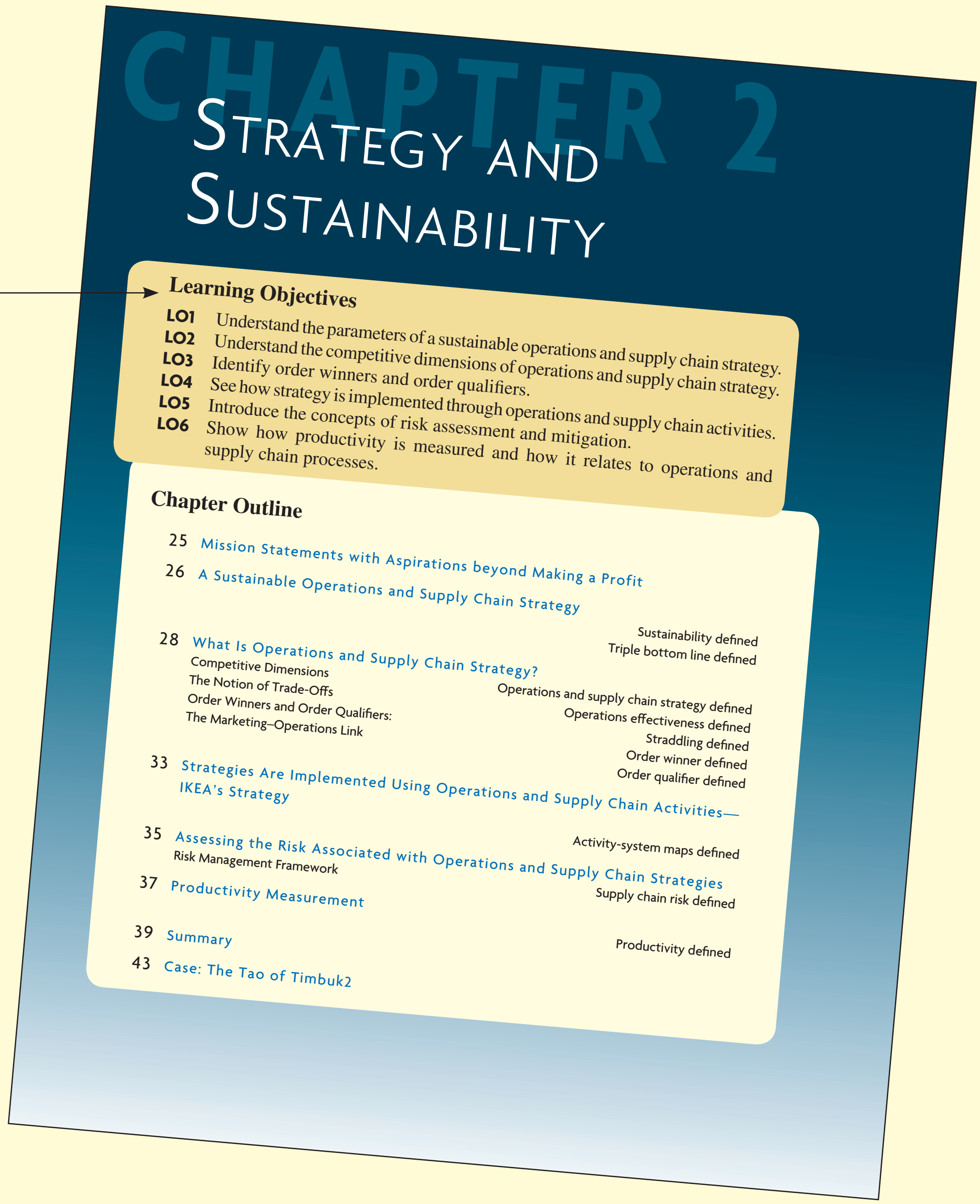
Walkthrough

Major Study and Learning Features

The following section highlights the key features developed to provide you with the best overall text available. We hope these features give you maximum support to learn, understand, and apply operations concepts.

Chapter Opener



CHAPTER 2

STRATEGY AND SUSTAINABILITY

Learning Objectives

LO1 Understand the parameters of a sustainable operations and supply chain strategy.
LO2 Understand the competitive dimensions of operations and supply chain strategy.
LO3 Identify order winners and order qualifiers.
LO4 See how strategy is implemented through operations and supply chain activities.
LO5 Introduce the concepts of risk assessment and mitigation.
LO6 Show how productivity is measured and how it relates to operations and supply chain processes.

Chapter Outline

Opening Vignettes

Each chapter opens with a short vignette to set the stage and help pique students' interest in the material about to be studied. A few examples include:

- Mission Statements with Aspirations Beyond Making a Profit, Chapter 2
- From Bean to Cup: Starbucks Global Supply Chain Challenge, Chapter 3
- Inside the iPad, Chapter 9
- Clarity Is Missing Link in Supply Chain, Chapter 13

TOSHIBA: PRODUCER OF THE FIRST NOTEBOOK COMPUTER

Tokyo Shibaura Denki (Tokyo Shibaura Electric Co. Ltd.) was formed in 1939 by a merger of two highly innovative Japanese companies: Shibaura Seisaku-sho (Shibaura Engineering Works), which manufactured transformers, electrical motors, hydroelectric generators, and x-ray tubes, and Tokyo Electric Company, which produced lightbulbs, radio receivers, and cathode-ray tubes. The company was soon after known as "Toshiba," which became its official name in 1978. Toshiba became the first company in Japan to make fluorescent lamps (1940), radar (1942), broadcasting equipment (1952), and digital computers (1954). Toshiba also became the first in the world to produce the powerful 1-megabit DRAM chip and the first laptop computer, the T3100, both in 1985.

Toshiba has built its strength in the notebook PC market by

Boxes

The boxes provide examples or expansions of the topics presented by highlighting leading companies practicing new, breakthrough ways to run their operations. Examples include:

- The World's Biggest Construction Projects, Chapter 5
- Mayo Clinic Design Improves the Patient-Provider Experience, Chapter 7
- It's All in the Planning, Chapter 8
- Capability Sourcing at 7-Eleven, Chapter 13

The World's Biggest Construction Projects

Think redoing your kitchen is a headache? Imagine supervising one of these megaprojects.

South-to-North Water Transfer Project, China

Who's building it: the Chinese government

Budget: $62 billion (445 billion yuan)

Estimated completion date: 2050

What it takes: 400,000 relocated citizens and a very thirsty northern China. Economic development in the North China Plain is booming, but its water supplies are falling short, far short. Desperate farming communities are digging wells as deep as 600 feet to find clean water, but the Chinese government has much more digging in mind. Drawing on an unimplemented proposal from Mao himself, the Communist Party has decided to divert water from the Yangtze—a southern river known for its rising tides—to the dry rivers of the north. If it is completed, 12 trillion gallons of water will flow northward yearly through three man-made channels whose combined construction is expected to displace almost 400,000 people. Construction is well under way for the east and central canals, but environmental concerns have kept the western route at the planning stage. The project's $62 billion price tag also makes the South-to-North project by far the most expensive construction project ever in China. But having finished the Three Gorges Dam—a $25 billion project that has forced the relocation of more than 1 million people—China is no stranger to pricey megaprojects.

on Panamax-size vessels—ships that are the maximum size that can fit through the canal. But in a project that broke ground—or canal bed—in the fall of 2007, the Panama Canal will soon be equipped with the world's biggest locks, capable of handling most shipping vessels that are over Panamax size. Also, by adding a wider, deeper, and longer third lock lane to the existing two, the project will more than double the canal's current effective capacity of 15,000 transits per year.

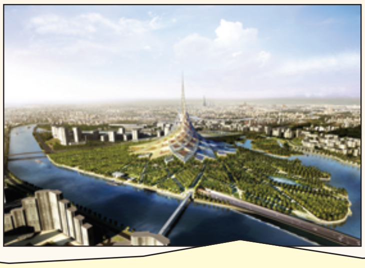
Crystal Island, Moscow

Who's building it: Shalva Chigirinsky, oil and real estate mogul

Budget: $4 billion (98 billion rubles)

Estimated completion date: 2014

What it takes: 27 million square feet of floor space in the middle of the Moscow River and an eye for the extreme. In a city booming with petro-wealth projects, Crystal Island—designed to be the largest building in the world—is sure to grab most of the attention. Planned



Examples with Solutions

Examples follow quantitative topics and demonstrate specific procedures and techniques. Clearly set off from the text, they help students understand the computations.

A series of detailed, worked-out solutions for every example in the text can be found on the text Website, which provides another level of detailed support for students.

Step by Step

Example 3.1: Forecast Including Trend

Assume a previous forecast including trend of 110 units, a previous trend estimate of 10 units, an alpha of .20, and a delta of .30. If actual demand turned out to be 115 rather than the forecast 110, calculate the forecast for the next period.

SOLUTION

The actual A_{t-1} is given as 115. Therefore,

$$\begin{aligned} F_t &= \text{FIT}_{t-1} + \alpha(A_{t-1} - \text{FIT}_{t-1}) \\ &= 110 + .2(115 - 110) = 111.0 \\ T_t &= T_{t-1} + \delta(F_t - \text{FIT}_{t-1}) \\ &= 10 + .3(111 - 110) = 10.3 \\ \text{FIT}_t &= F_t + T_t = 111.0 + 10.3 = 121.3 \end{aligned}$$

ICONS

Step by Step

Every example in the book includes a step-by-step icon. They draw attention to detailed, worked-out solutions on the text Website.

Step by Step

Excel

Excel icons point out applications where Excel templates are available on the text Website.

Excel

Tutorials

The tutorial icons highlight links to the ScreenCam tutorials on the text Website.

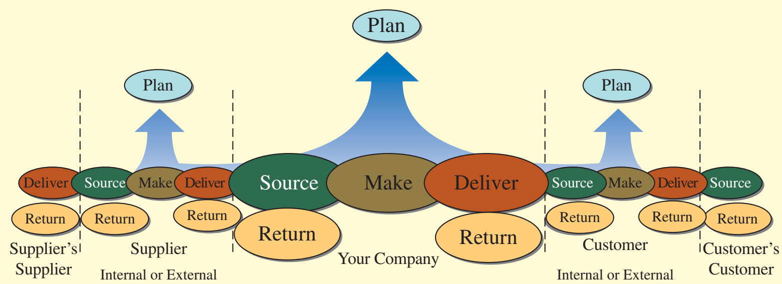
Tutorials

Photos and Exhibits

Photos and exhibits in the text enhance the visual appeal and clarify text discussions. Many of the photos illustrate additional examples of companies that utilize the operations and supply chain concepts in their business.

8 *section 1* STRATEGY AND ANALYTICS

exhibit 1.3 Supply Chain Processes



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

THE ELMO CHICKEN DANCE TOY GETS A SOUND CHECK AT A MATTEL LAB IN SHENZHEN, CHINA. MATTEL LOBBIED TO LET ITS LABS CERTIFY TOY SAFETY. THE CALIFORNIA COMPANY HAS 10 LABS IN SIX COUNTRIES.

Solved Problems

Representative problems are placed at the end of appropriate chapters. Each includes a worked-out solution giving students a review before solving problems on their own.

Solved Problems

SOLVED PROBLEM 1

Excel: Queue

Quick Lube Inc. operates a fast lube and oil change garage. On a typical day, customers arrive at the rate of three per hour, and lube jobs are performed at an average rate of one every 15 minutes. The mechanics operate as a team on one car at a time.

Assuming Poisson arrivals and exponential service, find

a. Utilization of the lube team.
b. The average number of cars in line.
c. The average time a car waits before it is lubed.
d. The total time it takes to go through the system (that is, waiting in line plus lube time).

Solution

$\lambda = 3, \mu = 4$

a. Utilization $\rho = \frac{\lambda}{\mu} = \frac{3}{4} = 75$ percent.

b. $L_q = \frac{\lambda^2}{\mu(\mu - \lambda)} = \frac{3^2}{4(4-3)} = \frac{9}{4} = 2.25$ cars in line.

c. $W_q = \frac{L_q}{\lambda} = \frac{2.25}{3} = .75$ hour, or 45 minutes.

d. $W_s = \frac{L_s}{\lambda} = \frac{\lambda}{\mu - \lambda} \Big/ \lambda = \frac{3}{4-3} \Big/ 3 = 1$ hour (waiting + lube).

SOLVED PROBLEM 2

Excel: Queue

American Vending Inc. (AVI) supplies vended food to a large university. Because students often kick the machines out of anger and frustration, management has a constant repair problem. The machines

Key Terms

The vocabulary of *Operations and Supply Chain Management* is highlighted in the Key Terms section at the end of each chapter and includes definitions.

Key Terms

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

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

Effectiveness Doing the right things to create the most value for the company.

Efficiency Doing something at the lowest possible cost.

Mass customization Producing products exactly to a particular customer's requirements.

Process Made up of one or more activities that transform inputs into outputs.

Product-service bundling Building service activities into a firm's product offerings to create more value for the customer.

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.

Value Ratio of quality to price paid. Competitive "happiness" is

Formula Reviews

These lists at the end of chapters summarize formulas in one spot for easy student access and review.

Formula Review

Mean or average

$$\overline{X} = \frac{\sum_{i=1}^{n} x_i}{n} \quad [10.1]$$

Standard deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \overline{X})^2}{n}} \quad [10.2]$$

Capability index

$$C_{pk} = \min\left[\frac{\overline{\overline{X}} - \text{LSL}}{3\sigma}, \frac{\text{USL} - \overline{\overline{X}}}{3\sigma}\right] \quad [10.3]$$

Process control charts using attribute measurements

$$\overline{p} = \frac{\text{Total number of defective units from all samples}}{\text{Number of samples} \times \text{Sample size}} \quad [10.4]$$

$$s_p = \sqrt{\frac{\overline{p}(1 - \overline{p})}{n}} \quad [10.5]$$

$$\text{UCL} = \overline{p} + zs_p \quad [10.6]$$

$$\text{LCL} = \overline{p} - zs_p \text{ or 0 if less than 0} \quad [10.7]$$

$$\overline{c} = \text{Average number of defects per unit} \quad [10.8]$$

$$s_p = \sqrt{\overline{c}} \quad [10.9]$$

$$\text{UCL} = \overline{c} + z\sqrt{\overline{c}} \quad [10.10]$$

$$\text{LCL} = \overline{c} + z\sqrt{\overline{c}} \text{ or 0 if less then 0} \quad [10.11]$$

Process control $\overline{X}$- and R-charts

$$\text{UCL}_{\overline{X}} = \overline{\overline{X}} + zS_{\overline{X}} \quad \text{and} \quad \text{LCL}_{\overline{X}} = \overline{\overline{X}} - zS_{\overline{X}} \quad [10.12]$$

$$\overline{\overline{X}} = \frac{\sum_{j=1}^{m} \overline{X}_j}{m} \quad [10.13]$$

$$\overline{R} = \frac{\sum_{j=1}^{m} R_j}{m} \quad [10.14]$$

$$\text{Upper control limit for } \overline{X} = \overline{\overline{X}} + A_2\overline{R} \quad [10.15]$$

$$\text{Lower control limit for } \overline{X} = \overline{\overline{X}} - A_2\overline{R} \quad [10.16]$$

$$\text{Upper control limit for } R = D_4\overline{R} \quad [10.17]$$

$$\text{Lower control limit for } R = D_3\overline{R} \quad [10.18]$$

Super Quiz

The super quiz includes many straightforward review questions, but also has a selection that tests for mastery and integration/application level understanding, that is, the kind of questions that make an exam challenging.

Super Quiz

1 A strategy that is designed to meet current needs without compromising the ability of future generations to meet their needs.
2 The three criteria included in a triple bottom line.
3 The eight operations and supply competitive dimensions.
4 It is probably most difficult to compete on this major competitive dimension.
5 This occurs when a company seeks to match what a competitor is doing while maintaining its existing competitve position.
6 A criterion that differentiates the products or services of one firm from those of another.
7 A screening criterion that permits a firm's products to be considered as possible candidates for purchase.
8 A diagram showing the activities that support a company's strategy.
9 A measure calculated by taking the ratio of output to input.

1. Sustainable 2. Social, economic, environmental 3. Cost, quality, delivery speed, delivery reliability, coping with changes in demand, flexibility and speed of new product introduction, other product-specific criteria 4. Cost 5. Straddling 6. Order winner 7. Order qualifier 8. Activity-system map 9. Productivity

Cases

Cases allow students to think critically about issues discussed in the chapter. Cases include:

The Tao of Timbuk2, Chapter 2
Pro Fishing Boats: A Value Stream Mapping Exercise, Chapter 12
Shouldice Hospital: A Cut Above, Chapter 4

Case: The Tao of Timbuk2*

"Timbuk2 is more than a bag. It's more than a brand. Timbuk2 is a bond. To its owner, a Timbuk2 bag is a dependable, everyday companion. We see fierce, emotional attachments form between Timbuk2 customers and their bags all the time. A well-worn Timbuk2 bag has a certain patina—the stains and scars of everyday urban adventures. Many Timbuk2 bags are worn daily for a decade or more, accompanying the owner through all sorts of defining life events. True to our legend of 'indestructibility,' it's not uncommon for a Timbuk2 bag to outlive jobs, personal relationships, even pets. This is the Tao of Timbuk2."

What makes Timbuk2 so unique? Visit their Website at www.timbuk2.com and see for yourself. Each bag is custom designed by the customer on their Website. After the customer selects the basic bag configuration and size, colors for each of the various panels are presented; various lines, logos,

specifications of the customer on the Timbuk2 assembly line in San Francisco and sent via overnight delivery directly to the customer.

Recently, Timbuk2 has begun making some of its new products in China, which is a concern to some of its longstanding customers. The company argues that it has designed its new products to provide the best possible features, quality, and value at reasonable prices and stresses that these new products are designed in San Francisco. Timbuk2 argues that the new bags are much more complex to build and require substantially more labor and a variety of very expensive machines to produce. They argue that the San Francisco factory labor cost alone would make the retail price absurdly high. After researching a dozen factories in China, Timbuk2 found one that it thinks is up to the task of producing these new bags. Much as in San Francisco, the China factory employs a

Analytics Exercises

There are so much more data now available for decision making. The analytics movement takes this to a new level using statistical analysis to extrapolate what to expect in the future to support operations and supply chain decisions. A series of 11 analytics exercises are spread through the chapters. These include

Forecasting Supply Chain Demand: Starbucks Corporation, Chapter 3
Processing Customer Orders: Analyzing a Taco Bell Restaurant, Chapter 7
Designing a Manufacturing Process: Toshiba's Notebook Computer Assembly Line, Chapter 6
Global Sourcing Decisions: Grainger: Reengineering the China/U.S. Supply Chain, Chapter 13

Analytics Exercise: Designing a Manufacturing Process

Toshiba's Notebook Computer Assembly Line

Toshihiro Nakamura, manufacturing engineering section manager, is examining the prototype assembly process sheet (shown in Exhibit 6.8) for the newest subnotebook computer model. With every new model introduced, management felt that the assembly line had to increase productivity and lower costs, usually resulting in changes to the assembly process. When a new model is designed, considerable attention is directed toward reducing the number of components and simplifying parts production and assembly requirements. This new computer was a marvel of high-tech, low-cost innovation and should give Toshiba an advantage during the upcoming fall/winter selling season.

Production of the subnotebook is scheduled to begin in 10 days. Initial production for the new model is to be 150 units per day, increasing to 250 units per day the following week (management thought that eventually production would reach 300 units per day). Assembly lines at the plant normally are staffed by 10 operators who work at a 14.4-meter-long assembly line. The line is organized in a straight line with workers shoulder to shoulder on one side. The line can accommodate up to 12 operators if there is a need. The line normally operates for 7.5 hours a day (employees work from 8:15 A.M. to 5:00 P.M. and regular hours includes one hour of unpaid lunch and 15 minutes of scheduled breaks). It is possible to run one, two, or three hours of overtime, but employees need at least three days' notice for planning purposes.

The Assembly Line

At the head of the assembly line, a computer displays the daily production schedule, consisting of a list of model types and corresponding lot sizes scheduled to be assembled on the line. The models are simple variations of hard disk size, memory, and battery power. A typical production schedule includes seven or eight model types in lot sizes varying from 10 to 100 units. The models are assembled sequentially: All the units of the first model are assembled, followed by all the units of the second, and so on. This computer screen also indicates how far along the assembly line is in completing its daily schedule, which serves as a guide for the material handlers who supply parts to the assembly lines.

For Instructors

Text Website

Text Online Learning Center (OLC) at www.mhhe.com/jacobs3e. The text Website includes a variety of material for instructors and students.

Student Website

Excel templates
PowerPoint slides
ScreenCam tutorials
Glossary
Updates and Errata
Guided Examples
Interactive OM

Instructor Site

Test Bank
Instructor PowerPoint Slides
Instructor Solutions Manual
Text Exhibits
Updates and Errata

Operations Management Video Series

The 17-volume series, free to text adopters, includes professionally developed videos showing students real applications of key manufacturing and service topics in real companies. Each segment includes on-site footage, interviews with company managers, and a focused presentation of OM applications in use to help the companies gain competitive advantage. Companies such as Zappos, FedEx, Suburu, Disney, BP, Chase Bank, DHL, Louisville Slugger, McDonald's, Noodles, and Honda are featured.

ScreenCam Tutorials

These screen "movies" and voice-over tutorials demonstrate chapter content using Excel and other software platforms.