Strategic Supply Chain Management

SECOND EDITION

THE FIVE DISCIPLINES FOR TOP PERFORMANCE

Shoshanah Cohen & Joseph Roussel

PRAISE FOR
STRATEGIC SUPPLY CHAIN MANAGEMENT

"Following on from their groundbreaking first edition, the authors provide further evidence of the critical role of supply chain management in creating competitive advantage. Managers facing the challenge of coping with increasing levels of complexity in global supply chains will find valuable guidance in this revised work."

—Martin Christopher, Emeritus Professor of Marketing and Logistics, Cranfield School of Business, Cranfield University

"Offering practical insights relevant to all members of the management team, this book illustrates how companies can use their demand chains to become market leaders. I recommend it highly."

—Takafumi Asano, Senior Vice President, and President, Eisai Demand Chain Systems, Eisai Co. Ltd.

"This is not another one of those books that are heavy on theory but light on practical advice. Filled with examples of companies from a wide range of industries and geographical regions, it provides guidance that is clear and easy to understand."

—Greg Clapp, SVP, Operations, Fujitsu

"*Strategic Supply Chain Management, Second Edition*, is a great refresher for senior executives seeking to update their knowledge of modern supply chain management. It's equally useful for those new to the subject, who need to understand how top global supply chains work."

—Bill Black, Group SVP for Quality and Operational Excellence, ABB

"This book has it all—innovative content, compelling data, and accounts of top global companies that have made their supply chains potent strategic assets. It should be on all senior executives' reading lists."

—Robert Keels, Director of Manufacturer Services Development, Alliance Healthcare

"Theory can take you only so far. This book goes the distance, with practice, advice, and concrete examples that illustrate how top companies use their supply chains for a competitive edge—not only what makes for a robust supply chain strategy, but also how to put that strategy into practice."

—Abe Eshkenazi, CEO, APICS, The Association for Operations Management

"This essential read presents a practical account of how to get the most out of your supply chain. It should be required reading for the senior management team."

—Bill Muir, Chief Operating Officer, Jabil

"Concise and cogent, *Strategic Supply Chain Management, Second Edition*, lays out the key components for top supply chain performance and backs up these insights with new benchmarking research. Managers across the organization will find answers to their supply chain questions here."

—Paul Bischler, Vice President and Controller, Burlington Northern Santa Fe Railway

Strategic Supply Chain Management

This page intentionally left blank

Strategic Supply Chain Management

SECOND EDITION

THE FIVE DISCIPLINES FOR TOP PERFORMANCE

Shoshanah Cohen &
Joseph Roussel

New York Chicago San Francisco Lisbon London
Madrid Mexico City New Delhi San Juan
Seoul Singapore Sydney Toronto

ISBN: 978-0-07-181309-9

MHID: 0-07-181309-8

The material in this eBook also appears in the print version of this title: ISBN: 978-0-07-181308-2, MHID: 0-07-181308-X.

Shoshanah Cohen:

To Collin for his unfailing support,
and to Meredie and Riley for their unbounded spirit.

Joseph Roussel:

To Jana, Robert, and Claire, for their encouragement,
and to my mother, Alma, for her inspiration.

This page intentionally left blank

CONTENTS

This page intentionally left blank

PREFACE

When the first edition of *Strategic Supply Chain Management* was published, in 2005, we were convinced that the supply chain provides a vital source of competitive differentiation. Although it goes without saying that the goods and services that people want are prerequisites to a company's success, a well-managed supply chain is a major contributor to profitable growth. Research conducted by PwC's Performance Measurement Group (PMG) for the second edition backs up this premise, demonstrating that superior supply chain performance is directly correlated with superior financial performance.

The supply chain's strategic value has only grown since we published the first edition, as the business landscape has become more challenging. Economic instability, marked by decreased access to working capital and volatile energy prices, has become a constant. Competition for natural resources has intensified. The playing field has gotten more crowded with the entry on the global scene of companies from less-developed economies. The rise in labor costs has forced companies to rethink long-held assumptions concerning their global footprint. Natural disasters are occurring more frequently. A stronger focus on sustainability and corporate social responsibility has posed other challenges. These trends have conspired to make global supply chains more critical to success but also more vulnerable to disruption.

As a result, companies worldwide have changed their thinking about the supply chain. Not only have they increasingly made the supply chain a management priority, they've changed the way they use it to drive business success. These developments have made familiarity with the supply chain

critical for people who work in the supply chain organization as well as for executives across the enterprise.

Which brings us to a much-discussed question: What exactly is a supply chain? We define it as a core enterprise process that encompasses all the activities—that is, all the physical, informational, and financial flows—required to produce and deliver goods and services. It also involves interactions with consumers, trade customers, and multiple tiers of suppliers.

The second edition provides the reader with an overview of the basic principles of supply chain management as well as the innovative practices that supply chain managers are following today. Each of the first five chapters addresses one of five core disciplines: supply chain strategy, process architecture, organization, collaboration, and performance measurement and management.

Chapter Six summarizes cross-industry benchmarking analysis by PMG and provides insight into the practices that characterize companies with top-performing supply chains. This includes the key Plan, Source, Make, and Deliver practices they have honed as well as the ways they manage supply chain complexity to their advantage.

Chapter Seven addresses the challenge of how to marshal the core disciplines to make the supply chain a greater strategic asset. The discussion

offers new thinking on successful supply chain transformation, with a focus on today's large, geographically distributed organizations. Like the chapters on the disciplines, it is grounded in real-life company examples.

There is probably no better way to demonstrate superior supply chain management than with an in-depth profile of a company. We are privileged to include profiles of six companies that are all leaders in their industries: BASF, Essilor, Haier, Kaiser Permanente, Lenovo, and Schlumberger. These profiles illustrate how each company uses its supply chain strategy, and the supporting core disciplines, to execute its business strategy.

We wrote the second edition with various kinds of readers in mind: supply chain operations professionals who are looking for insights into practices that can make a difference, managers in functions outside of the supply chain who are interested in getting a better view of how these functions affect supply chain performance, senior executives who are seeking a better understanding of the importance of the supply chain for the management agenda, and students of business who are eager to supplement their knowledge of how companies operate. Whichever category you fit into, we hope you will find the book useful and thought-provoking.

So, step back from the daily grind and start reading. Maybe you will gain a new perspective. Perhaps you will find inspiration in other companies' successes. You may even want to chart a whole new course. Whatever the outcome, you'll have a better understanding of your supply chain's strategic potential.

This page intentionally left blank

ACKNOWLEDGMENTS

From start to finish, the work—research, writing, editing, and design—that transformed the first edition of *Strategic Supply Chain Management* into this second edition took less than a year. This time frame and the fact that a considerable amount of the content is new attest to the intensity of the effort, not only by the core development team but also by the many individuals and organizations that provided unflagging support worldwide.

The book in its entirety would not have been possible without the guiding hand of executive editor Julia Heskel, who managed all aspects of content development and ensured adherence to exacting standards. Julia oversaw a team of writers, copy editors, and graphic designers. Moreover, she conducted many of the interviews for the company profiles and wrote much of the profile content. Based in Boston, she worked on a daily basis with both authors, one based in California and the other in France—no small feat!

One of the key strengths of the book is the quantitative analysis and benchmarking provided by PwC's Performance Measurement Group (PMG). Kara Kardon led this effort. She developed the content for Chapter 6, providing critical thought leadership in the form of quantitative research on supply chain performance, practices, and complexity. PMG analyst Alma Arrayales worked many hours to glean insights from raw data; her effort helped us throughout the book.

Special thanks are due to Susan Campbell from PwC's graphic-design department for her superb work in transforming our scribbles into the book's insightful illustrations. She was an example of patience and professionalism through the many revisions and refinements we requested.

Our project manager, Marcia Carvalho, and our project support manager, Mark Harrison, kept us on schedule and on budget, coordinating hundreds of tasks between McGraw-Hill, the research team, the authors, and the executive editor. Marcia and Mark diligently managed the budget, kept hundreds of files organized, ran weekly calls, planned our major face-to-face working sessions, and executed many other tasks, including the arduous process of ensuring that examples and quotations were properly vetted and approved. They were ably supported by Marie Le Corre, who scheduled and set up numerous calls and meetings, and Neha Krishna, who provided research support.

We are also grateful to the companies that agreed to share their stories: BASF, Essilor, Haier, Kaiser Permanente, Lenovo, and Schlumberger. Their challenges and successes in using their supply chains to achieve strategic advantage are inspiring. We'd especially like to thank Andreas Backhaus (BASF), Eric Javellaud (Essilor), Lim Chin Chye (Haier), Laurel Junk and Laurie Spoon (Kaiser Permanente), Mark Stanton (Lenovo), and Stéphane Biguet and Phil Teijeira (Schlumberger) for mobilizing their organizations behind the project.

Thanks are also owed to a number of individuals who, because of their relationships with these companies, helped secure the companies' participation: Volker Fitzner, Harald Geimer, and Mark Lustig for BASF; Etienne Boris and Christine Bouvry for Essilor; Craig Kerr and Lillian Wang for Haier; Vitaly Glozman and Rick Judy for Kaiser Permanente; Kevin Keegan for Lenovo; and Marc Waco for Schlumberger.

We are also indebted to a talented team of freelance writers and editors—Jennifer Baljko, Catherine Cuddihee, Elyse Friedman, Bronwyn Fryer, Jeff Garigliano, Lauren Keller Johnson, and Neil Shister—who helped write and edit the content.

It's fair to say that the second edition would not have come into existence without the support of PwC. We are grateful to the PwC network for the many resources it provided. Thanks are owed to Tony Poulter, who championed the book project, and to Mark Strom and Joe Ipolitto,

who provided guidance. We are also indebted to a number of individuals who volunteered their nights and weekends to review the book from cover to cover: Gordon Colborn (United Kingdom), Mike Giguere (United States), Brad Householder (United States), Craig Kerr (China), Johnathon Marshall (United Kingdom), and Yorozu Tabata (Japan).Their objective feedback proved immensely helpful. We also thank Stanford University professor Hau Lee, who provided advice and counsel throughout the writing process.

We would be remiss if we failed to mention the enthusiastic support of Knox Huston, our editor at McGraw-Hill Education. Respectful of our knowledge and professional experience, Knox has graciously allowed us to write the kind of book we thought was needed. Moreover, he made it possible for us to accelerate the publishing cycle.

Ultimately, a book of this scope would not have been possible without years of experience in making change happen. It's that experience that has shaped our view of what's happening today and what's emerging in the practice of supply chain management. We thank all the organizations and talented professionals with whom it has been our privilege to work.

This page intentionally left blank

CHAPTER ONE

DISCIPLINE 1: ALIGN YOUR SUPPLY CHAIN WITH YOUR BUSINESS STRATEGY

Management teams are under intense pressure from their boards and shareholders to develop business strategies that can be executed in the real world. Key to any actionable business strategy is a supply chain strategy that is robust enough to support all aspects of operations, yet nimble enough to address today's rapidly changing market conditions. This is a tall order, but the right approach can make your company's supply chain a true source of competitive differentiation.

Few would dispute that we are in a world of slower economic growth, unpredictable swings in demand, and volatility in the prices of key inputs such as commodities. Many prominent economists refer to this period of ongoing economic uncertainty as the "new normal."[1] While broader macroeconomic adjustments are needed to return to sustained growth, it is also necessary for every company to take action, on multiple fronts.

In this new normal, the supply chain has become a critical asset for any company pursuing global growth and profitability. Yet many companies think about their supply chains only when something is broken—high inventory levels, dissatisfied customers, or supplier problems, for example.

Or perhaps a benchmarking analysis showed supply chain performance lagging behind that of others in the industry. The best-performing companies are harnessing their supply chains for competitive advantage. They constantly search for new ways for their supply chains to add value and push the boundaries of performance. Moreover, they keep making refinements so that their supply chains—and their overall business performance—stay one step ahead of the competition.

Of the various disciplines needed for strategic supply chain management, the most important is supply chain strategy. Companies with high-performing supply chains understand that their supply chain strategy should be closely aligned with their overall business strategy. They know that their supply chain strategy decisions will, to a large degree, determine decisions regarding all the other core disciplines: process, organization, collaboration, and performance measurement and management.

Developing a good supply chain strategy requires addressing a fundamental paradox. Although it can take years to fully implement a supply chain strategy, companies must be able to respond quickly to changes in the business environment. This balance of long-term and short-term considerations can be extremely difficult to achieve. But by thoughtfully laying out the elements central to the strategy, companies can navigate issues whenever they arise, while building a supply chain that will support differentiation over the long term.

THE CORE STRATEGIC VISION

An effective business strategy begins with a core strategic vision that establishes the boundary conditions for your business: what you are, what you'll do, and—just as important—what you are not and what you won't do (Figure 1.1).

The core strategic vision answers three key questions: What are your company's overall strategic objectives? What value does it deliver

Figure 1.1 Boundary Conditions of the Core Strategic Vision

to customers? How does your company differentiate itself in the marketplace? The answers must inform your supply chain strategy decisions, or your supply chain will be operating in a vacuum.

HOW COMPANIES USE THEIR SUPPLY CHAIN TO COMPETE

Companies compete on the basis of innovation, customer experience, quality, and cost (Table 1.1). While all four factors are important, leading companies choose one to be their primary basis of competition in a chosen market and use the others to support that competitive positioning. The key is to excel at the basis of competition that really matters for the customer and that provides a strong means of differentiation versus the competition. A supply chain can play a major role in this endeavor, provided the company's basis of competition informs the supply chain strategy and the supporting disciplines of process architecture, organization, collaboration, and performance measurement and management.

Table 1.1 Using the Supply Chain As a Strategic Asset

Primary basis of competition	Product and service attributes	Key supply chain contributions
Innovation	Cutting-edge, must-have	Time to market and time to volume
Customer experience	Tailored to meet customers' specific needs	Supply chain interactions designed from the customer's perspective
Quality	Reliable performance	Procurement and production excellence and quality control
Cost	Lowest priced	Efficient, low-cost configuration and processes

The best companies understand that they can't be all things to all people. Make sure that your company's supply chain strategy supports the company's primary basis of competition, but remember that strategy is a balancing act. No cost leader can afford to ignore customer experience, nor can an innovator ignore the price ceiling of a market. Companies with top-performing supply chains understand the trade-offs among service levels, lead times, working capital, and costs, and they make decisions that best fit their overall strategic mission. The key is to choose where to focus and then to achieve best-in-class supply chain performance in those areas.

COMPETING ON INNOVATION

Companies that compete on innovation develop the must-have products and services in their industry. Innovation leaders like Apple, BMW, and Alstom have a finger on the pulse of their customers and consistently launch products that outsell those of the competition.

How does the supply chain support a company that competes on innovation? Time to market is critical because the window of opportunity before fast followers start taking market share can be small. Success depends on integrating the supply chain with the design chain—that is, integrating all of the activities inside and outside the enterprise that are involved in the design of a new product or service. This degree of integration entails coordinated management of processes, physical assets, and information.[2]

Time to volume is also important. For an innovation-driven company, creating strong demand for a new product and then being unable to produce enough volume to meet that demand is one of the worst things that can happen. Close collaboration between the design chain and the supply chain helps to ensure that when demand cranks up, the whole supply chain is ready.

Consider Zara, a Spanish clothing retailer that competes on innovation while keeping a close eye on costs.

Many apparel manufacturers keep costs down by outsourcing production to Asia. Contract manufacturers' use of fixed production schedules, however, can limit retailers' ability to change, on short notice, the types and volumes of the products they order. This is especially problematic in a sector like fashion, where consumer preferences shift rapidly. With too many of the wrong garments on hand, retailers can end up with marked-down inventory and eroded margins.

Zara uses a very different model. The retailer, owned by global giant Inditex, positions itself as the purveyor of "fast fashion"—trendy clothes for the price-conscious consumer. To deliver on that strategy, Zara manufactures almost 50 percent of its garments nearby, in Spain, Portugal, and Morocco. Although production costs are 15 percent to 20 percent higher than those of the competition, Zara more than makes up for the cost differential by taking steps to ensure that the products that customers want are available when they want them. Point-of-sale information from stores worldwide makes it possible to identify best-selling items and get them produced and delivered to stores quickly. The result: more full-priced sales and fewer markdowns. From 2005 through 2011, Inditex's annual revenue doubled; in 2011, Zara's profit margins were 19.3 percent, substantially higher than competitors'.[3]

COMPETING ON CUSTOMER EXPERIENCE

Companies that compete on this factor provide an experience that meets their customers' specific needs. They use a deep understanding of customer preferences to tailor the associated supply chains. Research conducted by

PwC's Performance Measurement Group (PMG) indicates that companies that provide exceptional customer experience average almost 5 percent higher earnings before interest, taxes, depreciation, and amortization (EBITDA) than the competition. They also average a compound annual growth rate of sales that is more than 8 percent higher.[4]

Why does superior customer experience lead to such striking financial gains? Companies that excel in customer experience understand the relationship between cost to serve and profitability, and can assess the cost of offering customized services. They know not only when to offer lots of choices to customers but also when not to. By getting products and services to customers when and where customers want them, they avoid the costs related to both expedited production and customer churn. That's why companies that compete on customer experience report lower account turnover, reduced customer-retention costs, and a stronger bottom line.[5]

The Internet has made it easier for business-to-consumer companies to enhance the customer experience. Take, for example, the apparel industry, where a number of online start-ups now offer custom-made clothes for a fraction of what bespoke clothing once cost. One U.S.-based company, J. Hilburn, took a different tack, developing a buying process that is part online, part offline. First, the customer places an order online; then, a sales consultant goes to the customer's home to take measurements and share fabric swatches. After the order has been delivered, the consultant returns to make sure the clothes fit correctly. J. Hilburn keeps the customer measurements in a file online so that the customer can easily log on and place new orders. This innovative supply chain—custom orders placed in the United States, fabrics designed and woven in Italy, and clothing produced in China—has allowed J. Hilburn to offer custom-fitted clothes for the cost of off-the-shelf garments.[6]

Customer experience is an important source of competitive advantage in the business-to-business arena as well. In many industries, companies have created customized services that are invoiced according to their contribution to the customer's ability to generate revenue. Take the mining

industry, for example, where 24-7 operations require tools to be constantly available, and where reliability and safety are paramount. A drill needs to run for years in extreme conditions as deep as 10,000 feet underground, drilling up to 100 miles every year.

Sandvik Mining, a part of the Sandvik Group, is a leading supplier to the mining industry and is known for its reliability and leading-edge technology. Its offerings include rock drilling, exploration drilling, cutting, and crushing, as well as materials handling for surface and underground mining. "Service has become the key differentiator in the rapidly changing global mining business," explains Sandvik's president of drilling, exploration, and rock cutting, Gerald Elliott. "More and more mining companies are now more focused on productivity, as opposed to upfront equipment and spare-parts costs."

In Sandvik's case, this means charging for the number of hours worked, the number of feet drilled, or, in some cases, the tons of product produced. In return, the company keeps the equipment up and running for its entire life cycle, with the help of service experts deployed at the customer site. This approach allows Sandvik to provide its customers with what matters most: greater output at a lower total cost.

COMPETING ON QUALITY

Companies that compete on quality are best known for their premium products and services, offerings that are consistent and reliable. Lexus automobiles, Louis Vuitton leather goods, and Tropicana juices are three examples that immediately come to mind. Product development is critical to quality, and so are key supply chain processes such as production, sourcing, quality assurance, and return. If a product is fragile or perishable, transportation and storage also play integral roles.

Consider Tropicana, the world's leading producer of branded fruit juices. As the largest single buyer of Florida fruit, Tropicana developed what it calls the "grow to glass" approach, a proprietary system to ensure that fruit is harvested at its peak. The company also uses specially engineered

carton and plastic packaging to keep the juice fresh, while state-of-the-art refrigerator trucks and specially designed railcars deliver juice to distribution centers throughout North America.[7]

For many companies competing on quality, the ability to trace a product back to its point of origin, known as *traceability*, has become a source of differentiation (although for some industries it is a response to regulatory mandates). In industries in which counterfeiting has become a serious threat, such as pharmaceuticals, the integrity of the end-to-end supply chain is essential. To ensure traceability, manufacturers closely control product flows to consumers. Moreover, they use markings and track-and-trace technologies to guarantee that what customers purchase is the "genuine article."

COMPETING ON COST

To be sure, all companies need to keep an eye on costs. But that's not the same thing as competing on cost. Companies that compete on cost offer prices to attract cost-sensitive buyers or to maintain share in a commodity market. This basis of competition demands highly efficient operations. Standardization of products and processes is fundamental, as are supplier and production quality and inventory control. Supply chain performance is measured with efficiency-related metrics such as asset utilization, inventory days of supply, product costs, and total supply chain management costs.

Consider India's number one pharmaceutical company, Dr. Reddy's Laboratories, a vertically integrated maker of proprietary and generic drugs. Dr. Reddy's generics business aims to make pharmaceuticals affordable to people worldwide by offering lower-cost alternatives to high-priced products. The company produces both branded and unbranded generics in its plant in India, while its supply chain manages distribution from its plant in India to customers in more than 100 countries across the globe. The company has honed its supply chain costs so well that it is able to provide products that match those of local competitors on both quality and price.[8]

KEY ELEMENTS OF SUPPLY CHAIN STRATEGY

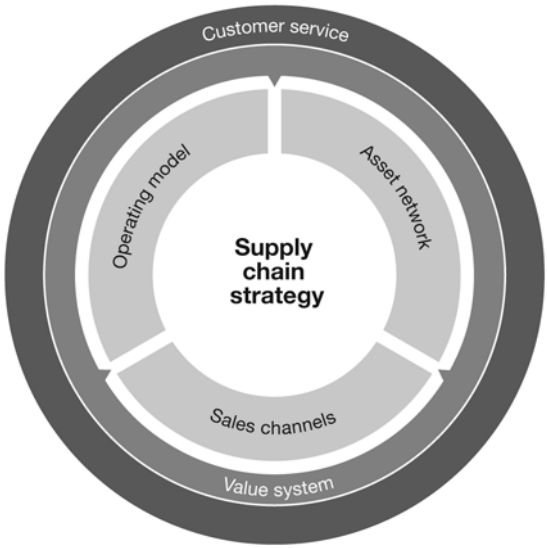
A supply chain strategy involves many interlocking activities and decisions, large and small. According to Michael Porter, strategy guru and author of *Competitive Advantage*, successful business strategy relies on the concept of "fit"—that is, a group of activities that support a chosen competitive strategy. Although any single activity can be copied, the activities taken together form a system that is virtually impossible to duplicate.[9]

Porter's concept of fitness holds equally true for supply chain strategy. Five elements of your business—and the choices you make regarding these elements—are fundamental:

- *Customer service.* What are your objectives in terms of delivery speed, accuracy, and flexibility?
- *Sales channels.* How will your customers order and receive your goods and services?
- *Value system.* Which supply chain activities will be performed by your organization and which by your partners?
- *Operating model.* How will you organize the planning, ordering, production, and delivery processes to provide customer service while still meeting your working capital and cost objectives?
- *Asset footprint.* Where will you locate your supply chain resources, and what is their scope of action?

Companies often make decisions about each of these elements in isolation, without considering the others. It's possible, for example, to develop a manufacturing footprint that reduces costs, only to fall short of required customer-service levels. To get the full strategic benefit a supply chain can offer, however, it's critical to treat each element as part of an integrated whole (Figure 1.2).

Figure 1.2 Elements of Supply Chain Strategy



CUSTOMER SERVICE

The first step in developing a supply chain strategy is to define customer service objectives. Offering various levels of delivery speed, accuracy, and flexibility for different types of customers can help distinguish the overall customer experience. Should, for example, deliveries reach all customers in the same amount of time, or should customers who are more valuable receive deliveries faster? Should the ordering process be the same for all customers? Answers to questions like these will be dictated by your company's business strategy and target audience—that is, whether you are addressing B2C or B2B segments.

Business to Consumer

In the B2C world, off-the-shelf product availability is often the key service criterion. Customers are willing to wait for hot products from a leading brand—but only up to a point. Retailer Nordstrom introduced an innovation in online retailing when it made the inventory of its 115 brick-and-mortar

stores visible to consumers shopping on its online store. Previously, customers saw only what was available in the web warehouse and sometimes found that the product they wanted was not available. The retailer's change in practice led to higher product availability, increased sales, and lower inventories.[10] Approaches such as this one help Nordstrom maintain its reputation for outstanding customer service and overall customer experience.

Business to Business

In the B2B world, customer service is often synonymous with meeting committed delivery dates, because the customer uses the product or service in revenue-generating activities. But lead-time performance can also be critical.

Consider, for example, a supplier of mining equipment that sells machinery to two very different customer types: companies that own their mines, and contractors that conduct mine development and other activities for those mining companies. Because mining companies have capital investment plans and a fleet to maintain, they typically order equipment far in advance of when they need it, on a predictable timeline. So mining-equipment suppliers typically have six months or more to deliver equipment to mining companies. Contractors, by contrast, typically operate on a very compressed calendar: they wait until they have a contract in hand from a mining company before placing equipment orders, and they need the machines delivered in three months or less.

SALES CHANNELS

Companies have multiple options for getting products and services to buyers. They can use indirect channels—distributors or retailers—or they can sell directly to customers via the Internet or a sales force. The market segments and geographies being targeted will drive these decisions. Since profit margins vary depending on which channels are used, you have to decide on the optimal channel mix, and who gets the goods in times of product shortages or high demand.

Consider the multibillion-dollar bottled-water industry. The industry uses three different distribution channels to serve its three major consumer segments. Traditional retail distributors serve retail customers, vending machines serve the individual consumer market, and service agents provide on-site water units for home and office users. Each segment requires different supply chain processes, assets, suppliers, and performance metrics.

If you are a new player in the bottled-water industry, should you sell your product through distributors that already have relationships with key retailers or distribute directly to those retailers? If you choose the distributor channel, should you integrate your order-management and inventory-management systems with the distributors' systems? If so, to what extent, and who should pay for it? Should you maintain dedicated inventory for all distributors or only those distributors that you consider to be strategic partners? These decisions will drive your company's asset and cost performance and so must be a part of your overall channel strategy—along with decisions on pricing, vendor-financing policies, promotions, and so on.

VALUE SYSTEM

An effective supply chain strategy requires a solid understanding of the company's value system, which according to Porter, encompasses the value-adding activities of the enterprise as well as those of suppliers, customers, suppliers' suppliers, and customers' customers.[11] This understanding will help determine which supply chain activities will be performed by the company in question and which by its partners.

In this context, companies must consider two types of activities: those related to decision making and those related to execution. Often companies choose to outsource execution-related activities while retaining control over decision making. For example, many consumer packaged goods (CPG) companies that produce a high volume of goods in their own plants outsource the last stage of production to contract manufacturers (CMs). The CPG companies maintain responsibility for purchasing raw materials, while the CMs have full responsibility for quality and

lead time. That way, the CPG companies use their economies of scale to get lower materials prices while also benefiting from the CMs' lower manufacturing costs.

Benefits and Risks of Outsourcing

Generally speaking, companies outsource supply chain activities to gain access to other companies' scale, scope, technology expertise, or resources:

- *Scale.* Third-party providers can often offer services such as manufacturing or logistics with less expense because they have a large customer base, which keeps utilization rates high and unit costs low. External partners can also help companies scale up quickly without having to invest in new capacity.
- *Scope.* In cases where a company wants to expand into new markets or geographical areas, partners can provide access to operations in new locations that would not be economical for the company to replicate internally at current business volumes.
- *Technology expertise.* Partners may have expertise in a product or process technology that would require a sizable capital investment to develop internally.
- *Resources.* External partners in the value chain can offer rapid access to materials, talent, or financing.

Outsourcing also poses significant risks. A supply chain that's been lengthened by the addition of numerous external partners can result in longer lead times and higher working capital. Risk is also an issue if production depends on a single supplier for a critical component and that supplier suddenly halts production for financial or other reasons. Therefore, value systems need processes and information systems that create transparency and enable proactive decision making, so that companies can adapt quickly to unanticipated changes in demand or supply.[12]

Making the Decision to Outsource

Executives often treat outsourcing as a decision of "core versus noncore," arguing that core competencies, as things a company is good at, should be kept in-house, whereas noncore competencies should be outsourced. That reasoning, however, is overly simplistic. An activity or process that a company excels at isn't necessarily a core competency and, conversely, areas of less-than-optimal performance may in fact be core to the company's success. Most important is maintaining control of activities that are critical to competitive differentiation, business growth, customer experience, or superior offerings.

Vertical integration can be a core means to achieving that control. Consider Manufacture des Montres Rolex SA, known around the world for its Rolex brand. The company produces not only the components for its watches but also the machines, tools, and supplies needed to manufacture those components.[13] Maintaining control of production is integral to ensuring the quality that sets Rolex apart as a premium watchmaker.

OPERATING MODELS

Taken together, the decisions about how a company produces goods and services constitute its operating model. These decisions affect more than manufacturing. They shape how planning, order management, procurement, and physical delivery are handled as well.

There are four types of operating models (Table 1.2):

- *Make to stock.* This is the most broadly used approach for standardized products that sell in high volume. A plant produces goods in advance of receiving customer orders; finished products are stored to await a customer order. The larger production batches keep production costs down, and the readily available inventory means customer demand can be met quickly.
- *Make to order.* This is the preferred model for customized products or products that are in infrequent demand. Companies

Table 1.2 Types of Operating Models

Operating model	When to choose this model	Benefits
Make to stock	• Standardized offerings selling in high volume	• Low production costs • Meeting customer demands quickly
Make to order	• Customized offerings • Offerings with infrequent demand	• Low inventory levels • Wide range of product options • Simplified planning
Configure to order	• Offerings requiring many variations	• Customization • Reduced inventory • Shorter delivery times
Engineer to order	• Complex offerings that meet unique customer needs	• Responding to specific customer requirements

produce the service or product only when they have a customer order in hand. This approach keeps inventory levels low while allowing for a wide range of product options.

- *Configure to order.* This is a hybrid model in which a product is partially completed, to a generic level, and then finished when an order is received. This is the preferred model when there are many variations of the end product and it's important to have a shorter customer lead time than is possible with the make-to-order model. A variant of the configure-to-order model is assemble to order; companies using an assemble-to-order model produce component parts in response to sales forecasts and then finalize assembly upon receipt of a customer order.
- *Engineer to order.* This model shares many of the characteristics of the make-to-order model. It is used in industries that create complex products and services with specifications that are unique to a particular customer. In the final step of the customer's ordering process, the manufacturer's engineering function defines the specifications and develops a list of needed materials unique to that customer's order.

The operating model can provide a key source of performance advantage. Consider a consumer software company that made to stock, shipping products directly to inventory sites in various countries. Because of the small size of the packaged product and the need for many language variants, items were customized for a particular market very early in the production process. This approach, however, created unnecessary inventory and obsolescence as product definitions evolved.

To improve service levels while reducing inventory, the company shifted from a make-to-stock model to a configure-to-order model. Under the new model, generic products were shipped from the plant floor to a central distribution center. As orders came in from each market, products were customized and shipped accordingly. A configure-to-order model posed some important advantages. Under the old operating model, multiple stock locations required separate forecasting and inventory-management functions for each site, raising the likelihood that supply and demand would be out of sync. In a centralized distribution center, by contrast, it became much easier to ensure that the right amount of inventory was on hand to meet demand. At the same time, the new approach simplified supply chain planning, allowing focus on a relatively small number of different generic products instead of hundreds of language-based variants. Not surprisingly, product availability shot up and inventory declined.

It may be advantageous to deploy different operating models for different products or market segments. The automotive industry offers a good example. While most automakers have long preferred the make-to-stock model, manufacturers of high-end vehicles have pursued make-to-order and configure-to-order strategies.

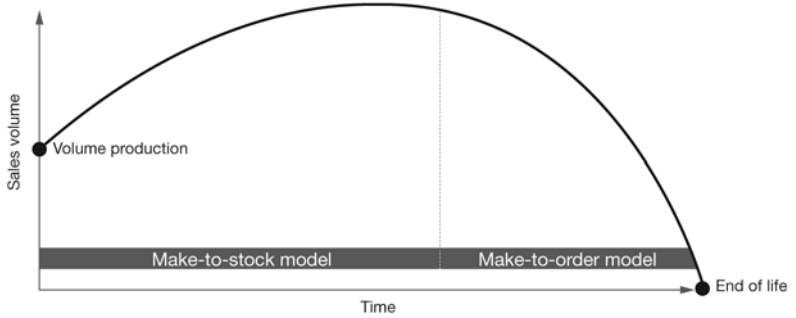
But make-to-order is challenging: given the millions of potential end configurations, it's difficult to offer passenger cars on a make-to-order basis while maintaining a competitive lead time. Unless suppliers can be fully integrated into the make-to-order supply chain, automakers run unnecessarily high inventory risks, meaning they could be stuck with obsolete or unsellable inventory. In addition, changing the production process to allow each car to match a unique set of characteristics is a very costly undertaking.

Not surprisingly, only 2 percent of Lexus passenger cars sold in 2011 in the United States were made to order. The rest were made to stock and sold from dealer lots. The percentage of made-to-order vehicles in Europe was greater. In the German domestic market, for instance, about 60 percent of the high-end cars made by BMW, Audi, Porsche, and Mercedes were made to order. In Japan, approximately 50 percent of Nissan sales were configured to order.[14]

These numbers tell only part of the story. A significant part of customization now takes place at retail car dealerships. This customization is basically a make-to-order or configure-to-order activity based on the vehicle provided by the manufacturer. In North America, dealers offer two types of customization activities. One type involves making major changes to the vehicle, such as modifying the engine, raising the suspension, or repainting. The other type of customization doesn't touch the vehicle itself; it ranges from nonstandard tires and rims to frills like mud flaps.

As is the case with the other elements that make up a company's supply chain strategy, the operating model needs to be responsive to changes in demand throughout the product life cycle, from launch to exit. During this progression, a company may start with a make-to-stock model to ensure maximum product availability; it may then move to make-to-order to reduce inventory risk while still ensuring availability at a competitive price (Figure 1.3).

Figure 1.3 Change in Operating Models over Product Life Cycle



New technologies are altering production processes, and operating models along with them. The most familiar examples are digital print-to-order and digital distribution, which have revolutionized publishing. And in industries ranging from healthcare to industrial products, new 3D printing technology—also known as "additive manufacturing"—allows single-unit production of very complex designs, such as artificial limbs. This technology, in which the printer creates an object by layering different materials such as plastics or metals on top of each other, is ideally suited for make-to-order production strategies. Eventually, it may be used for many product categories that are currently made to stock.[15]

ASSET FOOTPRINT

The final element to be considered in defining a supply chain strategy is the asset footprint. This includes not only hard assets (like plants, warehouses, equipment, order desks, and service centers) but also soft assets (like the people, processes, information systems, and access to capital). The location, size, and purpose of these assets have a major impact on supply chain performance. The asset footprint may differ for production, sourcing, planning, order management, and warehousing and distribution.

Production Assets

For production assets, most companies choose one of three network models, taking into account factors like business size, customer service requirements, tax advantages, existence of a supplier base, local content rules, and labor costs. The network models are:

- *Global model.* In this model, production of a given product line takes place in one location for the entire global market. This model is suited for companies that wish to control unit production costs for very capital intensive products or that need access to highly specialized production skills.

- *Regional model.* Production takes place primarily in the region where the products are sold. In some cases, however, the production center in the given region is dedicated to one type of product, and plants from other regions produce other types of products. Companies often opt for the regional model when products need to meet specific regional requirements, when delivery times can't be achieved by the global model, or when total costs (duties, transportation, and so on) make it preferable to produce goods close to the customer.
- *Country model.* Production takes place primarily in the country where the market is located. This is the model of choice for goods that are prohibitively expensive to transport, such as newsprint. Other factors include duties and tariffs, and market access that is conditional on in-country production.

Many production-asset-footprint decisions are driven by the product life cycle. In rapidly evolving industries such as consumer electronics, companies may start with a global model while ramping up production of a new product to test the manufacturing process, and then transition to a regional model to improve customer service. At the end of the product life cycle, the global model may once again be a better choice as a way to fulfill demand with the lowest product cost and inventory investment.

Planning and Sourcing Assets

It's important to organize planning and sourcing assets in a way that is consistent with the decisions made on production assets. Just because you're using regional and country production-asset models doesn't mean it's necessary to use regional and country planning and sourcing. The key is locating these assets in places that will ensure effective operational performance.

Tax optimization is an additional consideration for some companies when it comes to locating sourcing and planning assets. Locating resources that make decisions on supply levels and purchasing volumes in a lower-tax jurisdiction can have a significant impact on the effective tax rate. The more that decision making and decision control are centralized, the greater the potential tax savings. For companies that have used a decentralized decision-making model for sourcing or planning, centralizing such decision making in a tax-efficient location can be a major undertaking. It's important that nontax benefits such as customer service and working-capital performance are sufficient to justify the move.

MULTIPLE SUPPLY CHAIN CONFIGURATIONS

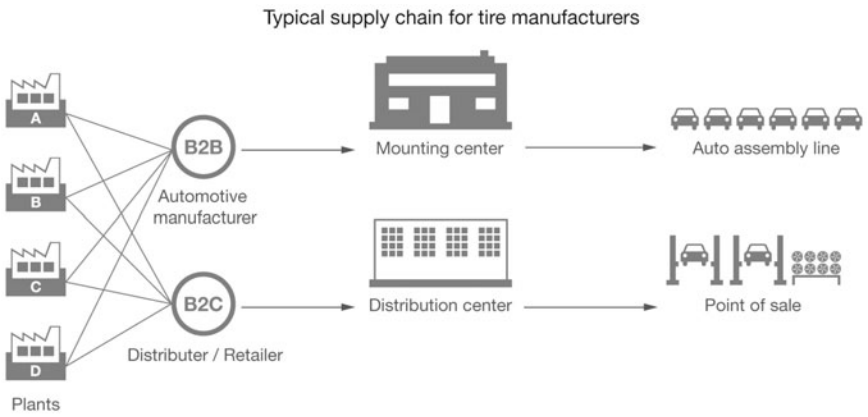
For some companies, one supply chain with a single set of physical assets, processes, and information systems may be insufficient if a company has customers with widely varying needs. In such situations, multiple supply chains are advantageous because they make it easier to meet the specific needs of each customer without compromising the needs of the rest.

One example is Michelin. The company's passenger-car tire business serves two market categories: automakers and aftermarket customers such as distributors and retailers that sell tires to individual consumers. The same Michelin factories produce tires for both automakers and the aftermarket, an approach that allows the company to use a single production-planning process and maximize capacity utilization.

The paths that automaker and aftermarket tires take after production, however, are quite different (Figure 1.4). For automakers, which depend on precisely timed deliveries to keep production on schedule, Michelin delivers tires to mounting centers; the mounting centers then move the tires directly to the automotive assembly line, observing very tight delivery deadlines. Tires for the aftermarket, by contrast, go to distribution centers that supply a vast network of distributors and retailers.

Research shows that even within an individual channel, industry leaders tailor their supply chains to meet the needs of different customer segments.[16] Leading companies recognize that the requirements along the supply chain

Figure 1.4 Example of Multiple Configurations to Meet Needs of Different Market Segments



have more to do with the specific channel and customer needs than with the products or services being sold. The goal of each configuration is to meet those needs by providing the best balance of delivery performance, cost to serve, and flexibility.

TESTS OF A GOOD SUPPLY CHAIN STRATEGY

Each of the five elements of a supply chain strategy—customer service, sales channels, value system, operating model, and asset footprint—needs to meet a number of criteria if your company's supply chain is going to provide a real competitive edge. As Figure 1.5 demonstrates, your supply chain strategy must be:

- *Aligned with the power position.* This is the way to match supply chain objectives with market influence.
- *Tailored to the right level of complexity.* This ensures that the supply chain can deliver the product or service offering without becoming unwieldy.

Figure 1.5 Tests of Supply Chain Strategy

- *Resilient.* Resilience is the way to manage and mitigate risks.
- *Responsible.* Responsibility promotes social and environmental well being.
- *Adaptable.* Adaptability is the readiness to respond to a changing business environment.

ALIGNED WITH THE POWER POSITION

A good supply chain strategy requires an understanding of your company's influence relative to that of customers and suppliers. That's because a company's relative power determines to a large degree its ability to reconfigure the supply chain to meet strategic objectives.

Many of the supply chain innovators you read about are in an enviable position: they're large, and they have enormous market clout. These companies can leverage their volume of output to buy inputs more cheaply, boost asset utilization, and reduce the cost of everything from information systems to transportation. Just as importantly, they can impose their own processes and rules on suppliers and customers. In the auto industry,

for example, a supplier that fails to deliver on time—thereby forcing an automaker to stop production—can be subject to a penalty as high as the equivalent of the revenue lost while the line is down. Of course, not every company can dictate such terms. It requires power of scale.

But scale is relative. Companies often underestimate their own power because they're thinking about power in broad, global terms, instead of country or market-segment terms. Even relatively small companies can find ways to work with select suppliers or customers to gain a competitive edge. The key is to segment, focus, and consolidate.

To fully assess your company's power position, determine if your supply chain is brand-led, channel-led, or supplier-led. Do you need your channels more than they need you? How about your suppliers? A supplier in an industry that's fragmented on the supply side but concentrated on the demand side, as is the case in the auto industry, may have limited power. The opposite would hold true in the electronics industry, in which there are relatively few contract manufacturers able to provide the specialty components that are in great demand by original equipment manufacturers (OEMs).

Although supply chain *control* is a possibility, supply chain *collaboration* is a better bet for most companies. (See Chapter 4.)

TAILORED TO THE RIGHT LEVEL OF COMPLEXITY

Complex supply chains cost more to operate, tie up greater working capital, and are slower to adapt to changes in demand. Decisions regarding the allocation of work to partners have a tremendous bearing on complexity, as do asset footprint decisions regarding the number of locations needed for production, order management, and distribution. Operating-model choices are another source of complexity, especially if multiple models are used.

While the key elements of supply chain strategy are important, product/service strategy—the number and variety of products/services, the level of customization, and the number of options available to customers—is often

an even bigger driver of supply chain complexity.[17] Research conducted by PMG shows that companies that have demonstrated best-in-class supply chain performance don't differ much from other organizations in terms of the number of manufacturing sites, distribution centers, orders, and customers. Best-in-class supply chain companies do, however, have a more limited product and service offering. They maintain almost 50 percent fewer distinct saleable items. (See Chapter 6.)

But complexity is not all bad. The same decisions that drive "bad" or unnecessary complexity are also responsible for "good" complexity—that is, the specifics that can prove a powerful source of advantage. For example, a decision to create many different product or service options can boost sales, or it can simply contribute to higher inventory. The goal is not to eliminate complexity but rather to determine the right level of complexity and manage performance. More than half of the best-in-class companies measure complexity drivers on an ongoing basis and integrate these measures into their management's key performance indicators, while only 15 percent of companies that are not best in class have adopted this practice.[18]

While consideration of complexity management starts with decisions on the five elements of supply chain strategy, it's also critical to consider complexity when designing supply chain processes, organization roles and responsibilities, and performance measurements. (See Chapters 2, 3, and 5.)

RESILIENT

Resilience is a key characteristic of a robust supply chain strategy. Global networks that are built solely to optimize costs and inventory during ideal conditions may be unable to deliver in times of natural disasters, political turmoil, or financial stress. But supply chain resilience isn't just about managing risk and devising a plan to deal with catastrophes. It's

about taking steps to be ready for potential disruptions in a way that can create competitive advantage.[19]

Strategies for building supply chain resilience typically feature a combination of redundancy and flexibility.

Redundancy strategies such as dual sourcing, multiple production facilities, and additional inventories ensure that backup resources are available when needed. Each of these strategies incurs additional costs that must be justifiable. Companies with strong pricing power can simply pass these costs along to customers. But most companies need to determine where redundancy is critical and where lean makes better sense.

Flexibility strategies focus on making the most of the existing asset footprint to meet changes in demand and supply. The key is to have visibility on where resources are in abundance and where they're in short supply. In the case of a shortage, such visibility makes it possible to reallocate scarce materials to the production of the goods or services of greatest strategic importance. Visibility also makes it possible to shift activities such as production or transportation to meet demand spikes.[20]

RESPONSIBLE

Responsible companies ensure that activities across the value system meet sustainability, labor, and ethical standards.

Sustainability has become a key concern in supply chains, as companies continue to reduce their use of materials for production and packaging, procure those materials from sustainable sources, and ensure that what is used can be recycled. Companies that succeed in these efforts not only cut their supply chain costs—they're often able to differentiate themselves to customers who are increasingly attuned to environmental issues. These companies have their eye on what is called the "triple bottom line."

Also known as the three Ps—profit, people, and planet—the triple bottom line measures social and environmental performance in addition to financial performance. Similarly, transparency with regard to supply chain practices has become a requirement in today's business environment. Some companies have addressed the issue of illegal, abusive, or forced labor in overseas contract factories. The rise of the Fair Labor Association and similar organizations requires that companies control and verify working conditions in their facilities and those of their partners across the value chain, regardless of where those facilities are located.

Companies with multiple outsourced production facilities worldwide are taking note. Take Nike, for example. Viewed as a leader in supplier responsibility, Nike ranked twenty-fifth on Interbrand's 2011 list of "Best Global Brands." And it ranked tenth on *Corporate Responsibility Magazine*'s "100 Best Corporate Citizens" list for 2011. That's because Nike established monitoring and enforcement systems to identify factories with subpar labor conditions and then published the names and addresses of supplier factories. This strategy not only helped Nike ensure compliant labor conditions but also prompted Puma, Adidas, and Reebok to follow suit.[21]

ADAPTABLE

Since change is constant, remaining adaptable is key. An unwatched supply chain strategy can soon fall out of sync with market needs. Both internal and external factors can trigger a need to adjust the supply chain strategy. These factors include:

- *A change in market conditions.* When customers have to tighten their belts, companies can still meet their needs without sacrificing margins. Rethinking one or more of the supply chain elements can lead to new approaches that drive down the cost of meeting customer requirements without affecting quality.

- *A technology that transforms the dynamics of your industry.* Disruptive technologies have the potential to introduce new players and dislocate existing ones, thereby changing the fundamentals of the value system. New technologies such as electronic delivery can make possible more frequent product launches, higher levels of customization, and less costly delivery of smaller orders, requiring changes in customer service, asset footprint, and operating models.
- *A change in offerings or markets.* If a company is offering new products or services, targeting new markets, or expanding geographically, it may need to expand production capacity, add new distribution capabilities, develop new channels, find new suppliers, or perhaps rethink the supply chain strategy overall.
- *A change in the basis of competition.* Perhaps a new competitor has emerged with a stronger value proposition, or your company wants to enter a market that requires faster delivery, greater flexibility, or higher quality. Any major change to your company's basis of competition should drive a reexamination of the supply chain strategy.
- *The need to assimilate a new acquisition.* Mergers and acquisitions can create a need to reconfigure the supply chain. You'll have to see where it makes sense to eliminate redundancies, where to keep operations separate, and where to integrate. The desire to accelerate delivery of the targeted value will need to be balanced with an understanding of which supply chain activities can be changed quickly without jeopardizing customer-facing performance.

A company's growth trajectory can have major implications, too. Is the volume of sales rising or falling? Is the industry expanding or contracting? A supply chain strategy designed to support growth may no longer be appropriate during retrenchment, when the focus is on cost control.

Although change is a given, the frequency of significant change will differ by industry. Consumer electronics moves more quickly than does, say, aerospace. But the pace of change can also vary within a given industry. In the PC category, for instance, the principal option for consumers throughout much of the 1990s and 2000s was PCs. Since that time, the pace of change has greatly accelerated, as computer technology has leapt from one platform to another: laptops, netbooks, tablets, and ultrabooks.

Change can provide a powerful incentive for companies to adapt. Danone, the global food conglomerate, felt the effects of the global recession of 2008 as much as any other large company. However, rather than hunkering down and waiting for demand to return, Danone took concerted steps to drive sales volume by lowering the price of products in its Fresh Dairy Products unit, which represented roughly 60 percent of total sales. Implementing a program called "Reset," Danone decided to wring out supply chain inefficiencies so that it could reduce prices without sacrificing margins. Some of these leaning efforts allowed Danone to reduce prices by as much as 15 percent. The resulting increase in sales volume more than justified the price reductions.[22]

Finally, companies periodically review their overall business strategy and how well they are executing. A 2012 PwC survey of corporate directors found that more than one-third (36 percent) of companies review their strategy every six months.[23] Boards of directors are increasingly pressuring management teams to develop strategies that the company can execute without any surprises or missteps. These periodic reviews are a good time to review your supply chain strategy as well. After all, any changes in the business strategy—even minor adjustments—will require corresponding changes in the supply chain strategy. This balancing act is difficult, but as top-performing companies know, it's crucial to success.

KEY TAKEAWAYS

- Your supply chain strategy should be aligned with and support your company's overall business strategy.
- To ensure this alignment, design your supply chain strategy around several key elements—the customer-service proposition, sales channels, value system, operating model, and asset footprint.
- Test the supply chain strategy frequently against several criteria. Is it aligned with your company's power position? Is it tailored to the right level of complexity? Is it resilient, responsible, and adaptable?
- Evaluate and update the supply chain strategy regularly—top-flight performance demands it.

This page intentionally left blank

BASF: INCREASING FARM YIELDS THROUGH INNOVATIONS IN CHEMISTRY

A few weeks before harvest time, unusually heavy rains have drenched wheat fields all over Germany, making a devastating fungal infestation likely. A protective fungicide is needed right away. The best solution is Adexar®, BASF's innovative control agent. However, the timing is extremely tight. Farmers, who can't keep a supply of the agent on hand because they lack adequate storage facilities for housing this kind of material, need to be able to get Adexar from the nearby dealer with little advance notice. Moreover, they have little time to administer the fungicide before harvest.

Meanwhile, in Brazil, millions of acres are now being prepared for soybean planting. Farmers there can count on Opera®, another protective fungicide in BASF's portfolio. After inspecting the fields, locally stationed BASF representatives provide guidance on how to use this high-tech product to ensure that it's applied correctly and efficiently.

In both scenarios, BASF, the world's largest chemical company, must make sure that the product is delivered from the warehouse to the distributor in the next 24 hours, and there's no margin for delay. Complicating matters, the total lead time required to produce these fungicides is well over a year.

MASTERING A MULTI-INDUSTRY CHAIN

The timing of Adexar's and Opera's production and delivery would pose a challenge for any supply chain. It's even more daunting in this case because these are just two of thousands of products that BASF sells. The company's portfolio covers a wide range of areas, including chemicals, plastics, performance products, crop protection, and oil and gas. Products include chemicals for semiconductors, polyurethanes for packaging and car parts, pigments for inks, technology for the production of liquefied natural gas, thermal insulation used in construction, super-plasticizers to improve the flow of wet concrete, coating for automobiles, super-absorber for baby diapers, and made-to-measure molecules for pharmaceuticals. Not to mention several crop-protection agents.

THE VALUE OF *VERBUND*

Producing and delivering so many different kinds of products requires an unusually versatile supply chain. For decades, BASF's secret recipe for success has been a novel production approach called *Verbund*, or "linked to the ultimate degree." At each Verbund site—there are six in all, located around the globe—the Verbund system creates efficient value chains that extend from basic chemicals right through to high value-added products such as coatings and crop protection agents. In addition, the by-products of one plant can be used as the starting materials of another.

In the Verbund system, chemical processes consume less in the way of raw materials and energy while producing higher product yields. As a result, Verbund helps conserve resources, minimize emissions, and reduce transport distances. For these reasons, Verbund provides benefits that are ecological as well as economical.

The Verbund model continues to provide a substantial source of competitive advantage. Recent changes in the business environment, however, have required BASF to take additional steps to maintain its edge. As the number of competitors increased worldwide and offerings that once commanded

a premium became commodities, several BASF business units recalibrated their overall strategies. In an effort to focus more strongly on the customer, they expanded the proportion of specialized higher-value products in the portfolio.

The new offerings included higher-technology products, such as Adexar. They also included solutions—that is, products with services wrapped around them. For example, instead of selling just paint to the automotive industry, BASF's coatings experts work on the original equipment manuafucturer's (OEM's) production line, providing support during the car-body-painting process. Both products and solutions create greater value for the customer while generating higher margins and return on capital for BASF.

These offerings, however, posed a new challenge for the supply chain. Since the customer segments across the different business units had widely varying needs, the higher service levels spawned an enormous variety of planning and sourcing processes, as well as IT systems. The supply chain of BASF's Crop Protection Division, for example, had to be able to meet demands for fungicide within a day's notice in different parts of the world without creating unacceptable levels of inventory.

HARMONIZED PROCESSES

Clearly, a one-size-fits-all approach was infeasible. BASF experts looked instead to streamline supply chain processes without sacrificing responsiveness. To get the best of both worlds, they established a central supply chain organization whose mission was to integrate supply chain operations enough to allow each business unit to execute its own business strategy without sacrificing the economies that were possible with BASF's global scale. This meant providing the business units with sufficient flexibility to maximize revenues while at the same time managing costs across the enterprise.

The solution was harmonization, which BASF defined as a standardization of processes with some room left for variations. Key to the effort were "global process experts," who were tasked with formulating a number of standard supply chain processes, each of which featured a menu of options.

The idea is for each business unit to use the basic process as it was defined, with a choice of various options for the parts of the process that involve direct interaction with the customer.

"We have a backbone of the order-to-cash process, which is more or less the same for everybody," explains Andreas Backhaus, senior vice president of global supply chain and process innovation. "You get an order in, you allocate it and you transport it to the customer." The order, however, could be received in a variety of ways—telephone, fax, or e-commerce channels. Correspondingly, there might be several different ways of providing order dates and managing the scheduling of deliveries, thus allowing each unit to deploy the process that is best suited to its business.

As a result of these changes, processes taking place on the back end are highly standardized, with filling, warehousing, and logistics carried out for all the business units. By contrast, the parts of the supply on the front end—that is, the processes where BASF directly interacts with the customer—are more customized. Those are the processes in which BASF invests the most because they help differentiate BASF's offerings from those of competitors.

"The supply chain is critical to our goal of moving closer to our customers," says Robert Blackburn, president of BASF Group's information services and supply chain. "We are developing differentiated supply chain models that will allow BASF to leverage our economies of scale and extensive knowledge of our customers' industries."

DEALING WITH UNPREDICTABLE DEMAND A YEAR IN ADVANCE

BASF's harmonized supply chain processes provide a starting point for the Crop Protection Division supply chain in its effort to produce and deliver its fungicides to farmers. The unit uses the same processes for filling, warehousing, and logistics as other business units, while tailoring distribution and the supporting planning processes to meet the needs of its distinctive business model.

The crop protection business is unique among BASF businesses in a number of respects. For one thing, it produces goods for the end customer, in this case the professional farmer. These products have to earn the money to cover very high R&D investments, much like pharmaceuticals. Additionally, in most cases BASF does not sell its products directly to farmers. Rather, it sells to distributors, which store the fungicides in warehouses and sell them to farmers on a per-need basis.

PLANNING CHALLENGES

These factors in combination present some unique planning challenges. Basically, the agricultural supply chain organization needs to predict demand for its many products accurately enough that distributors have sufficient quantities on hand to meet farmers' last-minute orders without building up excess inventory. Owing to unpredictable factors like disease and weather, however, that's not easy to do. The average accuracy of demand forecasting for agricultural products rarely surpasses 70 percent.

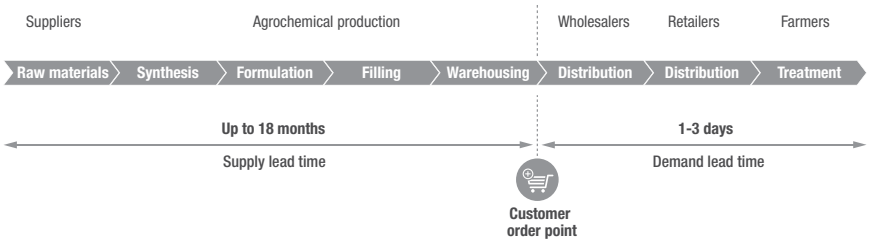
What makes planning so important—but also so difficult—is the lead time involved. It takes a long time to produce the high-tech chemicals that go into the fungicides—in some cases as long as 18 months. That needs to be balanced with the customer's need to receive delivery within a day of placing an order. Products are formulated with an eye to always having sufficient levels of active ingredients in stock, but those ingredients are expensive and perishable. Moreover, some products can become obsolete if laws or registration requirements change. As a result, keeping extra stock on hand is not an option.

In addition, fungicides must be registered in the country where they are to be sold. A fungicide that's registered in one country cannot just be sold in another without having a registration there. Product formulations also vary according to the regulations of the particular market. So both product formulations and labels must be customized. This means BASF generates a great many end products that are produced in relatively small batches, each with a different formulation and label. To take one example:

BASF has some 1,500 agricultural-product references for the region of Europe, Africa, and the Middle East, which encompasses several thousand customers. When all the customized formulations and labels are tallied, there are more than 10,000 unique saleable items to deal with.

Taken together, these different issues make demand planning an arduous task, requiring the Crop Protection Division supply chain organization to continuously weigh working-capital costs against lost sales. And it's not just a matter of the current year's sales that are at stake: lost revenue can lead to long-term loss of customers to competitors as well.

The Agrochemical Supply Chain



Source: BASF

DEMAND PLANNING AT WORK

The typical agricultural-products consumer is a farmer who contacts the local wholesaler or distributor to place an order. The wholesaler places an order with the distributor, who ships the fungicide to the wholesaler or directly to the farm. Thanks to real-time visibility on these inventory levels, BASF can replenish inventory within 48 hours.

BASF's demand-planning process ensures the fungicide is available for replenishment. For most products (that is, those for which demand is fairly stable), the agricultural supply chain has a process for aligning demand and supply that occurs twice per year, six months or so before the beginning of the spring and autumn growing seasons. In this process, demand by country is aligned with supply, and volumes of supply are allocated to each country. The final plan is then used to develop a production plan for the formulation plants. On the eve of the growing season, as farmers

prepare to plant their first seeds, BASF conducts price negotiations with its distributor customers. The supply chain organization uses this information to further refine the plan for the products in the case of short supply.

In addition to this basic process, the agricultural supply chain organization has a sales and operations planning process that focuses on high-margin products with a significant degree of demand volatility. Regional teams meet once a month with the global team to update the demand forecast and to determine the needed quantity of supply.

The real test of supply chain excellence is reliability. "Our daily work is about fulfilling our customer's expectations on what they get by when," notes Henry Comolet, head of sales excellence for Europe, Africa, and the Middle East. "This is our daily mission." The goal of the overall planning process is to ensure BASF can keep those commitments.

PRODUCTS IN THE FIELD

Although BASF's agricultural supply chain focuses much attention on getting demand planning right, it also goes to great effort to ensure the correct and most efficient use of its products in the field. Several years ago, some BASF agronomists deployed an initiative with farmers in India called *Samruddhi*, Sanskrit for prosperity. Through town hall education, on-field trials, and visits to individual farms, sales representatives provide advice on crop yields, price setting, and profitability. The initiative has proved quite successful, resulting in higher yields and net income for the farmers. Since that time, the strategy has been rolled out to other countries in Asia as well as a number in Africa.

MEASURES OF SUCCESS

BASF has a strong focus on business performance management and is known for constantly evaluating and optimizing its portfolio. From a supply chain perspective, performance measurement and management are priorities. The central supply chain performance measurement

team produces monthly reports for senior management and for supply chain operations; the team also helps managers across the company in understanding supply chain performance data. These reports are provided to each of BASF's global businesses and cover key supply chain measures such as inventory figures, logistics costs, and customer delivery performance.

Managers across the company use these data to create real value for BASF. They use logistics costs and customer service data to optimize the physical network as well as to negotiate with service providers. Inventory data are a key input in product portfolio decisions as well as in the monthly planning process.

Data are particularly important for understanding customer delivery performance. For agriculture, this means collecting data from more than 400 shipping points around the globe. "BASF looks at customer delivery from both perspectives—whether deliveries reach the customer on the date requested by the customer as well as the date BASF committed to," explains Senior Manager for Supply Chain Performance Measurement Traci May. "Because customer service is a top priority, performance data are updated on a daily basis and made available online to people across the business."

The supply chain performance measurement team works closely with what BASF calls a "community network." Consisting of representatives from each of the businesses, the community network sees to it that measurement standards are applied across the company. It also ensures the ongoing evolution of the system by defining solutions that meet the specific requirements of each business.

Once again, harmonization, not standardization, is the rule. The supply chain performance team works with the community to take into account business-specific measurement needs so that each unit can monitor its supply chain operationally, while maintaining globally consistent key performance indicators for management reporting and benchmarking purposes. By measures both objective and subjective, BASF's supply chain transformation is achieving success and contributing value to the enterprise.

But responsive agricultural supply chains are more than just a business objective at BASF—they are a social imperative. It's estimated that without crop protection products, nearly half of the worldwide harvest would be lost each year.[1] As the world population continues to grow, the need for greater agricultural yields will grow as well.

BASF's global supply chains will need to keep evolving to meet this need. Since getting innovative products from the lab to the fields isn't likely to get easier anytime soon, mastering this challenge will be essential to ensuring that the world's food supply keeps pace with demand.