, the role of operations management has become the focal point of efforts to increase competitiveness by improving value added and efficiency.

Value added The net increase created during the transformation of inputs into final outputs.

Efficiency Performing activities well and at the lowest possible cost.

Differences between Manufacturing and Service Organizations

LEARNING OBJECTIVE

Describe the difference between manufacturing and service organizations.

Manufacturing organizations

Organizations that primarily produce a tangible product and typically have low customer contact.

Service organizations

Organizations that primarily produce an intangible product, such as ideas, assistance, or information, and typically have high customer contact.

Organizations can be divided into two broad categories: **manufacturing organizations** and **service organizations**, each posing unique challenges for the operations function. There are two primary distinctions between these categories. First, manufacturing organizations produce physical, tangible goods that can be stored in inventory before they are needed. By contrast, service organizations produce intangible products that cannot be produced ahead of time. Second, in manufacturing organizations most customers have no direct contact with the operation. Customer contact occurs through distributors and retailers. For example, a customer buying a car at a car dealership never comes into contact with the automobile factory. However, in service organizations the customers are typically present during the creation of the service. Hospitals, colleges, theaters, and barber shops are examples of service organizations in which the customer is present during the creation of the service.

The differences between manufacturing and service organizations are not as clear-cut as they might appear, and there is much overlap between them. Most manufacturers provide services as part of their business, and many service firms manufacture physical goods that they deliver to their customers or consume during service delivery. For example, a manufacturer of furniture may also provide shipment of goods and assembly of furniture. A barber shop may sell its own line of hair care products. You might not know that General Motors' greatest return on capital does not come from selling cars, but rather from post-sales parts and service. **Figure 1.3** shows the differences between manufacturing and services, focusing on the dimensions of product tangibility and the degree of customer

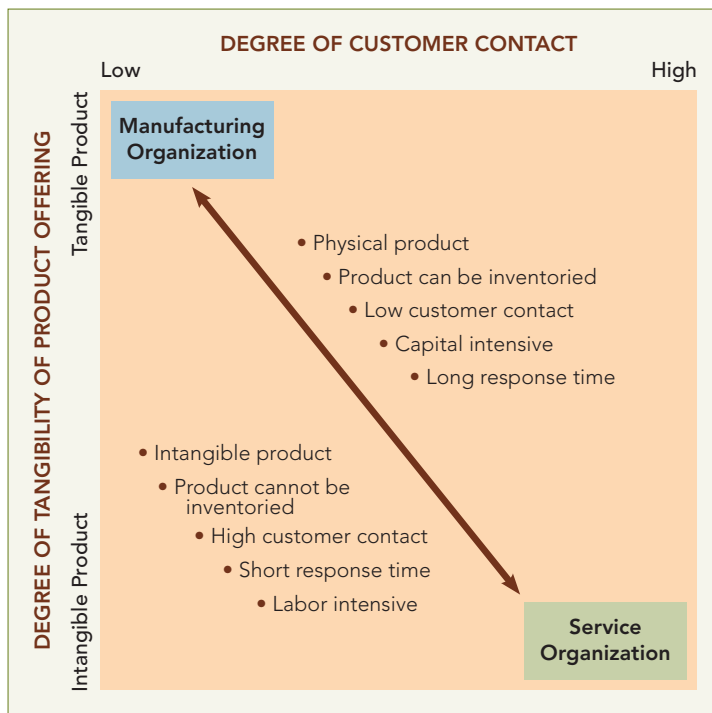


FIGURE 1.3 Characteristics of manufacturing and service organizations

contact. It shows the extremes of pure manufacturing and pure service, as well as the overlap between them.

Even in pure service companies some segments of the operation may have low customer contact while others have high customer contact. The former can be thought of as “back room” or “behind the scenes” segments. Think of a fast-food operation such as Wendy’s, for which customer service and customer contact are important parts of the business. However, the kitchen segment of Wendy’s operation has no direct customer contact and can be managed like a manufacturing operation. Similarly, a hospital is a high-contact service operation, but the patient is not present in certain segments, such as the lab where specimen analysis is done.

In addition to pure manufacturing and pure service, there are companies that have some characteristics of each type of organization. It is difficult to tell whether these companies are actually manufacturing or service organizations. Think of a post office, an automated warehouse, or a mail-order catalog business. They have low customer contact and are capital intensive, yet they provide a service. We call these companies *quasi-manufacturing organizations*.

The U.S. Postal Service is an example of a quasi-manufacturing type of company. It provides a service: speedy, reliable delivery of letters, documents, and packages. Its output is intangible and cannot be stored in inventory. Yet most operations management decisions made at the Postal Service are similar to those that occur in manufacturing. Customer contact is low, and at any one time there is a large amount of inventory. The Postal Service is capital intensive, having its own facilities and fleet of trucks and relying on scanners to sort packages and track customer orders. Scheduling enough workers at peak processing times is a major concern, as is planning delivery schedules. Note that although the output of the U.S. Postal Service is a service, inputs include labor, technology, and equipment. The responsibility of OM is to manage the conversion of these inputs into the desired outputs. Proper management of the OM function is critical to the success of the U.S. Postal Service.



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U.S. Postal Service
www.usps.com

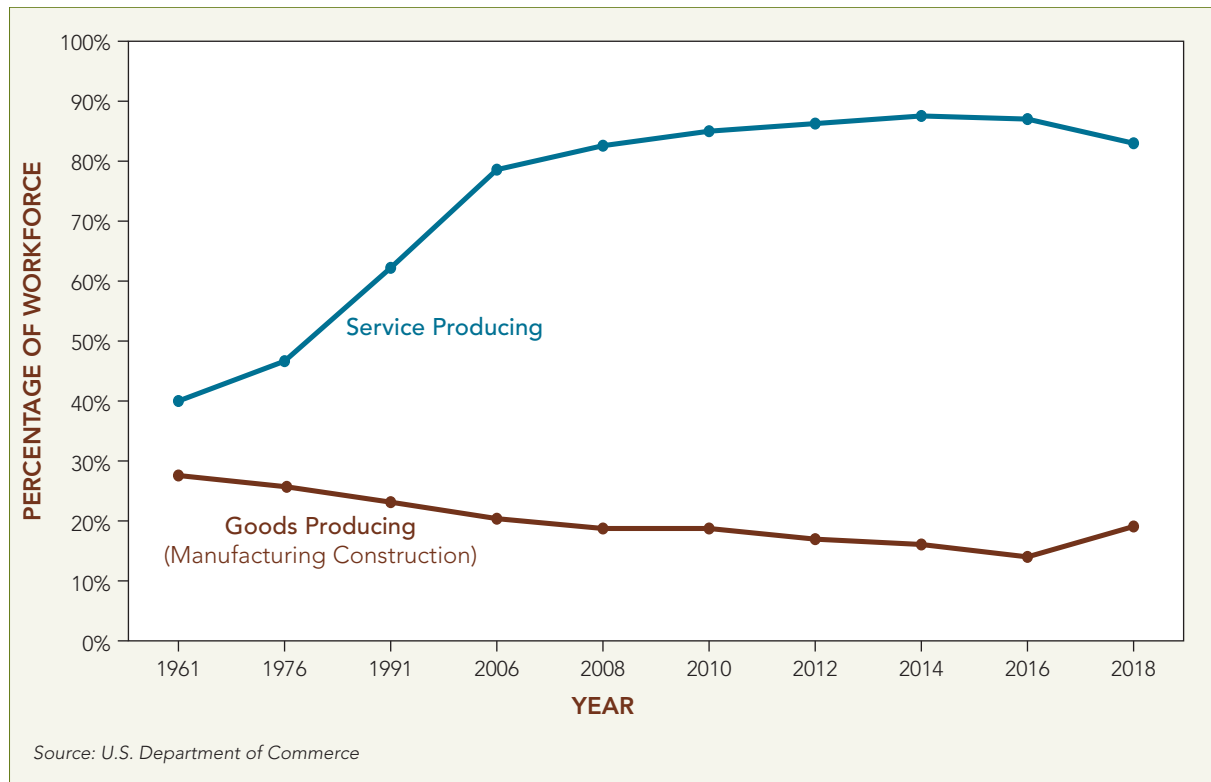


FIGURE 1.4 U.S. employment by economic sector

It is important to understand how to manage both service and manufacturing operations. However, managing service operations is of especially high importance. The reason is that the service sector constitutes a dominant segment of our economy. Since the 1960s, the percentage of jobs in the service-producing industries of the U.S. economy has increased from less than 50 to over 80 percent of total nonfarm jobs. The remaining 20 percent are in the manufacturing and goods-producing industries. **Figure 1.4** illustrates this large growth of the service sector.

Operations Management Decisions

LEARNING OBJECTIVE

Describe decisions that operations managers make.

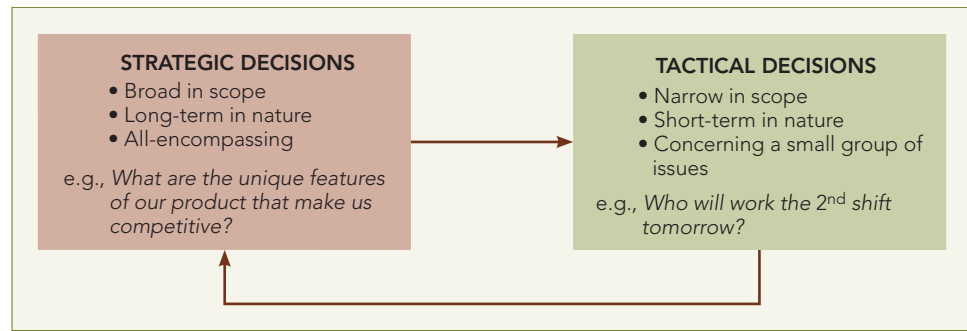
In this section we look at some of the specific decisions that operations managers have to make. The best way to do this is to think about decisions we would need to make if we started our own company—say, a company called Gourmet Wafers that produces praline-pecan cookies from an old family recipe. Think about the decisions that would have to be made to go from the initial idea to actual production of the product: that is operations management. **Table 1.1** breaks these down into the generic decisions that would be appropriate for almost any good or service, the specific decisions required for our example, and the formal terms for these decisions that are used in operations management.

Note in the Gourmet Wafers example that the first decisions made were very broad in scope (e.g., the unique features of our product). We needed to do this before we could focus on more specific decisions (e.g., worker schedules). Although our example is simple, this decision-making process is followed by every company, including IBM, General Motors,

TABLE 1.1 Operations Management Decisions for Gourmet Wafers

General Decisions to Be Made	Decision Specific for Cookie Production	Operations Management Term
What are the unique features of the business that will make it competitive?	The business offers freshly baked cookies “homemade” style, in a fast-food format.	Operations strategy
What are the unique features of the product?	The unique feature of the cookies is that they are loaded with extra-large and crunchy pecans and are fresh and moist.	Product design
What are the unique features of the process that give the product its unique characteristics?	A special convection oven is used to make the cookies in order to keep them fresh and moist. The dough is allowed to rise longer than usual to make the cookies extra light.	Process selection
What sources of supply should we use to ensure regular and timely receipt of the extract materials we need? How do we manage these sources of supply?	The key ingredients, pecans and syrup, will be purchased from only one supplier located in South Carolina because it offers the best products. A relationship is worked out in which the supplier sends the ingredients on the exact schedule that they are needed.	Supply chain management
How will managers ensure the quality of the product, measure quality, and identify quality problems?	A quality check is made at each stage of cookie production. The dough is checked for texture; the pecans are checked for size and freshness; the syrup is checked for consistency.	Quality management
What is the expected demand for the product?	Expected sales for each day of the week have been determined; for example, it is expected that more cookies will be sold on weekdays and most during the lunch hours. Expected cookie sales for each month and for the year have also been determined.	Forecasting
Where will the facility be located?	After looking at locations of customers and location costs, it is decided that the facility will be located in a shopping mall.	Location analysis
How large should the facility be?	The business needs to be able to produce 200 cookies per hour, or up to 2000 cookies per day.	Capacity planning
How should the facility be laid out? Where should the kitchen and ovens be located? Should there be seating for customers?	Decisions are made about where the kitchen will be located and how the working area will be arranged for maximum efficiency. The business is competing on the basis of <i>speed</i> and <i>quality</i> ; therefore, the facility should be arranged to promote these features. There will be a small seating area for customers and a large counter and display case for buying.	Facility layout
What jobs will be needed in the facility, who should do what task, and how will their performance be measured?	Two people will be needed in the kitchen during busy periods and one during slow periods. Their job duties are determined. One person will be needed for order taking at all times.	Job design and work measurement
How will the inventory of raw materials be monitored? When will orders be placed, and how much will be kept in stock?	A different policy is developed for common ingredients, such as flour and sugar. These ingredients will be ordered every two weeks for a two-week supply. A special purchasing arrangement is worked out with the supplier of specialty ingredients.	Inventory management
Who will work on what schedule?	Two people will work the counter in split shifts. One kitchen employee will work a full shift, with a second employee working part-time.	Scheduling

FIGURE 1.5 The relationship between strategic and tactical decisions



Strategic decisions Decisions that set the direction for the entire company; they are broad in scope and long-term in nature.

Tactical decisions Decisions that are specific and short-term in nature and are bound by strategic decisions.

Lands' End, and your local floral shop. Also note in our example that before we can think about specific day-to-day decisions, we need to make decisions for the whole company that are long-term in nature. Long-term decisions that set the direction for the entire organization are called **strategic decisions**. They are broad in scope and set the tone for other, more specific decisions. They address questions such as: What are the unique features of our product? What market do we plan to compete in? What do we believe will be the demand for our product?

Short-term decisions that focus on specific departments and tasks are called **tactical decisions**. Tactical decisions focus on more specific day-to-day issues, such as the quantities and timing of specific resources. Strategic decisions are made first and determine the direction of tactical decisions, which are made more frequently and routinely. Therefore, we have to start with strategic decisions and then move on to tactical decisions. This relationship is shown in **Figure 1.5**. Tactical decisions must be aligned with strategic decisions because they are the key to the company's effectiveness in the long run. Tactical decisions provide feedback to strategic decisions, which can be modified accordingly.

You can see in the example of Gourmet Wafers how important OM decisions are. They are critical to all types of companies, large and small. In large companies these decisions are more complex because of the size and scope of the organization. Large companies typically produce a greater variety of products, have multiple location sites, and often use domestic and international suppliers. Managing OM decisions and coordinating efforts can be a complicated task, and the OM function is critical to the company's success.

We can illustrate this point by looking at operations management decisions made by Texas Instruments (TI) in order to position itself for global collaboration with customers, distributors, and suppliers. In 2008 TI realized its business was growing exponentially, with

more than 120,000 monthly orders received and processed electronically. The coordination effort encompassed 56 factories, including subcontractors, and the management of over 45,000 products. To succeed, the company needed to develop a system to generate better forecasts, coordinate manufacturing of products, manage orders, and track deliveries. Managing and coordinating global operations management functions was considered paramount to the company's success. TI adopted a comprehensive software package called enterprise resource planning (ERP) that integrates information throughout the organization, manages forecasts, and coordinates factory operations. Designing and implementing the ERP system at TI required an understanding of all the strategic and tactical operations decisions; otherwise, it would not be effective. The system has proven to be a success and a major achievement, enabling TI to consistently manage factory operations across the globe. In 2019 TI continues to lead in the semiconductor industry.

 **Links to Practice**

Texas Instruments
Incorporated
www.ti.com



Walter Bibikow/Danita Delimont/Alamy Stock Photo

Before You Go On

You should understand that operations management (OM) is the business function responsible for planning, coordinating, and controlling the resources needed to produce a company's goods and services. OM is directly responsible for managing the transformation of a company's inputs (e.g., materials, technology, and information) into finished products and services. OM requires a wide range of strategic and tactical decisions. Strategic decisions are long-range and very broad in scope (e.g., unique features of the company's product and process). They determine the direction of tactical decisions, which are more short-term and narrow in scope (e.g., policy for ordering raw materials). All organizations can be separated into manufacturing and service operations, which differ based on product tangibility and degree of customer contact. Service and manufacturing organizations have very different operational requirements.

Historical Development

LEARNING OBJECTIVE

Identify major historical developments in operations management.

Why OM?

Business did not always recognize the importance of operations management. In fact, following World War II the marketing and finance functions were predominant in American corporations. The United States had just emerged from the war as the undisputed global manufacturing leader due in large part to efficient operations. At the same time, Japan and Europe were in ruins, their businesses and factories destroyed. U.S. companies had these markets to themselves, and so the post-World War II period of the 1950s and 1960s represented the golden era for U.S. business. The primary opportunities were in the areas of marketing, to develop the large potential markets for new products, and in finance, to support the growth. Since there were no significant competitors, the operations function became of secondary importance, because companies could sell what they produced. Even the distinguished economist John Kenneth Galbraith observed, "The production problem has been solved."

Then in the 1970s and 1980s, things changed. American companies experienced large declines in productivity growth, and international competition began to be a challenge in many markets. In some markets such as the auto industry, American corporations were being pushed out. It appeared that U.S. firms had become lax due to the lack of competition in the 1950s and 1960s. They had forgotten about improving their methods and processes. In the meantime, foreign firms were rebuilding their facilities and designing new production methods. By the time foreign firms had recovered, many U.S. firms found themselves unable to compete. To regain their competitiveness, companies turned to operations management, a function they had overlooked and almost forgotten about.

The new focus on operations and competitiveness has been responsible for the recovery of many corporations, and U.S. businesses experienced a resurgence in the 1980s and 1990s. Operations became the core function of organizational competitiveness. Although U.S. firms have rebounded, they are fully aware of continued global competition, scarcity of resources, and increased financial pressure. Companies have learned that to achieve long-run success they must place much importance on their operations.

Historical Milestones

When we think of what operations management does—namely, managing the transformation of inputs into goods and services—we can see that as a function it is as old as time. Think of any great organizational effort, such as organizing the first modern Olympic games,

TABLE 1.2 Historical Development of Operations Management

Concept	Time	Explanation
Industrial Revolution	Late 1700s	Brought in innovations that changed production by using machine power instead of human power.
Scientific management	Early 1900s	Brought the concepts of analysis and measurement of the technical aspects of work design and development of moving assembly lines and mass production.
Human relations movement	1930s to 1960s	Focused on understanding human elements of job design, such as worker motivation and job satisfaction.
Management science	1940s to 1960s	Focused on the development of quantitative techniques to solve operations problems.
Computer age	1960s	Enabled processing of large amounts of data and allowed widespread use of quantitative procedures.
Environmental issues	1970s	Considered waste reduction, the need for recycling, and product reuse.
Just-in-time systems (JIT)	1980s	Designed to achieve high-volume production with minimal inventories.
Total quality management (TQM)	1980s	Sought to eliminate causes of production defects.
Reengineering	1980s	Required redesigning a company's processes in order to provide greater efficiency and cost reduction.
Global competition	1980s	Designed operations to compete in the global market.
Flexibility	1990s	Offered customization on a mass scale.
Time-based competition	1990s	Based on time, such as speed of delivery.
Supply chain management	1990s	Focused on reducing the overall cost of the system that manages the flow of materials and information from suppliers to final customers.
Electronic commerce	2000s	Uses the Internet and World Wide Web for conducting business activity.
Outsourcing and flattening of the world	2000s	Convergence of technology has enabled outsourcing of virtually any job imaginable from anywhere around the globe, therefore "flattening" the world.
Big data analytics	2010s - present	Applies math and statistics to large volumes of structured and unstructured data to gain unprecedented business insights.

building the Great Wall of China, or erecting the Egyptian pyramids, and you will see operations management at work. Operations management did not emerge as a formal field of study, however, until the late 1950s and early 1960s, when scholars began to recognize that all production systems face a common set of problems and to stress the systems approach to viewing operations processes.

Many events helped shape operations management. We will describe some of the most significant of these historical milestones and explain their influence on the development of operations management. Later we will look at some current trends in operations management. These historical milestones and current trends are summarized in **Table 1.2**.

The Industrial Revolution

Industrial Revolution An industry movement that changed production by substituting machine power for labor power.

The **Industrial Revolution** had a significant impact on the way goods are produced today. Before this time, products were made by hand by skilled craftspeople in their shops or homes. Each product was unique, painstakingly made by one person. The Industrial Revolution changed all that. It started in the 1770s with the development of a number of inventions that relied on machine power instead of human power. The most important of these was the steam engine, which was invented by James Watt in 1764. The steam engine provided a new source of power that was used to replace human labor in textile mills, machine-making plants, and other facilities. The concept of the factory was emerging. In addition, the steam engine led to advances in transportation, such as railroads, that allowed for a wider distribution of goods.

About the same time, the concept of *division of labor* was introduced. First described by Adam Smith in 1776 in *The Wealth of Nations*, this concept would become one of the important ideas behind the development of the assembly line. Division of labor means that the production of a good is broken down into a series of small, elemental tasks, each of which is performed by a different worker. The repetition of the task allows the worker to become highly specialized in that task. Division of labor allowed higher volumes to be produced, which, coupled with the advances in transportation of steam-powered boats and railroads, opened up distant markets.

A few years later, in 1790, Eli Whitney introduced the concept of *interchangeable parts*. Prior to that time, every part used in a production process was unique. Interchangeable parts are standardized so that every item in a batch of items fits equally. This concept meant that we could move from one-at-a-time production to volume production, for example, in the manufacture of watches, clocks, and similar items.

Scientific Management

Scientific management was an approach to management promoted by Frederick W. Taylor at the turn of the twentieth century. Taylor was an engineer with an eye for efficiency. Through scientific management he sought to increase worker productivity and organizational output. His concept had two key features. First, it assumed that workers are motivated only by money and are limited only by their physical ability. Taylor believed that worker productivity is governed by scientific laws and that it is up to management to discover these laws through measurement, analysis, and observation. Workers are to be paid in direct proportion to how much they produce. The second feature of this approach was the separation of the planning and doing functions in a company, which meant the separation of management and labor. Management is responsible for designing productive systems and determining acceptable worker output. Workers have no input into this process—they are permitted only to work.

Many people did not like the scientific management approach, especially workers, who thought that management used these methods to unfairly increase output without paying them accordingly. Still, many companies adopted the scientific management approach. Today many view scientific management as a major influence in the field of operations management. For example, *piece-rate incentives*, in which workers are paid in direct proportion to their output, came out of this movement. Also, Taylor introduced a widely used method of work measurement, *stopwatch time studies*. In stopwatch time studies, observations are made and recorded of a worker performing a task over many cycles. This information is then used to set a time standard for performing the particular task. This method is still used today to set a time standard for short, repetitive tasks.

The scientific management approach was popularized by Henry Ford, who used the techniques in his factories. Combining technology with scientific management, Ford introduced the *moving assembly line* to produce Ford cars. Ford also combined scientific management with the division of labor and interchangeable parts to develop the concept of *mass production*. These concepts and innovations helped him increase production and efficiency at his factories.

The Human Relations Movement

The scientific management movement and its philosophy dominated in the early twentieth century. However, this changed with the publication of the results of the **Hawthorne studies**. The purpose of the Hawthorne studies, conducted at a Western Electric plant in Hawthorne, Illinois, in the 1930s, was to study the effects of environmental changes, such as changes in lighting and room temperature, on the productivity of assembly-line workers. The findings from the study were unexpected: the productivity of the workers continued

Scientific management An approach to management that focused on improving output by redesigning jobs and determining acceptable levels of worker output.

Hawthorne studies The studies responsible for creating the human relations movement, which focused on giving more consideration to workers' needs.

to increase regardless of the environmental changes made. Elton Mayo, a sociologist from Harvard, concluded that the workers were actually motivated by the attention they were given. The idea of workers responding to the attention they are given came to be known as the *Hawthorne effect*.

Human relations movement

A philosophy based on the recognition that factors other than money can contribute to worker productivity.

The study of these findings by many sociologists and psychologists led to the **human relations movement**, an entirely new philosophy based on the recognition that factors other than money can contribute to worker productivity. The impact of this new philosophy on the development of operations management has been tremendous. Its influence can be seen in the implementation of a number of concepts that motivate workers by making their jobs more interesting and meaningful. For example, the Hawthorne studies showed that scientific management had made jobs too repetitive and boring. *Job enlargement* is an approach in which workers are given a larger portion of the total task to do. Another approach to giving more meaning to jobs is *job enrichment*, in which workers are given a greater role in planning.

Recent studies have shown that environmental factors in the workplace, such as adequate lighting and ventilation, can have a major impact on productivity. However, this does not contradict the principle that attention from management is a positive factor in motivation.

Management Science

Management science

A field of study that focuses on the development of quantitative techniques to solve operations problems.

While some were focusing on the technical aspects of job design and others on the human aspects of operations management, a third approach, called **management science**, was developing that would make its own unique contribution. Management science focused on developing quantitative techniques for solving operations problems. The first mathematical model for inventory management was developed by F. W. Harris in 1913. Shortly thereafter, statistical sampling theory and quality control procedures were developed.

World War II created an even greater need for the ability to quantitatively solve complex problems of logistics control, for weapons system design and deployment of missiles. Consequently, the techniques of management science grew more robust during the war and continued to develop after the war was over. Many quantitative tools emerged to solve problems in forecasting, inventory control, project management, and other areas. A mathematically oriented field, management science provides operations management with tools to assist in decision making. A popular example of such a tool is linear programming.

The Computer Age

In the 1970s the use of computers in business became widespread. With computers, many of the quantitative models developed by management science could be employed on a larger scale. Data processing became easier, with important effects in areas such as forecasting, scheduling, and inventory management. A particularly important computerized system, material requirements planning (MRP), was developed for inventory control and scheduling. Material requirements planning was able to process huge amounts of data in order to compute inventory requirements and develop schedules for the production of thousands of items, processing that was impossible before the age of computers. Today the exponential growth in computing capability continues to impact operations management.

Just-in-Time

Just-in-time (JIT)

A philosophy designed to achieve high-volume production through elimination of waste and continuous improvement.

Just-in-time (JIT) is a major operations management philosophy, developed in Japan in the 1980s, that is designed to achieve high-volume production using minimal amounts of inventory. This is achieved through coordination of the flow of materials so that the right parts arrive at the right place in the right quantity; hence the term *just-in-time*. However, JIT is much more than the coordinated movement of goods. It is an all-inclusive organizational philosophy that employs teams of workers to achieve continuous improvement in processes and organizational efficiency by eliminating all organizational waste. Although JIT was first used in

manufacturing, it has been implemented in the service sector, for example, in the food service industry. JIT has had a profound impact on the way companies manage their operations. It is credited with helping turn many companies around and is used by companies such as Honda, Toyota, and General Motors. JIT promises to continue to transform businesses in the future.

Total Quality Management

As customers demand ever higher quality in their products and services, companies have been forced to focus on improving quality in order to remain competitive. **Total quality management (TQM)** is a philosophy—promulgated by “quality gurus” such as W. Edwards Deming—that aggressively seeks to improve product quality by eliminating causes of product defects and making quality an all-encompassing organizational philosophy. With TQM, everyone in the company is responsible for quality. Practiced by some companies in the 1980s, TQM became pervasive in the 1990s and is an area of operations management that no competitive company has been able to ignore. Its importance is demonstrated by the number of companies achieving ISO 9000 certification. ISO 9000 is a set of quality standards developed for global manufacturers by the International Organization for Standardization (ISO) to control trade into the then-emerging European Economic Community (EEC). Today ISO 9000 is a global set of standards, with many companies requiring their suppliers to meet the standards as a condition for obtaining contracts.

Total quality management (TQM) Philosophy that seeks to improve quality by eliminating causes of product defects and by making quality the responsibility of everyone in the organization.

Business Process Reengineering

Business process **reengineering** means redesigning a company’s processes to increase efficiency, improve quality, and reduce costs. In many companies things are done in a certain way that has been passed down over the years. Often managers say, “Well, we’ve always done it this way.” Reengineering requires asking why things are done in a certain way, questioning assumptions, and then redesigning the processes. Operations management is a key player in a company’s reengineering efforts.

Reengineering Redesigning a company’s processes to make them more efficient.

Flexibility

Traditionally, companies competed by either mass-producing a standardized product or offering customized products in small volumes. One of the current competitive challenges for companies is the need to offer to customers a greater variety of product choices of a traditionally standardized product. This is the challenge of **flexibility**. For example, Procter and Gamble offers 22 different product designs in the Pampers line of diapers. Although diapers are a standardized product, the product designs are customized to the different needs of customers, such as the age, sex, and stage of development of the child using the diaper.

One example of flexibility is **mass customization**, which is the ability of a firm to produce highly customized goods and services and to do it at the high volumes of mass production. Mass customization requires designing flexible operations and using delayed product differentiation, also called postponement. This means keeping the product in generic form as long as possible and postponing completion of the product until specific customer preferences are known.

Flexibility An organizational strategy in which the company attempts to offer a greater variety of product choices to its customers.

Mass customization The ability of a firm to highly customize its goods and services at high volumes.

Time-Based Competition

One of the most important trends within companies today is **time-based competition**—developing new products and services faster than the competition, reaching the market first, and meeting customer orders most quickly. For example, two companies may produce the same product, but if one is able to deliver it to the customer in two days and the other in five days, the first company will make the sale and win over the customers. Time-based competition requires specifically designing the operations function for speed.

Time-based competition An organizational strategy focusing on efforts to develop new products and deliver them to customers *faster* than competitors.

Supply Chain Management

Supply chain management (SCM) Management of the flow of materials from suppliers to customers in order to reduce overall cost and increase responsiveness to customers.

Supply chain management (SCM) involves managing the flow of materials and information from suppliers and buyers of raw materials all the way to the final customer. The network of entities that is involved in producing and delivering a finished product to the final customer is called a supply chain. The objective is to have everyone in the chain work together to reduce overall cost and improve quality and service delivery. Supply chain management requires a team approach, with functions such as marketing, purchasing, operations, and engineering all working together. This approach has been shown to result in more satisfied customers, meaning that everyone in the chain profits. SCM has become possible with the development of information technology (IT) tools that enable collaborative planning and scheduling. The technologies allow synchronized supply chain execution and design collaboration, which enables companies to respond better and faster to changing market needs. Numerous companies, including Amazon, Walmart, and Toyota, have achieved world-class status by effectively managing their supply chains.

 **Links to Practice**

- The Publishing Industry
<https://www.wiley.com/en-us>
<https://www.mheducation.com/>
<https://www.harpercollins.com/>
<https://www.penguinrandomhouse.com/>



Q-Images/Alamy Stock Photo

SCM is as important in the service industry as it is in manufacturing, even in pure service industries such as the creative arts. Consider the publishing industry, which is responsible for delivering the creative art of literature to readers. The typical publishing supply chain, shown in **Figure 1.6**, consists of the author, the publisher, and the bookstore retailer. In the traditional publishing supply chain, the publisher is typically responsible for all the functions involved in transforming the author’s literary creation

into a tangible product to be placed on a bookshelf. This includes editing, printing, distribution, inventory management, and marketing.

Many writers have seen the traditional publishing supply chain as a setback to maintaining control and innovation over their art. Large publishing houses maintain control of many critical functions of the supply chain, resulting in the commoditization of the literary arts being sold in chain-type retailers. The net effect is often a homogenization of titles and writers across stores, creating a best-seller list that does not necessarily reflect literary merit. This, in turn, creates a barrier for writers who have in fact created something highly personal.

Some writers have innovatively overcome the large supply chain barrier between author and bookshelf by forming their own publishing company. By doing this, they enable themselves to maintain control of all aspects of their art, including retaining artistic editorial prerogatives, such as choosing to print their writing in unique styles, rather than resorting to the same font and formatting dictated by a publishing house. This freedom is uniquely important to writers.

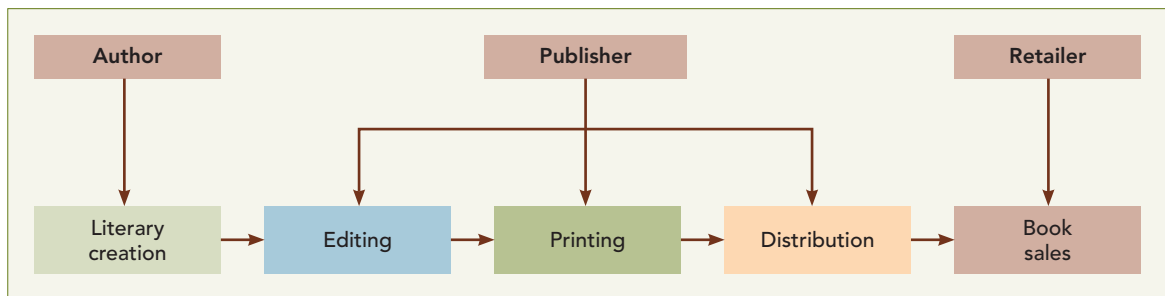


FIGURE 1.6 The traditional publishing supply chain

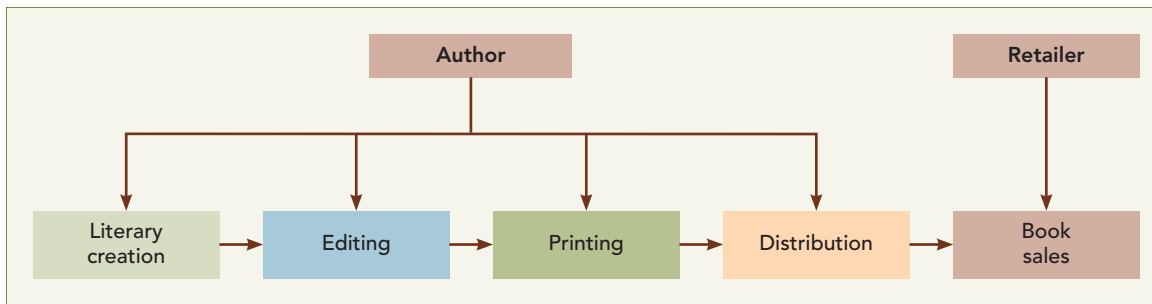


FIGURE 1.7 Author-controlled publishing supply chain

In addition to maintaining artistic freedom, this enables writers to retain full legal rights of their own work. This supply chain is shown in [Figure 1.7](#).

Global Marketplace

Today businesses must think in terms of a **global marketplace** in order to compete effectively. This includes the way they view their customers, competitors, and suppliers. Key issues are meeting customer needs and getting the right product to markets as diverse as the Far East, Europe, or Africa. Operations management is responsible for most of these decisions. OM decides whether to tailor products to different customer needs, where to locate facilities, how to manage suppliers, and how to meet local government standards. Also, global competition has forced companies to reach higher levels of excellence in the products and services they offer. Regional trading agreements, such as the North American Free Trade Agreement (NAFTA), the European Union (EU), and the global World Trade Organization (WTO), are designed to guarantee continued competition on the international level.

Global marketplace A trend in business focusing on customers, suppliers, and competitors from a global perspective.

Sustainability and Green Operations

There is increasing emphasis on the need to reduce waste, recycle, and reuse products and parts. This is known as **sustainability** or *green operations*. Society has placed great pressure on business to focus on air and water quality, waste disposal, global warming, and other environmental issues. Operations management plays a key role in redesigning processes and products in order to meet and exceed environmental quality standards. The importance of this issue is demonstrated by a set of standards termed ISO 14000. Developed by the International Organization for Standardization (ISO), these standards provide guidelines and a certification program documenting a company's environmentally responsible actions.

Sustainability A trend in business to consciously reduce waste, recycle, and reuse products and parts.

Electronic Commerce

Electronic commerce (e-commerce) is the use of the Internet for conducting business activities, such as communication, business transactions, and data transfer. The Internet, developed from a government network called ARPANET created in 1969 by the U.S. Defense Department, has become an essential business medium since the late 1990s, enabling efficient communication between manufacturers, suppliers, distributors, and customers. It has allowed companies to reach more customers at a speed infinitely faster than ever before. It also has significantly cut costs, as it provides direct links between entities.

The electronic commerce that occurs between businesses, known as **B2B (business-to-business)** commerce, makes up the highest percentage of transactions. The most common B2B exchanges occur between companies and their suppliers, such as General Electric's Trading Process Network. A more familiar type of e-commerce occurs between businesses and their customers, known as **B2C (business-to-customer)** exchange, as engaged in by online retailers such as Amazon.com. E-commerce also occurs between customers, known as

Business-to-business (B2B) Electronic commerce between businesses.

Business-to-customers (B2C) Electronic commerce between businesses and their customers.

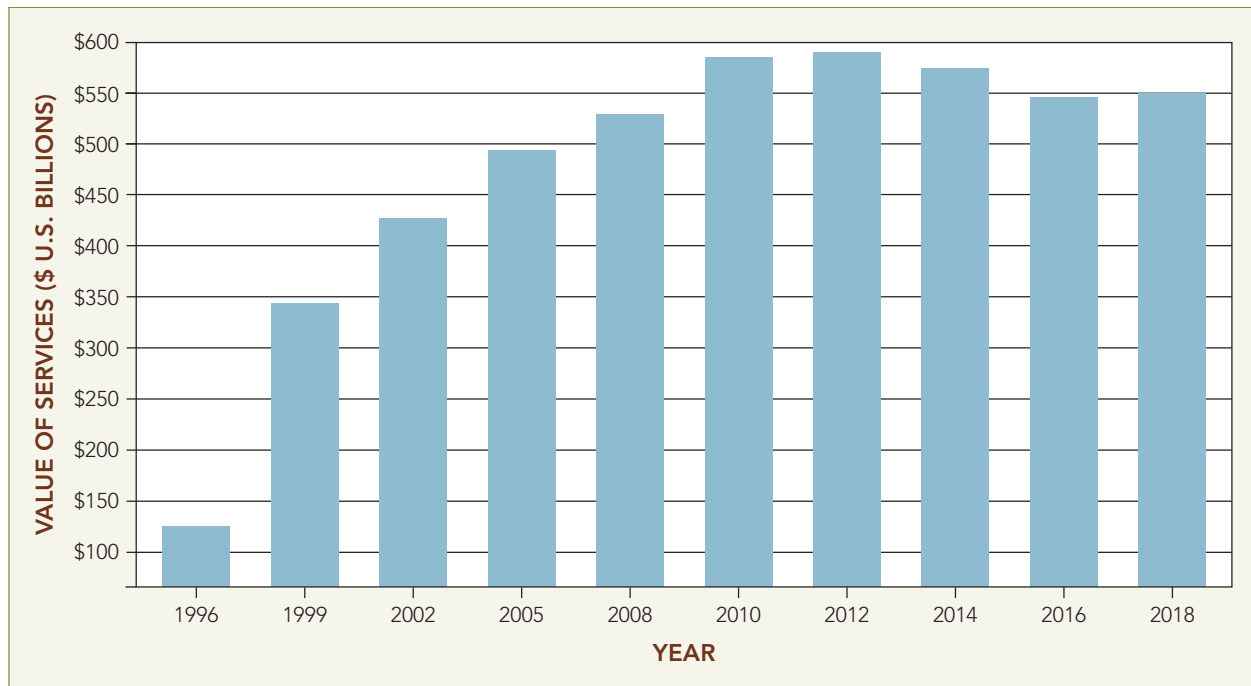


FIGURE 1.8 U.S. market for outsourcing services 1996–2014

Customer-to-customer (C2C) Electronic commerce between customers.

C2C (customer-to-customer) exchange, as on consumer auction sites such as eBay. E-commerce is creating virtual marketplaces that continue to change the way business functions.

Outsourcing and Flattening of the World

Outsourcing is obtaining goods or services from an outside provider. This can range from outsourcing of one aspect of the operation, such as shipping, to outsourcing an entire part of the manufacturing process. The practice has rapidly grown in recent years, as you can see in [Figure 1.8](#), although it has stabilized most recently. It has helped companies be more efficient by focusing on what they do best. Outsourcing has been touted as the enabling factor that helps companies achieve the needed speed and flexibility to be competitive. Management guru Tom Peters has been quoted as saying, “Do what you do best and outsource the rest.”

The convergence of technologies at the turn of this century has taken the concept of outsourcing to a new level. Massive investments in technology, such as worldwide broadband connectivity, the increasing availability and lower cost of computers, and the development of software such as e-mail, search engines, and other software, allow individuals to work together in real time from anywhere in the world. This has enabled countries like India, China, and many others to become part of the global supply chain for goods and services and has created a “flattening” of the world. Such “flattening,” or leveling of the playing field, has enabled workers anywhere in the world to compete globally for intellectual work. The result has been the outsourcing of virtually any job imaginable. Manufacturers have outsourced software development and product design to engineers in India; accounting firms have outsourced tax preparation to India; even some hospitals have outsourced the reading of CAT scans to doctors in India and Australia. The “flattening” of the world has created a whole new level of global competition that is more intense than ever before.

Big Data Analytics

Big data analytics is applying mathematics and statistics to large volumes of structured and unstructured data to gain unprecedented business insights. Today’s world is awash in data that come in all forms. These data include point-of-sale (POS), radio frequency identification (RFID), and global positioning systems (GPS) data, or can be in the form of Twitter feeds, Facebook, call centers, or consumer blogs.

Today's advanced analytical tools allow us to extract meaning from all types of data. Big data analytics enables converting this large amount of information into an unprecedented amount of business intelligence. It allows companies to precisely understand what happened in the past and better predict the future. Just consider examples such as IBM's Watson computer that uses an algorithm to predict best medical treatments and UPS that uses analytics to predict vehicle breakdowns. Big data analytics has enabled companies to gain huge business intelligence and has become a game changer for competitiveness.

Today's OM Environment

LEARNING OBJECTIVE

Identify current trends in operations management.

Today's OM environment is very different from what it was just a few years ago. Customers demand better quality, greater speed, and lower costs. In order to succeed, companies have to be masters of the basics of operations management. To achieve this ability, many companies are implementing a concept called **lean systems**. Lean systems take a total system approach to creating an efficient operation and pull together best practice concepts, including just-in-time (JIT), total quality management (TQM), continuous improvement, resource planning, and supply chain management (SCM). The need for efficiency has also led many companies to implement large information systems called **enterprise resource planning (ERP)**. ERP systems are large, sophisticated software programs for identifying and planning the enterprise-wide resources needed to coordinate all activities involved in producing and delivering products to customers.

Applying best practices to operations management is not enough to give a company a competitive advantage. The reason is that in today's information age best practices are quickly passed to competitors. To gain an advantage over their competitors, companies are continually looking for ways to better respond to customers. This requires them to have a deep knowledge of their customers and to be able to anticipate their demands. The development of **customer relationship management (CRM)** has made it possible for companies to have this detailed knowledge. CRM encompasses software solutions that enable the firm to collect customer-specific data, information that can help the firm identify profiles of its most loyal customers, and provide customer-specific solutions. Also, CRM software can be integrated with ERP software to connect customer requirements to the entire resource network of the company.

Another characteristic of today's OM environment is the increased use of **cross-functional decision making**, which requires coordinated interaction and decision making among the different business functions of the organization. Until recently, employees of a company made decisions in isolated departments, called "functional silos." Today many companies bring together experts from different departments into cross-functional teams to solve company problems. Employees from each function must interact and coordinate their decisions, which require employees to understand the roles of other business functions and the goals of the business as a whole, in addition to their own expertise.

Lean systems A concept that takes a total system approach to creating efficient operations.

Enterprise resource planning (ERP) Large, sophisticated software systems used for identifying and planning the enterprise-wide resources needed to coordinate all activities involved in producing and delivering products.

Customer relationship management (CRM) Software solutions that enable the firm to collect customer-specific data.

Cross-functional decision making The coordinated interaction and decision making that occur among the different functions of the organization.

Operations Management in Practice

LEARNING OBJECTIVE

Describe the flow of information between operations management and other business functions.

Of all the business functions, operations is the most diverse in terms of the tasks performed. If you consider all the issues involved in managing a transformation process, you can see that operations managers are never bored. Who are operations managers and what do they do?

The head of the operations function in a company usually holds the title of vice president of operations, vice president of manufacturing, V.P., or director of supply chain operations and generally reports directly to the president or chief operating officer. Below the vice president level are midlevel managers: manufacturing manager, operations manager, quality control manager, plant manager, and others. Below these managers are a variety of positions, such as quality specialist, production analyst, inventory analyst, and production supervisor. These people perform a variety of functions: analyzing production problems, developing forecasts, making plans for new products, measuring quality, monitoring inventory, and developing employee schedules. Thus, there are many job opportunities in operations management at all levels of the company. In addition, operations jobs tend to offer high salaries, interesting work, and excellent opportunities for advancement. Many corporate CEOs today have come through the ranks of operations. For example, the third president and CEO of Walmart from January 2000 to January 2009, H. Lee Scott, came from a background in operations and logistics. Another former CEO of Walmart, Michael Duke, came from a background of international operations, as did the previous CEO, Doug McMillon. The current Walmart CEO, Greg Foran comes from a 30 year experience in operations. Also from the operations background are the former CEO of Home Depot, Bob Nardelli, and the former CEO of Lowe's, Robert Tillman.

As you can see, all business functions need information from operations management in order to perform their tasks. At the same time, operations managers are highly dependent on input from other areas. This process of information sharing is dynamic, requiring that managers work in teams and understand each other's roles.

Within OM: How It All Fits Together

Just as OM decisions are linked with those of other business functions, decisions *within* the OM function need to be linked together. We learned that OM is responsible for a wide range of strategic and tactical decisions. These decisions directly impact each other and need to be carefully linked together, following the company's strategic direction. In the Gourmet Wafers example we observed that decisions on product design are directly tied to process selection (Chapter 3). The reason is that a company's process needs to be capable of producing the desired product (Chapter 6). Similarly, the forecast of expected demand (Chapter 8) directly impacts functions such as capacity planning (Chapter 9), inventory management (Chapter 12), and scheduling (Chapter 15). These are just a few examples of linkages within the OM function.

Throughout this book we will study different OM functions and will learn how each impacts the other. You will realize that OM decisions are not made in isolation. Rather, each decision is intertwined with other business functions and other OM decisions.

OM across the Organization

Now that we know the role of the operations management function and the decisions that operations managers make, let's look at the relationship between operations and other business functions. As mentioned previously, most businesses are supported by three main functions: operations, marketing, and finance. Although these functions involve different activities, they must interact to achieve the goals of the organization. They must also follow the strategic direction developed at the top level of the organization. **Figure 1.9** shows the flow of information from the top to each business function, as well as the flow between functions.

Many of the decisions made by operations managers are dependent on information from the other functions. At the same time, other functions cannot be carried out properly without information from operations. **Figure 1.10** shows these relationships.

Marketing is not fully capable of meeting customer needs if marketing managers do not understand what operations can produce, what due dates it can and cannot meet, and what types of customization operations can deliver. The marketing department can develop an exciting marketing campaign, but if operations cannot produce the desired product, sales will not be made. In turn, operations managers need information about customer wants and

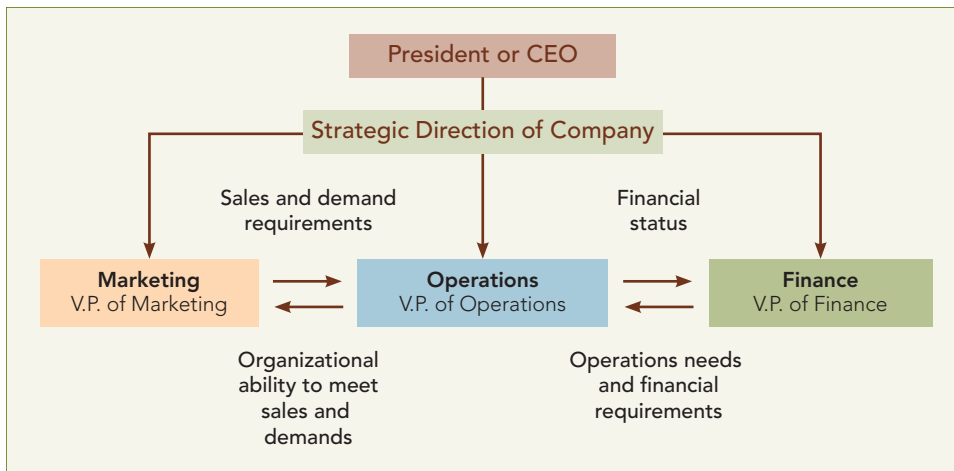


FIGURE 1.9 Organizational chart showing flow of information

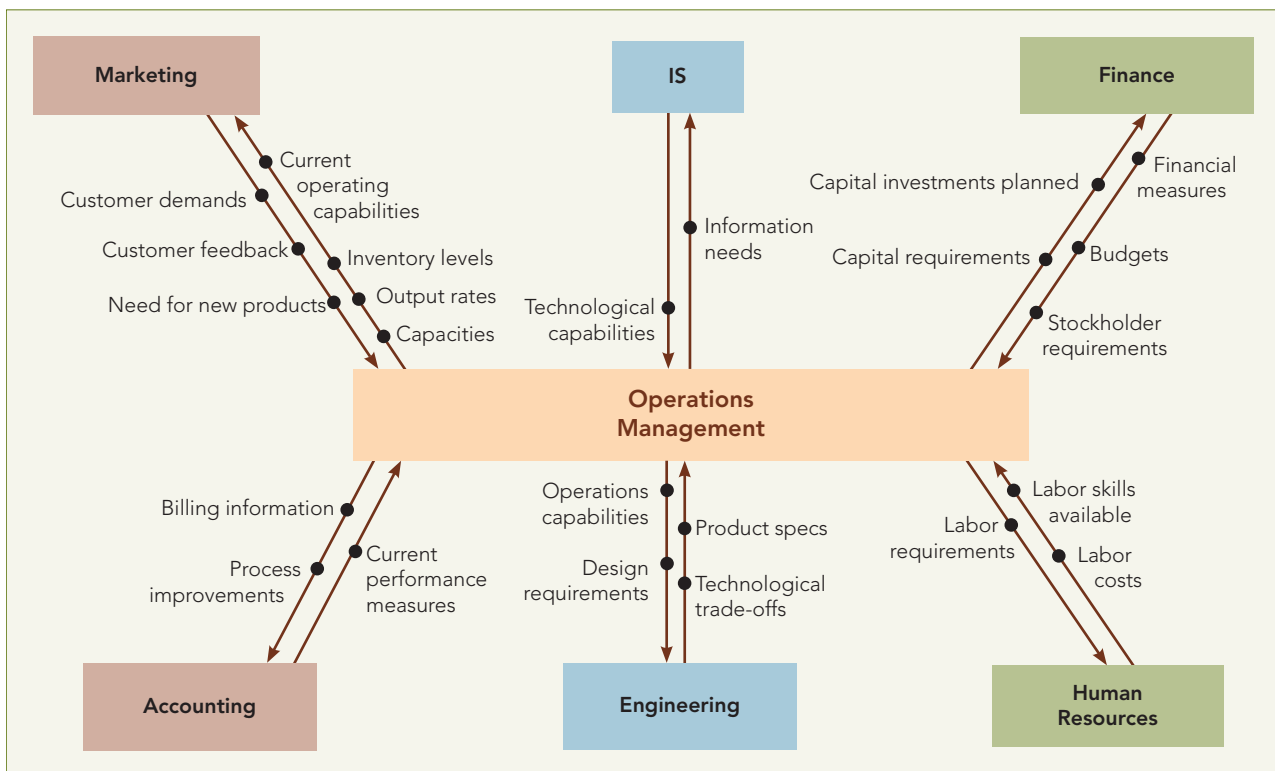


FIGURE 1.10 Information flow between operations and other business functions

expectations. It is up to them to design products with characteristics that customers find desirable, and they cannot do this without regular coordination with the marketing department.

Finance cannot realistically judge the need for capital investments, make-or-buy decisions, plant expansions, or relocation if finance managers do not understand operations concepts and needs. On the other hand, operations managers cannot make large financial expenditures without understanding financial constraints and methods of evaluating financial investments. It is essential for these two functions to work together and understand each other's constraints.

Information systems (IS) is a function that enables information to flow throughout the organization and allows OM to operate effectively. OM is highly dependent on information such as forecasts of demand, quality levels being achieved, inventory levels, supplier deliveries, and worker schedules. IS must understand the needs of OM in order to design an adequate information system. Usually, IS and OM work together to design an information network. This close relationship needs to be ongoing. IS must be capable of accommodating the needs

of OM as they change in response to market demands. At the same time, it is up to IS to bring the latest capabilities in information technology to the organization to enhance the functioning of OM.

Human resource managers must understand job requirements and worker skills if they are to hire the right people for available jobs. To manage employees effectively, operations managers need to understand job market trends, hiring and layoff costs, and training costs.

Accounting needs to consider inventory management, capacity information, and labor standards in order to develop accurate cost data. In turn, operations managers must communicate billing information and process improvements to accounting, and they depend heavily on accounting data for cost management decisions.

Engineering and other disciplines that are not in the business field are also tied to operations. Operations management provides engineering with the operations capabilities and design requirements, and engineering, in turn, provides valuable input on technological trade-offs and product specifications. These are essential for the product design process.

The coordinated interaction and decision making between all these functions and OM are needed for success in today's competitive environment. It is also important to extend this coordination to organizations that make up a supply chain, such as suppliers, manufacturers, and retailers. This is discussed in the following box.

The Supply Chain Link

Today's companies understand that successfully managing their own OM functions is not enough to maintain leadership in a highly competitive marketplace. The reason is that every company is dependent on other members of the supply chain to successfully deliver the right product to the final customer in a timely and cost-effective manner. For example, a company is dependent on its suppliers for the delivery of raw materials and components in time to meet production needs. If these materials are delivered late or are of insufficient quality, production will be delayed. Similarly, a company depends on its distributors and retailers for the delivery of the product to the final customer. If these are not delivered on time, are damaged in the transportation process, or are poorly displayed

at the retail location, sales will suffer. Also, if the OM function of other members of the supply chain is not managed properly, excess costs will result, which will be passed down to other members of the supply chain in the form of higher prices. Therefore, each company in the supply chain must successfully manage its OM function. Also, the companies that comprise a supply chain need to coordinate and link their OM functions so that the entire chain is operating in a seamless and efficient manner. Just consider the fact that most of the components Dell uses are warehoused within a 15-minute radius of its assembly plant and Dell is in constant communication with its suppliers. Dell considers this essential to its ability to produce and deliver components quickly.

The Sustainability Link

Environmental concerns, including climate change, energy use, environmental contamination, and resource depletion, are all part of the contemporary business landscape. Emerging economies, such as that of India and China, are growing at double-digit rates, and continued growth of the world population has created shortages of many resources we used to take for granted. Companies are increasingly aware that they must design their operations functions, and their entire supply chains, for sustainability. This means designing their operations processes to better and more efficiently use their resources, to use environmentally friendly inputs, and create outputs that can be recycled and that do not contaminate the environment. It also means better use of human resources, from labor to suppliers.

The operations function, with its transformation role, is uniquely poised to help companies achieve their sustainability goals. One of the best examples of this is illustrated through the joint efforts of the National Resources Defense Council (NRDC) and Major League Baseball (MLB) to change baseball operations to reduce the environmental impact. The "operation" of a baseball

game brings together numerous industries, such as the beverage and chemical industries, as well as automotive, plastics, steel, and agriculture. The NRDC and MLB have worked together to make MLB operations more sustainable by working with industries that serve as suppliers for baseball games, and placing "green" requirements on their goods and services. MLB has changed everything—from its purchasing and transportation decisions to the way it manages its stadiums and arenas. For example, a "red carpet" event, planned for MLB, was designed to use a carpet made from only recycled fibers, in a factory that is LEED certified¹ and wind and solar powered, emitting less global-warming pollutants. Simple changes such as this resulted in a more sustainable operation. This has also resulted in savings of thousands of dollars on energy, waste, and water bills.

¹LEED certification is the recognized standard in the United States and other countries for measuring building sustainability; we will learn about LEED certification later in the text.

Cases

Case: Hightone Electronics, Inc.

George Gonzales, operations director of Hightone Electronics, Inc. (HEI), sat quietly at the conference table overlooking the lobby of the corporate headquarters office in Palo Alto, California. He reflected on the board meeting that had just adjourned and the challenge that lay ahead for him. The board had just announced their decision to start an Internet-based division of HEI. Web-based purchasing in the electronics industry had been growing rapidly. The board felt that HEI needed to offer online purchasing to its customers in order to maintain its competitive position. The board looked to George to outline the key operations management decisions that needed to be addressed in creating a successful Internet-based business. The next board meeting was just a week away. He had his work cut out for him.

Hightone Electronics, Inc. was founded in Palo Alto, California, over 50 years ago. Originally, the company provided radio components to small repair shops. Products were offered for sale through a catalog that was mailed to prospective customers every four months. The company built its reputation on high quality and service. As time passed, HEI began supplying more than just radio parts, adding items such as fuses, transformers, computers, and electrical testing equipment. The expansion of the product line had been coupled with an increase in the number and type of customers the company served. Although the traditional repair shops still remained a part of the company's market, technical schools, universities, and well-known corporations in the Silicon Valley were added to the list of customers.

Today HEI operates the Palo Alto facility with the same dedication to supplying quality products through catalog sales that

it had when it was first founded. Customer service remains the top priority. HEI stocks and sells over 22,000 different items. Most customers receive their orders within 48 hours, and all components are warranted for a full year.

Expanding HEI to include Web-based purchasing seems to be a natural extension of catalog sales that the company already does successfully. George Gonzales agrees that the company has no choice but to move in this competitive direction. However, George does not agree with the opinion of the board that this would be "business as usual." He believes that there are many operations decisions that need to be identified and addressed. As he stated in the meeting, "Having a slick website is one thing, but making sure the right product is delivered to the right location is another. Operations is the key to making this happen." His challenge for the next board meeting was to identify the key operations decisions and persuade the board that these issues needed serious consideration.

Case Questions

1. Explain why operations management is critical to the success of a business. Why would developing an Internet-based business require different operations considerations for HEI? Is George Gonzales correct in his assessment that this would not be "business as usual"?
2. Recall that HEI wishes to continue its reputation of high quality and service. Identify key operations management decisions that need to be considered. How different will these decisions be for the Internet business?

Case: Creature Care Animal Clinic (A)

It has been three years since Dr. Julia Barr opened Creature Care Animal Clinic, a suburban veterinary clinic. Dr. Barr thought that by now she would be enjoying having her own practice. She had spent many years in college and worked to save money in order to start a business. Instead, she felt overwhelmed with business problems that were facing the clinic. She thought to herself: "I don't produce anything. I just provide a service doing something I enjoy. How can this be so complicated?"

Company Background

Dr. Barr opened Creature Care Animal Clinic as a veterinary clinic specializing in the care of dogs and cats. The clinic was set to operate Monday through Friday during regular business hours, with half days on Saturday and extended hours on Wednesday evening. Dr. Barr hired another full-time veterinarian, Dr. Gene Yen, a staff of three nurses, an office manager, and an office assistant. Both doctors were to work during the week and rotate the shift for Wednesday evenings and Saturdays. A similar schedule was

set up for the nurses. The office manager worked during regular business hours, and the assistant worked on Wednesday evenings and Saturdays. Dr. Barr set up this schedule based on a clinic she had observed as a resident and thought it sounded reasonable.

Since the clinic was small, Dr. Barr did not have a formal system of inventory management. All physicians and nurses were allowed to place purchase orders based on need. Initially this system worked well, but after a few months problems started developing. Frequently, there was excess inventory of certain items, and in many cases there were multiple brands of the same product. Sometimes medications passed their expiration dates and had to be thrown away. At the same time, the clinic often unexpectedly ran out of stock of certain supplies and rush orders had to be placed. On one occasion, the clinic ran so low on bandages that the assistant had to be sent to the local drugstore.

Dr. Barr continued to rotate with Dr. Yen for coverage on Saturdays and Wednesday evenings. However, demand was increasing so rapidly on Saturdays that one doctor was not enough to provide needed coverage. Also, the Friday afternoon

schedule was usually so packed that the staff frequently had to stay late in the evening. At the same time, there was little demand on Wednesday evenings and Dr. Barr found herself working on paperwork on those evenings, while the nurse and office assistant performed menial office tasks.

Case Questions

1. Identify the operations management problems that Dr. Barr is having at the clinic.
2. The schedule Dr. Barr set up worked well at the clinic where she was a resident. What are some of the reasons why it might not be working here?
3. Identify some of the reasons why the clinic is having inventory problems.
4. What should Dr. Barr have done differently to avoid some of the problems she is currently experiencing?
5. What suggestions would you make to Dr. Barr now?

Case: Analytics in Decision Making

You graduated with an MBA from Northwestern University in 2005 and became an entrepreneur. Since then you have started seven different businesses, and today each of those businesses generates many millions of dollars in revenue. You believe in “umbrella branding,” and you have marketed all your businesses under the brand name of *NUcleus*.

Spotting a trend in data analytics, you recently began exploring the possibility of a new business in this space. After talking with the business community, you have identified the need of small and medium firms for analytics services in analyzing web traffic on their websites. Given your successful track record as an entrepreneur, a number of businesses have already expressed their willingness to sign a service contract with you, and you have provisioned financing for the new startup.

With financing and clients lined up, you are planning to begin operating your new organization, called *NUcleus Analytics*, in three months.

Case Questions

1. Identify the operations management decision you need to make in order to begin operating *NUcleus Analytics*.
2. What criteria should you include in contracting with your customers to measure how well you are serving them?
3. One of your seven ventures, branded as *NUcleus Robotics*, makes industrial robots. How should its customer contract differ from that of *NUcleus Analytics*? (Tip: One business is a service, the other manufacturing).

Interactive Case: Virtual Company

WileyPLUS

Online Case: Cruise International, Inc.

Assignment *Introduction to Cruise International, Inc.* You will be an intern for Cruise International, Inc. (CII). The company competes in the cruise industry in the small-ship, medium-ship, and large-ship markets. Your internship begins in a few weeks. Bob Bristol, your immediate boss, has asked you to become familiar with the cruise industry and its basic markets prior to beginning any of your assignments. This assignment will enhance your knowledge of the material in Chapter 1 of your textbook while preparing you for future assignments.

To access the WileyPLUS:

- Click **Virtual Company/Cruise International, Inc.**
- Click **Consulting Assignments**

Online Case: Valley Memorial Hospital

Assignment *Welcome to Kaizen Consulting.* Bob Reilly, head of Kaizen Consulting, Inc. just called to let you know that you have been accepted as an intern for his company. Kaizen handles many different clients, but you will primarily be working with one of its healthcare clients, *Valley Memorial Hospital*. Your internship will start in a few weeks. Bob has advised you to get thoroughly familiar with the company and its operations before you start working on the specific tasks that will be assigned to you. This assignment will enable you to enhance your knowledge of the material in Chapter 1 while preparing you for a successful internship.

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Internet Challenge: Demonstrating Your Knowledge of OM

Visit the websites of at least one service and one manufacturing company. For each company, identify at least five characteristic OM decisions and show your results in a table. Which decisions are strategic and which are tactical? How do these decisions differ between the two companies? Here are some websites to consider.

Select service company websites:

www.ritzcarlton.com (Ritz-Carlton Hotel)
www.sprint.com (Sprint Corporation)

www.yrcw.com (YRC Worldwide)
www.kmart.com (Kmart Corporation)
www.yahoo.com (Yahoo!)

Select manufacturing company websites:

www.alcoa.com (Alcoa Inc.)
www.milliken.com (Milliken & Company)
www.Intel.com (Intel Corporation)
www.ge.com (General Electric Company)

Chapter Highlights

1. Operations management is the business function that is responsible for managing and coordinating the resources needed to produce a company's products and services. Without operations management there would be no products or services to sell.
2. Organizations can be divided into manufacturing and service operations, which differ in the tangibility of the product and the degree of customer contact. Manufacturing and service operations have very different operational requirements.
3. Operations management is responsible for a wide range of decisions, ranging from strategic decisions, such as designing the unique features of a product and process, to tactical decisions, such as planning worker schedules.
4. A number of historical milestones have shaped operations management into what it is today. Some of the more significant of these are the Industrial Revolution, scientific management, the human relations movement, management science, and the computer age.
5. OM is a highly important function in today's dynamic business environment. Among the trends that have had a significant impact on business are just-in-time, total quality management, reengineering, flexibility, time-based competition, supply chain management, a global marketplace, and environmental issues.
6. Operations managers need to work closely with all other business functions in a team format. Marketing needs to provide information about customer expectations. Finance needs to provide information about budget constraints. In turn, OM must communicate its needs and capabilities to the other functions.

Key Terms

operations management (OM) 2
role of operations management 2
value added 4
efficiency 4
manufacturing organizations 4
service organizations 4
strategic decisions 8
tactical decisions 8
Industrial Revolution 10
scientific management 11

Hawthorne studies 11
human relations movement 12
management science 12
just-in-time (JIT) 12
total quality management (TQM) 13
reengineering 13
flexibility 13
mass customization 13
time-based competition 13
supply chain management (SCM) 14

global marketplace 15
sustainability 15
business-to-business (B2B) 15
business-to-customers (B2C) 15
customer-to-customer (C2C) 16
lean systems 17
enterprise resource planning (ERP) 17
customer relationship management (CRM) 17
cross-functional decision making 17

Discussion Questions

1. Define the term *operations management*.
2. Explain the decisions operations managers make and give three examples.
3. Describe the transformation process of a business. Give three examples. What constitutes the transformation process at an advertising agency, a bank, and a TV station?
4. What are the three major business functions, and how are they related to one another? Give specific examples.
5. What are the differences between strategic and tactical decisions, and how are they related to each other?
6. Find an article that relates to operations management in either the *Wall Street Journal*, *Fortune*, or *Business Week*. Come to class prepared to share with others what you learned in the article.
7. Examine the list of *Fortune* magazine's top 100 companies. Do most of these companies have anything in common? Are there industries that are most represented?
8. Identify the two major differences between service and manufacturing organizations. Find an example of a service company and a manufacturing company and compare them.
9. What are the three historical milestones in operations management? How have they influenced management?
10. Identify three current trends in operations management and describe them. How do you think they will change the future of OM?
11. Define the terms *total quality management*, *just-in-time*, and *reengineering*. What do these terms have in common?
12. Describe today's OM environment. How different is it from that of a few years ago? Identify specific features you think characterize today's OM environment.
13. Describe the impact of e-commerce on operations management. Identify the challenges posed by e-commerce on operations management.
14. Find a company you are familiar with and explain how it uses its operations management function. Identify what the company is doing correctly. Do you have any suggestions for improvement?

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