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Operations **Now**

PROFITABILITY, PROCESSES, PERFORMANCE

BYRON J. FINCH

DVD INCLUDED



Operations Now

PROFITABILITY, PROCESSES, PERFORMANCE

BYRON J. FINCH
Miami University

SECOND EDITION



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OPERATIONS NOW: PROFITABILITY, PROCESSES, PERFORMANCE

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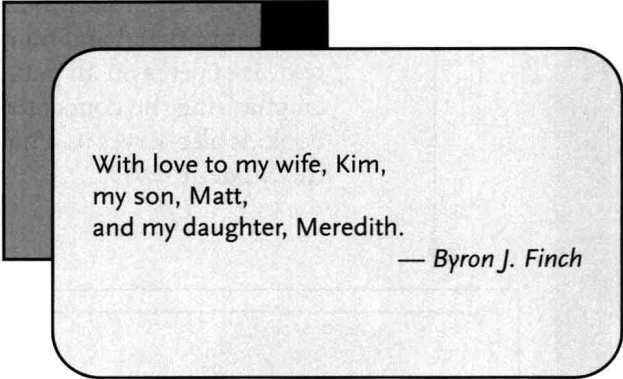
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With love to my wife, Kim,
my son, Matt,
and my daughter, Meredith.

— *Byron J. Finch*

Guided Tour

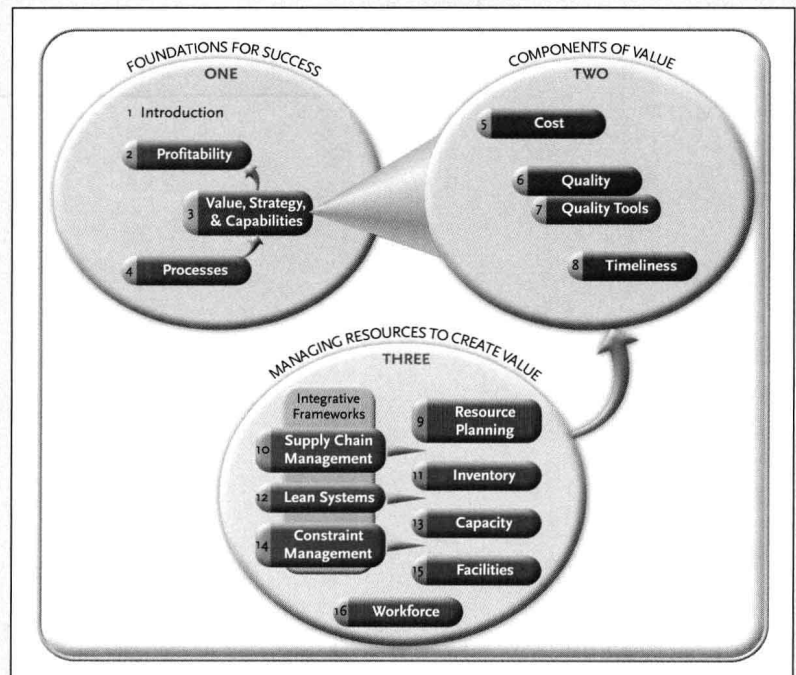
A Context and Structure to Reflect Today's Reality

Byron Finch's Resource/Profit Model provides the *critical context* and *organizing structure* often lacking in operations management coverage. Unlike some business disciplines such as marketing, accounting, and finance, the field of operations management is not universally recognized by students as being critical, despite its position at the core of all service and manufacturing businesses. This lack of familiarity with the subject can lead to a perceived lack of relevance, prompting students to ask: "Why do we need this?" That's a great question and one that, if not answered and reinforced throughout the course, can destroy the course's impact.

Putting Operations Management in a Context All Business Students Can Appreciate: The Bottom Line

The Resource/Profit Model

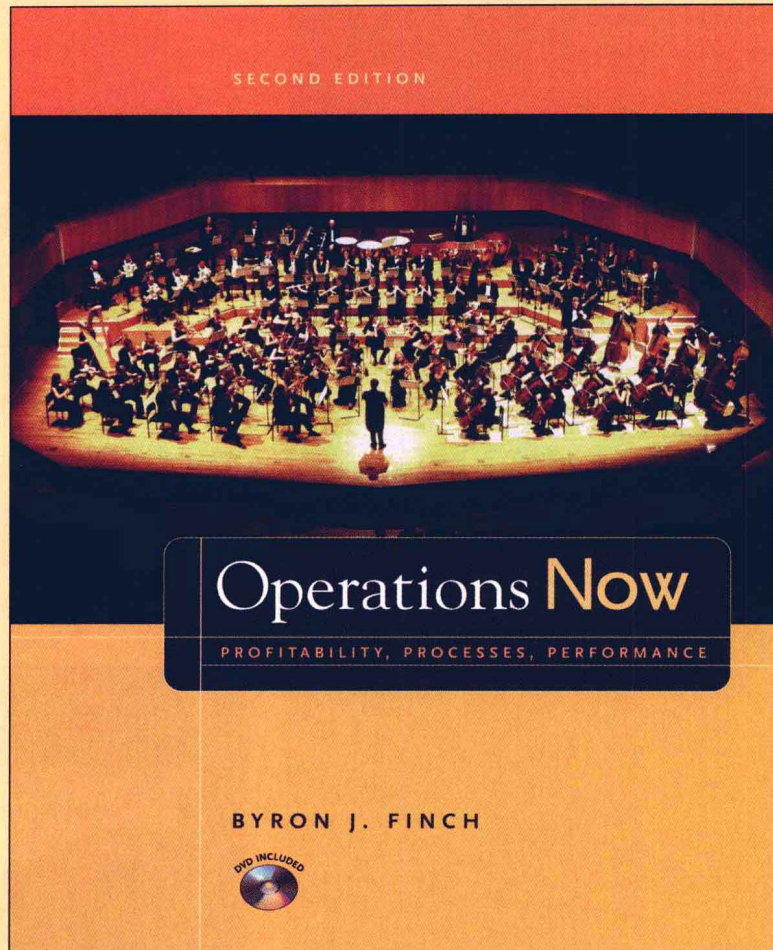
The Resource/Profit Model is used as an organizational and framework throughout the text. It appears on all part and chapter openers, emphasizing the conceptual structure of the book. It also serves as a navigation tool on the Student DVD.



Operations Now

Profitability, Processes, Performance

The Resource/Profit Model addresses the true core of operations relevance—*its direct link to enterprise profitability*. Profitability forms the foundation of long-term business success. Value creation precedes profitability, and is maintained through strategic decisions. Value is viewed by the customer as a desired balance between the components of processes, costs, quality, and timeliness. Value components are achieved through effective management of resources, including inventory, capacity, facilities, and workforce. Broader decision-making frameworks such as supply chain management, lean systems, and constraint management assist managers in effectively managing those resources. All exist to enhance profitability. Rather than address specific decision-making techniques within the contexts of such topics as inventory or resource scheduling, the Resource/Profit Model places operations management into its *real* context—the business and its success.



“The Resource/Profit Model serves as a unifying framework that can be used to accommodate a wide array of OM concepts. I particularly like the author’s focus on value creation and profitability.”

—Eric Jack, University of Alabama, Birmingham

Guided Tour

Getting Business Students Motivated about Operations Management

To get motivated about any subject, students need to see how it relates to them, or how it will relate to them in the future. *Operations Now* is the most approachable text on the market, with a wide variety of examples—and kinds of examples—of operations topics put into a context that all business students can understand.

As you'll see on the following pages, *Operations Now* offers students a multitude of aides and hands-on learning tools that will help them not only understand the material, but understand why the information is important to them.

Each chapter opens with a vignette illustrating how one of the main points of the chapter affects a real

"I think the text is generally more interesting for students to read than many other operations management texts. That is a big attraction for me."

—Charles H. Smith, Virginia Commonwealth University

company. By putting the chapter's information into a context they will recognize, students can see that operations management is about more than just factories.



PROFITABILITY IN THE DISCOUNT AIRLINE INDUSTRY

As the major "legacy" airlines have struggled for profitability since September 11, 2001, discount airlines such as Southwest and JetBlue in the United States, Ryanair in Ireland, and EasyJet in the United Kingdom have taken market share and recorded profits. The concept of a discount airline is a bit of a misnomer, though, because quite often the legacy airline fares are as cheap as those of the discount airlines. Profitability, however, is a different matter. The discount airlines are more profitable, but how can that be?

Discount airlines are more profitable because they use resources more effectively. By resources, we don't mean people. Labor costs are no cheaper for the discount airlines. They use their planes more effectively. How do they do this? There are several ways. First, rather than fly their planes seven or eight hours a day, they have their planes in the air nine or ten hours a day. That's an increase of 25 percent, which translates into a 25 percent increase on the return on assets for those planes. They're in the air more, which means the airline needs fewer of them to achieve the same return.

Beyond simply flying the planes more, the discount airlines are structured to fly what are called "point-to-point" (pt-pt) routes. This contrasts with the more typical hub-and-spoke structure used by the larger airlines. Pt-pt routes provide several advantages. First of all, the shortest distance between two points is a straight line. Travelers flying a hub-and-spoke airline rarely fly

one leg. They fly to the hub and then on to their final destination, usually nothing like a straight line. The pt-pt routes mean that passengers usually fly a single leg. This eliminates costly baggage transfers and all of the resources necessary to accomplish that function. It also helps keep planes in the air more of the time by avoiding larger airports.

In addition to planes being in the air a greater percentage of the time, while they're in the air, more of their seats are full. The percentage of the seats that are full, known as the "load factor," means that there are more paying customers on each flight.

These approaches have been so successful that the large airlines have gone beyond noticing it and have decided to copy it. In an effort to create an airline within an airline, Delta has "Song" and United has "Ted."

On Song flights, all seats have more legroom, and every seat has its own video monitor for satellite TV, mp3s, and multiplayer interactive games. Beverages are free, and food can be purchased on the flight. On Ted, passengers can also purchase food and access TV monitors. Both airlines try to promote an image that is more fun and personal and provide a sense of individualized service, reminiscent of other discount airlines.

Source: Scott Kirsner, "Song's Startup Flight Plan," *Fast Company*, June 2003; *Air Transport World*, April 2004, Vol. 41, No. 4; "JetBlue Skies Ahead," *CIO Magazine*, July 2002; National Public Radio, Morning Edition, March 30, 2004; <http://www.flysong.com>, March 31, 2004; <http://www.flyted.com>, March 31, 2004.

Keyword: “Real-World”

An abundance of real-world examples are used throughout the text to illustrate key points in the chapters. Three categories of boxed inserts (OM Advantage, Targeting Technologies, and Going Global) give students current, real information about how what they’re studying applies to the world outside the classroom.

om ADVANTAGE PayPal: The Worst Idea of the Year?

PayPal, the largest Internet payment network, allows money to be sent by e-mail. It has dominated the auction company Ebay as a safe and convenient way to transfer money from buyer to seller. It has a customer base of 10 million and has grown rapidly. It expects \$3 billion in transactions per year. Surprisingly, PayPal didn't start out with that concept in mind at all. Originally, PayPal started in 1998 as a specialized service for owners of Palm computers who needed to transmit funds to each other using the device's infrared port. In its early days, however, to actually use the feature the two Palm users had to be so close they could have easily handed checks to each other. One trade publication voted the idea the worst of the year. PayPal also provided a means for non-PayPal users to transfer money, and it was this capability that began to become popular. The Palm-only service was dumped and PayPal began to grow. PayPal is expanding its position to be the online means of transferring money for all types of online business transactions, including traditional bills like phone and utility bills. PayPal has 40 million account members worldwide in 38 countries.

PayPal's success lies in the fact that it doesn't try to reinvent everything. It recognizes what needs to be reinvented and does that very quickly. The rest PayPal leaves alone. PayPal has been particularly attractive to small merchants that can be charged as much as 5 percent by credit card companies. PayPal charges only 2.9 percent plus 30 cents per transaction.

Source: "Fix It and They Will Come," *The Wall Street Journal*, February 12, 2001, p. R4; www.paypal.com, March 23, 2004; "These Guys Will Make You Pay," *Fast Company*, November 2001, Online Edition.

“OM Advantage” boxes call attention to and discuss real businesses that exemplify (for better or worse) the topic at hand.

“Targeting Technology” boxes explore how today’s companies use today’s technologies to improve their operations.

TARGETING technology The Value of Precision

Differentiating capabilities often result from the application of technologies not originally designed for business use. One technology having profound impact on customer service in logistics and transportation businesses is global positioning systems, or GPS technology, which was originally intended for military application. GPS technology incorporates the use of 28 satellites to enable anyone with a GPS device to pinpoint a position on earth with extreme accuracy, often within 1 foot.

The ability to be able to track exact location and movement has many implications for customer service. For businesses that must be able to tell customers exactly when a delivery will arrive, knowing exactly where that shipment is at any given moment is critical. GPS technology yields that information, and more. Con-Way NOW is an example of the important role GPS can play. Con-Way NOW is a small division (350 trucks) of the huge transportation company CNF, which manages 41,000 trucks, tractors, and trailers.

Con-Way NOW operates on the principle of “time-definite delivery.” If a delivery is more than two hours late, it’s half price. If it’s four or more hours late, it’s free. That promise holds for deliveries of a few miles or thousands of miles.

GPS satellites orbit approximately 11,000 miles above the earth. The satellites are supported by the U.S. military and GPS access is free to anyone. Applications range from attaching GPS devices to products for theft prevention, to attaching GPS collars to cattle, to systems that warn when delivery vehicles are approaching.

Commercial applications, like those of Con-Way NOW, are booming, but consumer use is also about to explode. By 2005 all cell phones will have GPS technology so they can be located in emergencies.

Source: Charles Fishman, “The Sky’s the Limit,” *Fast Company*, July 2003, p. 90; <http://www.trimble.com>, May 3, 2004; “High-Tech Help for Lost Souls,” *BusinessWeek*, December 8, 2004.

Globalization is a hot topic in business today; “Going Global” boxes explore how global trends and concerns affect operations management, as well as how firms deal with the challenges and opportunities offered by a global economy.

GOING global

Radio-frequency identification (RFID) is viewed as a silver bullet for some activities in supply chain management, but it also has direct implications for in-house inventory management. Metro AG, a German retailer, has extended the use of RFID beyond Wal-Mart. Metro is Germany’s largest retailer, owning almost 2,400 stores in Germany and 27 other countries. 2003 revenues were up almost 25 percent from the previous year.

While Wal-Mart instructed its suppliers to utilize RFID at the pallet level by 2005, Procter & Gamble, Kraft, and Gillette were already putting RFID tags on goods they supplied to Metro in 2004. Metro expects to track inventory in and out of warehouses and stores with the technology. Expectations are to reduce inventory carrying costs by up to 20 percent by cutting loss and theft, increasing levels of stock on shelves, and reducing staffing needs.

Source: K. J. Delaney, “Inventory Tool to Launch in German; Wireless System Is Seen as Successor to Bar Codes; Metro AG Leads Wal-Mart,” *Wall Street Journal*, January 12, 2004, p. B5.

Guided Tour

PROBLEMS

- Big Screen Theater has set procedures for opening the movie house in preparation for customers. Management expects opening the theater to take no longer than 30 minutes for the two people involved (the assistant manager and the director of concessions). Activities required for opening are as follows:
 - The first activity for the assistant manager is to check for messages detailing any large groups that will be attending the theater. If there are messages, they must also be passed on to the director of concessions. Checking the messages takes the assistant manager about 5 minutes.
 - The assistant manager must then walk through the theater and verify that it is clean, an activity that takes approximately 10 minutes.
 - The assistant manager then prepares the movie projector, readying the first movie of the day, which takes the assistant manager up to the time when customers arrive.
 - The theater operates using a computer system to print out tickets, and the first duty of the director of concessions is to start the computer system and properly input the correct data. Preparing the computer takes around 10 minutes.
 - The director of concessions must then prepare the needed food, candy, and drinks for the incoming crowd, an activity that takes another 10 minutes. The director of concessions must also measure the food quantities to be consistent with the expected attendance, keeping in mind any messages passed on from the assistant manager.
 - Finally, the director of concessions must prepare the cash register, an activity which will last until the first customer is seen.

Construct a Gantt chart that presents the needed activities in opening theater.

- Bob, Kelly, and Joe work for HC Consulting, which specializes in identifying problems with clients' customer service operations. Even though they work as a team, each performs a distinct function. Bob is always the first to interact with clients, asking questions from appropriate employees. Kelly and Joe perform the next task, which is to observe the client company at work. While they observe the company, Bob examines the company's financial statements. Upon completion of these tasks, all three HC employees come together for a group discussion of the situation. When the problem is diagnosed, Kelly and Joe meet with the client company and present the findings, while Bob goes back to the office

Pumping Up Problem-Solving Skills

The second edition of *Operations Now* has 50 percent more end-of-chapter problems than the first edition, giving students plenty of opportunities to sharpen their problem-solving skills. Problems are framed in business contexts to remind students of *why* they're working the problems.

- Bryan, a hockey player, is very interested in how long it takes to prepare for a game. The table below provides information on all of the activities leading up to the game. What is the probability that Bryan would be ready in 25 minutes?

Activity ID No.	Immediate Predecessors	Activity Description	Most Likely			T _e	Variance
			Optimistic	Likely	Pessimistic		
1		Dress	9	11	13	11	0.4444
2	1	Warmup	4	6	8	6	0.4444
3	1	Stretch	3	5	7	5	0.4444
4	2, 3	Assignments	2	5	8	5	1.0000
5	4	Pregame	3	6	9	6	1.0000

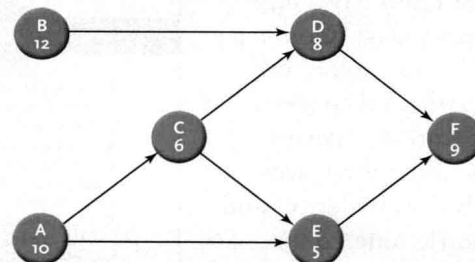
- Software Design assists companies with the implementation of new software products. Of course, time is of the essence and the company is on a very tight schedule. Use the following information to reduce the project duration as much as possible. What will it cost to reduce the project to that duration? The current critical path is 1, 2, 3, 5, 6.

Activity ID No.	Activity Description	Normal Time (days)	Crash Time (days)	Cost/Day (\$)
1	ID needs	30	28	250
2	Research market	15	14	500
3	Narrow solutions	14	13	250
4	Feasibility	7	6	400
5	Prototype	60	59	800
6	Implementation	90	89	950

- The network shown in Exhibit 8.29 has been solved, and the critical path is ACDF with a project duration of 33 days. Using the crashing data provided, crash the project until its duration cannot be reduced anymore and determine the cost of that reduction.

Activity	Normal Time	Minimum Crash Time	Crash Cost (\$) per Day
A	10	8	250
B	12	10	300
C	6	5	200
D	8	7	400
E	5	5	
F	9	8	350

EXHIBIT 8.29 Network Diagram for Problem 33



Skill-Building Tools

Additional skill-builders appear within the chapters. More than fifty examples demonstrating quantitative concepts are included in the second edition of *Operations Now*. Each text example has a cross-referenced Excel Tutorial, which shows how to work the problem using Excel, on the Student DVD and Online Learning Center.

Example 5.1 **Variance Analysis**

A small manufacturer of organic snack foods monitors all components that go into its products. One product in particular, a very popular salsa, utilizes a number of ingredients, but two of primary importance—pepper sauce and a very high grade of fresh cilantro—are tightly controlled for both taste and costs purposes. Usage variance can result in inconsistency in taste from batch to batch. Price variance results in cost variances that can eat up the profit margins available on the product. The standard usage rate for cilantro is 15 ounces per 50-gallon batch. The standard price is \$1.20 per ounce.

Current usage rates, determined by monitoring the amount of cilantro in the bin and the number of 50-gallon batches produced, average 16.3 ounces per 50-gallon batch. Cilantro prices have risen for the supplier and are now at \$1.42 per ounce. Compute the usage variance, price variance, and total variance.

Solution

Exhibit 5.6 provides a framework for the solution to this problem.

EXHIBIT 5.6 Variance Analysis for Example 5.1

Box 1

$$AQ \times AP$$

$$16.3 \times \$1.42$$

$$= \$23.146$$

Box 2

$$AQ \times SP$$

$$16.3 \times \$1.20$$

$$= \$19.56$$

Box 3

$$SQ \times SP$$

$$15 \times \$1.20$$

$$= \$18.0$$

Box 1 - Box 2

Price Variance

$$\$23.146 - \$19.56$$

$$= \$3.586 \text{ per batch}$$

Box 2 - Box 3

Usage Variance

$$\$19.56 - \$18.0$$

$$= \$1.56 \text{ per batch}$$

Box 1 - Box 3

Total Variance

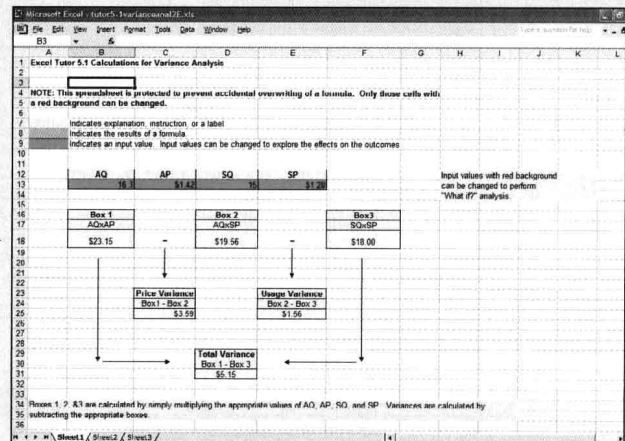
$$\$23.146 - \$18.0$$

$$= \$5.146 \text{ per batch}$$

The price variance is \$3.586 per batch, given the \$0.22 per ounce price variance over standard. The usage variance is \$1.56 per batch. Total variance is \$5.146 per batch produced. Excel Tutor 5.1 demonstrates how variance analysis can be done in a spreadsheet environment.

Examples are numbered for easy reference and offer the student fully worked-out solutions for the problem or concept under discussion.

References to the associated Excel Tutor follow each example.



Guided Tour

One of the best ways to get students interested in operations management is to show them practical applications of operations concepts and give them the tools for exploring and analyzing real-world problems. *Operations Now* includes three types of end-of-chapter cases to do just that.

Exploratory Cases send the student online to investigate a specific company or topic then pose thought-provoking questions.

EXPLORATORY CASE 2.1

Amazon's Short, but Successful History

In the short history of the Internet, Amazon has gone from quarter after quarter of no profit, to gradually expanding its range of products (from books and music to include electronics, toys and games, tools and hardware, videos, cell phones and services, kids' and babies' apparel and accessories, and more), and finally turning a profit. As an example of Amazon's focus on squeezing more profitability from its resources, it had 12 inventory turns in 2000, 16 in 2001, and 19 in 2002. Amazon's improvement in financial performance has resulted from a two-pronged attack on productivity—increasing the numerator and decreasing the denominator. Read "How Amazon Cleared the Profitability Hurdle," *BusinessWeek*, February 4, 2002 (among the supplementary readings for this chapter available online on the text Web site). In that article, Amazon's attainment of positive operating profit is described. CEO Jeff Bezos provides his perspective in the 2002 Letter to Shareholders, available at the Amazon.com Web site, in the Investor Relations section. Take a look at the 2001 Letter to Shareholders as well. The 2002 Letter to Shareholders provides ample evidence of Amazon's focus on low costs. To offer value to customers, Amazon focuses on the benefits and the costs, and uses technology to improve both.

- Describe how Amazon's use of technology increases customer value, and ultimately profitability, from both cost reduction and benefit enhancement.
- What contribution is made by Amazon's willingness to facilitate third-party sales of used products? Does this increase profit for Amazon? Or does it actually reduce new product sales? Explain your answer.

VIDEO CASE 2.2

Profitability by Continuing to Meet Customer Needs: Louisville Slugger

Based on Video 3 on the Student DVD

In some markets technological change can make an existing product obsolete instantly. In others, the process takes longer. In the baseball bat market, aluminum bats experienced increased popularity in the 1970s and 1980s, and by the 1990s they dominated all but professional baseball.

Hillerich & Bradsby, manufacturer of Louisville Slugger bats, shifted its focus from dominating the wooden bat market to aluminum when it purchased a factory from Alcoa.

- Why do you think Louisville Slugger purchased the Alcoa factory rather than continue letting Alcoa make its bats? In hindsight, was this a good decision? Why, after deciding to build a new plant, did Louisville Slugger stay in California?
- Product variety adds to costs and cuts into the profitability for any manufacturer. For Louisville Slugger, what costs do you think are added because of product variety? How do the different Louisville Slugger bats vary from one another? What value is added by the different types of product variety?

The acceptance of aluminum bats has not been universal. Years of controversy surrounded aluminum bat safety. The primary concern was that the baseball came off aluminum bats so fast that pitchers were at higher risk of being hit by the ball. Others felt that the aluminum bats destroyed the offensive/defensive balance of the game. This concern was supported by high scores. As an example, the final score at the 1998 NCAA Division I baseball championship game was 21–17.

In 1998 the NCAA Executive Committee approved new ball-speed standards. The new standards mandate that bats used by college players be narrower and heavier and

Operations Now's Video Cases take advantage of the latest technology by tying the textbook into the full-length videos presented on the Student DVD. Each Video Case sets up the video, putting it in the chapter's context, then asks engaging questions that often require quantitative as well as qualitative responses from the student.

Cases, Cases, Cases

Interactive Cases

In the second edition of *Operations Now*, the innovative Interactive Models developed for the first edition have been made even more valuable with the addition of new case studies to which they can be applied. Each case offers a real-world scenario—from overbooking to waiting line management—that can be analyzed and solved using the appropriate Interactive Model.

“These Interactive Models should enable even the most math-challenged individuals to see the cause and effect of many principles discussed while studying Operations Management.”

—Hillary Moyes,
University of Pittsburg

INTERACTIVE CASE 12.1

Implementing Kanban at Simmon's Electric

The kanban system simulation provides an interactive simulation of a kanban system. For each work center in the model, the user can set the processing rate by adjusting the corresponding sliding bar, the variability in the processing rate, and the breakdown severity. In addition, the user can set the maximum buffer size that precedes each work center. Work centers are only authorized to produce when the feeding inventory buffer is below its maximum. All work centers have the same maximum buffer size. When the simulation is paused or stopped, the average inventory for each work center and total number of breakdowns for each work center are provided. The user can also select the simulation speed from three options: slow, normal, and fast.

Simmon's produces electronic controls for a variety of customers, including automotive manufacturers, heating and air-conditioning equipment manufacturers, and the defense industry. One high-volume production line rotates its production among several different control models. That production line consists of five work centers, with visible buffers of inventory between the work centers and after work center 5.

1. Check the default parameters to make sure your system starts with these values:

Buffer size	3
Processing Times	
Work center 1	4
Work center 2	4
Work center 3	4
Work center 4	4
Work center 5	4
Demand rate	4

“I love the Interactive Models. They allow me to explain complex concepts using graphical, interactive approaches. . . . The coverage of Kanban systems aided by an interactive model is where I see the future of OM pedagogy in the introductory course.”

—Ajay Mishra,
State University of New York, Binghamton

Approachable, Student-Friendly Pedagogy

Appraisal Costs

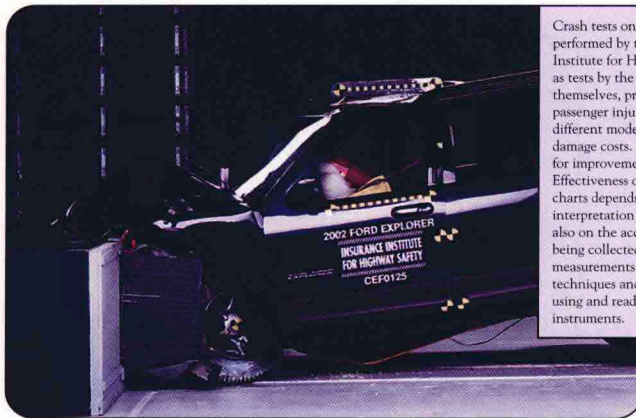
Appraisal costs are linked to inspection and testing processes and to the auditing of quality-related systems. Inspection and testing activities ensure that products and services meet predetermined specifications. System auditing activities ensure that the systems designed to maintain quality do what is necessary to achieve specifications and not deviate from their intended objectives.

Inspection activities, used primarily in manufacturing, examine products and compare their characteristics to characteristics specified by customers. Inspections can occur at any point, from the incoming raw materials, through all production stages, to the finished product. In services, when inspections are possible, they typically precede the customer's involvement. Inspections are used to ensure that the facilities a customer will encounter will be acceptable. The hotel and lodging industry, for example, inspects to ensure that the customer's accommodations are of expected quality. When products accompany the service, as in restaurants, retailing, or health care, inspections

appraisal costs

Costs associated with product inspection, testing, and auditing of quality-related systems.

Definitions of key terms used in the text are presented in the margin. Each chapter's key terms are indexed in the end-of-chapter material, and the text offers a full Glossary as well.



Crash tests on automobiles, performed by the Insurance Institute for Highway Safety, as well as tests by the manufacturers themselves, provide evaluations of passenger injury potential for different models of autos as well as damage costs. Results identify areas for improvement in design. Effectiveness of process control charts depends not only on the interpretation of the data used, but also on the accuracy of the data being collected. Precision measurements require consistent techniques and employee skills in using and reading measuring instruments.

Full-color photographs with detailed captions illustrate chapter concepts, bringing the topics being discussed to life. Colorful and easy-to-understand exhibits present material graphically.

Taking Things Step-by-Step

Whenever possible, processes that can be broken down into simple steps are presented in the "Step-by-Step" format shown here.

Step-by-Step: The Project Scheduling Process

The process followed in project scheduling can be organized into the following sequence:

1. Determine the activities that need to be accomplished to complete the project.
2. Determine the precedence relationships and estimated completion times for each activity.
3. Construct a network diagram for the project.
4. Determine the critical path by identifying the path that takes the longest.
5. Determine the early start schedule and late start schedules by calculating ES, EF, LS, and LF for each activity. Add this information to the network diagram, using the conventional notation.

House of Quality

EXHIBIT 6.15

